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THE MALE OCCUPATIONAL STRUCTURE OF ENGLAND AND WALES, 1600-1850



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This dissertation is submitted for the degree of Doctor of Philosophy

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ABSTRACT

This dissertation builds on a strong foundation: thirteen years of hard and inspired work by members of the ‘Occupational Structure of Britain 1379-1911’ project, led by Leigh Shaw-Taylor and E.A. Wrigley. It employs much of the project’s data – such as the digitized censuses and parish register datasets – as well as occupational and geographic codification systems. Its contribution to the project is threefold. Firstly, it incorporates an additional data source, namely the occupational data contained in probate documents, to resolve the deficient coverage provided by the project’s current data sources in the seventeenth and eighteenth century. Probate documents provide millions of occupational observations in these centuries, but are themselves a seriously flawed source of occupational information since they are severely socially and occupationally biased. An approach is presented and proven to yield reliable results, which employs parish register data to calibrate the probate data and, subsequently uses the – now no longer biased – probate data to interpolate and extrapolate the parish register data.

Secondly, this dissertation presents a solution for allocating the numerous men with the indistinct occupational descriptor of ‘labourer’ to occupational sectors, based on non-linear, constrained regression analyses. This has important advantages over existing allocation methodologies, being more reliable, more precise and, most importantly, capable of allocating labourers not merely at the national scale but also at regional and local scales.

Thirdly, it provides an answer to one of the Occupational Structure project’s most common criticisms: that early-modern men frequently engaged in gainful activities in addition to their principal occupation, and that these so-called by-employments therefore challenge occupational estimates based on principal occupations only. It is shown that the source on which the impression of ubiquitous male by-employments is based exaggerates their incidence with a factor of two. And it demonstrates that by-employments were overwhelmingly carried out by household members other than the male ‘household head’ and, as a result, do not truly distort principal-employment-only male occupational estimates after all.

All this results in a new set of estimates for the male occupational structure of England and Wales between 1600 and 1850, in twenty-year time intervals, at the level of sectors (primary, secondary, tertiary) and sub-sectors (farmers, miners, textile workers, transport workers, etcetera), at national, regional, and local geographical scales. The new estimates have two important implications for our understanding of the transition to modern economic growth, pioneered in Britain during this period.

First, they provide conclusive evidence for an observation made by Shaw-Taylor et al based on earlier, preliminary occupational estimates, namely that the structural shift from agriculture to

the secondary sector which has widely been associated with the above transition, was actually already complete by 1760, at the start of the Industrial Revolution. Indeed, the new estimates push this type of structural change back into the seventeenth and partially even the sixteenth century. Structural change during the Industrial Revolution is a central feature of the highly influential national accounts literature, based on occupational estimates derived from contemporary social tables which, as this dissertation shows, are a gravely flawed source. This, in turn, means that the national accounts literature greatly underestimates productivity growth in the secondary sector during the Industrial Revolution and, thereby, the effects of technological and organisational innovation. Thus, the new occupational estimates provide strong arguments for the partial resurrection of the so-called ‘discontinuity interpretation’ of the Industrial Revolution.

Second, they provide a detailed, quantitative basis for what could be called the ‘regional critique’ of the national accounts literature, namely that even if the discontinuity interpretation of the Industrial Revolution should not hold at the national scale, it does hold at *smaller* geographical scales. The new estimates paint a national picture of merely slow and limited shifts in male labour force during the eighteenth and early nineteenth century; but they also show that, below this calm surface, this was a period of great turbulence, which witnessed rapid concentration of economic activities in specific counties, in small regions within counties, in towns compared to the surrounding countryside – with all of these rapidly specialising regions held together by an ever growing transport sector. The role of small, highly specialist regions as incubators of technological innovation and novel forms of economic organisation is well-known in present-day economies. Since the new estimates show that strong regional specialisation clearly preceded the Industrial Revolution, it raises the intriguing question to which degree a uniquely decentralised yet well-integrated early-eighteenth-century economy was instrumental or even crucial in Britain’s precocious transition to modern economic growth.

PREFACE AND ACKNOWLEDGEMENTS

This dissertation aims to answer a straightforward question: what was the composition of the early-modern and early-industrial male labour force in England and Wales? It does this by building on the ground breaking work of Leigh Shaw-Taylor, Tony Wrigley, and other members of the ‘Occupational Structure of Britain, 1379-1911’ project. When I joined this project as a graduate student, I walked into a treasure house of data and knowledge. All of the census and parish register data and a substantial part of the probate data which, together, constitute the evidence base on which this dissertation is built, had already been collected by members of the project. Occupational codification systems were in place, as well as geographic information systems linked to census units, parishes, and townships. This enabled me to focus on confronting three central methodological problems. The solutions to these problems and their application to the existing and newly collected historical data, led to a new set of occupational estimates, at twenty-year time intervals, at the national, regional, and local scales, and at various levels of occupational abstraction. Together, these estimates constitute my answer to the question above. They are presented in this document, and particularly in the appendices, in the form of a large number of tables, figures, and maps.

An answer formulated at such diverse geographic and occupational scales connects with a similarly diverse set of historiographies. At the national level, it creates a new basis for the critical assessment of the national accounts literature on the Industrial Revolution, in the form of detailed quantitative information on the timing and extent of structural change and productivity growth during the seventeenth, eighteenth, and early-nineteenth century. At the level of counties, it provides a basis for a regional critique of the national accounts literature and, combined with sub-county level estimates, for engaging with the wide-ranging literature of local histories. At the level of (groups of) occupations, it creates a quantitative basis for a dialogue with the historiography on economic (sub-)sectors. To fit my analyses into the time available for a PhD and my results into the word limit of a PhD dissertation, I have been forced to be selective. I have explored the potential ramifications of my findings for the national accounts literature, including the regional critique. But I have not attempted to engage the specialist literature at the level of individual counties and below, and at the level of economic sub-sectors.

Without the prior work and the support of the Cambridge Group, even that would have been impossible. I would like to express my gratitude to the members of the Group, especially to its director and my supervisor, Leigh Shaw-Taylor. His critical but always constructive feedback on my approach and results was invaluable, his help in providing additional information for my analyses was vital, and his openness about the data and calculations underpinning his own estimates was exemplary. I would also like to thank him and Tony Wrigley for having the

audacity and resolve to start the ambitious Occupational Structure project in the first place, now some thirteen years ago. Other members of the Cambridge Group to which I am especially grateful are Max Satchell, for his help and advice on all things GIS, Jacob Field, for the collection and codification of probate indices, and Gill Newton, for her guidance on using the parish register data. I would like to thank the Economic and Social Research Council, as well as the president and fellows of Queens' College for their financial support. Finally, gratitude is due to the several bodies who have provided funding for the Occupational Structure of Britain project over the years: the Economic and Social Research Council, the Leverhulme Trust, the British Academy, and the Isaac Newton Trust.

DECLARATION

I declare that this thesis is my own work and includes nothing which is the outcome of work done in collaboration. Where reference is made to the work of others, the extent to which that work has been used is indicated and duly acknowledged in the text, footnotes and bibliography.

It is not substantially the same as any that I have submitted, or, is being concurrently submitted for a degree or diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. I further state that no substantial part of my dissertation has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University of similar institution except as declared in the Preface and specified in the text.

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1 INTRODUCTION

The British classical economists – Adam Smith, Robert Malthus, David Ricardo, John Stuart-Mill – perceived the prospects of economic growth in the terms which had been appropriate for human history until the middle of the eighteenth century: as, at best, provisional.¹ In hindsight, it is clear that this was progressively no longer true in their own days. The British Industrial Revolution introduced the world to a new reality, in which significant economic growth would be the norm rather than the exception. But despite its obvious importance, the first Industrial Revolution is still poorly understood. Significant progress has undeniably been made in the last few decades, in particular by the leading lights of the national accounts approach but, as discussed below, critical elements of their findings rely on occupational information which is crude and fundamentally flawed. The ‘Occupational Structure of Britain, 1379-1911’ project, led by Leigh Shaw-Taylor and Tony Wrigley, has begun to build a superior, detailed understanding of the composition of the labour force in England and Wales before and during industrialisation.² As will be discussed, the first results from this approach make it clear that some of the occupational assumptions behind the national accounts approach are, indeed, incorrect. That said, the current pre-census evidence of the Occupational Structure project is itself also not without problems. The main weaknesses of the project’s current evidence will be identified – to be addressed in subsequent chapters.

¹ Smith, *An inquiry into the nature and causes of the wealth of nations* (Edinburgh: Silvester Doig and Andrew Stirling, Adam Black, and John Fairbairn, 1817), Vol. I, Ch. IX, pp. 118-33; Malthus, *An essay on the principle of population*, 2nd edn (London: J. Johnson, 1803); Ricardo, *On the principles of political economy, and taxation*, 3d edn (London: John Murray, 1821), Ch. 2, pp. 49-76; Mill, *Principles of political economy*, People's edn (London: Longman, Green, Longman, Roberts, and Green, 1865), Bk IV, Ch. VI, pp. 452-55.

² And in Scotland, albeit for now only from 1841.

1.1 The importance of understanding occupational developments in England and Wales during the 1600-1850 period

Many reasons for being interested in ‘work’ and ‘labour’ are not unique to economic historians. Work occupied a major share of the waking hours of men, women and, often, even of children – much as it does today, although children’s work has mercifully become rare in Western societies. Someone’s work and the types of occupations which were open to him or her were often directly correlated with other important individual and household characteristics such as status, gender, prosperity, financial and social capital, consumption patterns, and education – as is still the case today, albeit not necessarily in the same fashion or to the same degree.³ Work and the way it was organised and remunerated was an important determinant of the inequality of wealth and power, between employers and employees, masters and apprentices, customers and suppliers, husbands and wives, parents and children, even masters and slaves – again, with important parallels in our society, economy, and political landscape today.

But there are also more specific reasons why economic historians are or, at least, should be interested in understanding ‘work’. Direct information on the national economy in Britain in terms of outputs, that is, quantities and prices of goods and services produced, is scarce before the advent of national accounts in the 1940s.⁴ Quantitative data on the division of the labour force across occupational sectors and subsectors often provide us with the best available – albeit indirect – information, on the composition of the economy. As will be discussed, this is especially the case at sub-national geographical scales. Furthermore, since work was usually the dominant, and always an important factor of production, insight into developments in the labour force are required to estimate productivity growth and gauge the room for improvements in the standard of living where and when independent output measures are available. A proper understanding of the historical economy and its development is thus dependent on reliable information on the contemporary occupational structure.

Both of these reasons are especially urgent for historians trying to understand the nature and causes of the first Industrial Revolution, as it unfolded in Britain at the end of the eighteenth century. Many economists analysing modern economic growth have reserved an important role

³ For well-known studies in which such individual and household characteristics are linked to occupations see Weatherill, *Consumer behaviour and material culture in Britain, 1660-1760*, 2nd edn (London: Routledge, 1996); Shamma, *The pre-industrial consumer in England and America* (Oxford: Clarendon Press, 1990); Roche, *The culture of clothing: dress and fashion in the 'ancien regime'* (Cambridge: Cambridge University Press, 1994); Jones, ‘Wealth estimates for the New England colonies about 1770’, *The Journal of Economic History*, 32:1 (1972), pp. 98-127.

⁴ Starting with James Meade and Richard Stone’s first tables in 1941; Meade and Stone, ‘The construction of tables of national income, expenditure, savings and investment’, *Economic Journal*, 6 (1941), pp. 216-33.

for structural change in their models. Arthur Lewis, for example, perceived a direct link between industrialisation and a shift in the occupational structure from agriculture to industry, by which underutilised labour in the former was put to more productive use in the latter.⁵ Simon Kuznets too emphasized the role of structural change in the transition to modern economic growth, from agriculture to industry, and from both towards the tertiary sector.⁶ Walt Rostow's five-stages model of economic growth was also strongly structuralist in nature, with the share of the working population engaged in agriculture declining from seventy-five to forty per cent during the 'take-off' stage, and to twenty per cent during 'drive to maturity' stage.⁷ Structural change is arguably put centre stage most explicitly in the so-called three-sector hypothesis, developed in the 1930s and 40s by Alan Fisher, Colin Clark, and Jean Fourastié.⁸ In their models, workforce shifts from the primary to the secondary sector and (much) later to the tertiary sector are the result, on the one hand, of changing demand patterns which themselves result from rising living standards and, on the other hand, of labour productivity differences between the sectors. Fourastié's stylized estimates for labour force shares before, during, and after industrialisation have been summarised in Figure 1.

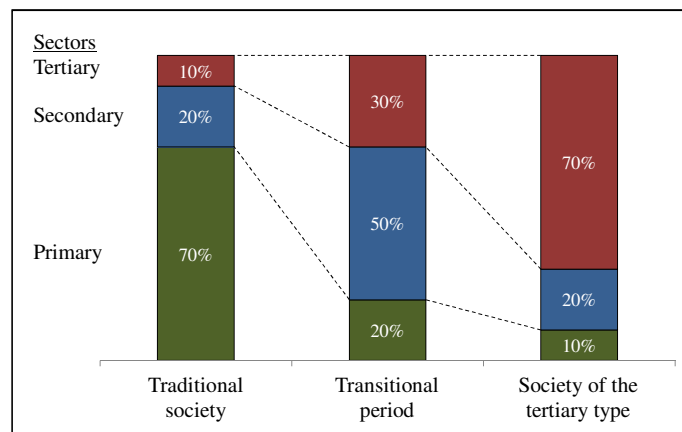


Figure 1. The evolution of (stylized) sectoral workforce shares according to Fourastié

⁵ Lewis, 'Economic development with unlimited supplies of labour', *The Manchester School*, 22:2 (1954), pp. 105-38..

⁶ Kuznets, *Modern economic growth: rate, structure, and spread* (New Haven: Yale University Press, 1966). See also his lecture when accepting the Nobel memorial prize in Economics in 1971: Kuznets, 'Modern economic growth: findings and reflections' in Lindbeck (ed.), *Nobel lectures, Economics 1969-1980* (Singapore: World Scientific Publishing Co., 1992), pp. 87-102.

⁷ Rostow, *The stages of economic growth: a non-communist manifesto*, 3d edn (Cambridge: Cambridge University Press, 1991), p. 71.

⁸ Fisher, *The clash of progress and security* (London: MacMillan, 1935); Clark, *The conditions of economic progress*, 3d edn (London: MacMillan, 1960), Ch. IX, in particular pp. 490-520; Fourastié, *Le grand espoir du XXe siècle; progrès technique, progrès économique, progrès social* (Paris: Presses universitaires de France, 1949).

More specific to the transition to modern economic growth in Britain, Phyllis Deane and W.A. Cole, Nick Crafts and Knick Harley, and, most recently, Stephen Broadberry et al have built on estimates of the contemporary occupational structure to generate national output estimates for economic sectors for which no independent data existed. For example, Crafts's estimates for domestic and personal services are based on Deane and Cole's assumptions of 1.37 per cent annual growth in employment and negligible labour productivity growth, as do Broadberry et al's.⁹ Where independent output estimates were available, the national accounts literature employs workforce shares to calculate sectoral productivity developments.¹⁰ It is here where one encounters one of the most remarkable elements of the dominant view of the British Industrial Revolution, as formulated by Crafts and Harley, namely that labour productivity growth in industry was slow, slower indeed than in agriculture.¹¹ This is the direct mathematical consequence of the relatively limited industrial output growth in their calculations combined with substantial labour migration from agriculture to industry. Whereas Crafts and Harley's results force one to question the magnitude of an industrial productivity spurt created by T.S. Ashton's schoolboy's 'wave of gadgets', the structural shift in the labour force retains its eminence as a truly revolutionary economic development in 1760-1830 Britain.¹²

This interpretation has not gone unchallenged.¹³ But Crafts and Harley have had to concede to their critics in only one area: that their national accounts approach potentially hides

⁹ Crafts, *British economic growth during the Industrial Revolution* (Oxford: Clarendon, 1985), p. 36; Deane and Cole, *British economic growth, 1688-1959: trends and structure*, 2nd edn (Cambridge: Cambridge University Press, 1967), p. 166; Broadberry et al, *British economic growth, 1270-1870* (Cambridge: Cambridge University Press, 2015), pp. 174-5.

¹⁰ See, for example, Broadberry et al, *British Economic Growth*, pp. 364-9.

¹¹ Crafts, *British economic growth*, pp. 83-6.

¹² Ashton, *The Industrial Revolution, 1760-1830* (London: Oxford University Press, 1948), p. 59. For another famous formulation of this traditional, technology-driven interpretation of the Industrial Revolution, see Landes, *The unbound Prometheus: technological change and industrial development in western Europe from 1750 to the present* (London: C.U.P., 1969).

¹³ Notably in Hoppit, 'Counting the Industrial Revolution', *The Economic History Review*, 43:2 (1990), pp. 173-93; Berg and Hudson, 'Rehabilitating the Industrial Revolution', *The Economic History Review*, 45:1 (1992), pp. 24-50; Jackson, 'Rates of industrial growth during the Industrial Revolution', *The Economic History Review*, 45:1 (1992), pp. 1-23; Esteban, 'British textile prices, 1770-1831: are British growth rates worth revising once again?', *The Economic History Review*, 47:1 (1994), pp. 66-105; Temin, 'Two views of the British Industrial Revolution', *The Journal of Economic History*, 57:1 (1997), pp. 63-82. For Crafts and Harley's reply to these criticisms, see Crafts and Harley, 'Output growth and the British Industrial Revolution: a restatement of the Crafts-Harley view', *The Economic History Review*, 45:4 (1992), pp. 703-30; Harley and Crafts, 'Cotton textiles and industrial output growth during the Industrial Revolution', *The Economic History Review*, 48:1 (1995), pp. 134-44; Harley and Crafts,

developments at local and regional scale which may well have been in keeping with the older ‘take-off’ interpretation of the Industrial Revolution.¹⁴ Lack of sub-national data has stood in the way of a quantitative validation or refutation what in this dissertation will be referred to as the ‘regional critique’. But the national picture painted by Crafts and Harley in the 1980s is, arguably, still the orthodoxy today. That said, Broadberry et al’s recent work represents a cautious return to ‘an earlier view of the industrial revolution with its emphasis on productivity-enhancing technological innovation’.¹⁵

However, Broadberry et al’s estimates, just like those of Crafts and Harley, and Deane and Cole before them, essentially depend on the same sources of occupational information. The credibility and accuracy of these sources are reviewed in the next section – and found wanting.

1.2 The problem with occupational estimates derived from social tables

The occupational estimates used in the national accounts literature for the late seventeenth, eighteenth, and early nineteenth century are all based on the so-called ‘social tables’ constructed by Gregory King, Joseph Massie, and Patrick Colquhoun, either directly or via the re-worked tables of Peter Lindert and Jeffrey Williamson.¹⁶ This is also true for the greenest branch in the

‘Simulating the two views of the British Industrial Revolution’, *The Journal of Economic History*, 60:3 (2000), pp. 819-41.

¹⁴ For the principal formulations of this ‘regional critique’, see Langton, ‘The Industrial Revolution and the regional geography of England’, *Transactions of the Institute of British Geographers*, 9:2 (1984), pp. 145-67; Berg and Hudson, ‘Rehabilitating’, pp. 38-9; Hoppit, ‘Counting’, p. 186. These build on Sidney Pollard’s earlier work; see for example Pollard, *Peaceful conquest: the industrialization of Europe, 1760-1970* (Oxford: Oxford University Press, 1981). See also Crafts and Harley’s reply to this critique: Crafts and Harley, ‘Restatement’, p. 721.

¹⁵ Broadberry et al, *British Economic Growth*, p. 369.

¹⁶ King, ‘Natural and political observations and conclusions upon the state and condition of England’, in Barnett (ed.), *Two tracts by Gregory King* (Baltimore: Johns Hopkins University Press, 1936); Massie, *Computation of the money that hath been exorbitantly raised upon the people of Great Britain by the sugar planters, in one year, from January 1759 to January 1760; shewing how much money a family of each rank, degree or class hath lost by that rapacious monopoly having continued so long after I laid it open, in my state of the British sugar-colony trade, which was published last winter* (London: T. Payne, W. Owen and C. Henderson, 1761); Colquhoun, *A treatise on indigence; exhibiting a general view of the national resources for productive labour with propositions ameliorating the conditions of the poor and improving moral habits and increasing the comforts of the labouring people, particularly the rising generation; by regulations of political economy, calculated to prevent poverty from descending into indigence, to produce sobriety and industry, to reduce the parochial rates of the Kingdom, and generally to promote happiness and security of the community at large by the diminution of moral and penal offences, and the future prevention of crimes.* (London: J. Hatchard, 1806); Lindert, ‘English occupations, 1670-1811’, *The Journal of Economic History*, 40:4 (1980), pp. 685-712; Lindert and Williamson, ‘Revising England’s social tables 1688–1812’, *Explorations in Economic History*, 19:4 (1982), pp. 385-408.

national accounts tree: Broadberry et al, despite having had access to preliminary calculations of the male occupational structure generated by the Occupational Structure project appear, 'given the provisional nature of [these] results', to have felt compelled to base their estimates of the occupational structure in the late seventeenth, eighteenth, and early nineteenth century on the above social tables instead.¹⁷ These tables, being contemporary, may at first sight seem fairly reliable, but that impression is deceptive, as a closer look at the most famous of them, Gregory King's table for 1688, reveals.

Broadberry et al's use of language when describing the social tables of King and others appears calculated to suggest accuracy and solidity: 'these writers had access to a rich array of data sources ... containing valuable information about occupations in combination with geographic details of the life-cycle events of birth, marriage and death ... as well as detailed information on specific tax revenues', with King described as even organising 'his own mini-censuses'.¹⁸ But more critical readers of King's 'observations and conclusions' judge them rather differently, as marred by 'a spurious credibility that has deceived many people' and 'far more the product of strained deduction, of mathematical juggling, or even plain guesswork, than of firmly grounded information'.¹⁹ These historians consider his social table as 'no more than a theoretical product of political arithmetic ... [which] better-informed later generations should not have fallen for'.²⁰ This has been judged as particularly the case for the secondary sector, as King's 'handling of those engaged in trade and manufacture was so inadequate as to be almost bizarre'.²¹ Lindert and Williamson, on whose reworking of the social tables both Crafts and Broadberry et al based their own estimates, had to multiply King's estimates for the secondary sector by a factor of almost four to get anywhere near a figure they considered probable.²² Paul Glennie felt that even with such revisions, social tables 'remain informed guesswork, however, with very wide margins of error'.²³ Broadberry et al suggest that King's figures are more reliable than Massie's, since the latter had a specific interest to serve.²⁴ But so had King, who wanted to demonstrate

¹⁷ Broadberry *et al*, *British Economic Growth*, pp. 345-60.

¹⁸ *Ibid*, p. 351.

¹⁹ Arkell, 'Illuminations and distortions: Gregory King's Scheme calculated for the year 1688 and the social structure of later Stuart England', *The Economic History Review*, 59:1 (2006), p. 40; Holmes, 'Gregory King and the social structure of pre-Industrial England', *Transactions of the Royal Historical Society*, 27 (1977), p. 63.

²⁰ Arkell, 'Illuminations', p. 65.

²¹ *Ibid*, p. 55.

²² Lindert and Williamson, 'Social tables', p. 393.

²³ Glennie, *'Distinguishing men's trades': occupational sources and debates for pre-census England* (Bristol: Historical Geography Research Group, 1990), p. 4.

²⁴ Broadberry *et al*, *British Economic Growth*, p. 324.

that England should cease the war with France as it taxed the already financially overburdened landed gentry too heavily.²⁵

Not only are King’s figures unreliable, they are also phrased in a terminology which has merely tenuous links to what we would consider an occupational structure. Understandably for a landed gentleman aiming to demonstrate the weight of the tax burden, his interest in the nobility, clergy, learned men, international merchants, and military and naval officers was much greater than in poorer families. The latter make up only a third of the ‘classes’ in King’s table, despite representing ninety-four per cent of all families. This leads to rather unhelpful categories such as ‘laboring people and outservants’ and ‘cottagers and paupers’ which, together, represent fifty-five per cent of the population in King’s table. It is therefore not surprising that this table has given rise to widely varying translations into occupational structures, as Figure 2 – created from data tabulated by Shaw-Taylor for the purpose of making this point – shows for the agricultural sector.

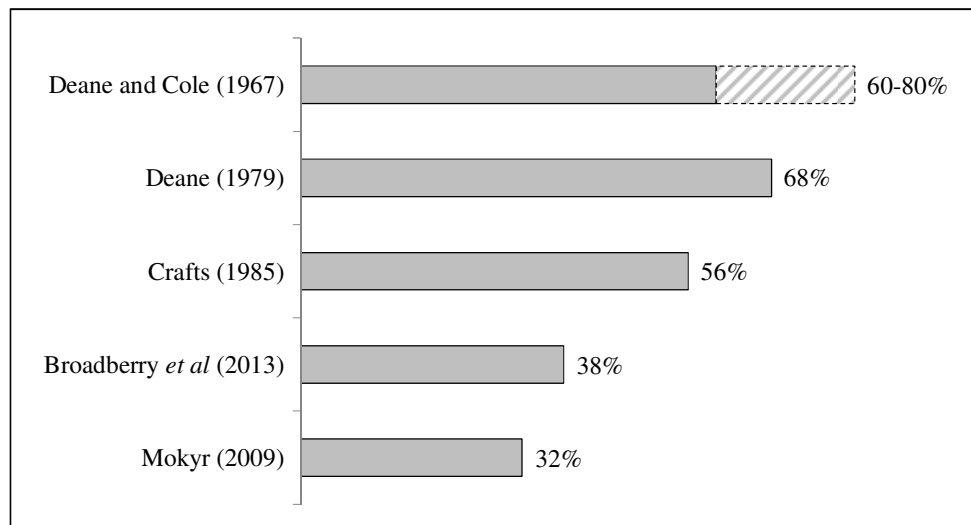


Figure 2. The agricultural share of the labour force in 1688, according to different interpretations of Gregory King’s social table

Source: Courtesy of Leigh Shaw-Taylor, who collected/calculated the above figures from the original books and papers.²⁶

²⁵ Lindert and Williamson, ‘Social tables’, p. 385.

²⁶ Shaw-Taylor, ‘The occupational structure of England and Wales 1381-2011; a preliminary and tentative overview’, paper presented at the Economic History Society Annual Conference, Warwick, 2014. The sources Shaw-Taylor used are Deane and Cole, *British economic growth*; Deane, *The first industrial revolution*, 2nd edn (Cambridge: Cambridge University Press, 1979); Crafts, *British economic growth*; Broadberry, Campbell, and van Leeuwen, ‘When did Britain industrialise? The sectoral distribution of the labour force and labour productivity in Britain, 1381–1851’, *Explorations in Economic*

In short, social tables like King's are of dubious value as a source of historical occupational information. Not only are they unreliable, but they allow those who base their occupational estimates on them far too much freedom of interpretation. One can speculate how much of a coincidence it is that Broadberry et al ended up so much closer to the Cambridge Group's occupational estimates – as available in working paper form – than Crafts, and Deane and Cole.²⁷

The social tables are flawed sources of information on the labour force in other, more readily apparent respects too. They provide hardly any occupational details below the top-level sectors, particularly for the secondary sector. They divide society into families, characterised only by the status or occupation of the, usually male, 'household head', ignoring the potentially quite different gainful activities of other household members, such as his wife. They are only available for a few, isolated years. And they do not provide any information below the national level.

To remedy these deficiencies, Shaw-Taylor, Wrigley, and other members of the Cambridge Group set out in 2003 to develop detailed occupational estimates for Britain, at national and local scales, for men and women, covering the 1379-1911 period, using as wide a range of primary sources as possible. These efforts and their results are discussed below. But before that, it is necessary to briefly explore other existing occupational estimates.

1.3 Other existing estimates, their limitations, and their promise

A society's occupational structure is typically related to other characteristics. For example, in the three-sector theory, discussed above, the centre of gravity of the labour force shifts from the primary, via the secondary to, ultimately, the tertiary sector in tandem with increasing incomes per capita. By comparing societies post-1945 in different stages of development, Clark, Cummins, and Smith have confirmed the correlation between these two economic features.²⁸ Wrigley, in a celebrated paper, used another logical correlation to estimate the agricultural share

History, 50:1 (2013), pp. 16-27; Mokyr, *The enlightened economy: an economic history of Britain, 1700-1850* (New Haven, London: Yale University Press, 2009).

²⁷ Shaw-Taylor *et al*, 'The occupational structure of England c.1710 to c.1871, work in progress' (Cambridge, 2010), <http://www.geog.cam.ac.uk/research/projects/occupations/britain19c/papers/paper3.pdf>; Shaw-Taylor and Wrigley, 'The occupational structure of England c.1750-1871, a preliminary report' (Cambridge, 2008), <http://www.hpss.geog.cam.ac.uk/research/projects/occupations/introduction/summary.pdf>.

²⁸ Clark, Cummins, and Smith, 'Malthus, wages, and preindustrial growth', *The Journal of Economic History*, 72:02 (2012), p. 365, fig. 1.

of the labour force for England and other European countries, namely that between occupational structure and urbanisation.²⁹

To do this, he divided the historical workforce into an urban and rural part, and estimated the non-agricultural fraction in the latter. As Wrigley himself pointed out, several general assumptions had to be made for this approach to work. Firstly, that 'England was neither a net importer nor a net exporter of food'; an assumption which Wrigley admitted was 'demonstrably false', especially during the eighteenth century, in which England moved from being a significant exporter to a substantial importer of foodstuffs.³⁰ Secondly, that the urban population was entirely non-agricultural. As Robert Allen pointed out, this was probably not wholly true; some six per cent of the Dutch urban population in c.1800 appears to have worked in agriculture, making it likely that there were some agriculturalists amongst England's city dwellers too.³¹ Wrigley's third assumption was that the 'consumption of food per head did not vary between 1520 and 1800', which he acknowledged was 'doubtful'.³² Following Crafts's lead, Allen replaced this assumption by a model estimating agricultural consumption per head based on contemporary prices and per capita income, using price and income elasticities derived from developing countries and nineteenth-century English budget studies.³³ He also included estimates about the agricultural import and export volumes in his calculations. But as Figure 3 shows, the net effect of these refinements were negligible, with Allen's figures being virtually identical to Wrigley's.

²⁹ Wrigley, 'Urban growth and agricultural change: England and the continent in the early modern period', *The Journal of Interdisciplinary History*, 15:4 (1985), pp. 683-728.

³⁰ *Ibid.*, p. 695.

³¹ Allen, 'Economic structure and agricultural productivity in Europe, 1300-1800', *European Review of Economic History*, 4:01 (2000), p. 4; De Vries and Woude, *The first modern economy: success, failure, and perseverance of the Dutch economy, 1500-1815* (Cambridge: Cambridge University Press, 1997), p. 526.

³² Wrigley, 'Urban growth', p. 695.

³³ Crafts, 'English economic growth in the eighteenth century: a re-examination of Deane and Cole's estimates', *The Economic History Review*, 29:2 (1976), pp. 226-35; Allen, 'Tracking the Agricultural Revolution in England', *The Economic History Review*, 52:2 (1999), pp. 212-3.

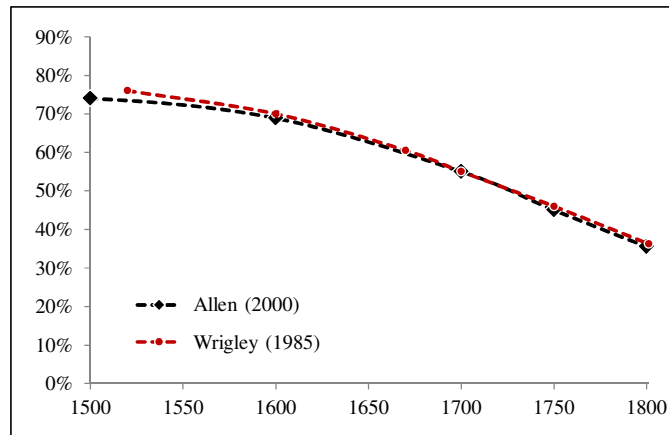


Figure 3. England's agricultural labour share, as derived from urbanisation estimates, 1500-1801

Urbanisation-derived figures have clear advantages over those from social tables. They are not dependent on unreliable estimates from contemporaries with a political axe to grind and do not, as such, require guess work on how to allocate large numbers of 'cottagers' or 'laboring people' to sectors. However, Wrigley's figure for 1801 is based on Deane and Cole's estimates, themselves derived from Colquhoun's social table and from the 1801 census, the occupational information in which Wrigley himself described elsewhere as 'so inconsistent as to be of little value'.³⁴ And earlier estimates are dependent on the non-agricultural fraction of the rural population, which can only be guessed, and on the urbanisation ratio, which is itself subject to a margin of error. Also, they share many of the limitations of the social table estimates, such as being only available at national levels, and not providing occupational details below the top-level sectors.

In contrast to the top-down approach followed by Wrigley and Allen above, some historians have attempted to build up national estimates from local data. Lindert, in a paper preceding and feeding into his later paper with Williamson, used a variety of 'census-like local returns', collected by Peter Laslett and Richard Wall at the Cambridge Group, to estimate England and Wales' occupational structure for six dates between 1670 and 1811.³⁵ His data included lists drawn up for the Marriage Duties Act of 1694, in combination with occupational information

³⁴ Allen suggest his 1800 estimates for European countries are based on censuses – see Allen, 'Economic structure', p. 6, but since English censuses do not provide occupational information until 1831, and only really become reliable and inclusive of female labour in 1851, it is unclear what his 1800 estimate for England is based on. Regarding Wrigley's judgement on the 1801 census' occupational reliability, see: Wrigley, 'Men on the land and men in the countryside: employment in agriculture in early- nineteenth-century England' in Bonfield, Smith, and Wrightson (eds), *The world we have gained: histories of population and social structure: essays presented to Peter Laslett on his seventieth birthday* (Oxford: Basil Blackwell, 1986), p. 329.

³⁵ Lindert, 'English Occupations'.

from burial registers. The number of parishes per sample period varied between twenty-seven and fifty-one for the burial registers, and from fifteen to twenty-six for the 'census-like' sources, generating a sample of, on average, thirteen thousand men and women per time period. To extrapolate from these parish samples to national estimates, a system of linear regressions was used, with male and female occupational shares as dependent (i.e. to-be-predicted) variables and several parish-specific variables such as soil type and the occupational structure of the parish in 1831 as independent (i.e. predictor) variables.

Lindert's approach was both innovative and promising. But the statistical relevance of the 185 regressions which Lindert used to generate his national estimates is difficult to judge. He provides very little detail on them apart from stating they 'yielded moderate fits and some plausible geographic patterns' and that R^2 exceeded .2 for some of the larger occupational shares.³⁶ With no information about how close to normally distributed the samples are, it is unclear whether these R^2 measures can correctly be interpreted as providing a reliable measure of the goodness of fit, and even if they can, they suggest that the correlations only explain twenty per cent of the variation. Furthermore, the sample is simply too small, representing about 0.2 per cent of the population in each time period, with a non-random geographical distribution. Lindert is commendably forthcoming about the range of possible error in his national estimates, describing them as 'wide enough to be very sobering'.³⁷ In his later paper with Williamson, they prefer to rely on figures from the social tables, unless these are clearly very wide of the mark, as in the case of King's estimates for industry and trade, discussed above.³⁸

Paul Glennie generated a male occupational structure for England between 1759 and 1778 using an, in that period, much more numerous source of local data: militia lists.³⁹ The national table is based on estimates from nine (parts of) counties, and constitute nearly ninety thousand men, or about five per cent of English men above the age of twenty. These regional estimates are converted into a national one using the occupational distribution in the 1831 as a guide for extrapolation, but taking differences in population growth rates by county into account. This requires making a number of assumptions which Glennie himself describes as 'unjustifiable' and 'unconvincing'. Although 'scores of times larger than Lindert's', Glennie considers his sample as 'demonstrably inadequately representative', and he is reluctant to infer 'more from

³⁶ Ibid, p. 697.

³⁷ Ibid, p. 701.

³⁸ Lindert and Williamson, 'Social tables'.

³⁹ Glennie, *Distinguishing men's trades*, tbl. 3, p. 127.

[his national] table than that the non-agricultural sector in England between the 1750s and 1770s was very much larger than some writers have supposed.⁴⁰

Both Linder and Glennie are, in short, quite critical of their own estimates. Both present their efforts a first exploration of the potential of local sources with detailed occupational information – such as local censuses, burial registers, and militia lists – rather than as a finished product. And in that sense they are an unqualified success and a major step forward. Lindert shows the promise of using parish registers for providing occupational information in the eighteenth and early nineteenth century, and the scope for collecting a much larger sample than the one he used.⁴¹ Glennie demonstrates the unique strengths of occupational information for providing a detailed, quantitative basis for economic history at county and local level.⁴² Both lead the way in building national and regional estimates from the ground up rather than top-down, and make clear the advantages this has in terms of reliability, accuracy, and geographic and occupational resolution of the resulting estimates.

Since 2003, Shaw-Taylor, Wrigley, and other members of the Occupational Structure of Britain project have been following their example in exploiting as diverse a set of local occupational sources as possible – as discussed in the next section

1.4 Progress made by the Cambridge Group in developing superior occupational estimates

Members of the Occupational Structure project have collected, standardised, and codified a wide range of primary sources containing occupational information. For the 1600-1850 period, the most important of these are the national censuses and parish register data. These will therefore be discussed first, before turning to additional data sources at the end of this section.

The first national census was taken on Tuesday the tenth of March 1801, ‘but both contemporaries and historians agree the returns to be so inconsistent as to be of little value’.⁴³ The occupational information collected in the 1811-1831 censuses is of increasing quality but still very problematic, using rough and poorly defined occupational categories, counting households rather than individuals, etcetera. Only from the 1841 census onwards is the recorded

⁴⁰ Ibid, p. 126.

⁴¹ Lindert, ‘English Occupations’, p. 689.

⁴² Particularly in his county study of Hertfordshire, Glennie, *Distinguishing men's trades*, pp. 66-118.

⁴³ Wrigley, ‘Men on the land’ in Bonfield *et al* (eds), *World we have gained*, p. 329.

occupational information sufficiently reliable, detailed, and well-defined to form the basis of a national male occupational structure. The 1841 census is, however, difficult to compare with the later censuses, since a new occupational categorisation was introduced in 1851.⁴⁴ Because, furthermore, the recording of female occupations was much improved in 1851, it is this census which is the ‘point of calibration’ for much of the Cambridge Group’s work on occupations. And it is therefore also this census which forms the endpoint of the analyses presented in this dissertation. Furthermore, owing to the efforts of Kevin Schürer, Edward Higgs, and others contributing to the Integrated Census Microdata (I-CeM) project, census data from 1851 have recently become available electronically at the level of (anonymised) individuals.⁴⁵ This makes it possible to map the 1851 census at very fine geographic scales – an important improvement, as the smallest spatial units for analysis used to be census registration districts, digitised by the Cambridge Group between 2006 and 2009, and themselves a step up from the county-based tabulations which had been the main form in which the census returns had formerly been used.⁴⁶

Before 1841, the Cambridge Group has had to resort to other data. Census data here are either of insufficient quality or, before 1801, entirely non-existent. Fortunately, information about the gainful activities of individuals, particularly when they were men, was quite regularly recorded because local dignitaries were interested in such information, because it could be used to distinguish individuals with the same name and place of domicile, or simply because it was perceived as an integral element of a person’s identity. The best systematic records of such information can undoubtedly be found in parish registers, particularly in the records of Anglican baptisms. This is especially true after so-called Rose’s Act, which came into effect in January 1813. Officially called the ‘Act for the Better Regulating, and Preserving of Parish and Other Registers of Births, Baptisms, Marriages and Burials in England’, the express purpose of this piece of national legislation was to ‘greatly facilitate the proof of pedigrees claiming to be entitled to real or personal property, and be otherwise of great public benefit and advantage’.⁴⁷ It introduced standardised forms for the registration of marriages, baptisms, and burials in Anglican parish registers. The new standard form for baptisms included a space for the ‘Quality,

⁴⁴ Wrigley, *Poverty, progress, and population* (Cambridge: Cambridge University Press, 2004), pp. 147-50.

⁴⁵ Shürer and Higgs, *Integrated Census Microdata (I-CeM), 1851-1911* (Colchester: UK Data Service, 2014), <http://dx.doi.org/10.5255/UKDA-SN-7481-1>.

⁴⁶ For an example of research based on census registration districts, see Shaw-Taylor, ‘Diverse experiences: the geography of female employment and the 1851 census’ in Goose (ed.), *Women's work in industrial England: regional and local perspectives* (Hatfield: Local Population Studies, 2007), pp. 51-75.

⁴⁷ Referenced in Basten, ‘From Rose’s Act to Rose’s Bill: a reappraisal of the 1812 Parish Register Act’, *Local Population Studies*, 76 (2006), p. 43.

Trade or Profession' of the father of the baptised infant. Private as well as public baptisms were, from now on, to be recorded which, it was concluded, had 'evidently added to the number of Registered Baptisms'.⁴⁸ Rose's Act ensured that, from 1813, historians have access to data on male occupations that cover all English and Welsh parishes. The Cambridge Group has painstakingly collected and transcribed these data, and used them as the basis for what has rightfully been called an occupational 'quasi-census' for the 1813-20 period.

The data for this quasi-census are not perfect, but their imperfections have either merely negligible impact on the male occupational structure derived from them, or can be fairly easily corrected, as Peter Kitson et al have shown.⁴⁹ Combined with the 1841 and 1851 censuses, the 1813-20 quasi-census presents historians with occupational data of unprecedented quality for the first half of the nineteenth century. The 1813-20 baptism data are vastly more occupationally precise than the social tables, providing reliable information not merely on the main sectors (primary, secondary, tertiary) but also on their subsectors (textiles, retail, etcetera) and even individual occupations (weaver, grocer, etcetera). They are, like the census data, carefully codified using Wrigley's Primary-Secondary-Tertiary (PST) system, a flexible hierarchical taxonomy of occupations, allowing one to easily switch between different levels of occupational abstraction.⁵⁰

Furthermore, their coverage is essentially universal and so geographically fine-grained that it allows for occupational analyses not only at the level of the entire country, but also for individual counties, hundreds, census registration districts, or even parishes and chapelries. Much of the discussion on long-run economic developments and the industrial revolution has been focused on the national level, since that is the level at which the national accounts approach delivers its insights. Quantitative occupational data at sub-national levels offer the opportunity to put spatial relationships back in the consideration of long-run economic development and the industrial revolution. Crafts and Harley rightly noted that 'regional development varied considerably and that exploring this diversity offers the potential of a set of quite different and valuable insights into the experience of the industrial revolution.'⁵¹ Using occupational information to generate a quantitative understanding of regional developments is therefore one of the great promises of the Occupational Structure project. For that reason, all of

⁴⁸ Ibid, p. 44.

⁴⁹ Kitson *et al*, 'The creation of a "census" of adult male employment for England and Wales for 1817' (Cambridge, 2012), <http://www.econsoc.hist.cam.ac.uk/docs/CWPESH%20number%204%20March%202012.pdf>.

⁵⁰ Wrigley, 'The PST system of classifying occupations' (Cambridge, 2010), <http://www.hpss.geog.cam.ac.uk/research/projects/occupations/britain19c/papers/paper1.pdf>.

⁵¹ Crafts and Harley, 'Restatement', p.721.

the Group's occupational data have been meticulously linked to a geographical information system (GIS), developed by members of the Group and in particular by Max Satchel, building on the work of Roger Kain and Richard Oliver and an earlier historical GIS by Humphrey Southall and Nick Burton.⁵²

Prior to Rose's Act, baptism records also occasionally recorded the father's occupation, if the local rector or bishop felt such information was valuable. All 11,400 Anglican parish registers were meticulously searched for such records by research assistants employed by the Cambridge Group, providing the basis for the Group's pre-1813 occupational structure estimates. Only parishes in which occupations were recorded in at least ninety-five per cent of baptisms for which an occupation could be expected – so, for example, excluding illegitimate children – were included, to ensure the data are reliable. As with the census data and the 1813-20 data, these earlier parish register data were codified geographically and occupationally.

This resulted in three subsets of parish register data, one for the early eighteenth century (c.1710), one for the middle (c.1755), and one for the end of that century (c.1785).⁵³ In their recent chapter in the Cambridge Economic History of Modern Britain (CEHMB), Shaw-Taylor and Wrigley used the data from the first of these subsets to generate estimates for the early eighteenth century male occupational structure for England and Wales and for two regional clusters of counties, at the sectoral and sub-sectoral level.⁵⁴

These estimates shed considerable doubt on the idea of a structural employment shift into industry during the 1760-1830 period. Shaw-Taylor and Wrigley's figures suggest that the manufacturing share of the male labour force rose only marginally during the period in England and Wales. Standing at thirty-seven per cent in 1710, it stood at no more than forty-two per cent

⁵² Satchell *et al*, *1851 England and Wales census parishes, townships and places* (Colchester: UK Data Service, 2016), <http://reshare.ukdataservice.ac.uk/852232/>; Kain and Oliver, *The historic parishes of England and Wales: an electronic map of boundaries before 1850 with a gazetteer and metadata* (Colchester: UK Data Service, 2001), <http://dx.doi.org/10.5255/UKDA-SN-4348-1>; Southall and Burton, *GIS of the ancient parishes of England and Wales, 1500-1850* (Colchester: UK Data Service, 2004), <http://dx.doi.org/10.5255/UKDA-SN-4828-1>.

⁵³ The precise periods for which occupational data were recorded in parish registers differed by diocese and, indeed, individual parish. The 1710, 1755, and 1785 dates therefore only represent the weighted average midpoints for each period, taking their data from quite a wide range of years. For example, the early eighteenth century sample, centred around the year 1710, contains parish register data from as early as 1695 and as late as 1729.

⁵⁴ Shaw-Taylor and Wrigley, 'Occupational structure and population change' in Floud, Humphries, and Johnson (eds), *The Cambridge Economic History of Modern Britain. Volume 1. Industrialisation, 1700-1870* (Cambridge: Cambridge University Press, 2014), pp. 53-88.

in 1817.⁵⁵ Indeed, in Lancashire, Cheshire and the West-Riding, focal points of the mechanisation of textile's manufacturing, the secondary sector labour share may have slightly *declined* in relative importance over the 1760-1830 period.⁵⁶ And although agriculture did decrease in occupational importance during the Industrial Revolution, it did so to a smaller degree than previously assumed. According to Shaw-Taylor and Wrigley, fifty per cent of English and Welsh men worked in agricultural in the early eighteenth century, compared to the roughly fifty-six per cent which Crafts and Harley assumed, and the sixty to eighty per cent in Deane and Cole's earlier analyses. And the secondary sector, which Crafts and Harley assumed to have employed about one in four men at that time, made up thirty-seven per cent of the male labour force in Shaw-Taylor and Wrigley's figures. There was thus, quite simply, much less room for structural change than Crafts and Harley presumed. Furthermore, it was the tertiary, not the already quite substantial secondary sector which was the main beneficiary of this structural change.

If upheld, Shaw-Taylor and Wrigley's results necessitate a major rethink of the Industrial Revolution. Crafts and Harley's estimates of labour productivity growth in industry would have to be significantly increased. Rather than regarding industrial output growth as predominantly the result of increased labour inputs, the traditional, technological interpretation of the Industrial Revolution – sudden, revolutionary innovation enabling rapid productivity improvement – would be at least partly restored. Eric Jones's proverbial 'dead horse' would be proven to have quite a bit of life in it yet.⁵⁷ As the flipside of the coin, productivity growth in agriculture would have to be considerably reduced. Output growth estimates for the tertiary sector, partially derived from labour inputs, would have to be increased, thereby also raising GDP growth figures somewhat.

In addition to the parish register data, the Cambridge Group has been and is still in the process of collecting other pre-1813 data, such as militia lists and local tax records. These are only available for certain counties or parishes, at isolated moments in time. But recently, members of the group have started exploring recognizances from quarter sessions and other local court documents which offer the promise of producing datasets for long stretches of time and

⁵⁵ Shaw-Taylor and Wrigley, 'Occupational structure and population change', in Floud *et al* (eds), *Cambridge Economic History*, p. 59, table 2.2.

⁵⁶ Shaw-Taylor and Wrigley, 'Occupational Structure 1750-1871', pp. 16-19. Shaw-Taylor and Wrigley, 'Occupational structure and population change', p. 64, table 2.3.

⁵⁷ Erik Jones branded the 'discontinuity' view of the Industrial Revolution as 'technicist' and the IR itself 'a dead horse not quite willing to lie down'; see Jones, *Growth recurring: economic change in world history* (Oxford: Clarendon Press, 1988), p.19. See also D.S. Landes's defence of the discontinuity view in Landes, 'The fable of the dead horse' in Mokyr (ed.), *The British industrial revolution: an economic perspective* (Boulder: Westview Press, 1999), pp. 128-60.

covering large geographic areas. The first results of using these data for occupational purposes are highly encouraging. Yet another systematic data source which the Group is starting to explore are coroners' inquests into accidental deaths, in first instance utilising lists of documents collected and transcribed by Steven Gunn and Tomasz Gromelski.⁵⁸ Again, these are, in principle, widely available both in temporal and geographic terms.

But both court records and coroners' inquests are currently a promise rather than a reality, as they will require a major effort and much time to collect, transcribe, codify, and standardise at a national scale. The Cambridge Group's wider occupational estimates are therefore, as yet, almost exclusively based on censuses and, before 1841, on parish register data. And it is the limitations of these which will be discussed next.

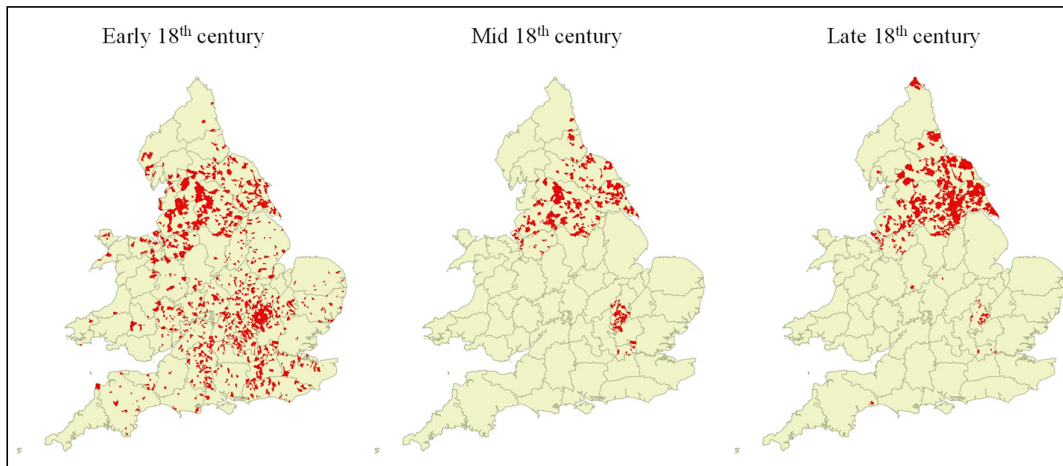
1.5 Limitations of the parish register data

An obvious weakness of the information provided by Anglican baptism registers is that the occupations of mothers were not recorded. They therefore only serve as a basis for documenting the male occupational structure. Within the Cambridge Group, Amy Erickson is heading up the work on this – given the paucity of reliable historical sources, highly challenging – issue; it is not one which could be addressed in the context of the research for this PhD, which only engages with the gainful activities of men. But three other issues very much *are* within the scope of the PhD, as they affect the range and reliability of *male* occupational estimates.

1.5.1 Coverage

Baptism registers only provide occupational information for a sample of parishes before Rose's Act. Coverage was particularly low for the mid and late eighteenth century, as shown in Map 1, and close to non-existent outside London before 1700.

⁵⁸ In the course of their ESRC funded project into 'Everyday life and fatal hazards in sixteenth-century England', <http://tudoraccidents.history.ox.ac.uk/>.



Map 1. Registration of male occupations in English and Welsh baptism registers over the course of the eighteenth century

Note: Parishes and chapelries in which male occupations were reliably recorded are indicated in red.

Data source: Parish register occupational database, created by the Cambridge Group.

In the early eighteenth century, only eleven per cent of all parishes recorded occupational information for a period of one or more years. For the mid and late eighteenth century, the figures are even lower, at only three and four per cent respectively. For occupational estimates at larger geographic scales, such as for England and Wales as a whole, small samples are not necessarily a problem, as long as the sample of parishes is representative of the population from which it is taken. However, as Map 1 shows, the samples are geographically non-random. Even in the relatively well-covered early-eighteenth century, urban areas are overrepresented, as are certain regions like industrialising Lancashire and the West Riding of Yorkshire, with other areas such as Wales, the South-West and East of England, the North, and several counties in the West Midlands covered hardly at all. Average coverage across the totality of England and Wales may have been eleven per cent in the early eighteenth century, but in two out of every three counties, coverage was below ten per cent. In the mid and late eighteenth century, lack of coverage was even more pronounced, with eight out of every nine counties below the ten per cent mark, whilst not a single parish in which occupations were registered could be found in four out of every five counties.

Even within counties, occupational structures were very far from uniform, so at this lower geographical level the sampled parishes cannot simply be presumed representative either. A case example can make that clear. Cheshire is amongst the counties with the highest parish register coverage, with occupations recorded reliably in thirty-three per cent of parishes in the early, nineteen per cent in the mid, and twenty-one per cent in the late eighteenth century. But the occupational structures derived directly from parish register data for these periods exhibit peculiar developments over time, as Figure 4 demonstrates: a sudden and sharp increase in the

size of the tertiary sector between c.1725 and c.1755; an unexpected, gradual decline of that sector in the years thereafter; relatively rapid decline of the agricultural sector before the industrial revolution, followed by slight growth after c.1785; sharp decline of the non-textiles portion of the secondary sector after c.1785. One reason for such unexpected developments is that the composition of the sample changes over time and the occupational bias is therefore not constant. Only in ten out of the thirty-one Cheshire parishes covered in c.1725, occupational information was also recorded in c.1755, and only seven parishes were covered in c.1725, c.1755, and c.1785. The rapid growth and subsequent decline of the tertiary sector over the 1715-1817 period in figure 2 may well be simply the result of ‘tertiary-sector-heavy’ parishes making up a greater share of the c.1755 than of the c.1725 and c.1785 datasets.

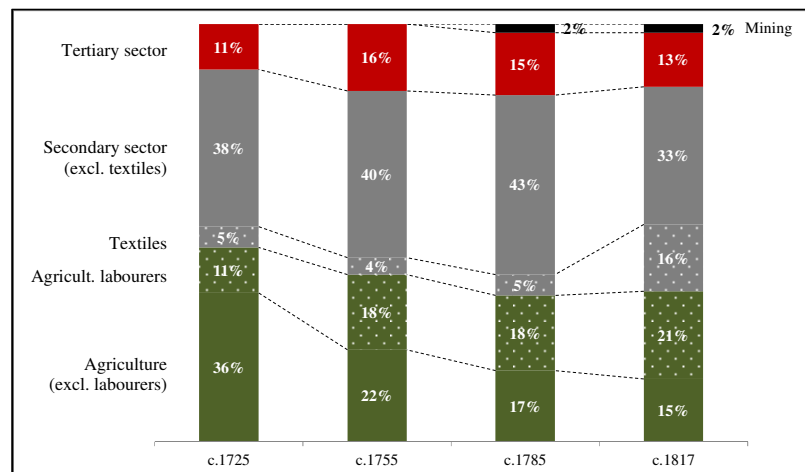


Figure 4. Cheshire's male occupational structure according to parish registers, c.1725-c.1817

Source: parish register data collected by the Cambridge Group.

Well aware of these issues, Shaw-Taylor and Wrigley did not simply base their c.1710 national estimate directly on the parish register sample. Instead, they divided the pre-Rose's Act parishes along two axes: urban versus rural, and north-west England versus the rest. The underlying assumption is that the covered parishes, known not to be representative of all parishes, are much more likely to be representative of parishes on the same side of these divides. More reliable occupational structures can therefore be calculated for the rural and urban subsets of parishes, and for parishes inside and outside north-west England. These partial occupational structures are subsequently recombined to create a national one.

On a national level, and provided that, as in c.1710, the parish data have a reasonable geographic spread across the England and Wales, the reweighting method is likely to generate good results.⁵⁹ Potential regional biases within the urban and rural subsets will be much diluted

⁵⁹ Although the method is not without issues, as discussed in Chapter 7.

on a national scale. The approach is less likely to generate reliable national results for the mid and late eighteenth century, as the required spread of parish register data across England and Wales is not available. For this reason, Shaw-Taylor and Wrigley refrained from including national estimates for these periods in the CEHMB chapter. The approach is also unreliable for smaller geographical levels, and Shaw-Taylor and Wrigley have therefore only used it nationally and on two large geographic regions. Had it been applied to a smaller region, such as a single county, the results might have been seriously misleading. For example, the Lancashire urban sample in c.1725 contains transport-dominated Liverpool but not manufacturing-dominated Manchester. This bias cannot be remedied by urban-rural reweighting. The reweighting methodology cannot therefore fulfil one of the key goals of the Occupational Structure project: to provide quantitative insight into regional and local developments.

These limitations of the urban-rural reweighting method are the direct consequences of the limitations of the parish register data. No methodology based on these data alone can hope to generate reliable national estimates for the mid or late eighteenth century because parish registers coverage was simply too low. For the same reason, occupational information in pre-Rose's Act parish registers was too sparse to generate county or sub-county level occupational estimates. Furthermore, the parish-register-based national estimates imply that the shift from the primary to the secondary sector took place before 1700 rather than, as in the older national accounts literature, during the eighteenth century. Any proper analysis of industrialisation in Britain must therefore include the seventeenth and, potentially, earlier centuries. The lack of pre-1700 coverage disqualifies the parish register data for this purpose.

Shaw-Taylor, Jacob Field, and other members of the Cambridge Group therefore started collecting data from alternative sources several years ago, with the intention to use those data to overcome the problem of limited coverage. Prominent amongst these alternative sources were indexes to probate documents, of which Shaw-Taylor realised that their geographical comprehensiveness offered opportunities for complementing the parish register data, using the latter, in turn, to remedy the social selectiveness of the former. In Chapter 2, an approach will be introduced which does exactly that. As will be shown, this new approach is capable of providing male occupational estimates at and below the county level, for the intermediate years between c.1710 and c.1817, and for the seventeenth century.

1.5.2 Labourers

Probate documents cannot provide a solution for a second issue: the prevalence of the term 'labourer' as an occupational denominator in pre- and early-industrial England and Wales. Thirty per cent of the men in the Cambridge Group's quasi-census of c.1817 are described as such in the baptism registers on which the census is based. It tells us that these men worked for

an employer and were probably mainly remunerated by money wages but, on its own, it does not tell us what kind of work they did and to what occupational sector they should be attributed. In the 1851 and later censuses, the problem is manageable, as the census enumerators were instructed to identify the most common types of labourers. One in five working men in the 1851 census were labourers, but seventy-four per cent of these were explicitly allocated to an occupational sector, mostly agriculture. The problem of how to apportion these labourers to sectors is therefore limited to five per cent of the male population. But for the c.1817 quasi-census and for earlier estimates of occupational structure, whether based on parish register, probate records, or social tables, no such contemporary allocation is available. For these estimates, therefore, historians have had to devise ways for allocating labourers to sectors themselves.

Crafts, in essence, allocated all labourers to agriculture, although he also performed a sensitivity analysis, using the ratio between agricultural and non-agricultural labourers in the 1831 census to calculate a lower bound for the agricultural sector.⁶⁰ For their 1381 and 1522 estimates, Broadberry et al allocate labourers to sectors in line with the agricultural and non-agricultural shares of non-labourers, assigning all non-agricultural labourers to the secondary sector. For their 1688, 1759, and 1801 estimates, they applied the 1522 allocation percentages, apportioning 68.2% per cent of labourers to agriculture and the remainder to the secondary sector.⁶¹ They are thus making two unlikely assumptions. Firstly, that labourers were divided across agriculture and the secondary sector in line with the agricultural/non-agricultural split for other workers, leading to the improbable result of the ratio between labourers and non-labourer being higher in the secondary than in the primary sector. Secondly, that the 1522 allocation key applies to a much more advanced economy with a very different occupational make-up nearly three centuries later. Another, lesser issue with this allocation method is that all non-agricultural labourers are presumed to have been working in the secondary sector, whilst some of them are in fact likely to have been engaged in tertiary sector activities such as dock work.

A new approach to the labourer problem was recently developed by Osamu Saito and Shaw-Taylor.⁶² It is still work in progress and remains unpublished, as the authors do not yet consider

⁶⁰ Crafts, *British economic growth*, p. 14.

⁶¹ Broadberry et al, *British Economic Growth*, pp. 346-7, 349-50, 352-4, 356-360. The 68.2 and 31.8 percentages for agricultural and non-agricultural labourers are actually based on the division of non-labourers for 1522 as calculated in an earlier journal paper, namely Broadberry et al, 'When did Britain industrialise?', pp. 17-21. However, this was a miscalculation, which was corrected in the more recent book. Nevertheless, the allocation percentages for later time periods remain to be based on the (it would seem miscalculated) division in the earlier paper.

⁶² The Saito and Shaw-Taylor paper is not yet publically available, but the authors kindly provided me with a draft version and with the underlying data.

it satisfactory, but it represents a major improvement on earlier approaches. A version of the approach was used for Shaw-Taylor and Wrigley's national estimates in the recent CEHMB. It utilises the fact that labourers were allocated with varying but generally increasingly precision to occupational groups in the censuses between 1851 and 1911. For these occupational groups, ratios between labourers and non-labourers can therefore be calculated. Such ratios from the late nineteenth and early twentieth century census were used to allocate the not-yet-specified labourers in the 1851 census more accurately to sectors. The 1851 ratios between labourers and non-labourers in the secondary and tertiary sector were subsequently used to estimate labourer-to-non-labourer ratios in earlier time periods. For c.1817, the 1851 ratio was used directly; for c.1710, two estimates were produced, one based on the 1851 ratio, and one on half that ratio. By applying these ratios to the number of non-labourers in the secondary and tertiary sectors, the number of labourers for each of these two sectors was estimated and subtracted from the total number of unspecified labourers, the remainder of whom were allocated to agriculture.

Saito and Shaw-Taylor note that using evidence from the mid nineteenth century to calculate labourer shares in c.1817 and c.1710 is 'far from ideal'. However, as they demonstrate, labourer-to-non-labourer ratios within the secondary and tertiary sectors were reasonably stable for the 1851-1911 censuses, suggesting that they likely did not vary a great deal between c.1817 and 1851 either. The c.1710 estimates are based on two sets of possible ratios since, as the authors remark, simply applying the 1851 ratios to the early eighteenth century 'would require a much greater leap of faith', particularly in light of growing proletarianisation over the intermediate years. The two ratios result in a difference of less than three percentage points in estimates of the primary sector share for c.1710.

This solution represents a significant improvement over previous approaches. As Saito and Shaw-Taylor readily admit, it is unfortunate that it has to rely on ratios derived from much later census data. Substantial employers of labourers such as the transport industry, in which most tertiary sector labourers worked, experienced fundamental changes over the c.1710-1851 period, for example moving from road to canal to rail transport, and this potentially changed employment opportunities for labourers substantially. The authors demonstrate satisfactorily, however, that the effects on the national estimates of the male occupational structure are likely modest. Another implicit drawback of the approach is that it only produces an indirect estimate for the primary sector, the largest employer of labourers.

Arguably, none of these issues is serious enough to necessitate developing yet another labourer allocation methodology. However, there is an additional problem with the Saito/Shaw-Taylor approach: as they themselves emphasize, it is only really suitable for allocating labourers on a national scale. As discussed, one of the great advantages of occupational data over the national accounts approach in analysing and explaining economic developments is that the former can be

used to generate estimates for particular regions or even for individual towns and villages. Regional economic trajectories often differed greatly in pre-industrial Britain, and the process of regional specialisation within an integrating economy was a recognizable feature of its economy, and potentially a factor in its relatively precocious development. But estimates below the national level cannot be generated with the Saito/Shaw-Taylor methodology.

A new method was therefore developed, based on multivariate regression techniques. Contrary to the Saito/Shaw-Taylor solution, it only uses contemporary data and provides a direct, independent estimate of the primary sector. It is founded on a minimal number of straightforward assumptions, the validity and accuracy of which can be directly tested. Most importantly, it can be used to allocate labourers on local as well as national scales. This method is discussed in Chapter 3.

1.5.3 By-employments

Parish registers – and, for that matter, probate documents and other contemporary sources – typically describe men with a single occupational denominator, whereas early modern historians generally presume that most pre-industrial men engaged in so-called by-employments in addition to their stated occupation.⁶³ If these were really as ubiquitous and important as has generally been assumed, an early modern occupational structure based on principal employments alone is unlikely to adequately represent the economic activities of contemporary men.⁶⁴ This is the most common criticism of the Cambridge Group's results, and has been raised at virtually every conference and seminar at which they have been presented.

The evidence for the prevalence of by-employments stems mostly from probate inventories. These documents provide occupational information in two ways: in the form of the occupational descriptor of the decedent, typically found in the inventory preamble, and in the form of tools, livestock, raw materials, produced goods, etcetera in the actual inventory. By-employment incidence is determined by means of a simple count of the numbers of inventories with and

⁶³ See, for example, Thirsk, 'Seventeenth-century agriculture and social change', in her Thirsk, 'The rural economy of England: collected essays', (London: Hambledon, 1984), pp. xiv,420p (p. 211); Everitt, 'Farm labourers', in Finberg (ed.), *The agrarian history of England and Wales. Vol. IV, 1500-1640* (Cambridge: Cambridge University Press, 1967), pp. 428-29.

⁶⁴ For an expression of this sentiment, see: Swain, *Industry before the Industrial Revolution: north-east Lancashire c.1500-1640* (Manchester: Manchester University Press for the Chetham Society, 1986), p. 207. In his review of the book, James Rosenheim commended Swain for exposing 'the futility of reliance on occupational information to assess the structure of the early-modern labor force.', see: Rosenheim, 'Review of Swain's "Industry before the Industrial Revolution"', *Albion*, 20:1 (1988), pp. 99-100. See also: Clarkson, *The pre-industrial economy in England, 1500-1750* (London: Batsford, 1971), p. 77; Pahl, *Divisions of labour* (Oxford: Blackwell, 1984), p.47.

without indications of additional employments – typically resulting in high incidence percentages, as shown in Table 1.

Table 1. Probate-inventory-based assessments of agricultural by-employment incidence⁶⁵

Historian	Region	Period	Principal occupations	Sample size	Incidence
C. Ironfield	Chipping (Blackburn hundred, Lancashire)	1650-1700	Craftsmen	14	79%
D. Hey	South-Yorkshire	1694-1769	Nailers and cuttlers	43	84%
B.A. Holderness	Lindsey in Lincolnshire	1660-1799	Artisans and shopkeepers	173	84%
D. Woodward	Lincolnshire, Lancashire, Cheshire	1550-1650	Carpenters	91	88%
J. Stobart	Cheshire	1700-1760	Tailors and shoemakers	27	63%
P. Frost	South-Staffordshire	1601-1640	Craftsmen	c.50 ^a	78%
		1681-1720	Craftsmen	c.250 ^a	55%
M.B. Rowlands	West-Midlands	1660-1710	Metalworkers	434	56%
J. M. Martin	South-Warwickshire	1727-1749	Craftsmen and traders ^b	98	51%
M. Overton, J. Whittle,	Kent	1600-1740	Craftsmen	735 ^c	47-63% ^d
D. Dean, and A. Hahn	Cornwall	1600-1740	Craftsmen	632 ^c	47-66% ^d

Notes: ^a The inventory numbers have been estimated here, based on shares of probate inventories belonging to the metal trades per time period, provided on page 29 and 38 of the paper.

^b This group includes an unstated number of labourers, but given that these very rarely left inventories, it has been assumed that this number was negligibly low.

^c The Overton et al figures are not easily comparable to the others in this table, since the classification of the occupational group to which the inventory belongs was based on the presence or absence of activities in the inventories, not on the stated occupation of the deceased. This means that occupational groups, as used in this table, inevitably overlap. For example, an inventory showing clear evidence of weaving and of commercial farming will be ranked under both occupational categories in the table above, and will be counted as by-employed in both categories.

^d The lower figure indicates commercial agriculture only, the higher indicates all agricultural activities, including (very) minor ones.

Sources: see footnote 65.

⁶⁵ Originally published in a slightly extended form in Keibek and Shaw-Taylor, 'Early modern rural by-employments: a re-examination of the probate inventory evidence', *Agricultural History Review*, 61:2 (2013), p. 248, table 1, based on figures from Ironfield, 'The Parish of Chipping during the seventeenth century', *Transactions of the Historic Society of Lancashire and Cheshire* 127 (1978), pp. 37, 41-2; Hey, 'A dual economy in south Yorkshire', *The Agricultural History Review*, 17:2 (1969), pp. 114-6, tables IV and V; Holderness, 'Rural tradesmen 1660-1850: a regional study in Lindsey', *Lincolnshire History and Archaeology*, 7 (1972), pp. 79 (table 1), 81; Woodward, 'Wage rates and living standards in pre-industrial England', *Past & Present*:91 (1981), pp. 39-42; Stobart, 'The economic and social worlds of rural craftsmen-retailers in eighteenth-century Cheshire', *The Agricultural History Review*, 52:2 (2004), p. 151; Frost, 'Yeomen and metalsmiths: livestock in the dual economy in south Staffordshire 1560-1720', *The Agricultural History Review*, 29:1 (1981), pp. 29, 38, 40; Rowlands, *Masters and men in the West Midland metalware trades before the Industrial Revolution* (Manchester: Manchester University Press, 1975), pp. 42-43; Martin, 'Village traders and the emergence of a proletariat in south Warwickshire, 1750-1851', *The Agricultural History Review*, 32:2 (1984), p.184; Overton et al, *Production and consumption in English households, 1600-1750* (London: Routledge, 2004), pp. 67-8.

In a recent paper on by-employments, co-authored with Shaw-Taylor, I demonstrated that probate inventories significantly exaggerate by-employments, as a direct result of their bias towards wealthy, capital-intensive estates.⁶⁶ Farmers, tanners, and brewers were much more likely to leave an inventory than tailors, weavers, and labourers because their occupations required work-related capital in the form of crops, livestock, large vats of ale, and tan yards full of hides. This made weavers by-employed as farmers, and farmers by-employed as brewers much more likely to leave an inventory than their non-by-employed colleagues. But the paper's results were insufficient in scope and accuracy to allow calculating a correction for the effects of by-employments on principal-occupation-only estimates. A much more powerful approach for correcting the probate inventory record for its wealth bias was therefore developed, and applied to the by-employment problem. This approach, and its results are discussed in Chapter 4.

1.6 The structure of this thesis

As discussed above, Chapters 2 to 4 of this dissertation are dedicated to introducing new methods for dealing with the limitations of the parish register data. The core datasets, to which these new methods have been applied, are described in more detail in Chapter 5. Solutions for areas or time periods missing in the dataset are provided in Chapter 6, which also covers exceptions and corrections to the general approach (described in Chapters 2 to 4). Chapter 7 presents the shift from methodology to results, presenting the new estimates of the male occupational structure in twenty year intervals for the 1600-1850 period at the national scale, Chapter 8 does the same, at regional and local scales. Finally, in Chapter 9, national, regional, and local perspectives are combined to assess the impact of the new estimates on some of the major issues of historiography.

⁶⁶ Keibek and Shaw-Taylor, 'Rural by-employments', pp. 244-81.

2 USING PROBATE RECORDS AS AN OCCUPATIONAL DATA SOURCE

Parish registers offer a wealth of reliable male occupational data at high geographical resolution but, as discussed, they provide incomplete coverage of England and Wales before Rose's Act of 1812, and hardly any coverage at all before 1700. Therefore, Shaw-Taylor and Wrigley have included only one national estimate before 1813 in their CEHMB chapter, for c.1710.⁶⁷ Furthermore, the limited coverage of the pre-1813 parish register data makes them unsuitable for realising a central promises of the Occupational Structure project, namely to generate regional and local occupational estimates before the nineteenth century and, thereby, put spatial relationships back in the consideration of long-run economic development and the industrial revolution. In this chapter, a second occupational data source is therefore examined: probate documents. As will be discussed, as a source of occupational information, probate documents are in many respects inferior to parish registers. On their own, they are unsuitable for deriving reliable occupational estimates. But they do provide better coverage than parish registers, both in terms of geographic areas and time periods covered. It will be shown that is possible to generate reliable male occupational structures at national, regional, and local levels, at regular time intervals, going back to the beginning of the seventeenth century by combining information from probate records and parish registers. A method is presented which utilises the strengths of each source to neutralise the weaknesses in the other.

2.1 Probate documents as an alternative source of occupational information

Many historical source provide occupational information, but few do so reliably, for large areas, and for long time periods, as Paul Glennie has shown in his systematic analysis of historical

⁶⁷ Shaw-Taylor and Wrigley, 'Occupational structure and population change', pp. 58-60.

data on men's trades.⁶⁸ There are really only two historical sources of sufficient detail, quality, and scope suitable for complementing the existing parish register data, namely records of court proceedings and probate documents. The former of these sources is very promising, in particular the recordings of Quarter Sessions and Assizes, which contain 'an abundance of occupational information about the people involved in the legal process in a variety of capacities'.⁶⁹ They go back to Elizabethan times and are available in large numbers; in recent research for a master's thesis, Tim Rudnicki was able to create a database of nearly 90,000 individual observations for Cheshire and Lancashire covering the early seventeenth to the early nineteenth century.⁷⁰ T.S. Cockburn has argued that they form a 'factually worthless' source of occupational information, but as Glennie has demonstrated, that judgement is far too harsh; the at first sight plausible criticism that low-status social groups are bound to be overrepresented in the court data is unjustified, as occupational information provided is not limited to suspected criminals but includes victims and witnesses.⁷¹ The main problem with this data source is a practical one: relatively little of the available information has been digitised or can easily be digitised from printed documents. Where digital or printed information is available, it is often in the form of plain transcripts of the original calendars, rolls, and books. These transcripts are difficult to use because they are highly variable in form, which makes creating structured databases of occupational information from them a very time consuming process.

Probate documents have a great advantage here: their occupational information is relatively easily accessible because it is often contained in the indexes which have been created to provide access to the original wills and testaments, inventories, letters of administration, bonds, and codicils. Many of these indexes have been digitised, often in a highly structured way, splitting off occupational from other items of information such as the decedent's name and domicile and the date at which the document was created. Even when the latter has not yet been done, the

⁶⁸ Glennie, *Distinguishing men's trades*.

⁶⁹ Cockburn, 'The use of assize records as historical evidence', *Journal of the Society of Archivists*, 5 (1975), p. 224; Glennie, *Distinguishing men's trades*, pp. 41-3, in particular tables 3.4 and 3.5; David Cressy has demonstrated that, for an admittedly small sample, occupational information from court records is in agreement with that from parish registers; see Cressy, 'Occupations, migration and literacy in East London, 1580-1640', *Local Population Studies*, 5 (1970), p. 55.

⁷⁰ Rudnicki, *The male occupational structure of northwest England, circa 1600 to 1851* (Master thesis, University of Cambridge, 2015). For another encouraging example of the use of such data for occupational analyses, see Sugden, *An occupational analysis of the worsted industry, circa 1700-1851. A study of de-industrialization in Norfolk and the rise of the West Riding of Yorkshire* (PhD thesis, University of Cambridge, 2015), pp. 191-211.

⁷¹ Glennie, *Distinguishing men's trades*, pp. 41-3; Rudnicki, *Northwest England*, pp. 19-32.

information is often presented in text strings of a fairly consistent nature, making it relatively easy to extract the required information.

Shaw-Taylor, understanding the need for complementary data and recognising the promise of the probate source, started collecting testamentary indexes on a large scale in 2007. As Glennie had before him, he understood that the strengths and weaknesses of probate and parish register data were, in many ways, complementary, with the former being socially selective but providing excellent geographic coverage, whilst the latter were representative of society but geographically sparse.⁷² Therefore, Shaw-Taylor saw much potential in trying to find a way to use parish registers to, somehow, reduce or even fully remove the social bias in the probate data. He found many county record offices prepared to supply such data in an electronic form. These were converted into a database, coded into the PST system, and linked to the GIS by Jacob Field, Gil Newton, and Ros Davies. These data were made available to me when I joined the group, providing me with a flying start. It proved possible to approximately double the number of usable observations by complementing the existing database with additional or superior indexes and, together, they form the basis for the research in this thesis.⁷³ As described in more detail in Chapter 5, they cover the vast majority of English counties and the whole of Wales, with most of the indexes going back well into the sixteenth century. Although many men were not probated and the indexes do not provide an occupational descriptor for all men that were, the total number of usable occupational observations provided by the probate database created for this research ran to over 800,000. Nesta Evans proclaimed probate documents to be ‘a more fertile source of [occupational] information than any other class of document’, because of their ‘sheer number’.⁷⁴ It is not surprising therefore that they have been used extensively by historians to analyse occupational developments, as discussed in the next section.

⁷² Glennie’s remarks on this are discussed below.

⁷³ I am tremendously grateful to Leigh Shaw-Taylor for collecting these data, to Jacob Fields for ‘matching’ them to the PST system of occupations and to GIS information, and to the Leverhulme Trust for providing the necessary financial support for this endeavour. I am also indebted to the many county record offices and the National Archives who provided me with additional or improved indexes.

⁷⁴ Evans, ‘The occupations and status of male testators in Cambridgeshire, 1551-1800’ in Arkell, Evans, and Goose (eds), *When death do us part: understanding and interpreting the probate records of early modern England* (Oxford: Leopard's Head Press, 2000), p. 176.

2.2 Examples of the use of probate documents as an occupational data source – and the problems with them

Most of the many examples of the use of occupational information in wills, inventories, and other testamentary documents in the historiography have a regional or local focus.⁷⁵ In many of them, probate documents are just one of several local data sources used, and few historians have aimed to create comprehensive occupational structures from probate data or indeed from other sources. But in two very recent studies, historians have been more ambitious and attempted to use probate data for establishing country-wide occupational estimates. In the first of these, Clark et al have used the index to probate records at the National Archives to calculate the share of men working in agriculture and fishing in England for the period of the Interregnum, between 1652 and 1660.⁷⁶ Since responsibility for the probate process was temporarily transferred to the newly-established Court for the Proving of Wills and the Granting of Administrations in London during the Interregnum, the National Archive's index to those testamentary documents should, in principle, cover the whole country. Additionally, Clark et al used probate indexes for seventeen (parts of) counties, overwhelmingly situated in the southern half of the country, to generate a national estimate for the 1560-79 period. For both this and the 1652-60 period, Clark et al calculate that fifty-nine per cent of English men were involved in agriculture or fishing. Since modern-day data from developing countries show a linear relationship between the share of the population employed in farming and average income per person, Clark et al conclude that average income per person in early-modern England must also have remained stable between

⁷⁵ See, for example, Patten, 'Changing occupational structures in the East-Anglian countryside' in Fox and Butlin (eds), *Change in the countryside: essays on rural England, 1500-1900* (London: Institute of British Geographers, 1979), pp. 103-21; Patten, 'Urban occupations in pre-industrial England', *Transactions of the Institute of British Geographers*, 2:3 (1977), pp. 296-313; Ripley, 'Village and town: occupations and wealth in the hinterland of Gloucester, 1660-1700', *The Agricultural History Review*, 32 (1984), pp. 170-7; Hudson, 'Landholding and the organization of textile manufacture in Yorkshire rural townships c. 1660-1810' in Berg (ed.), *Markets and manufacture in early industrial Europe* (London: Routledge, 1991), pp. 267-71; Zell, *Industry in the countryside: Wealden society in the sixteenth century* (Cambridge: Cambridge University Press, 1994), pp. 116-9, particularly tables 5.1 and 5.2; Stobart, 'Geography and industrialization: the space economy of northwest England, 1701-1760', *Transactions of the Institute of British Geographers*, 21:4 (1996), pp. 681-96; Stobart, 'Craftsmen-retailers', pp. 141-60; Evans, 'Occupations and status', pp. 176-88; Stobart, *The first industrial region: North-west England, c.1700-60* (Manchester: Manchester University Press, 2004), see in particular pp. 229-33; West, *Town records* (Chichester: Phillimore, 1983), pp. 126-7; Chalklin, *Seventeenth-century Kent; a social and economic history* ([London]: Longmans, 1965), appendix 2; Glennie, *A commercialising agrarian economy: late-medieval and early-modern Hertfordshire* (Master thesis, University of Cambridge, 1983); Glennie, *Distinguishing men's trades*, pp. 32-40; Sugden, *Worsted industry*, pp. 71-2, 249, 291; Sneath, *Consumption, wealth, indebtedness and social structure in early modern England* (PhD thesis, University of Cambridge, 2009).

⁷⁶ Clark et al, 'Malthus', pp. 364-92.

1560 and 1660, in line with Gregory Clark's earlier work on the absence of any real improvement in living standards during the entire medieval and early-modern periods.⁷⁷

A very recent working paper by Wallis et al is based on a database of probate records not dissimilar to the one on which this dissertation is built, originally constructed to analyse the development of medical professions during the early-modern period.⁷⁸ Wallis et al take issue with Clark et al's conclusions, arriving at figures close to Broadberry et al's social-tables-based occupational estimates, showing a clear decline of the primary sector share of the male labour force over the seventeenth century.

Historians working with occupational information from testamentary documents generally recognize that these 'do not record a representative cross-section of the early modern population'.⁷⁹ They deal with this issue in a variety of ways. Some attempt to limit the effects of social bias by using the data in a specific way; John Patten, for example, did not attempt to derive something resembling an occupational structure from the probate data for rural East-Anglia but merely used them to identify whether particular occupations were or were not present in certain parishes, and how this changed over time.⁸⁰ Others use probate documents only as a secondary occupational source; Peter Ripley, for example, used court records as the main source of information on Gloucestershire working men, and employed probate documents only to complement that information and to provide more insight into the details and scale of their work-related activities.⁸¹ Some historians do use probate data to establish comprehensive occupational structures but are open about the unavoidably limited accuracy of these estimates; Jon Stobart, for example, used probate documents as his prime data source on the Diocese of Chester's occupational structure and geography, it being the only 'spatially comprehensive' source available, but freely acknowledged that he could only provide a 'socially selective picture of male employment' in this way.⁸² Others set out to justify the reliability of their

⁷⁷ Clark, *A farewell to alms: a brief economic history of the world* (Princeton, N.J. ;Woodstock: Princeton University Press, 2007).

⁷⁸ Wallis, Colson, and Chilosi, 'Puncturing the Malthus delusion: structural change in the British economy before the industrial revolution, 1500-1800' (working paper, London, 2016), <http://www.lse.ac.uk/economicHistory/home.aspx>.

⁷⁹ Zell, 'The social parameters of the probate records in the sixteenth century', *Historical Research*, 57:135 (1984), p. 113.

⁸⁰ Patten, 'Changing occupational structures'. Note that Glennie rightly took issue with even this limited use of occupational information from wills, particularly when used for inter-county comparisons, because of differences in probate coverage and parish size between counties and the potential effects of the 'rural parish' definition. Glennie, *Distinguishing men's trades*, pp. 37-9.

⁸¹ Ripley, 'Village and Town'.

⁸² Stobart, *First industrial region*, p. 40-2.

probate-based figures. The two examples of national probate-based estimates discussed above fall into that category.

Clark et al attempt to validate their estimated agricultural labour shares by calculating the portion of men who left a trace in the probate record as a function of population density. They provide a number of local examples but since these all share the same rationale and approach, I will focus on one specific example here: Essex in 1801. Clark et al reason that since low-density rural parishes must have been overwhelmingly agricultural and high-density urban parishes must have been overwhelmingly non-agricultural, we should expect variations in the share of men being probated as a function of population density if men employed in agriculture had a lower or higher chance of being probated than men employed outside of agriculture. Since they do not find such differences in Essex in 1801, they conclude that agricultural workers were, apparently, not overrepresented and, therefore, that their probate-based estimates are reliable.⁸³ The problem is that the male agricultural population consisted largely of two groups: farmers who, as will be shown, had a very high probability of being probated and farm labourers for whom, as will also be shown, this probability was very low.⁸⁴ The labourer-to-farmer ratio differed greatly over the country and over time, so the average probability of being probated also varied greatly, both spatially and temporally, for the overall agricultural population. Similarly, non-agricultural men worked in a highly diverse group of occupations. As will be shown in Section 2.3, some non-agricultural occupations, such as tanners and merchants, were quite likely to be probated whilst for others, such as weavers and domestic servants, this was highly unlikely. Since the occupational composition of the non-agricultural share of the labour force varied over time and place, so did the average probability of being probated for non-agricultural workers. In other words, what was true in Essex in 1801 was, in all likelihood, not true in other counties and/or time periods. As will be shown in Table 3, there happens to be a good match between the probate-based estimate and the actual occupational structure in Essex in the early eighteenth century, but Essex is very much the exception here. Had another county been chosen, the results would have been quite different. In Lancashire, for example, men working in agriculture were 2.5 times as likely to be probated as non-agricultural men. In contrast, in Bedfordshire, men working outside agriculture were 1.8 times more likely to be probated than those working in the local agricultural sector, which consisted predominantly of farm labourers, only very few of whom left testamentary evidence.

⁸³ Clark *et al*, 'Malthus', pp. 369-71.

⁸⁴ Similarly, non-agricultural men worked in a highly diverse group of occupations. As will be shown in Section 2.3, some non-agricultural occupations, such as tanners and merchants, were highly likely to be probated and others, such as weavers and domestic servants, highly unlikely.

A second, smaller problem with the Clark et al paper is that they provide agricultural labour share estimates for two moments in time, 1560-79 and 1652-1660, but the collections of probate records on which these shares are based are quite different. Probate documents in the earlier period were proved in local church courts, whilst those in the later, Interregnum period were proved at the new, central Court for the Proving of Wills and the Granting of Administrations in London. Clark et al's implicit assumption seems to be that the dataset of centrally-proved probate documents in the Interregnum period was as socially and occupationally diverse as that based on documents proved in the local church courts outside the Interregnum. This assumption is incorrect. The annual number of probated decedents was markedly smaller during the Interregnum than just before and after, particularly in counties far away from the London court, as Figure 5 shows. It is therefore not surprising that the occupational composition of the locally-proved probate record just before and after the Interregnum also differed from that of the centrally-proved record during the Interregnum, particularly again in counties far removed from London, as Figure 6 shows. The social composition of the set of centrally proved probate documents during the Interregnum differed from those proved in local church courts outside the Interregnum. This makes comparisons between the 1560-79 and the 1652-60 datasets unreliable.

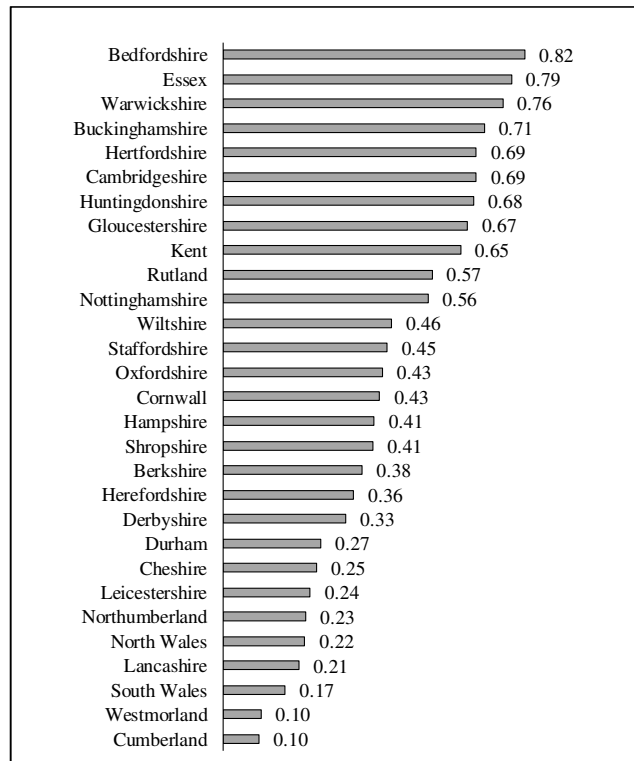


Figure 5. The ratio between the annual number of probated individuals per county in the 1652-60 period and the equivalent number in the decades preceding and following that period

Sources: The National Archives; county record offices.

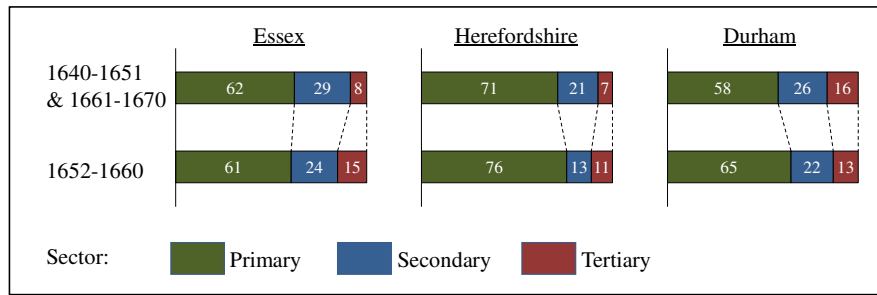


Figure 6. Comparison of sectoral shares in the probate record during and just outside the Interregnum in selected counties

Sources: The National Archives; county record offices.

Wallis et al, try to justify the reliability of their results in three ways. Firstly, they compare the probate-derived estimate to Broadberry et al's figures derived from social tables around 1700, apparently failing to appreciate that these figures are themselves highly problematic – as discussed in Section 1.2. Secondly, Wallis et al provide a comparison with occupational estimates based on apprenticeship records but note that these form a less reliable source than the probate records themselves, concluding that where the two sources do not match, it must be because the apprenticeship-records-suggested trends are incorrect.⁸⁵ Thirdly, they econometrically model 'counterfactual estimates' which, they claim, provide a 'strong robustness check' on their probate-based estimates. But this would seem to be a very optimistic claim, as the econometrical estimates do not provide an actual check on the effects of social bias itself but only on the potential effects of *changes* in social bias over time, and only to the degree that such changes are driven by a changing portion of deaths covered by the probate record. Furthermore, they only provide a check on *trends* over time, not on the actual *values* of occupational shares.⁸⁶

Rather than attempting to justify probate-derived estimates via theoretical and incomplete model calculations or comparisons to other estimates which are themselves problematic, in this dissertation the problem of social bias is tackled head on. A new approach aimed at resolving rather than playing down the probate record's non-representativeness problem will be introduced in Section 2.4. But before doing that, it is necessary to analyse the nature and severity of that problem in more detail.

⁸⁵ Wallis *et al.*, 'Puncturing', p. 28.

⁸⁶ *Ibid.*, pp. 29-32.

2.3 Occupational bias in the probate record

Only a minority of adult men left a will, inventory, or other probate document. Using Wrigley's recent work on county populations and the Cambridge Group's family reconstitution research, it is possible to calculate shares of adult men who were probated, the results of which are presented in Table 2 for several counties and time periods. As the table shows, these shares exhibited significant spatial and temporal variation. A population-weighted average of the table's figures indicates that roughly four out of five English male householders who died in the 1600-1850 period left no trace in probate documents.

Table 2. Approximate share of male householders probated in selected counties/areas and decades

County/area	1630-9	1680-9	1730-9	1780-9	1830-9
Cheshire	28%	28%	24%	13%	19%
Cornwall	19%	20%	27%	15%	14%
Cumberland	15%	22%	43%	20%	24%
Durham Diocese	13%	15%	12%	10%	13%
Essex	19%	10%	12%	7%	6%
Gloucestershire	16%	22%	16%	8%	9%
Hampshire	29%	25%	38%	14%	12%
Leicestershire	43%	34%	35%	23%	15%
Wiltshire	28%	27%	28%	15%	11%

Sources: Several county record offices; online databases of probate records from the consistory courts of York (from the Borthwick Institute, via Origins.net) and Canterbury (at the National Archives); Wrigley et al, *Family reconstitution*, tables 6.19 (p. 290), A9.1 (pp.614-5) and 5.3 (p. 149); Wrigley, *Early English censuses*, table 4.1 (pp. 104-5); Wrigley and Schofield, *Population history*, pp. 493-526.

Notes: Male householders are defined here as men older than the male average age of marriage. Age specific mortality rates ($_{10}M_x$) were derived from probabilities of dying per age interval ($_{10}q_x$) as provided by Wrigley et al, employing the relationship $_{n}q_x = 2 \times n(_nM_x) / [2 + n(_nM_x)]$.

The men that *were* probated were not a random subset of the adult male population. The church courts could charge for grants of probate if the decedent's estate was valued at five pounds or more, and therefore had a financial incentive to encourage application for probate in these instances. But they could not force anyone to make a will and/or inventory.⁸⁷ It is therefore not surprising that many decided to avoid the expense and bother of applying for probate. Since the trade-off between, on the one hand, the cost and effort of the probate process and, on the other hand, its value in case of disputes over the estate, was more likely to be positive for high-value than low-value estates, the former are overrepresented in the probate record. As the church courts were not allowed to charge for estates below the five pounds threshold, they may have actively discouraged probate in these instances – even though they could not refuse to process testamentary documents presented to them. It is unsurprising, then, that men who were wealthy

⁸⁷ Arkell, 'The probate process', p. 12.

and/or engaged in activities that required much capital – such as farmers, merchants, tanners, and brewers – were more likely to make probate than men who were poor or whose occupation required little or no capital – such as tailors, weavers, domestic servants, or labourers. The occupational bias of the probate record is clear from Figure 7, in which the relative share of men making probate has been calculated for a sample of occupations by comparing probate data with parish register data from the same area and time period. As the figure shows, the probability of an early-nineteenth-century farmer in Cheshire leaving a probate document was four times higher than a butcher, twelve times higher than a weaver, and twenty-five times higher than a labourer.⁸⁸

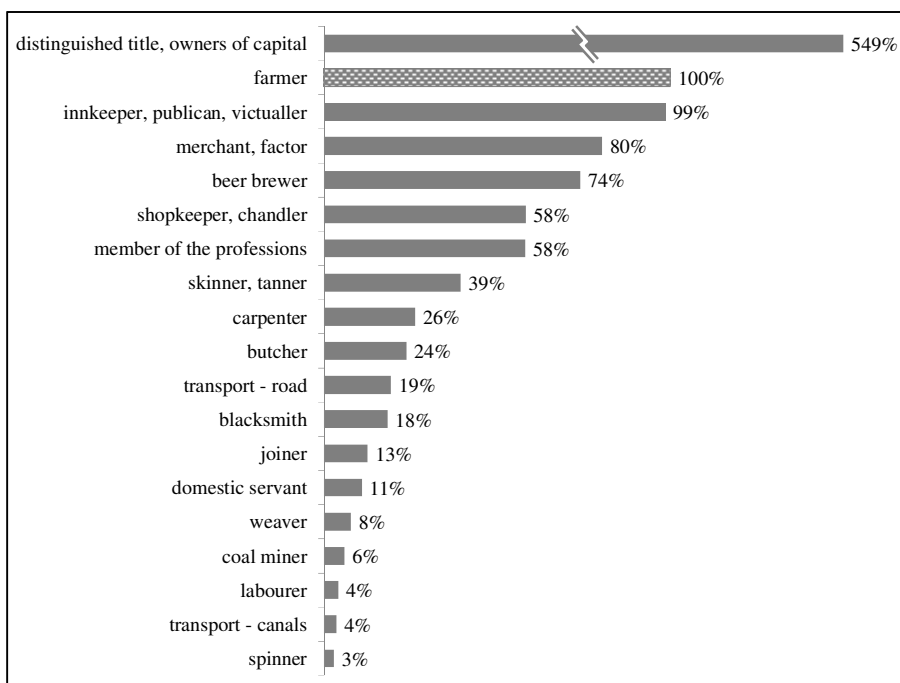


Figure 7. The relative chance of being probated for a sample of occupations in Cheshire, c.1817(relative to farmer = 100%)

Notes: The figures presented are the direct result of a comparison between the number of observations by occupation in parish registers and probate data for Cheshire. They represent relative rather than absolute probabilities of being probated, with farmers artificially set at 100 per cent to facilitate easy comparison. The parish register data covered the 1813-20 interval, the probate data were taken from a slightly longer time period, to create large enough samples: 1802-1832.

⁸⁸ Other historians have come to comparable conclusions about the severity of the occupational and social bias of the probate record, based on comparisons with other unbiased sources of occupational information, For example, Lindert, ‘An algorithm for probate sampling’, *The Journal of Interdisciplinary History*, 11:4 (1981), pp. 662-3; Churchley, *Differing responses to an industrialising economy: occupations in rural communities in the heart of England from the restoration to the railway age (c. 1660 - c. 1840)* (DPhil thesis, University of Birmingham, 2010), p. 46, table 2.1; Oestreicher, ‘The counted and the uncounted: the occupational structure of early American cities’, *Journal of Social History*, 28:2 (1994), pp. 354-5.

As a result, despite the popularity of probate documents as an occupational data source, occupational structures derived from them are highly unreliable. In Figure 8, male secondary and tertiary sector shares according to the probate record are compared to reliable figures derived from parish registers in the 1813-20 period, with each data point representing a county for which (sufficient numbers of) probate data are available. As the figure shows, the probate-derived figures bear little relationship to reality. A statistical test of correlation confirms the visual impression of Figure 8, with p-values of .70 and .14 for the secondary and tertiary sector respectively. Figure 8 also shows that the probate data lead to underestimates of the secondary sector in the majority of counties, and to overestimates of the tertiary sector in all but three counties.

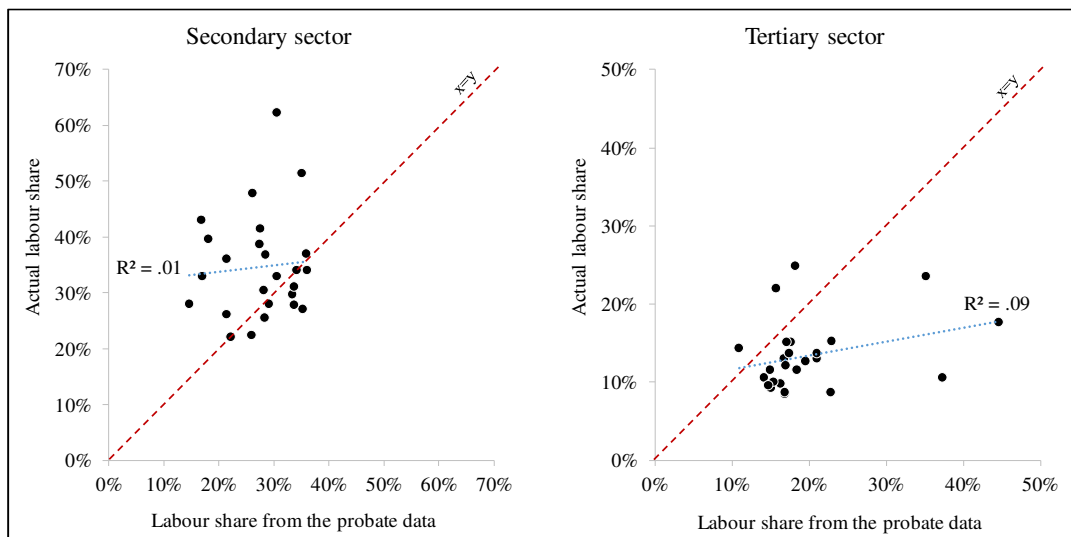


Figure 8. A county-based comparison between sectoral occupational share according to probate (x-axis) and parish register (y-axis) data (c.1817)

Notes: Each data point corresponds to a county or, in some cases, a combination of counties. Only counties for which sufficient numbers of probate data were available were included. These were: Bedfordshire, Berkshire, Buckinghamshire, Cambridgeshire, Cheshire, Cornwall, Cumberland, Devon, Dorset, Durham and Northumberland, Essex, Gloucestershire, Hampshire, Hertfordshire, Huntingdonshire, Lancashire, Leicestershire, Norfolk, North Wales, Nottinghamshire, Oxfordshire, South Wales, Suffolk, Westmorland, and Wiltshire. The parish register data cover the 1813-20 interval. The probate data were taken from a slightly longer time period, to create sufficiently large samples: 1802-1832. Labourers were allocated to sectors using the method and results presented in Chapter 3. The red 'x=y' equilibrium line was included to visualise the number of counties for which probate data exaggerated or underestimated sectoral labour shares. The blue linear fit line was included, with its R^2 value, as an indication of the goodness of fit between probate-suggested and actual occupational shares.

Zooming in on smaller geographical areas and on sub-sectors confirms the problem of non-representativeness of the probate evidence, as demonstrated in Table 3. As the table shows, the degree of non-representativeness differed by county. For Essex, which Clark et al used to demonstrate the reliability of their estimates, the probate-derived estimates are fairly close to the

actual occupational structure as determined from parish register data.⁸⁹ But in other counties the match is poor, for example in Lancashire and North Wales, in which the probate-derived figures underestimate the secondary sector by a factor of two, or in Durham and Northumberland, where they underestimate mining by a factor of five. In some sub-sectors, the match is particularly poor, for example in ‘dealers and sellers’ which is significantly overrepresented in the probate data in all counties, up to a factor of 4.6 in Durham and Northumberland. ‘Services and professions’ are also generally overrepresented, up to a factor of 2.5 in Lancashire. The probate data overstates the importance of the agriculture in counties dominated by family farming, but understates it in agrarian capitalist Bedfordshire, where the many farm labourers left few traces in the probate record. Indeed, according to the probate record, the share of labourers in Bedfordshire’s male labour force declined from twenty-one per cent in 1621 to just three per cent in 1821 – entirely at odds with the rising importance of agrarian capitalism in this county, discussed in Chapter 3.

Table 3. A comparison at sub-sectoral level between occupational structures according to probate and parish register data (c.1817)

	<i>Bedfordshire</i>			<i>Lancashire below the Ribble</i>			<i>North Wales</i>			<i>Durham & Northumberland</i>		
	Probate (%)	Par. reg. (%)	Factor (prob./par.)	Probate (%)	Par. reg. (%)	Factor (prob./par.)	Probate (%)	Par. reg. (%)	Factor (prob./par.)	Probate (%)	Par. reg. (%)	Factor (prob./par.)
Primary sector	56.0	68.5	0.8	32.0	19.5	1.6	72.6	64.2	1.1	39.3	41.0	1.0
Agriculture	55.9	68.1	0.8	31.3	15.6	2.0	69.7	54.5	1.3	36.0	22.2	1.6
Mining	0.0	0.0	-	0.6	3.6	0.2	2.6	9.3	0.3	2.8	17.6	0.2
Other	0.1	0.4	0.3	0.1	0.2	0.4	0.3	0.4	0.7	0.5	1.2	0.4
Secondary sector	27.2	22.3	1.2	36.8	69.0	0.5	14.7	28.7	0.5	28.3	41.9	0.7
Clothing	3.6	1.7	2.2	2.3	3.1	0.7	1.2	2.1	0.6	1.4	2.2	0.6
Footwear	2.0	3.1	0.6	1.8	2.8	0.6	1.4	3.5	0.4	2.4	4.3	0.6
Textiles	0.4	0.3	1.3	14.9	39.3	0.4	1.4	3.3	0.4	1.8	2.6	0.7
Metal trades & tools	2.4	2.2	1.1	2.9	4.7	0.6	1.9	3.5	0.6	3.7	5.3	0.7
Building	7.3	7.9	0.9	5.3	7.5	0.7	3.2	7.9	0.4	6.3	11.5	0.5
Other	11.6	7.1	1.6	9.6	11.5	0.8	5.7	8.5	0.7	12.7	16.0	0.8
Tertiary sector	16.7	9.2	1.8	31.2	11.5	2.7	12.7	7.1	1.8	32.4	17.1	1.9
Dealers and sellers	6.5	1.9	3.4	12.8	3.4	3.7	3.6	1.4	2.6	9.9	2.1	4.6
Services & professions	9.8	6.0	1.6	15.2	6.0	2.5	8.4	4.2	2.0	12.3	6.7	1.8
Transport*	0.4	1.3	0.3	3.2	2.1	1.5	0.6	1.5	0.4	10.3	8.2	1.3
	<i>Essex</i>			<i>Wiltshire</i>			<i>Leicestershire</i>			<i>Cornwall</i>		
	Probate (%)	Par. reg. (%)	Factor (prob./par.)	Probate (%)	Par. reg. (%)	Factor (prob./par.)	Probate (%)	Par. reg. (%)	Factor (prob./par.)	Probate (%)	Par. reg. (%)	Factor (prob./par.)
Primary sector	55.1	63.0	0.9	50.1	56.8	0.9	51.6	36.0	1.4	70.5	60.2	1.2
Agriculture	54.2	61.5	0.9	49.7	56.4	0.9	51.5	35.5	1.5	57.9	34.0	1.7
Mining	0.1	0.0	-	0.1	0.1	0.8	0.0	0.4	0.0	11.4	23.6	0.5
Other	0.8	1.5	0.5	0.4	0.3	1.3	0.1	0.1	0.6	1.3	2.6	0.5
Secondary sector	28.0	24.0	1.2	33.5	33.8	1.0	32.6	52.8	0.6	20.8	30.2	0.7
Clothing	1.3	1.2	1.1	1.5	1.4	1.1	9.6	27.5	0.3	0.8	1.2	0.7
Footwear	2.9	2.6	1.1	2.6	2.6	1.0	2.9	3.2	0.9	1.9	3.4	0.6
Textiles	0.8	0.5	1.5	5.5	8.4	0.7	3.1	3.3	0.9	0.6	0.3	2.1
Metal trades & tools	3.4	2.4	1.4	4.1	2.4	1.7	2.1	2.7	0.8	6.6	4.5	1.5
Building	6.9	7.7	0.9	8.9	10.5	0.9	4.8	6.3	0.8	5.3	12.2	0.4
Other	12.8	9.6	1.3	10.7	8.6	1.2	10.2	9.8	1.0	5.7	8.6	0.7
Tertiary sector	16.9	13.0	1.3	16.4	9.4	1.7	15.8	11.2	1.4	8.8	9.7	0.9
Dealers and sellers	6.0	2.4	2.5	6.9	1.8	3.8	3.9	2.2	1.8	2.5	1.3	1.9
Services & professions	9.4	8.1	1.2	8.5	5.9	1.4	11.0	6.4	1.7	5.6	6.2	0.9
Transport*	1.5	2.4	0.6	1.0	1.6	0.6	0.8	2.6	0.3	0.6	2.1	0.3

*excluding seamen

Notes: The parish register data cover the 1813-20 interval, the probate data were taken from a slightly longer time period, to create large samples: 1802-1832. Labourers were allocated to sectors using the method and results presented in Chapter 3. The ‘factor’ column present a straightforward division of the

⁸⁹ See the discussion about Clark *et al*’s choice of county, starting on page 29.

two columns to its left, to provide a straightforward measure of the degree to which the probate data exaggerate or underestimate labour force shares.

There can be only conclusion: the bias in the probate record makes occupational structures derived from it entirely unreliable. This would seem to disqualify probate documents as an occupational data source. Fortunately, this at first sight critical defect can be remedied, as discussed in the next section.

2.4 Correcting the probate record for occupational bias

The vastly different probabilities of being probated for men in different occupations, as presented in Figure 7 are more than merely a *measure* of the probate record's occupational bias; they are also at the heart of a *solution* for it. Their reciprocal values can be used as *calibration factors* with which to multiply the probate record to reconstruct the (missing) parish register record. How this works is best illustrated in a case example.

The index of Cheshire probate documents provides occupational information on nearly twenty-five-thousand male individuals who were probated between 1710 and 1830. For the purposes of this example, this 120-year period was divided into four intervals of thirty years, the mid-points of which corresponded with the mid-points of the parish register data, that is, 1725, 1755, 1785, and 1817. Thus, a temporal match was made between parish register and probate data.

These data can now be used for calculating accurate male occupational structures for the pre-Rose's Act time periods, in a three-step process, depicted schematically in Illustration 1 for the c.1725 data. In step 1, probate and parish register data from the same time period are matched geographically, to create a like-for-like basis for comparison between the two sources. Probate data are available for the whole of Cheshire, but parish registers recorded occupations in only thirty-one out of ninety-one parishes in c.1725. Only in these 'doubly-covered' parishes can a like-for-like comparison between probate and parish register data be made.

These parishes form the basis for calculating the calibration factors, in step 2. As discussed above, these are the reciprocal values of the (relative) probabilities of being probated:

$$[\text{calibration factor for occupation } i] = \frac{[\text{number of parish records with occupation } i]}{[\text{number of probated decedents with occupation } i]}$$

In step 3, the numbers of probated men per occupational group are multiplied with these calibration factors *in all parishes*. In the thirty-one 'doubly-covered' parishes, the result of this multiplication is, by definition, equal to the occupational structure according to the local parish register data. In the sixty other parishes, the result of the multiplication is a simulation of what the occupational structure derived from parish register data would have looked like *if such data*

had been available. Thus, a calibrated, unbiased estimate of the contemporary male occupational structure is generated.

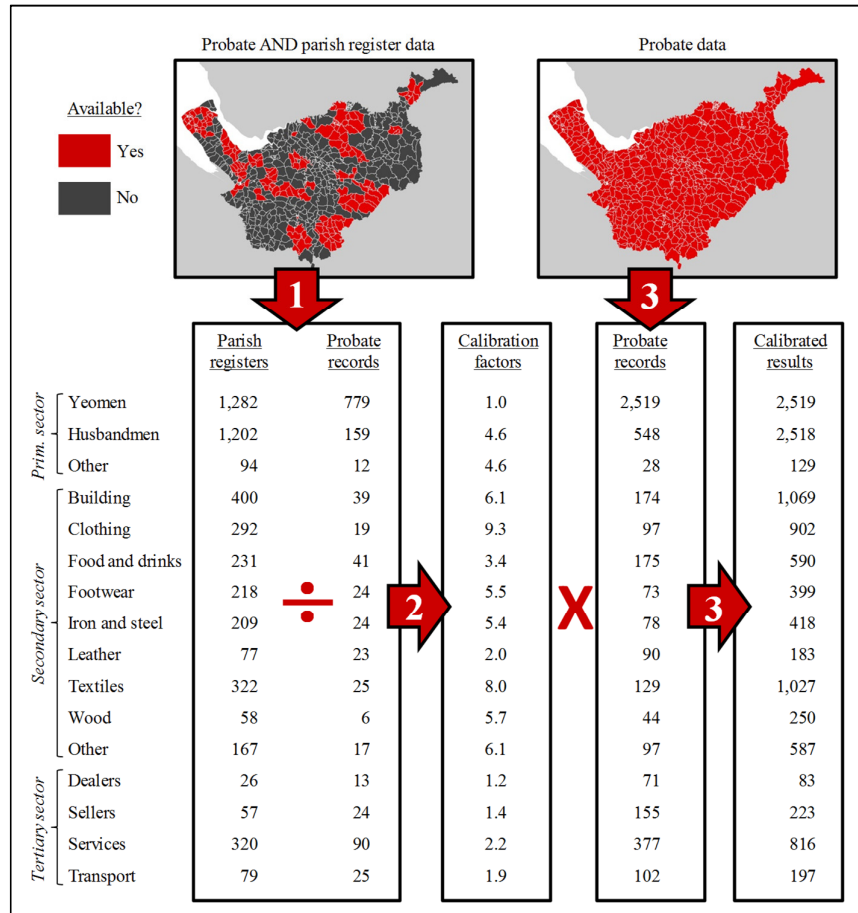


Illustration 1. A schematic depiction of the calculation of an unbiased male occupational structure from probate records (Cheshire, c.1725)

Note: the numbers in the arrows refer to the steps of the calibration and correction process, described in the main text.

As discussed, geographical matching of probate and parish register data is required for determining reliable probate calibration factors. This is usually straightforward, but not always, and it is therefore necessary to discuss it in a bit more detail. Probate records almost always provide geographical information on the deceased, usually in the form of the name of the hamlet or township in which he lived. Generally, the information from parish registers is geographically less precise. It is available at the level of, what the Cambridge Groups has called, Anglican Registration Units (RUs). These usually coincide with an Anglican parish, but in some cases, certain chapelries within a parish recorded baptisms separately; in those cases, one parish gives rise to several RUs, one for each of the separately-recording chapelries, and one for the

remainder of the parish. In rural areas, RUs generally contain several townships and hamlets.⁹⁰ Using a variety of sources of historical geographical information, the townships and hamlets mentioned in the probate data can be carefully ‘mapped’ onto RUs, to ensure that the two data sources are compared for the exact same geographical area when calculating the probate calibration factors. However, in large towns, the procedure is more complicated. The city of Chester was such a large town, and the only place in Cheshire for which a geographic match between probate and parish register data cannot be achieved in the manner described above. Like many larger towns, Chester was divided into several parishes. Not all of these Chester parishes recorded male occupations in the baptism register.⁹¹ As Figure 9 shows, a substantial share of Chester’s labour force is not covered by parish register data.

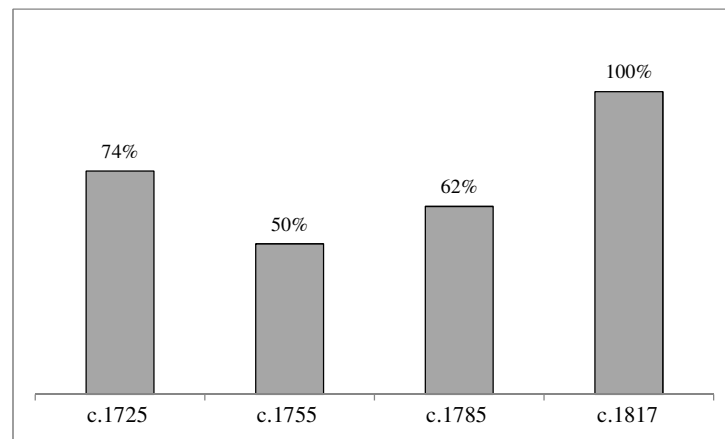


Figure 9. Estimated share of population in the Chester city parishes for which baptism register occupational data exists (c.1725-c.1817)

Sources: Wrigley, *Early Censuses*, table A.2.7; Lewis and Thacker, *A History of the County of Chester, Volume 5, Part 1, The City of Chester* (Woodbridge: Boydell and Brewer, 2003), pp. 90-7.

This would not be a problem in terms of geographically matching probate and parish data, if the former were specified at the level of parishes as well. The geographic data in probate records is usually more precise than the parish record data, because townships and hamlets were typically smaller than parishes, with several of them contained in one parish. In major towns like Chester however, the opposite is the case. Probate documents of men from Chester typically only mention that they lived in the Chester, and do not specify the decedent’s parish within that town. This means that it is not possible to make a direct, like-for-like geographic match between parish and probate records for large towns like Chester.

⁹⁰ For ‘The codebook of Anglican registration units’, created by P. Kitson, see <http://www.geog.cam.ac.uk/research/projects/occupations/britain19c/anglicanregistration.html>.

⁹¹ For example, c.1725, such data were recorded in St Bridget, St Martin, St Mary on the Hill, St Michael, St Oswald, and St Peter but not in Holy Trinity, St John the Baptist, and St Olave.

One cannot simply presume that the occupational structure in the covered Chester parishes was similar to that in the city's non-covered parishes. It is likely that Chester, as many towns then (and now) had a non-uniform occupational topography, with certain trades concentrated in specific parts of the town, or even in one or two streets. Indeed, Figure 10 shows that the covered parishes in Chester were not representative of the whole town. In the left hand side of this figure, the probate calibration factors for Chester are compared to those of the rest of Cheshire for c.1817. Because these are post-Rose's Act parish register data, all Chester parishes provide occupational information, so a one-on-one comparison with the probate data is possible. The probate multipliers for Chester city turn out to be in line with those from rural Cheshire. For the c.1725 data, displayed on the right hand side of the figure, a one-on-one geographic match could, as discussed, be made for rural Cheshire but not for Chester city. Nevertheless, if the covered parishes in Chester city *had* been representative of the town as a whole, Chester's probate multipliers should have been in line with those for rural Cheshire. That is not the case. Ergo, the covered parishes in Chester are not representative of the whole town.

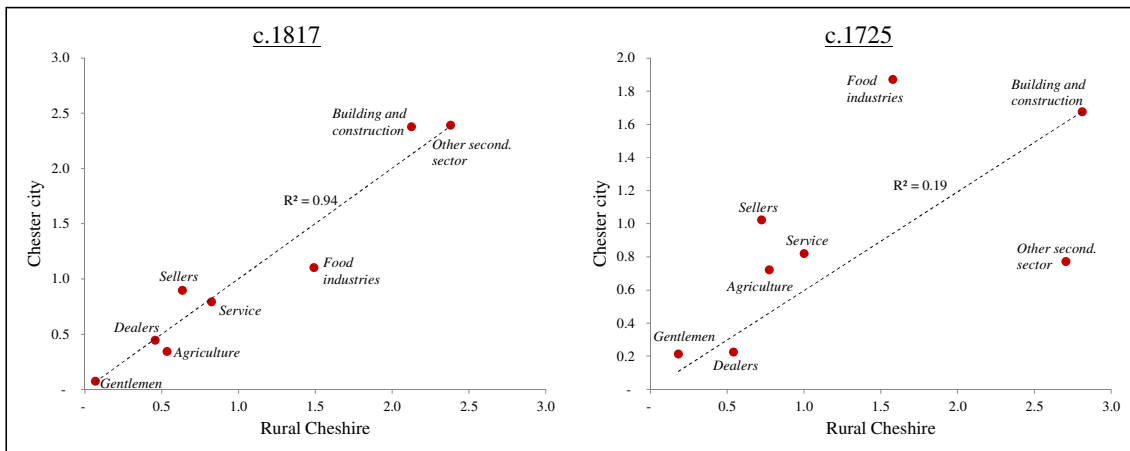


Figure 10. Probate calibration factors compared between rural Cheshire and Chester (indexed; average male decedent = 1).

Note: only occupations encountered sufficiently frequently in the Chester city parish registers and probate documents to enable a statistically meaningful calculation of the calibration factors were included in the charts.

But, Figure 10 also provides the solution for this problem. As the chart on the left-hand side showed, the probate multipliers for c.1817 in Chester and the rest of Cheshire were comparable. That was, in all probability, also the case in c.1725. Consequently, the c.1725 probate multipliers derived from *Cheshire excluding Chester* can be applied to the probate data for *the city of Chester*, which cover the whole town. Thus, a reliable occupational structure is derived for the county as a whole.

The final result is Figure 11, providing an unbiased picture of male occupational developments in Cheshire in the eighteenth and early nineteenth centuries. The peculiar developments suggested by the parish register data in isolation, depicted in Figure 4, disappear once the probate record has been employed to reconstruct the occupational structure in the ‘missing’ parishes. The early, sudden fall in importance of the agricultural sector is replaced by a gradual decline throughout the period, accelerating during the industrial revolution. The rapid growth and inexplicable later decline of the tertiary sector are replaced by a more gradual and plausible development. The calibrated occupational structures for c.1755 and c.1785 differ particularly strongly from those based on parish registers alone.

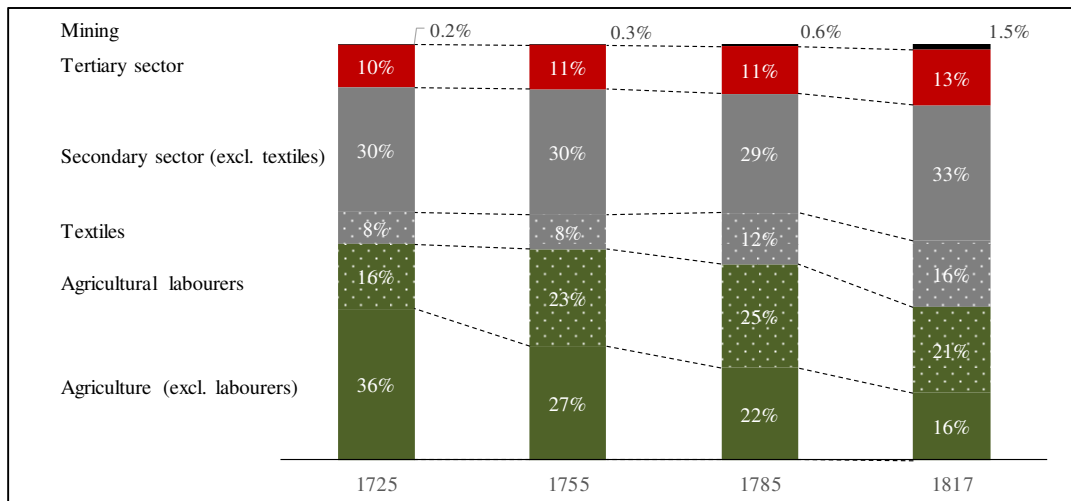


Figure 11. The occupational structure of Cheshire, from calibrated probate data (1725-1817)

Sources: probate databases; parish register database.

Two remarks regarding this calibration approach are worth making at this point. Firstly, it removes the probate data’s occupational bias regardless of the *cause* of this bias. Although the overrepresentation of capital-intensive and ‘wealthy’ occupations is undoubtedly the principal cause of occupational bias in the probate record, other causes cannot be ruled out entirely. For example, age bias in the probate record would translate into occupational bias if a non-trivial share of men altered occupations during their lifetimes. If a significant share of, say, men who started their working life as textile workers changed to, say, farming later in life, this would create a non-wealth-related, additional bias in the probate data. But this additional source of bias would automatically be reflected in a higher value of the calibration factors for workers in the textiles industry, and would therefore equally automatically be removed when applying these factors to the probate data.

Secondly, the approach obviously relies on the source of the calibration, that is parish registers, to be an unbiased and accurate source of occupational information itself. Any potential bias in

the parish register is reflected in the calibration factors and, therefore, replicated when these are applied to the probate data. When collecting parish register data, members of the Occupational Structure project have been very careful to minimise potential sources of bias. As discussed in Chapter 1, only baptism registers were included in the dataset in which occupations were recorded for at least 95 per cent of the baptised children for which a father's occupation could be expected to be given – so excluding illegitimate children. This was done to avoid bias produced by, for example, parish clerks frequently omitting an occupational descriptor for fathers employed in the dominant, 'default' occupation.⁹² By comparing them to other sources, Kitson et al have shown that the parish register data are, indeed, reliable.⁹³ At first sight, servants present a problem. Since servants were highly unlikely to be married and, therefore, to father children they are underrepresented in the baptism registers compared to sources which include men before the age of marriage. However, when combined with labourers, 'they comprise almost exactly the same share of the overall male workforce' since the vast majority of both servants and labourers worked in agriculture, with farm servants becoming farm labourers after marriage.⁹⁴ Domestic servants *are* somewhat underrepresented in the parish registers, however, as Kitson et al's comparison to the 1841 demonstrated, and a correction factor was therefore applied to the domestic servant numbers in the parish register data and the calibrated probate data presented in this dissertation.

2.5 Using the approach where/when no parish data are available

The probate calibration approach employs the strengths of one data source to eliminate the weaknesses of the other. Parish records have little or no bias, and can therefore be used to remove the probate record's inherent occupational bias. Conversely, probate data provide full geographic coverage and can therefore be used to reconstruct the missing parishes from the parish record. The methodology utilises to its advantage a contrast between the two data source which Glennie identified more than twenty years ago: 'The relatively sparse spatial and temporal coverage provided by parish registers is a major weakness, but is partially compensated for by their broad social coverage. More or less the opposite is true of wills and probate inventories.'⁹⁵ Indeed, the probate and parish record complement each other beautifully. In combination, they allow one to determine a reliable and unbiased occupational structure for every cohesive geographical area for which an index to probate documents and a reasonable number of parish records with occupational information are available. But, the methodology can

⁹² A real risk, as is clear from an analysis of precisely such a type of bias in the Gloucestershire 1608 muster list – as discussed on page 80.

⁹³ Kitson *et al*, 'Creation', pp. 10-5.

⁹⁴ *Ibid*, p. 11.

⁹⁵ Glennie, *Distinguishing men's trades*, p. 32.

also be used to determine male occupational structures in time periods and geographies for which no parish register data are available at all. How and why that works is explained in this section.

As demonstrated in the Cheshire case example, the methodology works by multiplying probate data with calibration factors derived from a comparison with parish register data which is ‘near’ in time and place. Near in time, as the comparison is limited to a relatively short time interval of three decades. Near in space, as the comparison is limited to parishes and chapelries in one and the same county. But what if there are no parish data which are near in time and space? In eighty per cent of English and Welsh counties, occupations were not reliably recorded in a single parish between 1730 and 1813. And before 1695, virtually no parishes with reliable occupational records can be found at all, outside London. Can we assume that the occupational bias of the probate records is sufficiently stable to justify ‘borrowing’ calibration factors from further away in time and place? Historians have generally assumed that the answer to this question is no. Glennie, for example, thought it: ‘unlikely that the “sample” of men represented by probate documents will possess precisely the same ... occupational bias in different areas, or for one area at different times.’⁹⁶ And Clark has recently suggested that the whole impression of a consumer revolution in the eighteenth century derived from probate inventories may not be a reflection of historical reality at all but simply the result of increasing bias in the probate record over that century.⁹⁷ It will be shown, however, that such fears are exaggerated.

Figure 12 tests the degree to which calibration factors can be ‘borrowed’ from nearby areas in the same time periods. Figure 12 focuses on southern England since there, the lack of parish register data for calculating local calibration factors was particularly problematic, with for example the South-West and South-East hardly having any parish register coverage at all. But similar charts were made for other parts of the country, with similar results. In each of the scatter plots in Figure 12, the x-axis represents the male occupational share per occupational sub-sector according to parish registers in one county, whilst the y-axis represents the share according to the calibrated probate data in the same county. But the calibration factors used are not those from the county itself, but from the combination of all *other* counties in the figure. In other words, the calibration factors that were used to calibrate the Berkshire probate data were derived from a comparison of probate and parish register data in Bedfordshire, Buckinghamshire, Cambridgeshire, etcetera. Each dot represents an occupational sub-sector. A red ‘x=y’ line has been included in each chart; had the probate calibration been perfect, all dots in each chart would have been on this line. As the figure shows, the calibration is not perfect,

⁹⁶ Ibid, p. 40.

⁹⁷ Clark, ‘The consumer revolution: turning point in human history, or statistical artifact?’ (Davis, 2010), <http://www.econ.ucdavis.edu/faculty/gclark/papers/Consumer%20Revolution.pdf>.

but the match with the parish register data is quite good. The coefficient of determination (R^2) varied between .89 for Bedfordshire to .97 for Cornwall. In short, for areas in which, in the absence of parish register data, no local calibration factors can be determined, using those from counties in the same general geographic area generates fairly accurate results.

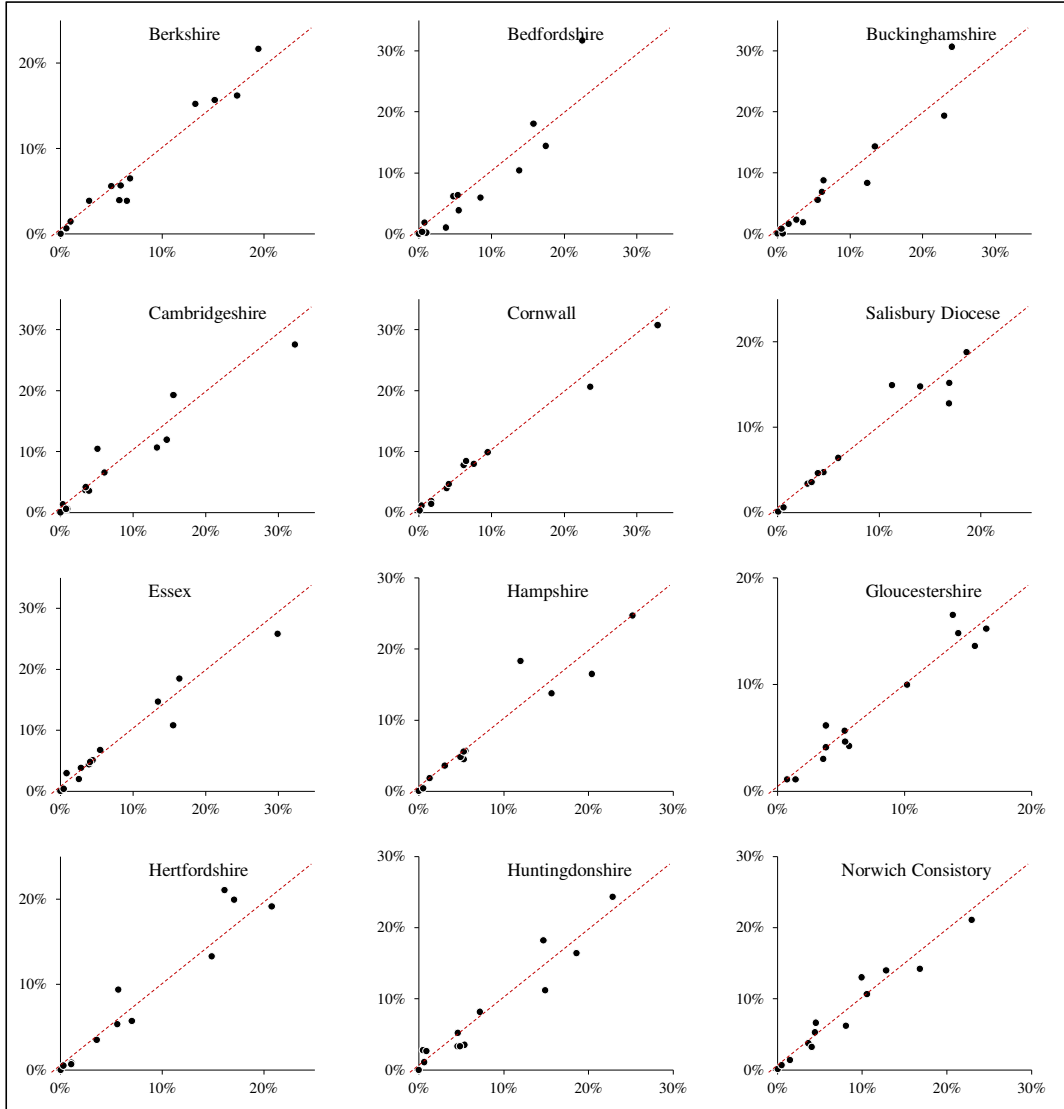


Figure 12. A comparison between parish register and probate-derived male occupational structure using calibration factors from nearby and comparable counties (southern England, c.1817)

Notes: Each data point represents an occupational sub-sector (agriculture, mining, other primary sector, clothing, footwear, textiles, metal and tools, building, other secondary sector, dealers and sellers, services and professions, and transport). Labourers and seamen were excluded, for reasons explained in Chapter 6. Actual male labour shares, derived from parish register data, are plotted on the horizontal axis, with the vertical axis representing those calculated from the calibrated probate data. The calibration factors used in each county/area are those derived from all *other* counties/areas. The red lines are 'x=y' lines; had the calibration been perfect, all data points would have landed on these lines. All charts represent a single county, except for 'Salisbury Diocese' (Wiltshire + those Dorset parishes in that probate jurisdiction) and 'Norwich Consistory' (Norfolk + those Suffolk parishes in that probate jurisdiction). Only parishes in

which probate and parish register data are available were included, as only for those can a one-on-one comparison be made.

The value of this what one might call ‘spatial extendibility’ of probate calibration factors is useful for areas for which, in the absence of parish register data, no local calibration factors can be determined. For example, no occupational data from parish registers exist for Cornwall before Rose’s Act, so no local probate calibration factors can be calculated for, say, the early eighteenth century. But for many southern English counties, parish register data *are* available. By using probate calibration factors derived from those, a reliable, unbiased male occupational structure can be calculated from Cornwall’s probate data.

This ‘spatial extendibility’ is also useful for another reason. To optimally remove the probate data’s occupational bias, it is beneficial to work with data at low levels of occupational abstraction, since the probability of being probated varied strongly even within sub-sectors. For example, the textiles sub-sector encompasses a variety of occupations – clothiers, fullers, dyers, weavers, male spinners, etcetera – with very different average wealth levels and capital requirements. Using one calibration factor for the entire textiles sub-sector potentially leads to sub-optimal results; the composition of the sub-sector varied over time and place, and this variation cannot accurately be captured using a single calibration factor. But there is a limit to the degree to which sub-sectors can be split into smaller occupational groups when calculating calibration factors: there have to be sufficient numbers of probate and parish register data for a reliable result. A balance needs to be struck between, on the one hand, occupational specificity and, on the other hand, statistical significance. For common occupations – yeomen, coal miners, tailors, blacksmiths, weavers, schoolmasters, etcetera – the numbers of parish register and probate observations were usually large enough to accurately determine calibration factors at the level of individual counties. But for other, rarer occupations – foresters, button makers, fullers, nailors, clock makers, naval officers, etcetera – this was only possible in some counties or for larger geographical areas. By combining counties, occupational specificity can be improved and low-level calibration factors can be calculated. This enables one to use local calibration factors for (locally) frequent occupations whilst using regional or national calibration factors for occupations that were (locally) rare. The calculations in this dissertation are based on a set of more than one hundred calibration factors, listed in Table 4. This high degree of occupational specificity in unbiasing the probate data was possible because not all of these calibration factors needed to be calculated from local data for every county; where local data were statistically insignificant, regional or even national figures could be used.

Table 4. Probate calibration factors and their average, national values c.1817

Sector	Sub-sector	Occupational group	Cal. factor	
Primary	Agriculture	Farmer/yeoman	1.00	
		Husbandman	5.63	
		(Market) gardener	3.90	
		Animal husbandry, sheep	6.81	
		Animal husbandry, other	1.04	
		Agriculture, management	7.18	
		Agriculture, other	14.51	
		Mining	Coal miner	24.53
	Miner (type unspecified)		10.76	
	Mining, other		3.82	
	Quarrying		9.11	
	Rest of primary		Fisherman	9.90
			Forester	4.49
		Game/parkkeeper	8.86	
Primary sector, other		4.56		
Secondary		Clothing	Tailor, clothing maker	5.28
			Button maker	1.84
	Clothing, other		5.29	
	Hatter/glover		7.95	
	Footwear	Shoe/bootmaker/clogger	6.72	
	Textiles	Weaver	13.33	
		Spinner	23.65	
		Clothier/textile fabric/products maker	2.85	
		Textile processor	9.40	
		Dyer	6.60	
		Wool comber, carder, fuller, shearer	8.40	
		Textiles, other	3.09	
		Metal manufacture and products	Blacksmith	5.15
			Iron/steel manufacture	12.71
Nail/screw/pin maker			10.48	
Iron/steel products making, other	5.58			
Non-ferrous metal, raw and products	3.91			
Machines and tools making	Machine making		3.40	
	Tool making	5.77		
	Edge tool manufacturer	6.42		
	Engineer/milwright	7.38		
Building and construction	Carpentry	6.04		
	Bricklaying	6.04		
	Masonry	7.50		
	Painter/decorator/plasterer	7.28		
	Plumber/glazier	2.14		
	Roofer/slater/tiler	7.84		
	Building, other, specialist trades	0.97		
	Rest of secondary sector	Brewer	1.72	
Baker/confectioner		3.13		
Butcher		3.39		
Miller		3.80		
Food and drinks, other		1.15		
Skinner/tanner		2.88		
Saddle/harness maker		2.72		
Leather industries, other		2.44		
Sawyer, timber worker		21.83		

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Sector	Sub-sector	Occupational group	Cal. factor
	Rest of second'y sector (cont'd)	Furniture maker	4.63
		Cooper, cask maker	3.40
		Wooden products, other	4.80
		Wheelwright	3.96
		Ship building	6.36
		Brick and tile making	4.93
		Chemical, salt, soap production	2.93
		Clock/watch/scientific instruments making	3.02
		Coach/cart building	5.33
		Glass production	11.72
		Paper making	9.99
		Pottery, earthenware manufacture	7.83
		Precious metal working, jewelry making	2.62
		Printer, book producer	12.39
		Rope making	6.24
		Secondary sector, other or unspecified	4.17
Tertiary	Dealers and sellers	Shopkeeper/chandler/grocer	1.53
		Ironmonger	0.98
		Jeweller	3.01
		Peddler, hawker, itinerant trader	2.45
		Retail, other	1.91
		Merchant	1.00
		Draper/mercator	1.50
		Dealer/factor/wholesaler	1.45
	Services and professions	Domestic service	14.09
		Soldier/non-commissioned officer/militiaman	15.89
		Army, other	2.97
		Naval officer	11.92
		Marine	20.64
		Navy, other	8.79
		Hospitality services	1.25
		Entertainment	5.54
		Hairdressing	3.85
		Warehousing	3.57
		Services, government	1.49
		Services, customs and excise, inland revenue	4.41
		Services, other	1.87
		Professions, education	2.60
		Professions, legal	6.05
		Professions, medical	1.31
		Professions, religious	1.29
		Professions, other	2.84
		Profession, support	2.97
	Transport and communications	Road transport, drivers	7.68
		Road transport, other	13.32
		Inland navigation	17.30
		Merchant navy, officer	1.10
		Merchant navy, other	8.50
		Maritime services	0.38
		Transport, other	6.71
Labourer	Labourer	Labourer	38.44
	Not included in occupational structure	Distinguished titles and owners of capita	0.29

But how to calibrate probate data in time periods when no parish register data are available at local, regional, or even national level? Figure 13 examines the ‘temporal extendibility’ of probate calibration factors for the c.1710-c.1817 time period, in a similar fashion to that in which Figure 12 tests ‘spatial extendibility’. Again, the x-axis in each chart represents the male occupational share per sub-sector according to parish registers, whilst the y-axis represents the share according to the calibrated probate data, with each data point being an occupational sub-sector. The probate calibration factors used for each chart were those derived from a comparison of probate and parish register data for c.1817.⁹⁸ As the charts show, projecting calibration factors backwards in time yields good results, with the vast majority of sub-sector ‘dots’ on or close to the ‘x=y’ lines. Apparently, calibration factors are remarkably stable over time, even over the full century separating the c.1710 probate data in the lower three charts from the c.1817 calibration period.

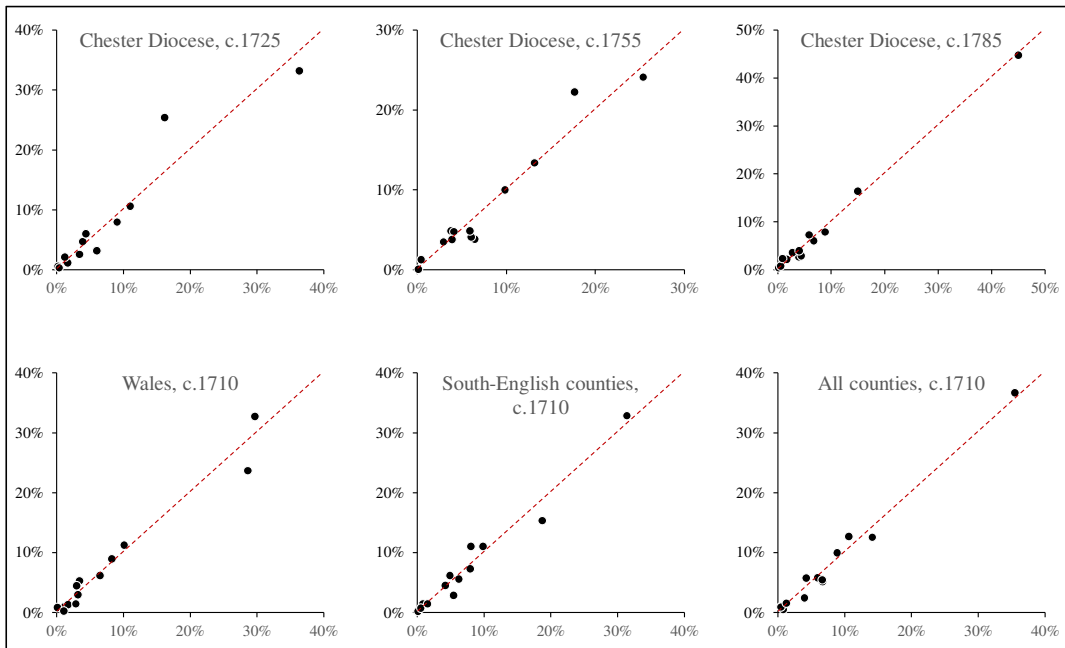


Figure 13. A comparison between parish register and probate-derived male occupational structure using calibration factors from c.1817 (England and Wales, c.1710-c.1785)

Notes: Each data point represents an occupational sub-sector (agriculture, mining, other primary sector, clothing, footwear, textiles, metal and tools, building, other secondary sector, dealers and sellers, services and professions, and transport). Labourers and seamen were excluded, for reasons explained in Chapter 6. Actual male labour shares, derived from parish register data, are plotted on the horizontal axis, with the vertical axis representing those calculated from the calibrated probate data. The calibration factors used in each county/area are those derived for c.1817 for the same geographic area, parish register data from the 1813-20 period and probate data from the 1802-32 period. The red lines are ‘x=y’ lines; had the calibration been perfect, all data points would have landed on these lines. Only parishes in which probate

⁹⁸ That is, parish register data for 1813-20 and probate data for 1802-32.

and parish register data are available were included, as only for those can a one-on-one comparison be made.

Since calibration factors are, apparently, sufficiently ‘temporally extendible’ to generate accurate results, they can be used to interpolate between two points in time for which both probate and parish register data are available. As discussed above, for the overwhelming majority of English and Welsh counties, no parish registers can be found in which occupations were reliably recorded for the mid and late eighteenth century. This is problematic, as this is a critically important time period from the perspective of economic history, since it coincides with the immediate run up to and initial phase of the Industrial Revolution. As probate data *are* available for this period in the overwhelming majority of English and Welsh counties, this problem can now be solved. Figure 14 provides an example for Wiltshire.

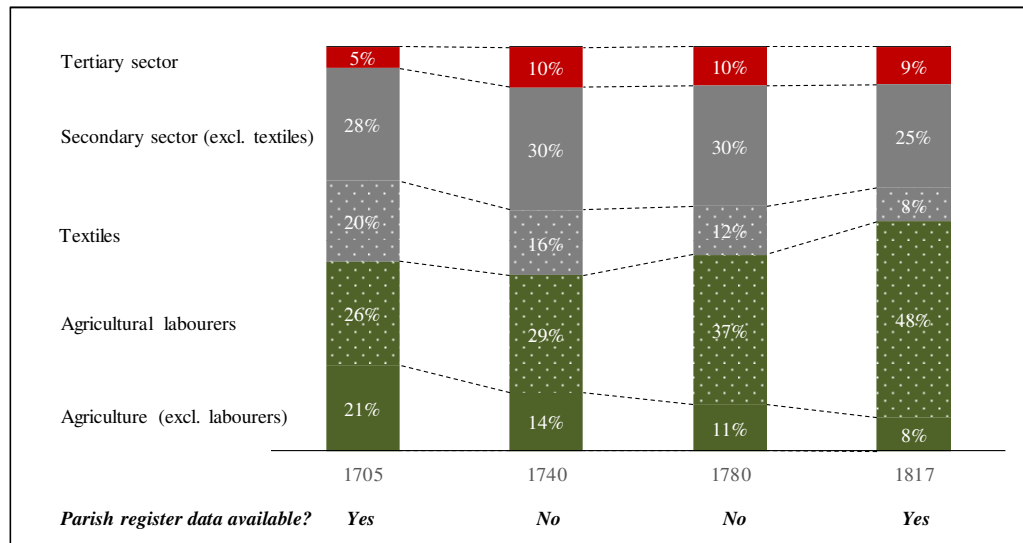


Figure 14. Development of Wiltshire’s male occupational structure, according to calibrated probate data, c.1705-1817

Notes: parish register data for calibrating contemporary calibration factors are available for c.1705 and, of course, post 1812. For c.1740 and c.1780, contemporary probate data and calibration factors ‘borrowed’ from c.1705 and c.1817 were used.

Sources: Wiltshire probate index, obtained from the Wiltshire Record Office; parish register database created by the Cambridge Group.

The ‘temporal extendibility’ of the calibration factors cannot only be profited from to *interpolate* between two points in time for which parish data are available, as in Figure 14, but also be used to *extrapolate* outside the period with parish data altogether. As discussed, before 1700, parish registers with reliable occupational information are very rare. By employing probate data and the – presumed constant – calibration factors derived from the parish register period, it is nevertheless possible to estimate male occupational developments in the seventeenth century. In Figure 15, this was done for Cheshire.

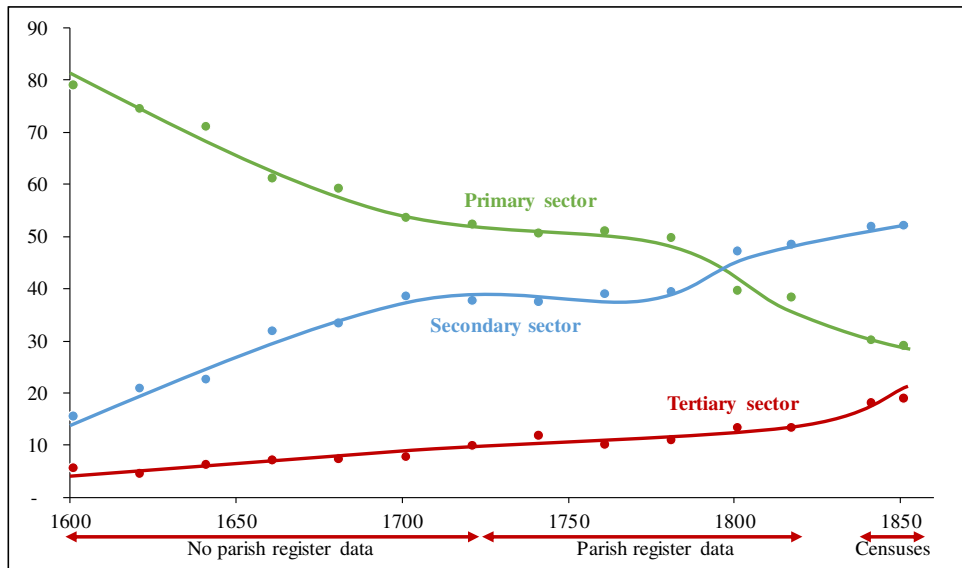


Figure 15. Male labour share percentage by occupational sector (Cheshire, 1601-1851)

Notes: before c.1725, no parish register data are available for determining contemporary calibration factors. The c.1725 factors were therefore used, and applied to pre-1725 probate data. Labourers were allocated to sectors in line with the approach set out in Chapter 3.

Sources: Probate index from the Chester Record Office; parish register database created by the Cambridge Group; 1841 and 1851 census.

But Figure 15 assumes that early-eighteenth-century calibration factors are temporally extendible into the seventeenth century. Unfortunately, it is not possible to test this assumption by creating the seventeenth-century version of Figure 13, since the required parish register data are lacking. Fortunately, two other sources of occupational data with (almost) comprehensive social coverage exist for the seventeenth century, albeit only for relatively small areas, and only for a single year. The first of these is formed by the returns for the 1660 poll tax for the Cheshire hundred of Northwich, which was transcribed for the Record Society of Cheshire and Lancashire by G.O. Lawton, and which contains occupations for most men.⁹⁹ All except those on poor relief were expected to pay this tax. An occupation was recorded for 73 per cent of the three thousand men listed in the returns. Table 5 provides a comparison of the male occupational structure according to the poll tax returns with those derived from probate data; the latter were calculated using calibration factors for Cheshire in c.1725, so over sixty years later. As the table shows, the two sources provide a very good match.

⁹⁹ Transcribed in Lawton, *Northwich hundred: poll tax 1660 and hearth tax 1664* (Bath: Pitman Press, 1979).

Table 5. Comparison of occupational structure according to poll tax and calibrated probate data (Northwich hundred, 1660)

	From poll tax (%)	From probate (%)
Primary sector	64.9	66.9
Agriculture	64.8	66.9
Mining	0.0	0.0
Other	0.0	0.0
Secondary sector	29.6	29.6
Clothing	5.2	4.7
Footwear	2.7	2.2
Textiles	4.6	6.5
Metal trades & tools	3.8	2.7
Building	4.1	2.8
Other	9.2	10.7
Tertiary sector	5.5	3.5
Dealers and sellers	1.4	0.6
Services & professions	3.7	2.7
Transport	0.3	0.2

Notes: The probate data used were for the period 1640-1670 (with relatively few data from the 1650s, when the probate process was centralised in London). C.1725 calibration factors were applied to the probate data. Labourers were allocated to sectors in line with the approach outlined in Chapter 3.

A second seventeenth century source of male occupational information with comprehensive social coverage is comprised by the 1608 muster list for Gloucestershire.¹⁰⁰ This source lay at the basis for ‘An occupational census of the seventeenth century’ in a deservedly famous paper of the same name by A.J. and R.H. Tawney.¹⁰¹ Deriving a reliable occupational structure from the muster list requires addressing two issues. Firstly, the share of men provided with an occupation in the muster list varies from place to place, and this variation is not random, as Figure 16 demonstrates: the more agricultural the area, the lower the share of men for whom an occupation was listed. If the muster list data would be taken at face value, the agricultural sector would be underrepresented. Why the occupations of a relatively high proportion of men were not specified in farming-dominated areas is a matter for speculation. It may simply have been caused by farming being *so* dominant in these area that it was considered the ‘default’ activity, with occupational specification (mostly) reserved for the few men who were *not* involved in agriculture. It is also possible that in the hamlets and small villages in which these men lived, an occupational denominator was simply not required to distinguish one man from another, as the likelihood of the same first name/surname combination occurring more than once was very low in these small settlements. As will be discussed in Chapter 6, examples of relatively low

¹⁰⁰ Smyth, *The names and surnames of all the able and sufficient men in body fitt for his Majestie's service in the warrs, within the City of Gloucester and the inshire of the same*, manuscript (1608).

¹⁰¹ Tawney and Tawney, ‘An occupational census of the seventeenth century’, *The Economic History Review*, a5:1 (1934).

occupational specification in rural, farming-dominated areas can also be found in some of the early probate records, notably in early-seventeenth-century Wales.

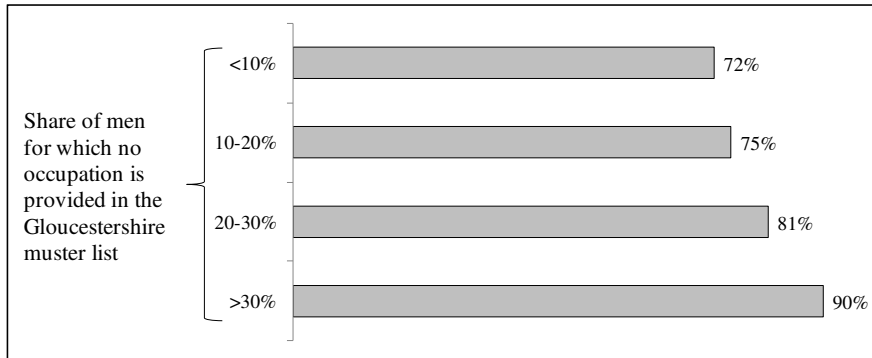


Figure 16. The agricultural share of the male labour force in the uncorrected probate record as a function of the percentage of men of unspecified occupation in the muster list (Gloucestershire, 1608)

A second problem with the muster list data is the sizeable number of servants. The Tawneys allocated these to occupational sectors based on the occupation of their masters. They considered servants of masters specified by status only – gentlemen, knights, esquires, etcetera – to have been domestic servants.¹⁰² The Tawneys’ approach leads to 39 per cent of servants being allocated to agriculture, 24 per cent to the secondary sector, and 37 per cent to the tertiary sector, almost all as domestic servants in the households of gentlemen and other men of status. This distribution seems rather light on farm servants. The Tawneys admit that the number of domestic servants is overstated as ‘some of those classed as household servants ... were undoubtedly farm servants’; indeed, they note that in a number of stately households, the servants are specified as domestic or agricultural, with the latter making up around forty per cent of the total.¹⁰³ But their assumption that servants of secondary sector workers were employed in their masters’ trade is also debatable. It is possible that many of them, perhaps even the overwhelming majority, were farm servants. As will be discussed in Chapter 4, a significant proportion of households whose male ‘household head’ worked in a secondary sector occupation was engaged in farming as a household by-employment, with most of the farming undertaken by household members other than the ‘household head’ such as his wife, living-in children, and (farm) servants.

Table 6 presents Gloucestershire’s estimated occupational structure in 1608 as derived from the muster list, taking the above two issues into account. The agricultural sector has been upwardly corrected for under-specification in farming-dominated parishes, as depicted in Table 6. To express the uncertainties in the allocation of servants to sectors, two scenarios were calculated.

¹⁰² Ibid, pp. 33-4.

¹⁰³ Ibid, p. 33; see also footnote 2 on that page.

One copies the Tawneys' approach, allocating servants in line with their masters' occupation. In the alternative approach, forty per cent of the servants of gentlemen and other men of status were allocated to farming rather than considered domestics, and all servants of secondary-sector workers were considered farm servants too. The result is a (manageable) range rather than a single set of values. Table 6 also includes the occupational structure derived from contemporary probate data, using calibration factors from the early eighteenth century. Despite a gap of more than a century between those calibration factors and the probate data to which they were applied, the muster list and calibrated probate estimates match well – with the exception of the textiles sub-sector, to which I shall return in Section 6.1.2.

Table 6. A comparison of male occupational structures as derived from muster list and calibrated probate data (Gloucestershire, c.1608)

	From muster list	From probate
	(%)	(%)
Primary sector	54-58	59
Agriculture	53-58	58
Mining	1	0
Other	0	0
Secondary sector	35-37	37
Clothing	5	4
Footwear	2	2
Textiles	14-15	20
Metal trades & tools	3	2
Building	4	5
Other	6-7	6
Tertiary sector	6-8	5
Dealers and sellers	1-2	1
Services & professions	3-5	2
Transport	2	1

Notes: Excluding Bristol, which was not covered in either data source and excluding Bilbury Peculiar, which was not included in the probate index. See main text for background. Note that domestic servants are included in 'services & professions'.

Sources: Probate database; parish register database; Gloucestershire muster list.

2.6 Closing remarks

In conclusion, probate documents, in their 'raw' form, are a gravely unreliable source of male occupational information, but they can be converted into a reliable data source through calibration with parish register data from the same parishes and time periods. Furthermore, the calibration factors obtained by this procedure can be used to remove the occupational bias from probate data from time periods and geographic areas in which no parish register data are available. The approach effectively exploits the complimentary properties of the parish register and probate data, using the latter to calibrate the former, and the former to interpolate and

extrapolate the latter. In this way, historical male occupational structures can be reconstructed at national, county, and sub-county levels for the 1600 to 1850 period.

It should be stressed at this point, however, that the above only describes the general approach to using probate data as followed in this dissertation. Occupational bias is the central problem of the probate data but, as will become clear, it is not the only one. There are many smaller, more restricted issues which require addressing too: how to achieve accuracy for particularly underrepresented occupations such as labourers; how to deal with the absence of miners in the probate record in some counties; how to account for changes in calibration factors over time for occupations experiencing major technological change – such as those in textiles – or increases in scale – such as farming in southern England; etcetera. These specific but not insubstantial issues, and their solutions, are addressed in Chapter 6.

Finally, as already discussed in Sections 1.5.2 and 1.5.3, two other significant problems exist, which are not the result of particular weaknesses of the probate data at all but are shared by all sources of historical occupational information: the sectoral allocation of labourers and the incorporation of by-employments. These are the subjects of the next two chapters.

3 ALLOCATING LABOURERS TO OCCUPATIONAL SECTORS

As discussed in the introductory chapter, the sectorally-non-specific occupational denominator of ‘labourer’ is very common in the historical sources, forcing historians to, somehow, allocate these men to sectors. Existing allocation methods were examined in Section 1.5.2, and it was concluded that a new approach was required, one capable of accurately distributing labourers across sectors on national, regional, and local scales. This new approach is introduced in this chapter, and its results are discussed and compared to those of existing allocation methods.

3.1 Principles of the new approach

The method is based on multivariate regression techniques, with the number of labourers (per geographical unit of analysis) as the dependent variable. The mathematical basis is straightforward: the total number of labourers (L) within a given geographic area equals the sum of the number of agricultural labourers (L_a) and non-agricultural labourers (L_{na}) in that area, the latter being composed of labourers working in mining and quarrying (L_m), in the secondary sector (L_s), and in the tertiary sector (L_t):

$$L = L_a + L_{na} = L_a + L_m + L_s + L_t \quad (1)$$

It should be noted here that a labourer’s employment was not necessarily restricted to a single type of work. Labourers may have taken up varying types of work, depending on availability, perhaps working in agriculture during the peak seasons of the farming year whilst working for building tradesmen at other times. The number of labourers in a specific trade should therefore not be interpreted in terms of individuals allocated fully to that trade, but rather as the sum of fractions of individuals, allocated to that trade, with those fractions corresponding to the share of the average working year in which they provided wage labour to employers in the trade. A general labourer working eight months of the year on the land and four in building and

construction is counted here as two-thirds of a farm labourers and one-third of a building labourer.

Returning to equation (1), one may logically presume that, for farms engaged in a similar type of farming, on similar terrain, and in a similar climate, there will have been a positive relationship between the average number of agricultural workers per farm and the mean farm surface. The shape of this relationship depends on potential economies of scale which larger farms may have enjoyed over smaller ones. The 1851 census provides the data to test the shape of the relationship directly, the results of which are displayed in Figure 17 for Bedfordshire and Rutland.

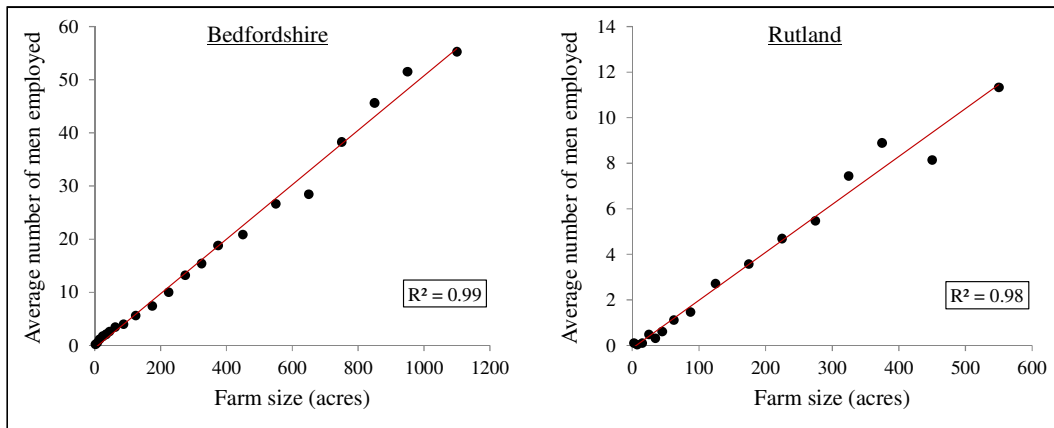


Figure 17. The average number of men employed per farm, as a function of farm size, 1851

Note: The data for these graphs were collected from the 1851 census by Leigh Shaw-Taylor for his research into the rise of agrarian capitalism, and kindly made available to me.

Sources: 1851 Census; Leigh Shaw-Taylor.

It is clear that economies of scale were minimal, and that the relationship was a simple linear one:¹⁰⁴

$$\frac{L_a + NL_a}{F} = C_s \cdot \frac{S}{F} \quad (2)$$

with L_a being farm labourers, NL_a being the other, non-labourer farm workers (farmers, family members, specialist workers, etcetera), F being the numbers of farms, S being the total surface in agricultural use, and with C_s a constant.

Equation (2) can only really be expected to hold for areas of homogeneous agricultural topography, such as within the boundaries of fairly uniform counties like Bedfordshire and

¹⁰⁴ The linearity of the relationship can also be tested directly, by trying out different curves in the regression analysis. This too shows that a linear relationship provides the best 'fit' between model and data.

Rutland. As Figure 17 shows, C_S differed considerably between these two counties, with one farm worker being added for every twenty acres in Bedfordshire, compared to one per forty-eight acres in Rutland. The value of C_S is a measure of the ‘labour intensity’ of agriculture, and depends on local factors such as soil quality, climate, type of agriculture, and the proximity to urban centres. For larger and more mixed counties, let alone for England and Wales *in toto*, a single constant cannot adequately describe the relationship between farm size and numbers of worker. Such heterogeneous areas have to be divided into smaller, (more) uniform areas, with equation (2) solved for each of these smaller areas separately. The smaller and the more uniform such areas are made, the more accurate the regression will be. Therefore, in this paper, the equation has always been solved at the lowest level of geographical detail for which the required data were available. For 1851, at the time these analyses were performed, this was the census registration district, as occupational information was not (yet) available for smaller geographical units.¹⁰⁵ Thus, for 1851, England and Wales were divided into 624 units. For 1813-20 and for earlier time periods, male occupational information derived from baptism registers was available at the much smaller level of (up to) 11,365 Anglican Registration Units, that is, the parishes and chapelries in which occupational information was recorded.¹⁰⁶ These smaller geographical areas were therefore used as the units of analysis in these time periods.¹⁰⁷

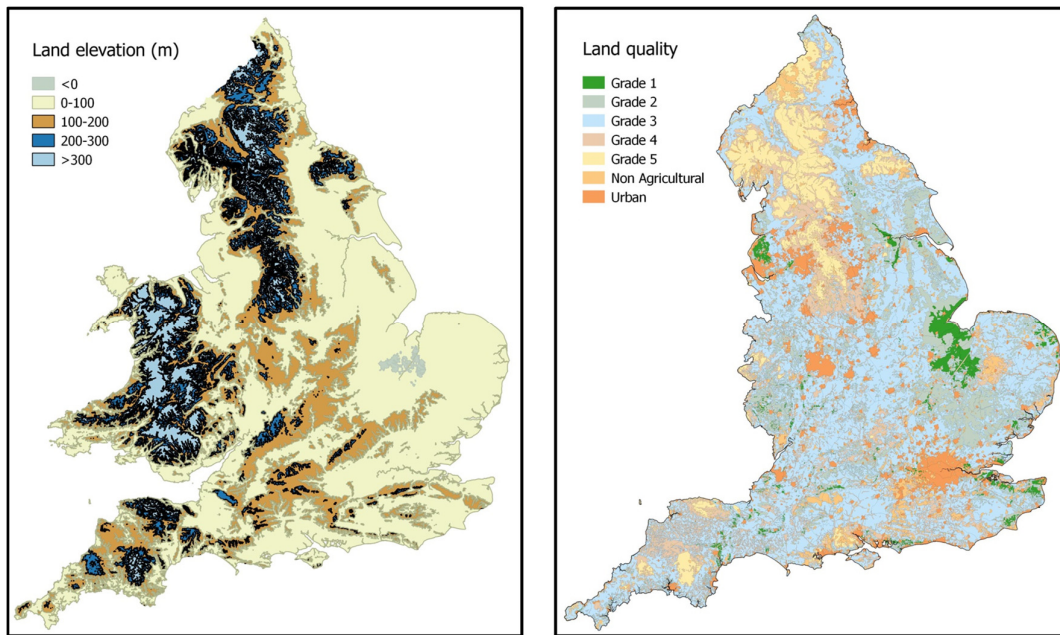
To cater for the differences in local climate and soil quality between these geographical units, a number of additional independent variables were included in the regression analyses, namely elevation, agricultural land quality, and latitude. Elevation has an obvious effect on the suitability of land for agriculture, with both climate and, generally, soil quality deteriorating with increasing altitude. The geographical units of analysis were therefore intersected with elevation contours, at hundred metre intervals, depicted on the left-hand side in map 1. Measures for agricultural land quality are not systematically and quantitatively available for the early nineteenth and eighteenth centuries. Therefore, modern-day land classification

¹⁰⁵ Via the I-CeM project, information for the 1851 census has recently become available at the level of parishes too.

¹⁰⁶ Kitson, ‘The codebook of Anglican registration units’ (Cambridge, 2010), <http://www.campop.geog.cam.ac.uk/research/projects/occupations/britain19c/anglicanregistration.html>.

¹⁰⁷ Benefitting from the availability of reliable contemporary population data from censuses in the early nineteenth century, some of the parishes and chapelries in the 1813-20 time period were consolidated into larger geographical units, so they could be matched up with the units at which population data were available. This reduced the number of units from 11,365 to 8,290. For the eighteenth century, the actual parishes/chapelries were used, as population data are not available anyway. The number of units here depended on the number of parishes/chapelries in which the occupation of fathers was reliably and consistently recorded in the baptism registers, which varied over time. For the early eighteenth century, 1,126 units were available as the basis for the analyses in this paper.

assessments were used.¹⁰⁸ Having to rely on modern-day data is, of course, not ideal for those parts of England in which land quality has changed significantly since the early nineteenth century, such as in the fenlands of East Anglia, but it is the best approximation currently available at low-level geographical scales. As with elevation, the geographical units of analysis were intersected with the land quality contours, depicted on the right-hand side in Map 2. For Wales, no land quality data were available at all; therefore, elevation is the only variable approximating land quality here. Latitude has a straightforward effect on local temperatures and, thereby, on conditions for agriculture. Longitude was also initially included, but found to be statistically irrelevant and, therefore, taken out of the model again.



Map 2. Contours of elevation (left) and modern-day land quality (right), with which the geographical units of analysis were intersected

In addition to these factors affecting local conditions for agriculture, the presence of other agricultural workers can also be expected to have affected the need/room for agricultural labourers. Specialist agricultural workers employed by farmers such as ploughmen, threshers, and chaff cutters may be expected to have, to a degree, served as ‘competitors’ for work to more general farm labourers. The 1851 census recorded a significant number of farmers’ sons which may, again, be expected to have reduced the need for external labour. Farmers themselves serve both as employers and competitors for farm labourers. Without farmers, no employment opportunities would exist at all. But farmers obviously also provided a fraction of the required

¹⁰⁸ As created in the Agricultural Land Classification surveys from 1966, and published by Natural England. See: <http://publications.naturalengland.org.uk/publication/35012> for more details. In these surveys land in agricultural use was divided into five classes (Grades 1 to 5, indicating ‘excellent’, ‘very good’, ‘moderate to good’, ‘poor’ and ‘very poor’ land respectively) with the remainder divided into ‘urban’ and ‘non-agricultural’ land.

agricultural labour themselves, reducing the need for external help. Men working in other agricultural occupations, such as dairymen, shepherds, and market gardeners are likely to have had very different, if any, requirements for agricultural labourers than farmers, and their numbers, differentiated by type, have been included separately in the regressions. An occupational denominator which requires special attention is the term ‘husbandman’ as it meant different things in different regions and time periods; since it could indicate a (small) farmer as well as an agricultural labourer, its number was included as a separate predictor variable.

Incorporating the above, equation (2) is expanded into:

$$L_A = \left[(1 + C_{Lat} \cdot Lat) \cdot \sum_i^{land\ types} C_{S,i} \cdot S_i \right] + \sum_j^{agri\ occs} C_{a,j} \cdot NL_{a,j} \quad (3)$$

in which the land types are the intersections of the land quality and elevation contours (except for the Welsh units, where only elevation contours are available), with S_i indicating the surface area of ‘type i’ land in the geographic unit. Given the positive relationship between acreage (of a certain elevation, land quality, etcetera) and the demand for labour, all $C_{S,i}$ must be non-negative, and this constraint was therefore imposed on the regression analyses. The ‘agri occs’ refer to the non-labourer agricultural occupations, with $NL_{a,j}$ indicating their numbers; an overview is provided in Table 7, below. Lat indicates latitude.

For non-agricultural labourers, it is reasonable to assume that, there was a roughly linear relationship between the number of labourers (L_{na}) and the number of non-labourers (NL_{na}) in the same line of work, that is:

$$L_{na,k} \sim NL_{na,k} \quad (4)$$

for each non-agricultural occupation k . After all, if there were twice as many bricklayers in area X than in area Y, it is likely that area X also offered twice the amount of work for bricklaying labourers than area Y. The linearity of the labourer-to-non-labourer relationship can be tested for the, much later, 1911 census, which allocated labourers at a high level of detail, distinguishing, for example, between different types of building labourers; Figure 18 depicts the relationships between builders and building labourers per county, demonstrating linearity.

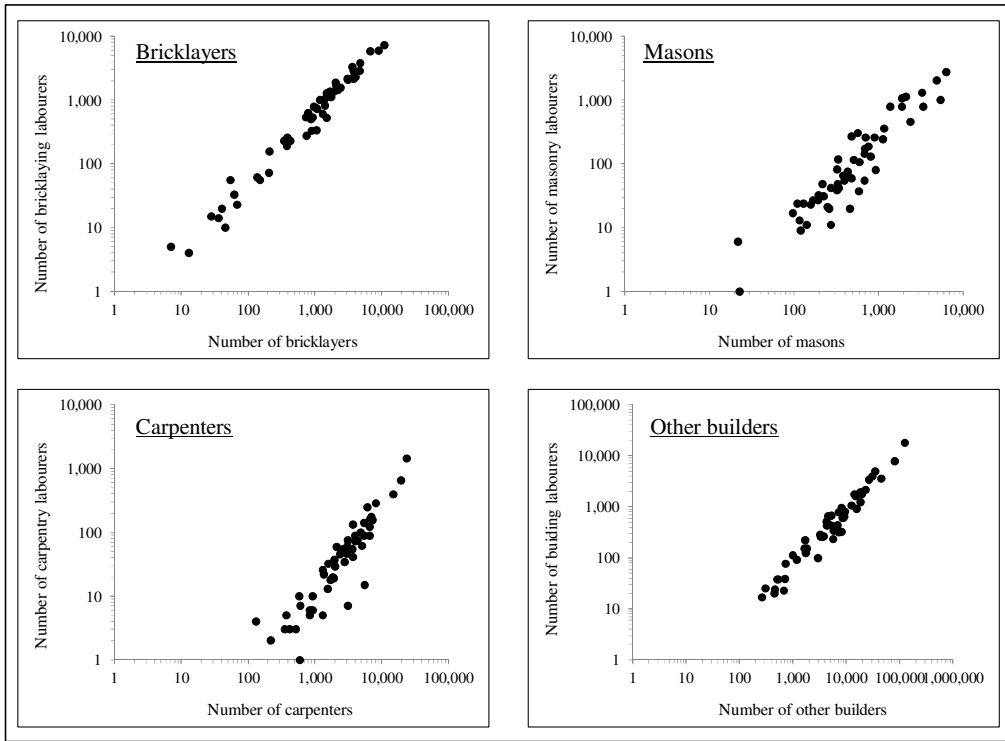


Figure 18. The relationship between building labourers and non-labourers, for different building trades, per registration county, 1911

Note: Each data point in the charts refers to a registration county.

Source: 1911 Census.

So, the number of non-agricultural labourers in a specific geographical area can be expressed as

$$L_{na} = \sum_k^{non-agri\ occs} C_{na,k} \cdot NL_{na,k} \quad (5)$$

with all $C_{na,k}$ constrained to non-negative values. As in the second part of equation (1), the different non-agricultural occupations can of course be grouped into sectors (mining, secondary, tertiary), but that straight-forward step has not been replicated here (see also Table 7, below).

Combining equations (3) and (5) then, the total number of labourers of all types in a given geographical unit can be expressed as:

$$L = \left[(1 + C_{Lat} \cdot Lat) \cdot \sum_i^{land\ types} C_{S,i} \cdot S_i \right] + \sum_j^{agri\ occs} C_{a,j} \cdot NL_{a,j} + \sum_k^{non-agri\ occs} C_{na,k} \cdot NL_{na,k} \quad (6)$$

with $C_{S,i} \geq 0$ for all i , and $C_{na,k} \geq 0$ for all k . Note that for the agricultural non-labourers, it is not clear *a priori* whether they created a demand for agricultural labourers as their employers (in which case, $C_{a,j} > 0$), or whether they reduced the demand for agricultural labourers by themselves providing the required labour (in which case, $C_{a,j} < 0$). Therefore, no constraints were

imposed on the C_{aj} coefficients. An overview of all the independent variables for the regression analyses is provided in Table 7.

Table 7. An overview of the regression predictor variables

<u>Surface area, England (acres)¹</u>		<u>Surface area, Wales (acres)²</u>	<u>Non-labs, continued (men/occ.)</u>
<i>Altitude (m)</i>	<i>Land quality</i>	<i>Altitude (m)</i>	<i>Secondary sector</i>
Below 0	& Grade 1	Below 0	Bricklayer
Below 0	& Grade 2	0 to 100	Carpenter
Below 0	& Grade 3	100 to 200	Mason
Below 0	& Grade 4	200 to 300	Building, other - general ⁶
Below 0	& Urban	Above 300	Building, other - specialist ⁷
Below 0	& Non Agricultural		Baker
0 to 100	& Grade 1	<u>Geo position (m)</u>	Butcher
0 to 100	& Grade 2	Lattitude	Brewer/distiller
0 to 100	& Grade 3		Woodworking - low skill ⁸
0 to 100	& Grade 4	<u>Non-labourers (men/occ.)</u>	Woodworking - high skill ⁹
0 to 100	& Grade 5	<i>Agricultural</i>	Iron manufacture
0 to 100	& Urban	Yeomen/farmer	Non-ferrous raw metal
0 to 100	& Non Agricultural	Husbandman	Blacksmith
100 to 200	& Grade 1	Market gardener	Nail/pin manufacture
100 to 200	& Grade 2	Sons of farmer	Other metal products ¹⁰
100 to 200	& Grade 3	Cattle/horse husbandry	Tanning
100 to 200	& Grade 4	Other animal husbandry	Other leather/rope/bone
100 to 200	& Grade 5	Agric. Manager	Textiles
100 to 200	& Urban	Other agricultural	Clothing
100 to 200	& Non Agricultural	<i>Mining</i>	Milling
200 to 300	& Grade 2	Miner	Pottery
200 to 300	& Grade 3	Quarry worker	Shipbuilding
200 to 300	& Grade 4	<i>Other primary sector</i>	Glass production
200 to 300	& Grade 5	All other prim. sector	Chemical industries ¹¹
200 to 300	& Urban	<i>Tertiary sector</i>	Other industrial manufacture ¹²
200 to 300	& Non Agricultural	Transport - road	Other specialist manufacture ¹³
300 to 400	& Grade 3	Transport - inland water	
300 to 400	& Grade 4	Transport - rail	
300 to 400	& Grade 5	Transport - sea	
300 to 400	& Urban	Maritime services ³	
300 to 400	& Non Agricultural	Other logistic services ⁴	
400 to 500	& Grade 3	Other tertiary sector ⁵	
400 to 500	& Grade 4		
400 to 500	& Grade 5		
400 to 500	& Non Agricultural		
Above 500	& Grade 4		
Above 500	& Grade 5		
Above 500	& Non Agricultural		

Notes: ^[1]The number of elevation/land quality combinations included for England (38) is smaller than the theoretical number ($7 \times 8 = 56$) would suggest because some intersections did not, in practice, occur (for example, grade 1 land quality above 500 metres elevation). Only non-empty intersections were included.

^[2]For Wales, no land quality data were available, and the highest elevation contour available was 300 metres.

^[3]Mostly dockworkers. ^[4]Mostly warehouse workers. ^[5]Since outside of transport, no other tertiary sector occupations were likely to employ general labourers on a significant scale, these were are lumped together. ^[6]Mostly consisting of men simply called 'builder' in the parish registers. ^[7] Mainly painters, glaziers, plasters, slaters, thatchers, tilers, and plumbers. ^[8]Mostly sawyers. ^[9]Coopers, furniture

makers, basket makers, etc. ^[10] For example, gun makers, hinge makers, cutlery makers. ^[11] Salt boilers, soap makers, dye makers, etc. ^[12] Mostly men merely indicated by the terms 'manufacture' or 'mill man'. ^[13] Coach makers, clock makers, book binders, etc.

Using a constrained, non-linear, multivariate regression analysis, this equation can now be solved statistically for all of the constants ($C...$) using contemporary data at the level of smallest geographical unit for which occupational data are available – as discussed above.

3.2 Results of the new approach

Agricultural labourers were identified as such in the 1851 census. This means that the validity and precision of the labourer allocation method described in the previous section can be tested by applying it to this census. If the approach works, it should accurately reproduce the actual division between agricultural and non-agricultural labourers. On a national scale, for England and Wales, the regression approach apportions 72.3% of all labourers to agriculture, and the remaining 27.7% to the others sectors. ¹⁰⁹ This compares remarkably well with the actual distribution, directly derived from the census, of 71.8% agricultural and 28.2% non-agricultural labourers. Labourers working in transportation are also specified in the 1851 census, and constitute 3.6% of all labourers there. ¹¹⁰ Again, this is very similar to the results from the regression approach, which allocates 3.4% of all labourers to transport.

In Figure 19, the regression has been tested for smaller geographical units, namely at the level of counties. In the left-hand chart, calculated and actual numbers of agricultural labourers are compared; in the right-hand chart, the same has been done for non-agricultural labourers. Clearly, the method works very well at this lower geographical level also.

¹⁰⁹ Namely 22.3% to the secondary sector, 3.4% to transport, 2.0% to quarrying and mining. Since transportation

¹¹⁰ These transportation labourers worked in maritime services and for the railways.

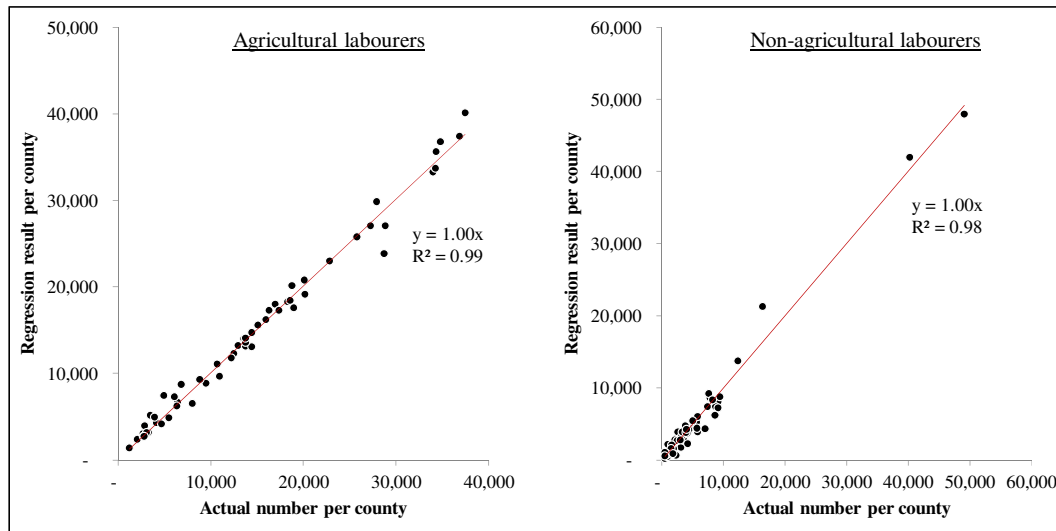


Figure 19. Comparison between the numbers of labourers calculated by the regression methodology and the actual numbers, per county (England and Wales, 1851)

Sources: 1851 census; regression-based labourer allocation approach.

Having demonstrated the accuracy of the approach, it can now be applied to data for which the labourer distribution is not known, such as the early-nineteenth century and eighteenth century parish register data, collected by the Cambridge Group. Combining these data with population figures from the 1811 and 1821 censuses – which, as discussed in footnote 107, leads to the need to consolidate some parishes/chapeltries into larger geographical units – generates a dataset of 8,290 geographical units. Thirty per cent of the men in this dataset are (unallocated) labourers. The regression approach was applied to this dataset, resulting in a very good fit, as demonstrated by the R^2 of .89, and as confirmed graphically in Figure 20, in which the actual and predicted numbers of labourers are compared at the county level.

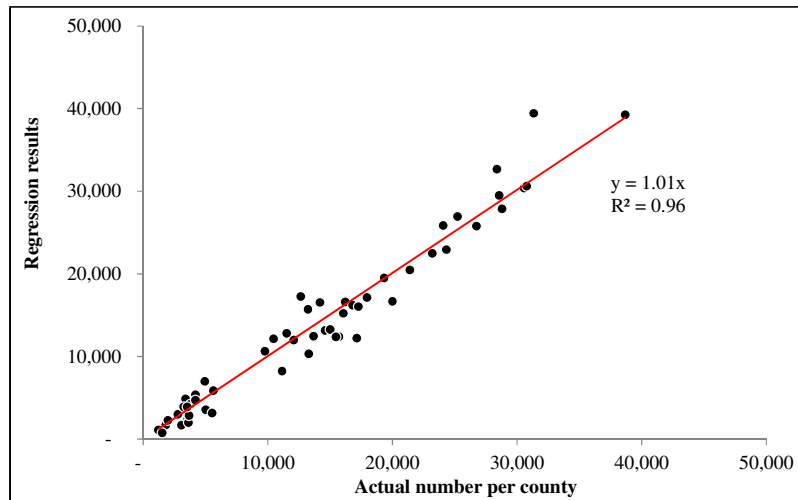


Figure 20. The total numbers of labourers per county as calculated by the regression approach compared to the actual numbers (England and Wales, 1813-20)

Sources: Parish register database for 1813-20; regression-based labourer allocation approach.

Only some of the regression coefficients turned out to be statistically significant ($p < .01$). These have been listed in Table 8, with their values.

Table 8. The coefficients resulting from the regression analysis, when applied to the parish register dataset (England and Wales, 1813-20)

<u>Surface area, England (labs/acre)¹</u>			<u>Surface area, Wales (labs/acre)²</u>		<u>Non-labourers (labs per non-lab)</u>	
<i>Altitude (m)</i>	<i>Land quality</i>	<i>Value</i>	<i>Altitude (m)</i>	<i>Value</i>		<i>Value</i>
Below 0	& Grade 1	0.0274	0 to 100	0.0191	<i>Agricultural</i>	
Below 0	& Grade 2	0.0464	100 to 200	0.0144	Yeomen/farmer	0.1099
0 to 100	& Grade 1	0.0281	200 to 300	0.0057	Husbandman	-1.0386
0 to 100	& Grade 2	0.0403	Above 300	0.0032	Market gardener	1.3219
0 to 100	& Grade 3	0.0319			Other agricultural	-0.5114
0 to 100	& Grade 4	0.0219			<i>Secondary sector</i>	
0 to 100	& Urban	0.0521	Geo position (per '000 km)		Bricklayer	0.4217
100 to 200	& Grade 1	0.0472	Latitude	-1.2048	Mason	0.7295
100 to 200	& Grade 2	0.0464			Building, other - specialist ³	0.5055
100 to 200	& Grade 3	0.0240			Woodworking - low skill ⁴	1.5854
100 to 200	& Grade 4	0.0143			Nail/pin manufacture	0.1992
100 to 200	& Grade 5	0.0144			Pottery	0.0936
100 to 200	& Urban	0.0404			Shipbuilding	0.3613
100 to 200	& Non Agricultural	0.0209			Tanning	0.4199
200 to 300	& Grade 3	0.0276			Brewer/distiller	2.0475
200 to 300	& Grade 4	0.0085			<i>Tertiary sector</i>	
200 to 300	& Grade 5	0.0075			Transport - inland water	0.1252
300 to 400	& Grade 3	0.0177			Maritime services ⁵	0.8812
300 to 400	& Grade 4	0.0175				
300 to 400	& Grade 5	0.0036				
300 to 400	& Non Agricultural	0.0007				
Above 500	& Grade 5	0.0028				

Notes: ^[1] Land quality data and 400 and 500 metre contours available for England only; see main text for more details. ^[2]For Wales, no land quality data were available, and the highest elevation contour available was 300 metres. ^[3] Mainly painters, glaziers, plasters, slaters, thatchers, tilers, and plumbers. ^[4] Mostly sawyers. ^[5]Mostly dockworkers.

A particularly interesting regression coefficient in Table 8 is the one for husbandmen. As discussed, the term was an ambiguous one, not distinguishing clearly between small farmers and farm labourers. This term had all but disappeared from use in many parts of England and Wales by the 1813-20 period, but it is still encountered in parish registers in some corners of England, notably East Anglia, the south-west, and the north. But its value of close to minus one suggest that, by this time, the term husbandmen had become virtually synonymous with agricultural labourer. Independent confirmation of this result from the regression allocation approach can be obtained by analysing the development of the numbers of farmers between 1813-20 and 1851. Figure 21 presents something of a counter-factual in which, for the sake of the argument, it is assumed that husbandmen were farmers. As the figure clearly shows, it is remarkable then that the number of ‘farmers’ (including husbandmen) increased everywhere in England, except for those counties in which a substantial share of the ‘farmers’ were husbandmen, indicated in red in the chart. Here the number of ‘farmers’ typically declined, with steepness of the decline directly correlated to the husbandmen share amongst the county’s ‘farmers’. The conclusion must be that these husbandmen were not, in fact, farmers at all but, rather, agricultural labourers. Lancashire is the only county with a high number of husbandmen which showed an overall growth in ‘farmers’, which is likely explained by the particularly high growth of (actual) farmer numbers in this county resulting from the extensive drainage of the Lancashire mosses in this period.

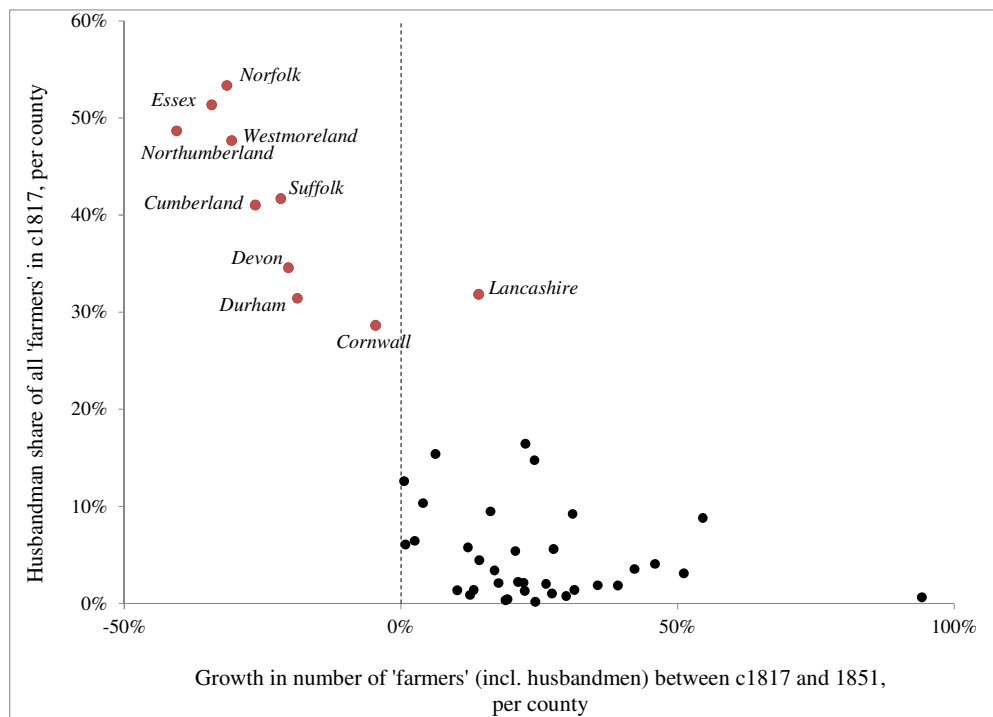


Figure 21. The development of the number of ‘farmers’ (including, for the purpose of the discussion, husbandmen) over the 1813-20 to 1851 period, compared to the husbandman share amongst these ‘farmers’ in English counties in 1813-20

The many geographic regression coefficients (elevation, land quality, latitude) have been more meaningfully summarised in Figure 22, showing the number of acres required for every additional labourer. Unsurprisingly, the lower the elevation and the better the quality of the land, the more labourers could be employed on the same area of land.

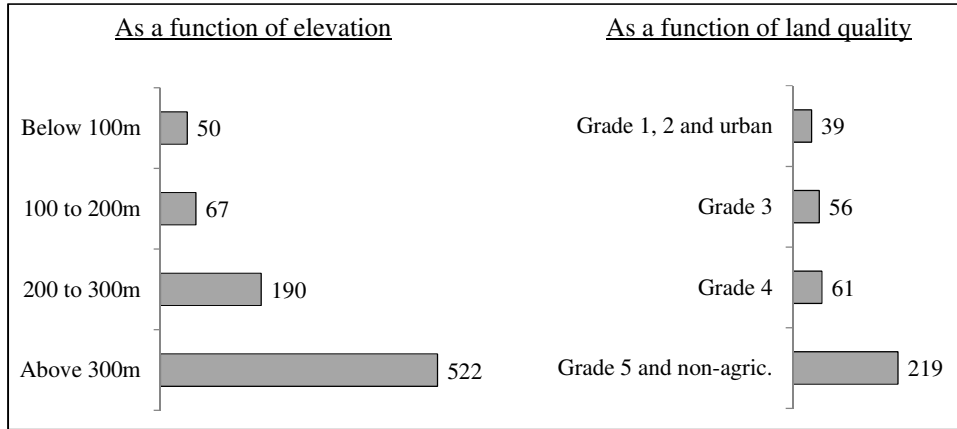
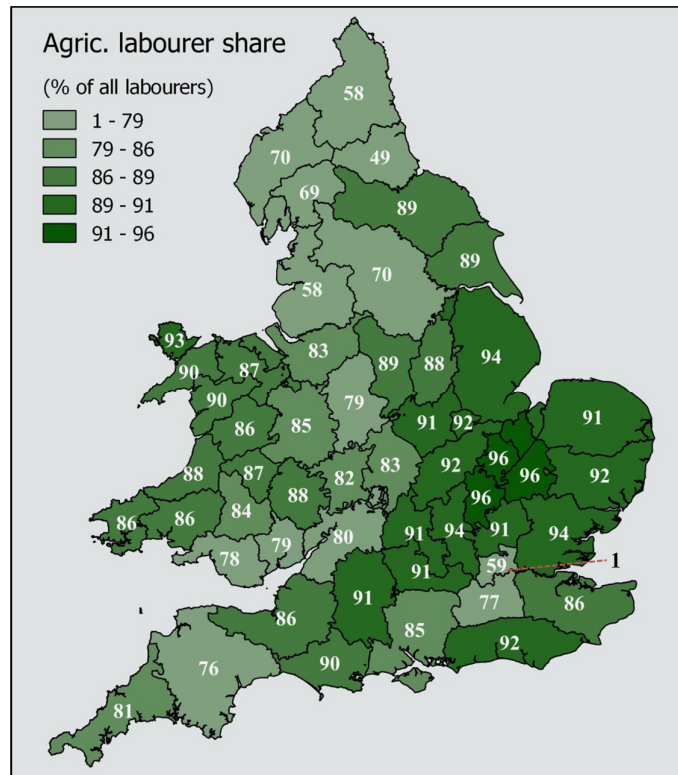


Figure 22. The number of acres per labourer as a function of elevation (England and Wales) and land quality (England only)

Note: The land quality categories are, as discussed, based on conditions today. Most of what is now urban land was in agricultural use at the time and, generally, of high quality, and has therefore been combined with grade 1 and 2 land.

Using these regression coefficients, labourers can now be allocated to sectors and, even, sub-sectors. At the national scale (England and Wales), eighty-four per cent of all labourers were agricultural, with the vast majority (80%) working on farms and the remainder (4%) employed by market gardeners. Of the sixteen per cent of labourers that were non-agricultural, fifteen per cent were employed in the secondary sector; only one per cent is to be allocated to the tertiary sector, all of them to transport. Nearly half the secondary sector labourers appear to have been employed in building and construction, with the remainder working in other sub-sectors, such as low-skill woodworking, nails and pin production, large scale brewing and tanning, and shipbuilding.

At the level of counties, the allocation varied considerably, as shown in Map 3. Unsurprisingly, in the Southern and Eastern English counties with their large farming sectors and big capitalist farms, usually over ninety per cent of labourers were employed in agriculture. The northern counties, characterised by family farms, had a relatively large share of non-agricultural labourers, particularly in industrialising and urbanising Lancashire. Unsurprisingly, in London, ninety-nine per cent of labourers were non-agricultural, the large majority working in the secondary sector, with partially urbanised Middlesex and Surrey also showing relatively low agricultural labourer shares.



Map 3. The share of labourers working in agriculture, by county (1813-20)

The results of the labourer allocation in *rural* England and Wales is interesting, albeit it perhaps not very surprising. 7,503 of the 8,290 geographical units in this data set can unambiguously be identified as rural.¹¹¹ In Figure 23, the regression-determined number of *agricultural* labourers per farmer, per county, is compared to the *total* number of labourers in the *rural* parishes in each county, as directly taken from the parish register data. With a R^2 of .98, the correspondence is almost perfect. The slope of the linear regression line shows that ninety-seven per cent of the rural labourers were employed in agriculture.

¹¹¹ By excluding all units that contain a (market) town, erring on the side of caution.

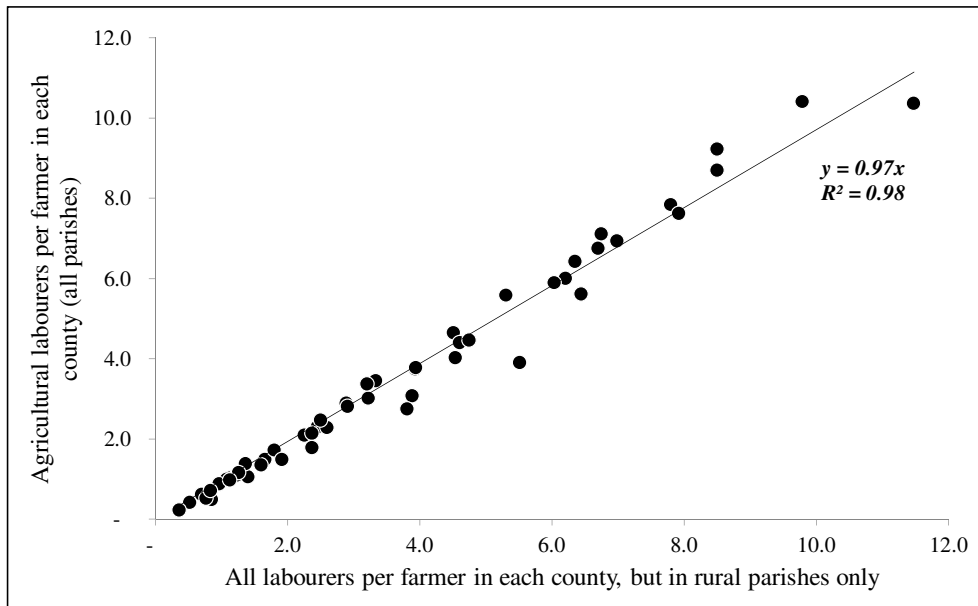


Figure 23. The number of agricultural labourers per farmer in all parishes (as determined by the regression approach) compared to the total numbers of labourers per farmer in rural parishes only (as directly derived from the parish register data set) (per county, 1813-20)

When the regression technique is applied to earlier time periods, the resulting labourer allocations turn out to be very similar to those in the 1813-20 period. The accuracy of these earlier regressions is somewhat affected by the fact that occupational information from parish registers is only available for a sample of the total number of parishes in England and Wales. But by calculating labourer numbers at the level of individual counties first, and then combining the county averages into a national one, using Wrigley's work on county populations, a national estimate can nevertheless be constructed, albeit with a margin of error.¹¹² Between eighty-five and eighty-nine per cent of all labourers in the early eighteenth century were employed in agriculture, with the remainder in the secondary sector, mainly in building. The figures for the mid and late eighteenth century were also in this range.

The stability in the agricultural/non-agricultural share of the labourer population over the eighteenth and early nineteenth century is not as surprising as it might, at first sight, appear. The number of agricultural labourers per farmer increased threefold over the period, from 1.0 in c.1710 to 3.2 in c.1817, as a result of the increasingly capitalist nature of farming in England and, to a lesser extent, Wales.¹¹³ But the number of non-farmers who were likely to employ

¹¹² Wrigley, *The early English censuses* (Oxford: British Academy Records of Economic and Social History, new series, 2011).

¹¹³ The c.1817 figure includes husbandmen, as the term husbandman had, by this time, become synonymous with farm labourer, as discussed above.

labourers increased similarly fast, in comparison to the rise in the number of farmer numbers. For every English and Welsh farmer in c.1710, there were 0.4 builders, but in c.1817 this ratio had also increased nearly threefold, to 1.0. The increase in agrarian capitalism being paralleled by a roughly similarly sized increase in the number of non-agricultural employers for labourers explains the relative stability in agricultural and non-agricultural labourer shares over the eighteenth century.

3.3 Comparing the results to those from existing methods

Comparisons can only be made at the national scale, as existing techniques only work at that level. The national results of the regression approach (84% in agriculture, 15% in the secondary sector, 1% in the tertiary sector in c.1817) are not dissimilar to those from the Saito/Shaw-Taylor approach, with the exception of the tertiary sector. Saito and Shaw-Taylor base their allocation on the assumption that labourers formed an equal share of the secondary and tertiary sectors in c.1817 as they did in 1851, at 10.1 and 8.1 per cent respectively, with the remaining labourers presumed to have worked in agriculture. Applying these percentages to the c.1817 quasi census leads to eighty-one per cent of all labourers being allocated to agriculture, fourteen per cent to the secondary, and five per cent to tertiary sector.

The much larger allocation of labourers to the tertiary sector than in the regression-based approach can be explained by comparing the composition of the tertiary sector in 1851 and c.1817. The tertiary sector labourers in 1851, as indicated by the census, worked in only two, very specific types of transportation occupations: in maritime services and the railways. These occupied a significant number of men in 1851, with 37,000 labourers and 42,000 other workers. These 42,000 other workers made up about four per cent of all tertiary sector employment for non-labourers. In c.1817, however, these occupations provided only very limited employment, with about 1,600 men working in maritime services, and (unsurprisingly) none in rail transport. These 1,600 men represent only 0.3 per cent of all tertiary sector employment in c.1817 and the tertiary sector labourer share in c.1817 must therefore have been much lower than in 1851. If the tertiary sector labourer allocation is based on the size of the maritime services and railway occupations rather than on that of the tertiary sector as a whole, the Saito/Shaw-Taylor approach would allocate of eighty-five per cent to agriculture, fourteen per cent to the secondary sector, and one per cent to the tertiary sector – virtually identical to the national distribution resulting from the regression approach. That two such different approaches arrive at such similar results is, surely, highly encouraging. It also confirms the expectation by Saito and Shaw-Taylor that their methodology would provide good results at the national level.

As discussed, the labourer allocations in the national accounts literature are flawed for a number of reasons. It is therefore not surprising that they differ significantly from the results of the

regression method and the Saito/Shaw-Taylor approach. Crafts essentially allocated all labourers to agriculture. Broadberry et al apportion thirty-two per cent of all labourers to the secondary sector in the eighteenth and early nineteenth centuries; this is more than twice the percentage generated by the regression approach (and by Saito and Shaw-Taylor).

4 CORRECTING THE OCCUPATIONAL STRUCTURE FOR BY-EMPLOYMENTS

Both parish register data and indexes to probate records generally describe men with a single occupational title. Scholarly orthodoxy has it that, before industrialisation, these men would often have been involved in gainful activities in addition to their principal occupation. Occupational structures based on principal employments only ignore these by-employments and are therefore potentially misleading. John Swain has contended that ‘the exceptionally high degree of participation in industry is largely hidden if undue reliance is placed on occupational data’ in early-modern Lancashire.¹¹⁴ James Rosenheim put it even stronger, praising Swain for his exposition of ‘the futility of reliance on occupational information to assess the structure of the early-modern labor force’.¹¹⁵ Jack Langton has even claimed that manufacturing by-employment was so widespread amongst the agricultural population that it renders the very term ‘agricultural sector’ essentially meaningless in its application to the early-modern world.¹¹⁶

This chapter therefore examines the need for a by-employment correction of the male occupational structure of pre-industrial England and Wales. It presents a set of headline estimates of by-employment incidence, that is, frequency counts of probate inventories. The three main problems which such estimates suffer from are identified, and analysed one by one. Based on these analyses, a judgement is made about the necessity for and the size of the by-employment correction.

¹¹⁴ Swain, *Industry*, p. 207.

¹¹⁵ Rosenheim, ‘Review of Swain’, pp. 99-100. This sentiment can also be found in other studies of the pre-industrial economy, for example in Clarkson, *Pre-industrial economy*, p. 77; Pahl, *Divisions*, p. 47.

¹¹⁶ Langton, ‘Prometheus prostrated?’, in Slack and Ward (eds), *The peopling of Britain: the shaping of a human landscape* (Oxford: Oxford University Press, 2002), pp. 244-46.

It should be noted here that many of the discussions in this chapter were previously addressed, in more extended form, in my MPhil thesis.¹¹⁷ They were included in this PhD dissertation because they play a central role in the search for a reliable male occupational structure in pre- and early-industrial Britain.

4.1 Evidence for the pervasiveness of by-employments

Only 0.1 per cent of all men in the early eighteenth century parish registers were described with a dual or triple occupational denominator. However, historians of the early modern period generally presume that a large share of the 99.9 per cent of men with a single occupational denominator were also engaged in additional gainful activities. Joan Thirsk, for example, believed that about half those employed in agriculture in seventeenth-century Britain were involved in manufacturing too.¹¹⁸ And these by-employments were of major significance in Thirsk view. She pleaded for narrowing down the question ‘why did the Industrial Revolution start in England’ to ‘why did it start in the pasture farming areas in England’. Her answer was clear: because that type of agriculture ‘left men with time for other employments which they could combine with farming’. These men were not only the first to become involved in early-modern cottage industry but, aiming to protect their local dual economy, also the first to experiment with mechanisation and steam-powered mine pumps.¹¹⁹ Despite the evident importance of by-employments, Thirsk provided little real evidence for their prevalence. So, what evidence is there?

One line of reasoning, followed for example by Fernand Braudel, is that by-employments *must* have been ubiquitous because they provided early-modern peasants with the necessary level of protection through differentiation of income, as well as a means to utilize spare hours in the slack periods of the farming year and day.¹²⁰ Such an argument sounds intuitively compelling but there is little actual evidence for its validity. For example, ‘the seasonality of farming often

¹¹⁷ Keibek, *By-employment and occupational structure in early-modern England* (MPhil dissertation, University of Cambridge, 2012). An extended version of this chapter was also published in the form of two working papers in January 2016: Keibek, ‘From probate inventories to households: correcting the probate record for wealth bias’ (Cambridge, 2016), <http://www.campop.geog.cam.ac.uk/research/projects/occupations/abstracts/paper29.pdf>; Keibek, ‘By-employments and occupational structure in pre-industrial England’ (Cambridge, 2016), <http://www.campop.geog.cam.ac.uk/research/projects/occupations/abstracts/paper30.pdf>.

¹¹⁸ Thirsk, ‘Agriculture and social change’, p. 211, in her Thirsk, *Rural economy*, p. 211.

¹¹⁹ Thirsk, ‘Horn and thorn in Staffordshire: the economy of a pastoral county’ in her Thirsk, *Rural economy*, pp. 170, 172-3, 181.

¹²⁰ Braudel, *Civilisation and capitalism, 15th-18th century. Vol. 2, The wheels of commerce* (London, 1982), p. 255.

coincided with the seasonality of manufacture'.¹²¹ And it is not obvious that manufacturing incomes would have provided an effective buffer against economic distress in the agricultural sector, since economic crises, then and now, have a tendency to hit sectors simultaneously – although by-employments may have provided a degree of economic protection against specifically *local* agricultural crises.

Historians have looked for more direct and harder evidence for the prevalence of by-employments and have found this in probate inventories. These documents, created as part of the probate process, list the moveable goods of a decedent, and provide a wealth of occupational data. Inventories almost always provide identifying information of the decedent. When the decedent was male, this information often includes a – usually single – occupational denominator.¹²² If such a denominator is missing, it can often be found in other probate documents referring to the same person. The actual list of assets provides additional information on gainful activities in the form of tools, materials, livestock and rooms that are listed and valued in them. The probate inventory of a farmer will typically list assets like livestock, agricultural tools, crops growing on the land or in storage, etcetera. If that farmer was by-employed as, for example, a weaver, the inventory will also list assets pertaining to that activity, such as one or more looms, other weaving-related tools, yarn, etcetera. Therefore, the incidence of by-employments can be calculated straightforwardly by examining a sufficiently large set of probate inventories, counting the number of inventories which indicate more than one occupation and expressing them as a fraction of the total data set. The estimates of by-employment incidence by early modern historians in Table 1 on page 24 above are all based on this type of frequency count.

Probate inventories are also the data source for my own assessment of the prevalence and significance of by-employments in pre-industrial England and Wales. The analyses in this chapter are based on a set of nearly 1,900 probate inventories, most of which were collected,

¹²¹ Hudson, 'Industrial organisation and structure', in Floud and Johnson (eds), *The Cambridge Economic History of Modern Britain Vol. 1: Industrialisation, 1700–1860* (Cambridge: Cambridge University Press, 2004), p. 30.

¹²² Overton et al have claimed that such information is unreliable, as the occupation stated in the inventory 'often differed from that stated by the decedent in his or her will'. See Overton *et al*, *Production and consumption*, p. 34. However, such alleged differences were only recorded in a handful of cases in the dataset used in this research, and clear evidence for the reliability of probate-derived occupational descriptors is provided in the discussion around Figure 24. Note that Craig Muldrew also found only very few such cases in his dataset. See Muldrew, *Food, energy and the creation of industriousness: work and material culture in agrarian England, 1550-1780* (Cambridge: Cambridge University Press, 2011), p. 166. See also the discussion on this issue in Shaw-Taylor, 'The nature and scale of the cottage economy' (unpublished book chapter, Cambridge, 2002), <http://www.geog.cam.ac.uk/research/projects/occupations/abstracts/paper15.pdf>, pp. 11-12.

transcribed and interpreted specifically for this research.¹²³ These covered six counties and wider geographic areas in early modern England in the 1700-1760 period and, for two of these areas, the 1560-1700 period as well. In addition to the need for a reasonable degree of geographic spread across England, the choice of counties was informed by the desire to include areas with arable and pastoral farming regimes, areas with well-developed manufacturing sectors as well as those which were overwhelmingly agricultural, and areas which industrialized in the eighteenth century and those which de-industrialized. Inventories were selected from lists provided by the several record offices. To ensure that principal employments could be distinguished from potential by-employments, only male inventories with known, principal occupations were considered. A targeted, non-random selection of inventories was made to ensure that all (principal) occupations within the two major occupational sectors were well represented, roughly in line with their share of the male occupational structure.¹²⁴ It is worth noting here that this approach differs fundamentally from the one taken by Overton et al for early-modern Kent and Cornwall. They ignored the ‘stated’ occupation of the ‘male household head’ and picked inventories entirely at random from the extant probate record in their selected parishes. This implies that their dataset must have had a very considerable overrepresentation of yeomen compared to husbandmen, of tanners and brewers compared to weavers and tailors, and more generally, of farmers compared to manufacturers. This means that, for example, the production activity mixes that they derived from inventories are not representative of actual, contemporary society.¹²⁵ The geographic and occupational composition of the inventory set is described in Table 9.

¹²³ I would like to thank Craig Muldrew, Ken Sneath and Leigh Shaw-Taylor for their generosity in sharing with me a substantial number of transcribed and untranscribed inventories from their own research, which were incorporated in this dataset.

¹²⁴ Remaining small differences between the ‘weight’ of occupations in the dataset and the overall occupational structure could, in principle, have been removed by working with weighted averages, but in practice this turned out to be unnecessary.

¹²⁵ Overton *et al*, *Production and consumption*, pp. 37-39.

Table 9. The inventory dataset.

Sector	Occupation	1700-1760						1560-1700			All
		Lancashire	Cheshire	Staffordshire	Northamptonshire	Lincolnshire & Rutland	Salisbury Diocese	Cheshire	Salisbury Diocese		
Agriculture	Yeoman	32	41	32	76	45	34	65	12	325	
	Husbandman	48	24	28	24	31	21	54	5	230	
	Shepherd				36				4	36	
	All agricultural	80	65	60	136	76	55	119	18	591	
	(Black)smith	15	27	14	31	14	15	18	12	146	
	Baker	6	6	8	29	5	3	3	5	59	
	Brewer/maltster	8	6	10	37	2	7	4	4	31	
	Butcher	10	16	10	41	10	10	14	8	115	
	Carpenter/joiner	26	38	11	41	18	12	1	13	160	
	Mason	11	11	2	29	2	3	2	3	63	
Manufacturing	Miller	5	9	5	1	1	1	12	9	43	
	Shoemaker/cordwainer/glover	12	20		28	1	3	3	13	80	
	Tailor	17	23		35	6		2	17	100	
	Tanner/skinner	8	12	8	32	4	5	18	4	59	
	Weaver/clothmaker	62	23	18		9	18	31	26	219	
	Other type of artisan	8		13		3	8	4	25	61	
	All manufacturers	188	185	89	263	75	85	112	139	1,136	
	Labourers	5	20		84	2	1	59		171	
	All	273	270	149	483	153	141	290	139	1,898	

Notes: The Lancashire inventories provide good coverage of all hundreds in that county which lie south of the Ribble river, but only very patchy coverage of the two northernmost hundreds, Amounderness and Lonsdale. The reason lies in the inventory database which was used for the Lancashire inventory selection, which is based on the records of the Diocese of Chester, whose ecclesiastical court only covered Lancashire south of the Ribble. Salisbury Diocese refers to the probate jurisdiction of said diocese, which covered Wiltshire and parts of Berkshire and Dorset. About half of the ‘Salisbury Diocese’ inventories in the dataset stemmed from Wiltshire, a quarter from Dorset, fifteen per cent from Berkshire and the remainder from several other, neighbouring counties. In addition to the pre-1700 manufacturers’ inventories for Salisbury Diocese, farmers’ and labourers’ inventories were collected as well, but have not yet been transcribed and have therefore not (yet) been included in the research.

4.2 Estimating by-employment incidence using probate inventories

When using probate inventories for estimating by-employment incidence amongst early modern men, several issues with these documents must be taken into account. They may be detailed and broad source of historical information, but they are far from unproblematic. As sources on individual people and households, probate inventories suffer from, as Overton et al have phrased it, ‘a depressingly long list of possible reasons why any single inventory may be misleading’.¹²⁶ As Lindert has rightly argued, these shortcomings are generally much diluted when probate inventories are used as a statistical source, that is, employed in large numbers to ‘build aggregate estimates’.¹²⁷ Nevertheless, even when using them in large numbers, probate inventories exhibit certain weaknesses as a source on (by-)employments.

A first problem is that probate inventories are always to a degree ‘abbreviated’, that is, they do not separately list items below a certain value. This threshold value differs per inventory. Most inventories feature headings like ‘hustlements’ or ‘things seen and unseen’, covering a collection of small, low-value items. Sometimes, however, the level of abbreviation goes much further, and all items in a room or even an entire house are grouped together under general terms like ‘household goods’. In such inventories, potential indications of gainful activities like carpentry tools or cheese presses are invisible. The solution for this problem is straightforward: only use a specific inventory for the purposes for which it is suitably detailed. It may contain enough detail on livestock to be used for counting cattle, yet be too abbreviated in other goods to serve as a reliable source on non-agricultural pursuits. In practice, the problem is fairly slight for agricultural and most manufacturing activities: only two per cent of the inventories collected for this research proved too abbreviated to provide reliable occupational indications.

A second, related problem is that some occupations leave few traces in probate records. This problem can be illustrated by comparing the decedents’ occupational descriptors with indications on gainful activities provided by the goods and rooms listed in the inventory. Figure 1 shows that for occupations which produced high-value output or which required expensive capital goods, significant quantities of raw materials, or tools of non-trivial value, this comparison is very encouraging. For example, only seven per cent of all yeomen’s inventories used in this research contained no or merely very weak indications of agricultural activities. For many manufacturing occupations, for example for weavers, tanners and brewers, the figure is comparably low. This is clear evidence for the reliability of the occupational descriptor of

¹²⁶ Ibid, p. 31.

¹²⁷ Lindert, ‘Algorithm’, p. 649.

probate documents.¹²⁸ It also indicates that such occupations will likely leave clear traces in inventories for which they are ‘merely’ by-employments.

But Figure 24 also shows that some occupations did not always leave such clear traces. Forty per cent of the shoemakers’ inventories used in our research showed no sign of the stated occupation and the same was true for over eighty per cent of tailors’ inventories. The low value of the tools used in these occupations means that they often go unmentioned. Furthermore, tailors typically worked on commission, so held little or no stock, and often worked with cloth provided to them by their customers, which therefore does not show up in the inventory either. Determining by-employment in such ‘trace-poor’ occupations is problematic. If a farmer’s inventory shows no proof of by-employment, one can be relatively sure that he was not involved in weaving, as that would probably have left clear traces, but it is much less certain that he was not by-employed as a shoemaker or tailor.

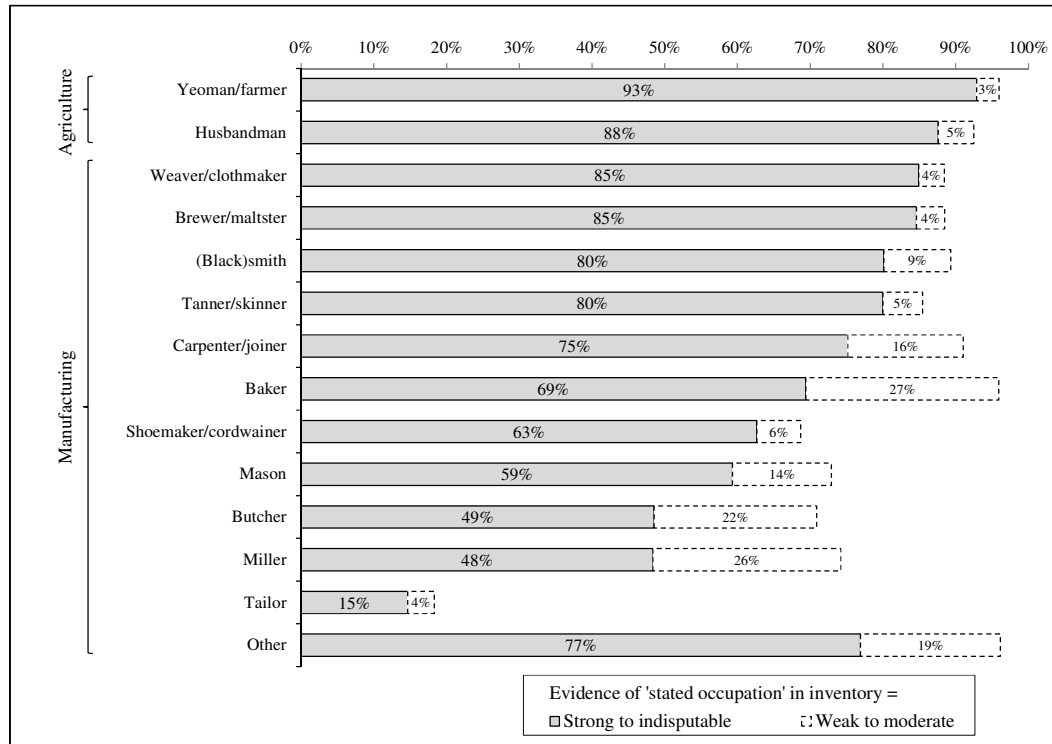


Figure 24. Strength of indication for the deceased’s principal occupation provided by the goods and rooms listed in probate inventories (all eighteenth-century inventories in the dataset)

Note: principal occupation defined as the one stated in the inventory preamble and/or other probate documents referring to the same deceased.

For male trace-poor male manufacturing occupations such as tailoring, this problem can be resolved if a reliable occupational structure is available, derived from parish registers and/or

¹²⁸ As announced in footnote 122.

social-bias corrected probate data. An approximate correction can then be applied to the by-employment calculations based on such occupations' general importance in the occupational structure. Nevertheless, Figure 24 does show that, in general, probate inventories are simply not a good source of information on by-employments that required and produced little stock and used no or merely very cheap tools. This is the case for many tertiary-sector by-employments and for wage labour. The analyses in this paper therefore generally exclude such by-employments. But this is not a fundamental problem. The tertiary sector was relatively small, and the by-employment historiography is almost exclusively concerned with primary- and secondary-sector activities. Wage labour as a subsidiary activity for farmers and manufacturers would have been limited to low-skilled work in periods of extreme labour shortage, such as helping out during the agricultural harvest. Such labour was occasional, therefore represented only a limited – although undoubtedly welcome – contribution to household income.¹²⁹

Some inventories suffer from a very specific, third problem: they fail to provide clear occupational evidence even though the deceased's (stated) occupation was not 'trace poor'. This was, for example, the case for seven per cent of yeoman farmers' inventories, as already mentioned above. One potential explanation would be that the occupational descriptor of these inventories is simply a misnomer, and they were really left by, say, weavers or carpenters. Alternatively, agricultural indications could be missing because the deceased was no longer an active farmer at the time of death due to ill health, or because cattle and equipment had already been transferred to his descendants before the inventory was taken. An analysis of the affected inventories shows that this second explanation is the more likely. None of the farmers' inventories without agricultural indications showed evidence of any other male occupation. Their households were, as Overton et al have called them, 'unproductive'.¹³⁰

This is both good and (somewhat) bad news for probate inventories' suitability for by-employment analyses. The good news is that the analysis reconfirms that their occupational descriptors are reliable, so indications of by-employments in the inventories really are precisely that and not the actual main employment masquerading as by-employment. The bad news is that 'unproductive' inventories represent a small but tricky problem for by-employment calculations. For occupations with relatively expensive production goods or stock, for example for tanners or farmers, unproductive inventories can be identified quite well, as the above shows. They can subsequently be excluded from the analyses. But for occupations like tailors and shoemakers, which often do not leave occupational evidence in the inventory anyway, this is impossible. Consequently, the inventory collection for these occupations will always include some

¹²⁹ For a discussion on what constitutes a by-employment in the sense in which the term has been used in this research, see the discussion on the 'fifth problem', on page 11-2. See also page 4.

¹³⁰ Overton *et al*, *Production and consumption*, p. 84.

individuals who were no longer gainfully employed at time of death, or whose estate had already been wrapped up before the inventory was made. If the deceased or his household had been by-employed, the evidence in the inventory will have disappeared along with the evidence for his primary employment. This results in an underestimate of by-employment. However, the effect is small, as can be demonstrated using the farmers' inventories, amongst which unproductive inventories can be identified with relative certainty. Had such inventories been left in the dataset, manufacturing by-employment amongst farmers would have been underestimated by a mere two per cent.

A potential fourth problem is caused by the fact that inventories were taken at the end of life. One might therefore logically presume that the elderly must be overrepresented in probate collections. If they had reduced their range of activities near the time of death compared to when they had been in their physical prime, this might lead to by-employment incidence being undercounted as evidence of these (former) activities may not be present in the inventory; with the period before death frequently characterised by ill health and, therefore, relative poverty, it is possible that part of the estate was liquidated to make up for lost income from work. However, systematic analysis by Mark Overton found no evidence of age bias in English inventories.¹³¹ Furthermore, 'moveable estates appear to have remained substantially intact' making inventories 'a reasonable guide ... to the moveable goods of individuals across adult life', as Shaw-Taylor has argued.¹³²

A fifth problem lies in the occasional lack of clarity of inventories' by-employment indications. Evidence for manufacturing activities is sometimes multi-interpretable. For example, the inventory of Joshua Walker, a butcher from Capesthorpe in Cheshire, lists a large number of livestock of all kinds. Since he was a butcher, this does not necessarily indicate agricultural by-employment, as he may have recently bought the livestock for (final fattening in preparation for) slaughter. But, his inventory also listed a significant number of pieces of agricultural equipment such as ploughs and harrows, making his agricultural by-employment pretty indisputable. He also owned £6 in hides and skins. This might indicate by-employment as a tanner, but since the deceased was a butcher and the inventory does not contain any references to tanning equipment or bark, it is more likely that he would simply have had hides and skins

¹³¹ Overton, 'Household wealth, indebtedness, and economic growth in early modern England', paper presented at the 14th International Economic History Congress, Helsinki, 2006, <http://www.helsinki.fi/iehc2006/papers3/Overton122.pdf>, pp. 15-7. See also Overton *et al*, *Production and consumption*, pp. 27-28, 208; Shaw-Taylor, 'Cottage economy', p. 2. Note, however, that American probate studies did find evidence of age bias – see for example Main, 'The standard of living in southern New England, 1640-1773', *The William and Mary Quarterly*, 45:1 (1988), p. 125.

¹³² Shaw-Taylor, 'Cottage economy', p. 2.

resulting from killing animals for their meat, and had been about to sell them to a genuine tanner for further processing.

And even for unambiguous indications of manufacturing activities, it can sometimes be difficult to gauge whether they really indicate a by-employment. In this paper, as discussed, activities in the household have only been considered true by-employments if their fruits were sufficiently large as to not be wholly consumed within that same household. Activities like baking bread, brewing beer, sowing or washing clothes could be undertaken on such a scale that a substantial surplus was available for sale 'in the market'. But, if small in size and solely intended for members of the own household, perhaps combined with some very limited barter trade with neighbouring households, such activities are correctly considered as domestic rather than as by-employments in the full meaning of the word, even though they of course reduced the need for purchasing the same products or services on the market and therefore constituted economic value for the household. It is, however, not always easy to infer from inventories whether an activity was 'for the market' or 'merely domestic'. The inventory of Samuel Sayer, a yeoman from Wheaton Aston in Staffordshire lists two little brewing looms, some malt and a malt mill, altogether valued at less than £2; this likely only indicates small-scale brewing for purely domestic use, but it is impossible to be entirely certain about this.

In short, it is not always feasible to decide with certainty whether an inventoried household was by-employed in manufacturing or not. The solution for this problem chosen in this paper was to therefore not make such 'binary' verdicts, but to express the strength of the indication on a nine-point sliding scale, ranging from 'none' for no indications whatsoever to 'indisputable' for undeniable indications of by-employment. Unless otherwise stated, only indications in the upper half of that scale, ranging from 'fairly strong' to 'indisputable' were considered sufficiently clear evidence of by-employment. The main conclusions were tested for robustness, however, by varying the by-employment 'cut-off point' along the scale.

For agricultural by-employments, a slightly different approach was taken. Ambiguity of indications is only rarely a problem here; ownership of, say, a pig or some poultry is, after all, a clear sign of involvement in agriculture. However, if there are no indications of additional agricultural activities, it signifies a very marginal agricultural activity and, in the meaning of the term adopted in this paper, not a true by-employment at all. Therefore, employing a cut-off point in the total value of agricultural assets of the inventoried household, agricultural by-employments were divided into 'substantial' and 'marginal' ones – in addition to the 'strength-of-indication scale' described above. For the early eighteenth century, a cut-off point of £3 10s in agricultural assets' value was chosen, which equalled five per cent of the value of the agricultural assets of the average husbandman's inventory. It is perhaps worth pointing out however that something which denoted marginal economic value to the average household may,

nevertheless, have represented substantial economic value to a very poor one. £3 10s in agricultural assets can, in livestock terms, roughly be translated as a single cow and, perhaps, its young calf. As Jane Humphries has calculated, such assets would still have represented significant value for a poor labourer's household.¹³³

4.3 The resulting estimates

Each of the 1,898 inventories in the dataset was transcribed and, subsequently, evaluated individually as to the degree to which its occupational indications corroborated the stated occupation of the deceased, and on whether it provided any additional information on his specialisation within that occupation, for example, pastoral rather than arable farming. Subsequently, a judgement was made on the strength of all by-employment indications contained in the inventory, along the lines discussed in the previous section. Two common manufacturing activities were excluded from the analyses. Spinning was excluded because the goal was to determine by-employments amongst men, whereas spinning was overwhelmingly the domain of women before industrialisation. Indeed, the fact that evidence of spinning turns up at all in male inventories is, itself, an indication of a problem of interpreting inventory-based by-employment estimates, discussed in detail in Section 4.6. Dairying was also excluded, again because it was mainly undertaken by women but also for another reason: no secondary-sector inventories were found in the dataset which contained dairying equipment such as butter churns or cheese presses, but lacked independent evidence of cattle farming and, *vice versa*, virtually all inventories with clear and substantial evidence of cow keeping also contained distinct proof of dairying. In her analysis of indications for women's work in probate inventories, Whittle has counted dairying as an independent activity but, in light of the evidence give above, I would argue that it should properly be considered a subsidiary activity to dairy farming rather than a separate activity.¹³⁴

So, what do these inventories suggest about by-employment incidence in eighteenth-century England? Table 14 provides a summary of their indications for manufacturing by-employments. As it shows, the incidence of such by-employments was, actually, quite low. Overall, only about one in eight farmers' and secondary-sector inventories showed clear signs of manufacturing by-employments. And although there was a certain geographical variation, in none of the investigated geographic areas were clear indications of such activities found in more than a

¹³³ Humphries, 'Enclosures, common rights, and women: the proletarianization of families in the late eighteenth and early nineteenth centuries', *The Journal of Economic History*, 50:1 (1990), p. 24.

¹³⁴ Whittle, 'Housewives and servants in rural England, 1440–1650: evidence of women's work from probate documents', *Transactions of the Royal Historical Society (Sixth Series)*, 15 (2005), p. 69; see also Overton *et al*, *Production and consumption*, p. 60.

quarter of the inventories. The inventories thus provide surprisingly limited support for the prevalence of manufacturing by-employments that is suggested by much of the literature. Robert Malcolmson wrote that in eighteenth-century Lancashire, ‘the term “yeoman” often indicated a landholder who divided his time between farming and weaving’.¹³⁵ In fact, of the twenty-seven yeoman’s inventories from that county, only three showed clear signs of weaving. Furthermore, manufacturing by-employments were generally not of the supposed ‘artisanal-industrial’ kind. Rather than textiles or metal working, it was brewing which was by far the most frequent.¹³⁶

Table 10. Indications for (ancillary) manufacturing activities in probate inventories for farmers and manufacturers (early eighteenth-century only, all areas except Northamptonshire)

		Farmers (319 inv.)			Manufacturers (614 inv.)		
		Fairly strong to indisputable	(Very) weak	None	Fairly strong to indisputable	(Very) weak	None
All geographies and activities		16%	27%	57%	16%	20%	64%
By geography	Lancashire	22%	22%	55%	11%	18%	71%
	Cheshire	10%	30%	60%	17%	20%	62%
	Staffordshire	7%	20%	72%	15%	18%	67%
	Lincolnshire & Rutl.	14%	31%	55%	18%	25%	58%
	Salisbury Diocese	25%	31%	44%	21%	19%	60%
By activity	Brewing	8%	17%		12%	9%	
	Baking	0%	3%		0%	4%	
	Weaving	4%	2%		2%	2%	
	Carpenting	1%	3%		0%	3%	
	Blacksmithing	1%	0%		0%	0%	
	Other or unspecified	<u>1%</u>	<u>2%</u>	—	<u>1%</u>	<u>2%</u>	—
		16%	27%	57%	16%	20%	64%

Note: (1) Northamptonshire was excluded from this and other analyses of manufacturing by-employments as these were not investigated in sufficient detail for that county. (2) Columns may not (seemingly) tally precisely due to rounding of the individual figures.

These low by-employment incidence figures are not the result of lack of detail within the inventories leading to by-employment indications being missed; manufacturing by-employment incidence was not significantly higher amongst the sub-set of especially detailed inventories. Nor are the low figures caused by ‘trace-poor’ secondary-sector occupations; a correction for these occupations raises the incidence figure by only two percentage points, to eighteen per cent. Nor can agricultural labourers revivify the image of ubiquitous manufacturing by-employment within the agricultural sector. Lamenting the ‘evil day when rural industries left the countryside and returned to the towns,’ Alan Everitt used probate evidence to calculate that sixty per cent of agricultural labourers in the 1560-1640 period were by-employed in

¹³⁵ Malcolmson, *Life and labour in England, 1700-1780* (London: Hutchinson, 1981), p. 39.

¹³⁶ Something also found by Overton *et al* – see Overton *et al*, *Production and consumption*, p. 77.

manufacturing.¹³⁷ However, as Shaw-Taylor has shown, Everitt's calculations are incorrect. Everitt assumed all inventories with a total value below a certain threshold to refer to agricultural labourers, ignoring the decedent's stated occupation. But, such a selection would consist mostly of secondary-sector workers instead of agricultural labourers, making it entirely unsurprising that so many of the inventories showed signs of manufacturing.¹³⁸ By-employments amongst labourers are inherently difficult to pin down, as the term 'labourer' does not with certainty indicate an agricultural labourer but might indicate a 'general' labourer, working in a manufacturing trade such as construction. But since only one in every seven labourers' inventories showed any signs of manufacturing, even if all inventoried labourers in the dataset were of the agricultural kind, manufacturing by-employment was as low amongst them as amongst farmers.¹³⁹

Indeed, the dominance of brewing in the above figures suggests that Table 10 is more likely to over- than underestimate manufacturing by-employment. Substantial brewing activities were counted as clear indications of by-employment but, in some of the surveyed areas, farms were actually often very large and 'capitalist', employing many agricultural labourers; it is very well possible that the ale and beer produced on such farms was consumed in its entirety by the household and its hired workforce.¹⁴⁰ Furthermore, as discussed in Section 4.6, brewing was often undertaken by the women of the household, in which case the presence of brewing-related goods provides a false by-employment indication for the male 'household head'.

Indications for by-employments in the opposite direction, that is, manufacturers' inventories with clear evidence of farming, were much more common in the dataset, as is clear from Table 11.¹⁴¹ Sixty-one per cent of the manufacturing inventories indicated *some* agricultural activities, and for fifty-two per cent these activities were sufficiently substantial to call them truly agriculturally by-employed. Within rural inventories, these percentages go up to sixty-six and fifty-seven per cent respectively.

¹³⁷ Everitt, 'Farm labourers', in Finberg (ed.), *Agrian history. Vol. IV*, pp. 428-29.

¹³⁸ Shaw-Taylor, 'Cottage economy', p. 20.

¹³⁹ A more thorough discussion of the by-employment incidence amongst labourers can be found in Keibek and Shaw-Taylor, 'Rural by-employments', pp. 266-7.

¹⁴⁰ Pamela Sambrook does not consider even a separate brew house as evidence of brewing for more than purely domestic use in large farms, see Sambrook, *Country house brewing in England, 1500-1900* (London: Hambledon Press, 1996), p. 166.

¹⁴¹ Something also found by others – see, for example, Overton *et al*, *Production and consumption*, pp. 69-70; Shaw-Taylor, 'Cottage economy', pp. 7, 18-9.

Table 11. Share of eighteenth-century manufacturers' inventories with strong to indisputable indications of agricultural by-employment – by substance, environment and geography

	All inventories (N=863)		Rural inventories only (N=687)	
	With (some) agricult. activities	With substantial agricult. activities	With (some) agricult. activities	With substantial agricult. activities
Lancashire	62%	56%	74%	67%
Cheshire	64%	58%	68%	62%
Staffordshire	64%	52%	67%	53%
Northamptonshire	61%	48%	64%	51%
Lincolnshire & Rutland	79%	74%	80%	76%
Salisbury Diocese	<u>36%</u>	<u>28%</u>	<u>38%</u>	<u>30%</u>
All	61%	52%	66%	57%

Here, indeed, the high incidences found by other historians and combined in Table 1 above are confirmed. The analysis of agricultural assets' quantities and values listed in inventories and summarized in Table 12 suggests that farming by-employments amongst probated manufacturers were, in the mean, of considerable size. The average agriculturally-by-employed manufacturer's inventory in the dataset lists nearly £27 in agricultural assets, which is the equivalent value of about ten heads of cattle.

Table 12. Mean agricultural assets by occupational sector in probate inventories (all areas, eighteenth-century inventories only)

Type of asset	Quantities		Valuations	
	All farmers	Agric. by-empl. manufacturers*	All farmers	Agric. by-empl. manufacturers*
	(358 inv.)	(431 inv.)	(358 inv.)	(431 inv.)
Cows	6.4	3.1		
Heifers, stirks etc.	2.9	0.8		
Calves	2.3	0.7		
Bulls and oxen	<u>0.6</u>	<u>0.1</u>		
All cattle	12.2	4.7	£ 25.92	£ 10.71
Horses of all kinds	4.0	1.4	£ 15.31	£ 4.04
Swine of all kind	2.8	1.2	£ 1.87	£ 0.70
Sheep of all kind	48.3	9.4	<u>£ 19.36</u>	<u>£ 3.38</u>
All livestock**			£ 62.55	£ 18.87
Crops			£ 35.60	£ 4.69
Hay and straw			£ 5.70	£ 2.23
Livestock produce (cheese, wool, dung, etcetera)			<u>£ 3.13</u>	<u>£ 0.77</u>
Total (excluding equipment)			£ 106.98	£ 26.56

* Strong to indisputable indications of substantial agricultural activities in the inventory.

** Including poultry and bees

4.4 The problems with these estimates

At first sight, Table 11 and Table 12 suggest that not only was there a high incidence of agricultural activities amongst secondary-sector workers, but also that these activities were quite sizeable. However, first impressions can be a poor guide. In fact, probate-based by-employment indications such as these are misleading, for three reasons.

Firstly, like all probate documents, probate inventories are subject to significant bias towards higher-value estates. Farming was a capital-intensive occupation, requiring expensive tools and draft animals. Crops, whether still growing on the land or stored after the harvest, typically represented significant value. Cattle and other livestock were expensive; the average mature cow in the inventory dataset was valued at £2-13s, more expensive than clocks, the dearest household goods with an average value of £1-15s. No wonder then that farmers were so much more likely to leave testamentary evidence than men occupied in capital-extensive occupations such as weaving and shoemaking. This means that weavers and shoemakers who possessed livestock or other expensive agricultural assets were also more likely to be inventoried than their non-by-employed colleagues and, thus, that probate inventories overstate agricultural by-employments amongst secondary-sector workers. Defoe observed on the textile industry of the contemporary West-Riding that ‘every manufacturer generally keeps a cow or two, or more, for his family’. But he also observed that amongst them lived, in ‘an infinite number of cottages or small dwellings’, the lesser weavers and labourers, ‘all hard at work, and *full employed* upon the manufacture’ (my italicisation).¹⁴² This second group was much less likely to be captured in the probate inventory record than the first. Indeed, direct evidence that probate inventories exaggerate the incidence and size of agricultural by-employments can be found by calculating livestock numbers and grassland acreage using inventory-derived figures such as those in Table 11 and Table 12. As shown elsewhere, a comparison with independent estimates demonstrates that the probate-derived figures are far too high.¹⁴³

By-employment incidence ‘in the other direction’, that is, the fraction of farmers by-employed in a secondary sector occupation is also exaggerated in the probate evidence, for the same reason. Some secondary sector occupations were capital-intensive themselves. Brewers required large and expensive vessels and most brewer’s inventories list substantial stocks of ale and malt. Tanner inventories list large and expensive quantities of hides and bark. Both brewers and tanners are therefore overrepresented in the testamentary evidence, and so were farmers by-employed in brewing and tanners, compared to their non-by-employed colleagues. Even being by-employed as a weaver would have added some capital to a farmer’s estate. The average

¹⁴² Defoe, *Tour thro' the whole island of Great Britain* (London, 1742), Vol. II, p. 602.

¹⁴³ Keibek and Shaw-Taylor, ‘Rural by-employments’, pp. 274-7.

weaver's inventory contained £8 in weaving-related assets, about ten per cent of the agricultural capital of the average farmer's inventory.

In Figure 25, by-employment incidence has been expressed as a function of inventory wealth by dividing the inventory dataset for Cheshire and Lancashire into cohorts of increasing wealth. Inventories have been used extensively as a source on pre-industrial wealth levels and distributions.¹⁴⁴ Several wealth measures can be constructed from the documents. The 'inventory total' is simply the combined value of all assets listed. A second measure, 'material wealth' is the inventory total minus the value of financial assets such as debts owed to the decedent and leases.¹⁴⁵ As such, it is arguably to be preferred over the inventory total, as Overton has shown by comparing probate inventories with – much rarer but more complete – wealth evidence from probate accounts.¹⁴⁶ A final wealth measure, 'domestic wealth', is the combined value of all household goods excluding those intended for market-directed production. It captures what one might argue the other inventory goods are merely there to provide: the household's standard of living.¹⁴⁷ It serves, as Margaret Spufford wrote, as 'an index of domestic comfort and consumption'.¹⁴⁸ But whatever wealth measure is adopted, the relationship between estate value and the likelihood of by-employment is clear from Figure 25. It is clear then that a correction for wealth bias is required if the probate data are to yield reliable insights into pre-industrial by-employments. A powerful new method for doing this is presented in Section 4.5, and applied to the by-employment estimates.

¹⁴⁴ See, for example, Shammas, 'Constructing a wealth distribution from probate records', *The Journal of Interdisciplinary History*, 9:2 (1978), pp. 297-307; Jones, 'Wealth estimates', pp. 98-127; Main and Jackson, 'Economic growth and the standard of living in southern New England, 1640-1774', *The Journal of Economic History*, 48:1 (1988), pp. 27-46. For a discussion on the wealth indications in inventories see Arkell, 'Interpreting probate inventories' in Arkell *et al* (eds), *When death do us part*, p. 95.

¹⁴⁵ Real estate was not normally included in English and Welsh inventories, something with Margaret Spufford has called 'the major defect' in inventories. See: Spufford, 'The limitations of the probate inventory' in Chartres and Hey (eds), *English rural society, 1500-1800: essays in honour of Joan Thirsk* (Cambridge: Cambridge University Press, 1990), p. 144. Real estate was recorded in a small number of inventories in the dataset.

¹⁴⁶ Overton *et al*, *Production and consumption*, p. 138; Overton, 'Household wealth', pp. 13-14, 35.

¹⁴⁷ This is the equivalent of what Carole Shammas has termed 'consumer goods' in her research – see, Shammas, *Pre-industrial consumer*, p. 88.

¹⁴⁸ Spufford, 'Limitations', p. 145; see also Levine and Wrightson, *The making of an industrial society: Whickham 1560-1765* (Oxford: Clarendon, 1991), p. 158.

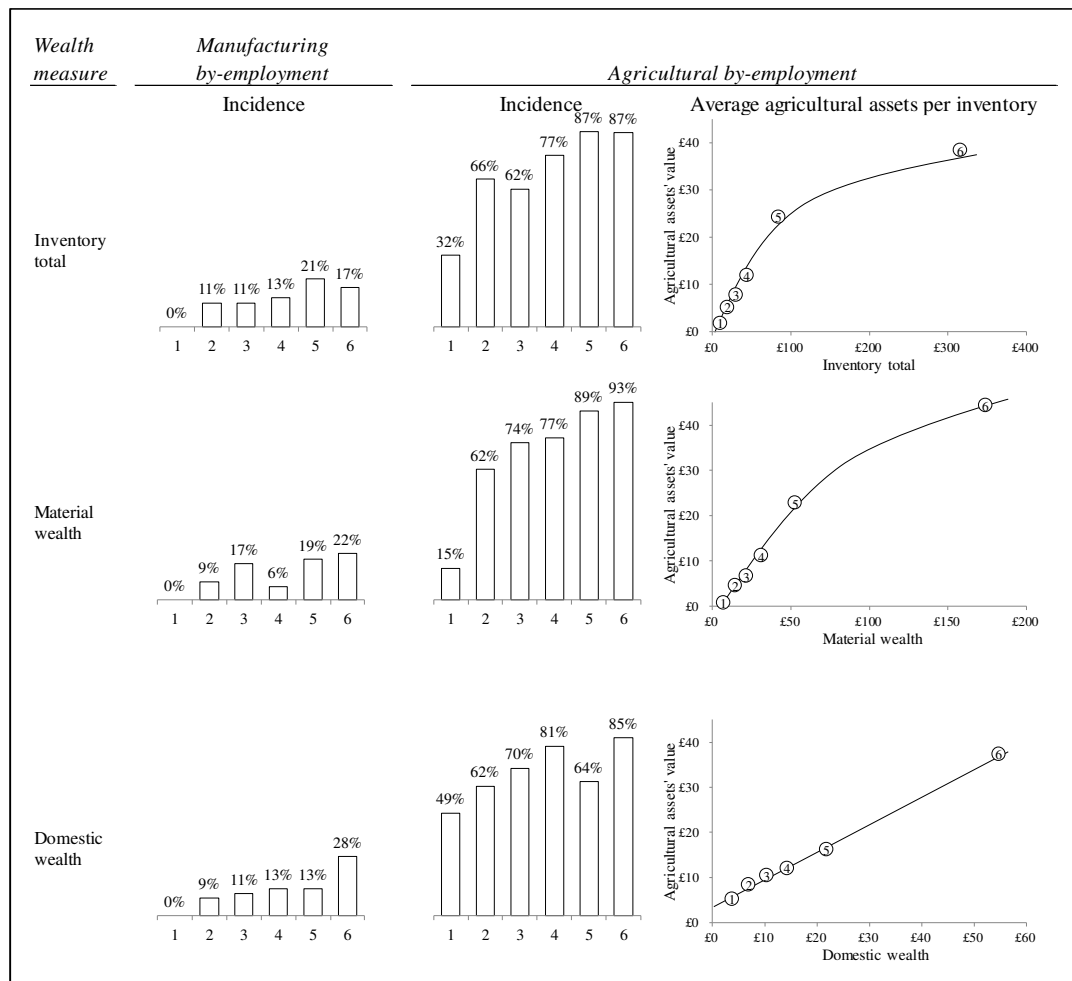


Figure 25. The relationship between wealth and by-employments in probate inventories of rural secondary-sector workers (Chester Diocese, early eighteenth century)

A second problem with interpreting the figures in Table 10 and Table 11 as indicating the prevalence of by-employments amongst pre-industrial men is that the inventories of these male decedents potentially include work-related goods used by other members of the household. The English or Welsh male ‘household head’ was also the legal owner of his wife’s goods with the possible – and, for the purpose of detecting economic activities, irrelevant – exception of small heirlooms or pieces of women’s apparel, which might be considered her individual property of his wife. Many of the goods used by his living-in children and servants, such as tools and furniture, would also have been his. His probate inventory thus presents material evidence of all significant gainful activities within the household, whether carried out by him or other household members.

An example may help to clarify what this means for inferring by-employment incidence from probate inventories. Illustration 2 presents the probate inventory of John Porter. As the

inventory header indicates, he was a blacksmith. It is therefore not surprising to find a workshop with a number of blacksmithing tools mentioned in the list of goods. Several beds are listed, indicating that John Porter's household probably consisted of several members. The presence of a barn and of several acres of crops indicate agricultural activities.

An Inventory & Appraisement of all & singular the Goods Chattels & Personal Estate of John Porter late of Wantings in the County of Berks Blacksmith deceased & taken this Tenth Day of September In the Tenth Year of the Reign of Our Sovereign Lady Anne by the Grace of God Queen of Great Brittain &c Annoq. dom. 1711.

Imptis Clothes & Cockett Money - - - - - 05:00:00.

In the garret

One Bedd & Lumber - - - - - 00:10:00. One bedd

In y^e Chamber.

One Bedd & app^r 6 Chairs One Chest of drawers &c - 02:00:00. One bedd

In the Hall below.

Two Tables, Bowler three Irons &c - - - - - 01:10:00.

In y^e Buttery.

Brafs, & Barrells &c - - - - - 01:00:00.

In the Shoppe.

One Anvill, a p^r Bellows, Two Vices, One Grindstone &c 01:10:00. In the shopp: One anvill, a pair of bellows, two vices, one grindstone

In the Barn.

Two Acres of Wheate - - - - - 05:00:00. In the barn: Two acres of wheate

Two Acres of Barley - - - - - 05:00:00. Two acres of barley

Two Acres & One Yard of Beans - - - - - 03:00:00. Two acres & one yard of beans

Two Hundred Pound Money at Interest - - - - - 40:00:00.

Apprais'd by us whose Names are subscribed at day & Year above written. *Jaac Grey*

Arch: Alworth

Exhibit d^e 30 July 1712 Per *Thomas Relick et Extrin* et p^r uno de que *Rachens et filⁱⁱ pulstria de Diedo et Li d* *Georgius Grey*

Information on identity and principal occupation

John Porter blacksmith

Indications of household size

Confirmation of stated employment

Agricultural activities (type and scale)

Illustration 2. The probate inventory of John Porter, blacksmith

In terms of by-employments, John Porter's probate inventory can be interpreted in three ways, as listed in Table 13. Historians using frequency counts of inventories with more than one gainful activity as indicating by-employed individuals implicitly follow interpretation A. This is problematic. The presence of several gainful activities in one inventories does not necessarily indicate that the decedent was himself by-employed but, merely, that there were several,

different sources of income in his household. At best, one could say that such frequency counts provide an upper limit of the incidence of individual by-employments. Hence, if the inventory evidence is taken at face value, it is likely to – potentially significantly – exaggerate individual by-employments and, therefore, the by-employment correction of the male occupational structure. This problem is addressed in section 4.6.

Table 13. Potential interpretations of John Porter’s probate inventory

Interpretation	Description	Was John Porter by-employed?
A	All occupational indications in the list of tools, goods, and crops refer to John Porter. He was a blacksmith by-employed in farming.	Yes
B	John Porter was purely a blacksmith. The agricultural activities indicated by his inventory were undertaken by other members of the household, such as his wife and living-in children or farm servants.	No
C	A large share of the agricultural activities indicated in the inventory were undertaken by other members of the household, such as his wife, living-in children or farm servants, but John Porter did contribute to some of them.	Yes

A third problem with by-employment incidence figures from probate inventories is that they tell only half of the story. Knowing that, say, twenty per cent of weavers was by-employed in agriculture is not sufficient for correcting the number of weavers for by-employments. It is also necessary to know what share of their working hours, or what share of their income was generated in their principal employment – weaving – and what in their by-employment – agriculture. This problem is addressed in Section 4.7.

4.5 Resolving problem 1: wealth bias in the probate inventory record

As discussed in Chapter 2, only a minority of male decedants was probated. An even smaller minority left was inventoried. Using age-dependent demographic data from family reconstitution and Wrigley’s recent work on county populations, it is possible to calculate the size of this minority.¹⁴⁹ In Table 14 this has been done for Cheshire, in decennial intervals, covering the hundred years between the Restoration and the Industrial Revolution.

¹⁴⁹ Wrigley *et al*, *English population history from family reconstitution, 1580-1837* (Cambridge: Cambridge University Press, 1997); Wrigley, *Early censuses*.

Table 14. Calculation of probate and, more specifically, inventory coverage amongst adult male householders in Cheshire, 1661-1760

	1661-70	1671-80	1681-90	1691-00	1701-10	1711-20	1721-30	1731-40	1741-50	1751-60	
National	Average age of first marriage (men) ¹	27.4	28.0	27.7	27.1	27.4	27.3	27.0	26.9	26.5	26.1
	Section of population above this age	48.5%	49.3%	50.6%	49.2%	47.2%	46.4%	47.3%	48.3%	48.3%	48.1%
	Mortality rate for this pop. section (per '000) ²	33.3	32.8	42.1	30.9	33.2	32.0	37.7	29.2	27.4	24.8
Cheshire	Population size (decennial mean) ³	91,560	90,438	88,880	90,164	94,592	100,691	107,183	114,094	121,450	135,565
	Male householders' deaths (decennial) ⁴	7,396	7,329	9,487	6,864	7,407	7,492	9,545	8,043	8,039	8,084
	Probated male decedents (decennial) ⁵	2,519	2,443	2,633	1,983	1,826	1,733	2,755	1,937	1,645	1,530
	Probate coverage for male householders	34%	33%	28%	29%	25%	23%	29%	24%	20%	19%
	Inventoried male decedents (decennial) ⁵	2,105	2,174	2,178	1,191	1,030	895	1,217	590	315	212
	Inventory coverage for male householders	28%	30%	23%	17%	14%	12%	13%	7%	4%	3%
	14%										

Sources: Database of probate records from the Cheshire Record Office; online databases of probate records from the consistory courts of York (from the Borthwick Institute, via Origins.net) and Canterbury (at the National Archives); Wrigley et al, *Family reconstitution*, tables 6.19 (p. 290), A9.1 (pp.614-5) and 5.3 (p. 149); Wrigley, *Early English censuses*, table 4.1 (pp. 104-5); Wrigley and Schofield, *Population history*, pp. 493-526.

Notes: ⁽¹⁾ Bachelor and spinster marriages. ⁽²⁾ Age specific mortality rates ($_{10}M_x$) derived from probabilities of dying per age interval ($_{10}q_x$) as provided by Wrigley et al, employing the relationship $_{n}q_x = 2 \times n({}_{n}M_x) / [2 + n({}_{n}M_x)]$. ⁽³⁾ Cheshire specific estimates are only available for 1600, 1700, 1750 and 1761. Intermediate years before 1700 were interpolated using national totals as a guide, since Cheshire's overall population growth between 1600 and 1700 was in line with the national total. After 1700, when Cheshire's population development clearly differed from the national, an exponential interpolation was employed, that is, constant population growth rates were applied between the 1700, 1750 and 1761 estimates. ⁽⁴⁾ Calculated from the rows above, assuming fifty per cent of adult deaths to be male. ⁽⁵⁾ As obtained from the probate record databases for the diocesan consistory court of Cheshire and the higher consistory courts of York and Canterbury.

As Table 14 shows, the number of deaths of male householders – here taken as all men above the average age of marriage – which led to some kind of probate document declined over the period from thirty-four to nineteen per cent. The number of inventoried householders was even lower, and declined much faster. Over the 1690-1730 period, only one in seven male householders' deaths resulted in a probate inventory. Similar calculations for other counties show that this low probate inventory coverage was not exceptional. For the same period, the inventoried share of male householders in Nottinghamshire, Wiltshire, and County Durham can be calculated to have been fifteen, nine and six per cent, respectively.

The likelihood of being inventoried was strongly correlated with wealth, as Figure 26 shows. In this figure, the share of men leaving an inventory has been depicted as a function of estate value by occupational group in early-eighteenth-century England. Probabilities were calculated by comparing the number of probate inventories in each occupational group to the occupational structure, derived from parish register data. Wealth per occupational group was approximated by the median inventory total for all inventories of that occupation in the dataset. The relationship is not perfect, and cannot be expected to be since Figure 26 ignores the wealth distribution within occupations, and since the probability function governing the chance of

leaving an inventory as a function of wealth was not a linear one - as will be discussed below. Nevertheless, Figure 26 confirms the importance of wealth as a determinant in whether or not a decedent would leave a probate inventory.

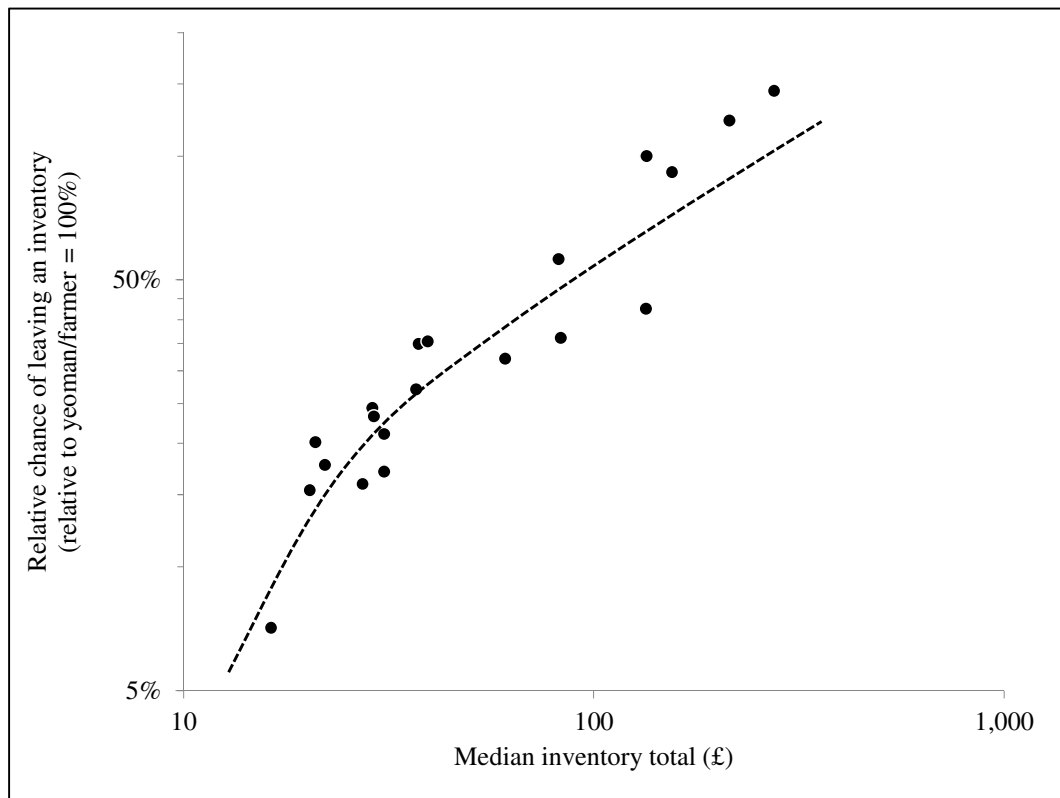


Figure 26. The relationship between median inventoried wealth and the (relative) chance of being inventoried, by occupational group (early-eighteenth-century England)

Notes: Each point in the chart represents an occupational group.

Sources: probate inventory dataset; parish register data collected by the Cambridge Group; indexes to probate data from several county record offices.

Before discussing solutions for the wealth bias issue, it should be remarked here that there are other potential biases in the probate record. There may have been reasons why one decedent was inventoried whilst another one was not in addition to the value of the decedent's estate. It seems logical that large families had a clearer need for an inventory of possessions than small ones, as they had more potential heirs, complicating the inheritance. Statistical analysis shows that estate value and household size were very strongly correlated.¹⁵⁰ This strong correlation is not surprising. Large families required more household goods, amongst which were expensive

¹⁵⁰ The Pearson coefficient is .660 ($p < .001$), as calculated for log-transformed inventory wealth. The log transform was necessary since inventory wealth is not normally distributed (so significance and size of correlation cannot accurately be judged), whereas its logarithm is.

goods like beds. Also, the earnings potential of large families was greater than that of small ones, and large households typically list many more work-related goods in their inventories. Given the strong correlation between estate wealth and household size, wealth bias in the probate record encapsulates the bias towards larger households. The same can be said about a potential further reason for the likelihood of an estate being inventoried: the complexity of its debts arrangements with outsiders. Again, statistical analysis shows that debts were very strongly correlated to the combined value of the material goods in the estate.¹⁵¹ Therefore, it can be argued that an approach that successfully resolves the problem of wealth bias in the probate record will, to a large degree, also resolve issues of other potential biases in the data.

So, how can the wealth bias issue be addressed? Historians have approached the problem in several ways. A first type of approach is the one taken by Overton et al, who accepted wealth bias as a *fait accompli*, perceiving themselves ‘forced to define the statistical population that we study from the sample that we have’.¹⁵² This means that it is explicitly admitted that all conclusions drawn from the probate analyses are not valid for society *in toto*, but only for the *inventoried section* of that society. There is of course nothing methodologically wrong with this approach. However, if not society, what is it exactly that is being analysed here? The ‘inventoried section’ is a rather elusive collection of contemporary households. It is often roughly equated with the ‘middling sorts’.¹⁵³ But, as Overton et al acknowledge, that is not an accurate assessment of the population defined by the probate record, which covers a much wider range of people than the term ‘middling sorts’ can meaningfully imply, however vague and flexible that term is in itself. After all, the poor may be underrepresented in the probate record, but they are not absent, and neither are the gentry.¹⁵⁴ So, not only does such an approach limit the validity of the analytical conclusion to merely a sub-section of society, which may furthermore vary over time and place, it is not actually possible to equal that sub-section with a recognisable historical ‘entity’.

A second approach has been to use inventories mainly for trend analyses. Daniel Smith, for example, has argued that ‘in general, probate records are a much better source for the analysis of

¹⁵¹ The Pearson coefficient is .812 ($p < .001$), as calculated for log-transformed total of material goods and total debts. The log transform was necessary since material inventory wealth and debts are not normally distributed (so significance and size of correlation cannot accurately be judged), whereas their logarithms are.

¹⁵² Overton *et al*, *Production and consumption*, p. 29.

¹⁵³ For example, by Maxine Berg in Berg, *Luxury and pleasure in eighteenth-century Britain* (Oxford: Oxford University Press, 2005); and by Peter Earle in Earle, *The making of the English middle class: business, society and family life in London, 1660-1730* (London: Methuen, 1991).

¹⁵⁴ Overton *et al*, *Production and consumption*, p. 26.

change over time within a small area than for the study of differences between regions and classes.’¹⁵⁵ The argument is that in this way, one set of households is compared to another set of essentially the same composition, thus providing a fair degree of insulation from the wealth bias problem. But, as Smith realized, such an approach is only valid if the inventoried share of society remained similar in size and composition over long time intervals. However, the share of households that were inventoried actually changed strongly over time, rising from very low levels during the late sixteenth century to a maximum in the final decades of the seventeenth century, and then declining and finally disappearing altogether during the eighteenth century. Secondly, Smith’s approach implicitly supposes that the trends observed in the inventoried households are reflected in very similar trends in non-inventoried households. Indeed, without this assumption, there would be little reason to choose this approach over the ‘sample defines the population’ approach discussed above. Such an assumption is not only untestable, as that would require information on the non-inventoried section of society, but it is also questionable, given the significant differences in wealth, occupational composition and social status between inventoried and non-inventoried households.

A third approach has been to supplement probate inventories with inventory collections specifically covering the poor, as in Peter King’s work on English pauper inventories.¹⁵⁶ Unfortunately, such inventory collections are very rare and generally quite small, limiting their application and statistical power; King’s dataset, for example, consisted of a mere fifty-one inventories. Furthermore, it is far from clear how to combine results from these ‘pauper’ datasets with those from probate inventories. Although such datasets allow one to peek at a section of early modern society that is difficult to observe through probate inventories, an integral view of society remains an elusive prospect.

A fourth approach has been to try to complete the picture of historical society by combining known analytical results for inventoried households with, for non-inventoried households, the ‘time honored [method] of the educated guess’.¹⁵⁷ For example, when attempting to discover the wealth distribution of American colonial society, Alice Hanson Jones assumed that non-probated individuals were x per cent as wealthy as those that were probated, with x dependent

¹⁵⁵ Smith, ‘Underregistration and bias in probate records: an analysis of data from eighteenth-century Hingham, Massachusetts’, *The William and Mary Quarterly*, 32:1 (1975), p. 106.

¹⁵⁶ King, ‘Pauper inventories and the material lives of the poor in the eighteenth and early nineteenth centuries’ in Hichcock, King, and Sharpe (eds), *Chronicling poverty: the voices and strategies of the English poor, 1640-1840* (Basingstoke: MacMillan, 1997), pp. 155-91; for another example, see Harley, *Material lives of the English poor: a regional perspective, c.1670-1834* (PhD thesis, University of Leicester, 2016).

¹⁵⁷ Shamma, ‘Wealth distribution’, p. 298.

on the inventoried share of the population. If that share was high, such as in the Middle Colonies, where seventy-one per cent of wealth holders left an inventory, she assumed x to be twenty-five per cent; if it was low, as in New England, where only one in three wealth holders was inventoried at death, she assumed x to be fifty per cent.¹⁵⁸ Such an approach obviously suffers from the arbitrariness of the choice of x . Furthermore, it is not at all clear that the average wealth difference between probated and non-probated households would be related in this way to the inventoried share of the population. It is possible that the comparatively high share of probated households in the Middle Colonies was caused by the fact that all but the very poorest were inventoried, thus lending credence to the low value of x assumed by Jones. But, the high inventory coverage could also be taken to suggest that many poor households must have been inventoried too, depressing the average wealth of inventoried households, leading to a *high* value of x . The point here is not which interpretation is correct, but that it is not possible to choose between them.

A fifth approach also relies on access to rare historical data, namely a non-probate-based source on the wealth distribution within society. Smith, in his study on early modern Hingham, Massachusetts, possessed a detailed tax list of inhabitants which could be matched to the probate record, thus allowing him to estimate the average wealth of non-inventoried relative to inventoried households¹⁵⁹ In effect, this removes the need to rely on an ‘educated guess’ for the x in the previous method; for Hingham, Smith could calculate x to have been 32.8 per cent. This approach only works when studying a small community, like Hingham, where it is feasible to match individuals between the several historical records. And even when limiting themselves to local studies, few historians are in the fortunate circumstance of having tax lists, probate records and death registers of sufficient detail to allow such a calculation to be made, as Smith readily acknowledged.¹⁶⁰ Furthermore, non-probate sources of wealth distribution data typically suffer from social bias themselves; early modern tax lists usually omit poor households and those with little or no real property as they were exempt from paying taxes. Also, the basis for determining the wealth of individuals in such sources is often so different from that in probate inventories that a meaningful ‘match’ is impossible, as Jones found in an experiment for Philadelphia County.¹⁶¹ Tax lists, for example, are often based on real estate values which, in the Anglo-American case, are usually not included in probated wealth. And for Britain, the entire approach

¹⁵⁸ Jones, ‘Wealth estimates’, pp. 116-17.

¹⁵⁹ Smith, ‘Underregistration’, p. 106.

¹⁶⁰ *Ibid*, p. 110.

¹⁶¹ Jones, ‘Wealth estimates’, p. 118, referencing here a paper titled ‘Wealth Distribution in the American Middle Colonies in the Third Quarter of the Eighteenth Century’, presented at the annual meeting of the Organization of American Historians, New Orleans (April, 1971), pp. 31-34.

is unfeasible, as Lindert argued, because property and income taxes were partitioned into ‘unlinkable schedules’ or levied on occupiers rather than owners.¹⁶²

A sixth approach is based on correcting the probate record for age bias, assuming that such a correction will also remove wealth bias. The underlying argument for this assumption is that since probate inventories were taken at the end of someone’s life, probated individuals were on average older and therefore likely to be wealthier than the average living person, having had a life time to accumulate that wealth. By correcting for age bias, that is, by reconstructing the society of the living from the records of the recently deceased, this age-related wealth bias would be removed. Since probate records do not themselves provide information on the age of the deceased, this approach, like the previous one, relies on detailed information on individuals, allowing one to link individual probate records to data on the decedent’s age at death. Like the previous approach therefore, it is only really applicable in local studies, and even then only in the happy circumstances that the required detailed information on local individuals is available. Yet, one might extrapolate from such local studies to regional or even national probate records, if one can find evidence to support the assumption that the effects of the local age correction are likely to be representative for that larger geographical area. The real problem with this approach lies in the assumption that age correction will, as a fortunate by-product, result in a practically complete wealth correction too. Whereas it may well result in *some* share of wealth bias being removed, it is unclear *what* share.¹⁶³ Main and Jackson have asserted that it is a large share. Based on comparisons between tax lists and probate inventories, they wrote that ‘as a result of these efforts, we feel reasonably confident that the only bias afflicting the records for most of the colonial period is the familiar and natural one of age’, yet provided no evidence to back this claim up.¹⁶⁴ Smith, using the exceptionally good Hingham records, was able to carefully test the assumption. He found that ‘age per se had little to do with a man’s leaving a will or having an estate inventoried. The pronounced differential [between the probated and non-probated] arises not from the age of the decedents, but from their wealth.’¹⁶⁵ Furthermore, if Overton et al’s study of the English parish of Milton is correct, age bias in the probate record was slight, meaning that an age correction would remove only a sliver of the inventories’ wealth bias.¹⁶⁶

¹⁶² Lindert, ‘Algorithm’, p. 661.

¹⁶³ Shammass, ‘Wealth distribution’, p. 297.

¹⁶⁴ Main and Jackson, ‘Economic growth’, p. 125.

¹⁶⁵ Smith, ‘Underregistration’, p. 105.

¹⁶⁶ Overton *et al*, *Production and consumption*, p. pp. 27-28, 208. See also the discussion in this dissertation, pp. 13-4.

Finally, Margaret Spufford has argued that the elderly, rather than being wealthy, were more likely to have given away much of their possessions.¹⁶⁷

A seventh and more promising approach has been to divide both the collection of probate inventories and contemporary society into several sections which may be expected to have differed in average wealth. These sections can then be ‘reweighted’ within the collection of probate inventories, using their share of *all* households as the ‘weight’. Such an approach has been proposed by Lindert, using occupational groups as the sections, and by Carole Shammas, using eight sections based on a combination of occupational status and age.¹⁶⁸ However, as Lindert realized, the average wealth of, say, probated artisans is not actually representative of the wealth of *all* artisans, as the former were a relatively wealthy subset of the latter. In other words, this reweighting approach will remove the effects of the over- and underrepresentation of entire sections of society in the probate record, but not those of wealth bias *within* these sections.¹⁶⁹ Or, to phrase this in the terms of the by-employment analyses, the same cause that made farmers or tanners likely to leave an inventory, namely the possession of livestock or expensive stocks of raw materials, would have made manufacturers who were by-employed in farming, or farmers who also worked as tanners more likely to leave an inventory than their non-by-employed colleagues. This means that the by-employed will be overrepresented within each of the occupational sections in the inventory record. A corrected inventory set, reweighting occupational sections in their entirety, would thus provide only a limited improvement over the ‘raw’ set, as the main cause of overrepresentation of the by-employed in the probate record lay *within* the occupational sections.

In short then, none of the above methodologies can adequately correct for the probate record’s inbuilt wealth bias. But Lindert and Shammas’s method does provide a starting point for an approach which can. This new approach can best be explained by first examining the historical process which led to the current probate record. The process has been sketched in Illustration 3, which should be read from top to bottom.

¹⁶⁷ Spufford, ‘Limitations’, pp. 139-175.

¹⁶⁸ Lindert, ‘Algorithm’, pp. 662-63; Shammas, ‘Wealth distribution’, pp. 298ff.

¹⁶⁹ Lindert, ‘Algorithm’, p. 664.

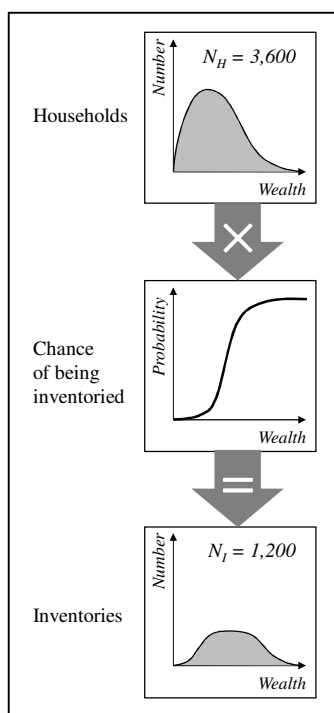


Illustration 3. Creation of the probate record

Suppose that a hypothetical historical ‘society’ consisted of N_h households which were distributed as a function of their wealth as depicted at the top. Suppose, further, that the probability that a male householder of a given wealth was inventoried was dictated by the probability function depicted in the middle – with poor household having a low and wealthy household a high chance of being inventoried. Then, the wealth distribution of the probate inventory record, depicted at the bottom, is nothing more than the result of a multiplication of the two curves above it. Since the probability of leaving an inventory positively depended on wealth, the process ‘moved’ the original, household wealth distribution to the right (higher wealth), explaining why the household and inventory wealth distributions differ. The more the original household wealth distribution was skewed towards the left (low wealth), the fewer households left an inventory. The ratio between the number of households (N_h) and the number of inventories (N_i)

thus depends both on the household wealth distribution and on the form of the probability function.¹⁷⁰ In the hypothetical example depicted here, on average one in three householders was probated.

In Illustration 4, the (fictional) population of households from Illustration 3 has been divided into three occupational subsets: farmers, manufacturers and labourers. Although the probability function is only dependent on the wealth of the individual householder, not on his occupation, the household wealth distribution differed per occupation and so did, therefore, the average share of households that left an inventory. Relatively more farmers were inventoried since wealthy householders were relatively more numerous amongst them – the farmers’ wealth distribution was skewed to the right. The opposite was the case for labourers. As a result, in the hypothetical example here, two in every three farmers’ households left an inventory, compared to in one in every four manufacturers and one in every twelve labourers. This explains why farmers are overrepresented in the probate record compared to manufacturers, and even more so compared to labourers.

¹⁷⁰ All this can perhaps be more clearly expressed in a mathematical fashion. The probability that deceased householder j with a wealth W_j was inventoried was a function of wealth $P(W_j)$. If the population of households numbers is N_h and the number of inventories is N_i then the relationship between those two numbers can be expressed straightforwardly as follows:

$$N_i = \sum_{j=1}^{N_h} P(W_j).$$

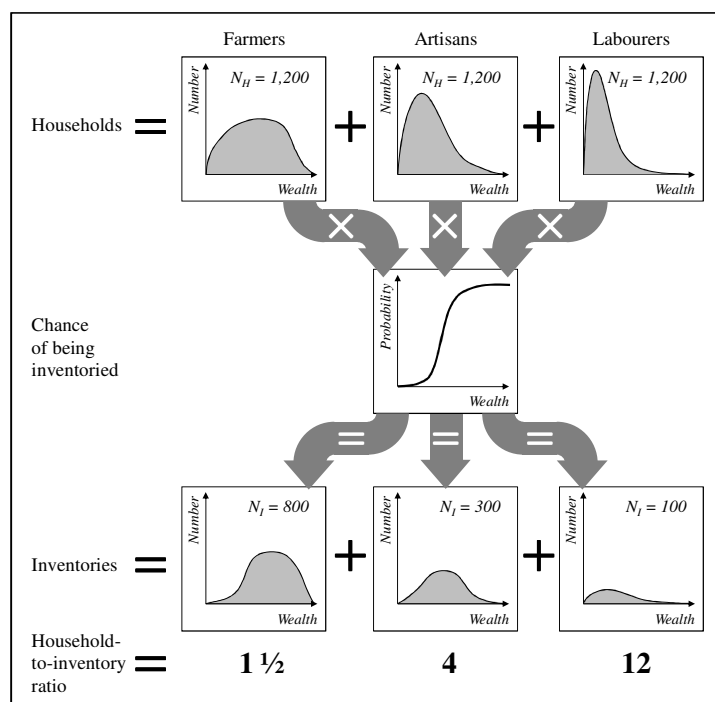


Illustration 4. An explanation of the variation in household-to-inventory ratios in occupational groups with different wealth profiles

Of course, both the household's wealth distribution and the probate probability function are, in practice, unknown. But the wealth distribution of the inventories is *knowable* – it can be accurately uncovered by analysing a sufficiently large and representative sample amongst all extant inventories. If we also knew the probate probability function, the above-described historical process could be reversed, and the original household wealth distribution could be uncovered as well.

Actually, the probate probability function is not entirely unknown. Certain logical constraints can be imposed upon it, as depicted in Illustration 5. The chance of leaving an inventory must have been negligible for households of near-zero wealth. Also, the wealthier a household was, the higher would have been the probability of being probated, so the probate probability function must have increased unceasingly and without peaks – in more technical terms, it must have been monotonically increasing and non-modal. It would also have been a continuous function, that is, it is highly unlikely that there would be household wealth levels at which the probability being inventoried suddenly, discontinuously 'jumped' upwards.¹⁷¹ And it would have been asymptotic in shape, as above a certain wealth level, chances of being inventoried would only increase marginally with even more wealth. It is possible that the probability of

¹⁷¹ The most probable candidate for a potential discontinuity would have been the infamous £5 'threshold' in English probate inventories but, as Cox and Cox report, this threshold did not actually exist. See: Cox and Cox, 'Probate, 1500-1800: a system in transition', in Arkell *et al* (eds), *When death do us part*, p. 26, fn. 65.

being inventoried also increased only marginally with wealth at the other end of the spectrum, for households with very low wealth. This would have led to the curvature of the probability function changing from positive to negative at a wealth level somewhere in between households with very low and very high wealth – but there is no reason to expect that the function could have had more than one such an inflection point. It can therefore be concluded that the probability function must have been either straightforwardly asymptotic or S-curve shaped.

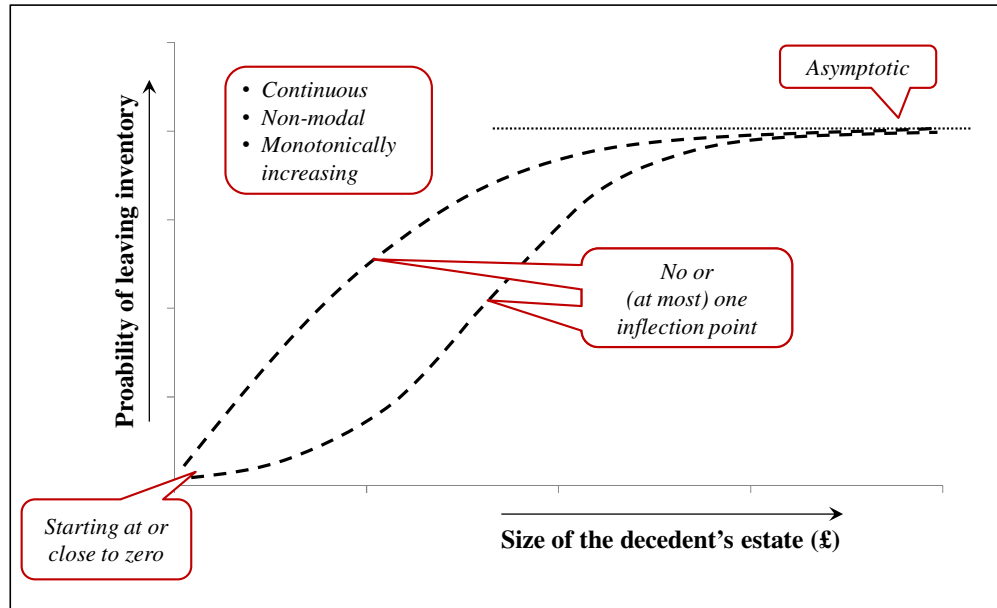


Illustration 5. Constraints on the shape of the potential probability function

The household-to-inventory ratios in Illustration 4 can be calculated by comparing that occupation's share within the occupational structure with its share within the inventory record. Figure 27 presents household-to-inventory ratios for the Diocese of Chester in the early eighteenth century. The direct probate jurisdiction of the Diocese of Chester covered the ancient counties of Cheshire and Lancashire, south of the river Ribble, corresponding to what Stobart has called the world's 'first industrial region'.¹⁷²

¹⁷² Stobart, *First industrial region*.

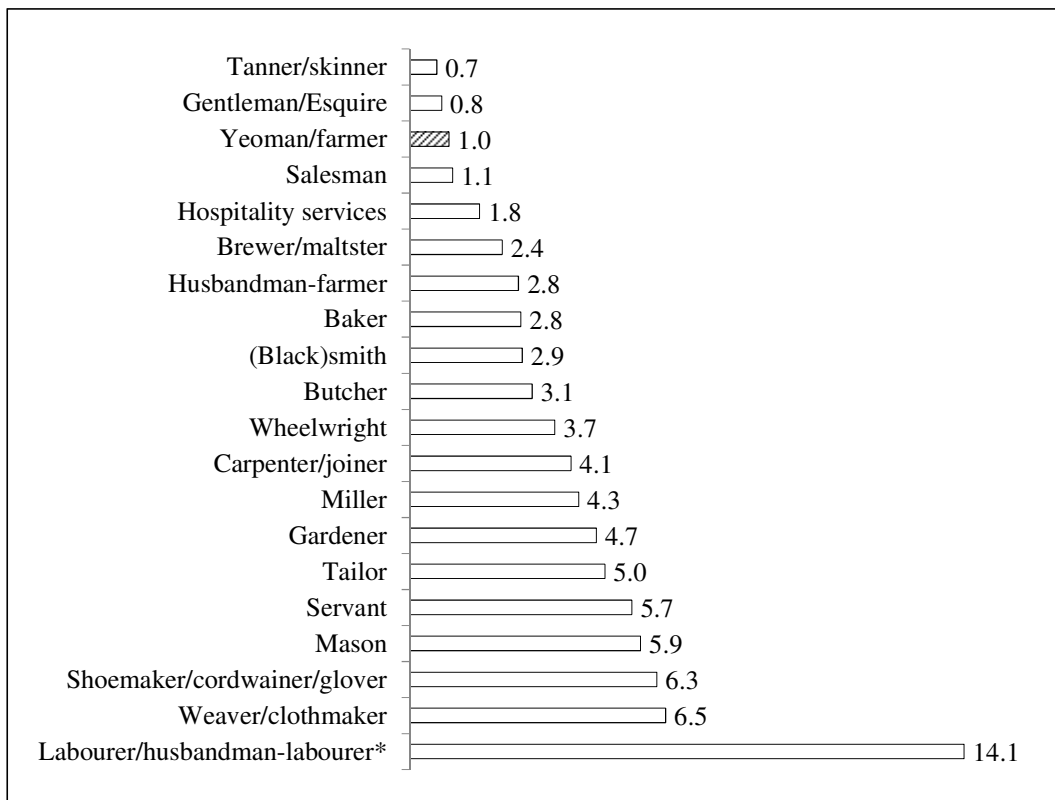


Figure 27. Relative household-to-inventory ratios; Chester Diocese, c.1725
(relative to yeoman/farmer = 100%)

Note: *A comparison between burial registers and probate data shows that one in seven decedents called ‘husbandman’ in their probate documents was called ‘labourer’ in the burial registers. Multivariate regression analyses, used as a means to allocate labourers to occupational sectors, also shows that 15% of all husbandmen in Cheshire and Lancashire were not farmers but labourers. The figures in this and following charts take this into account.

General remark: the probate data were restricted to the same set of parishes for which occupational information was available, to ensure an optimal one-to-one match.

Sources: probate database for Chester Diocese (i.e. Cheshire and Lancashire south of the river Ribble); parish records for the same geographic area, c.1725, collected by the Cambridge Group.

Armed with reliable information on the inventory wealth distribution, the (relative) household-to-inventory ratios for different occupations, and the approximate shape of the probability function, it is now possible to attempt to actually determine that function. In Illustration 6, the historical process depicted in Illustration 3 and Illustration 4 has been reversed. Reading from bottom to top, the number of inventories per sector is used to calculate the number of households per sector as implied by the probability function. The probability function is determined via an iterative four-step approach, depicted in red, and described in more detail below.

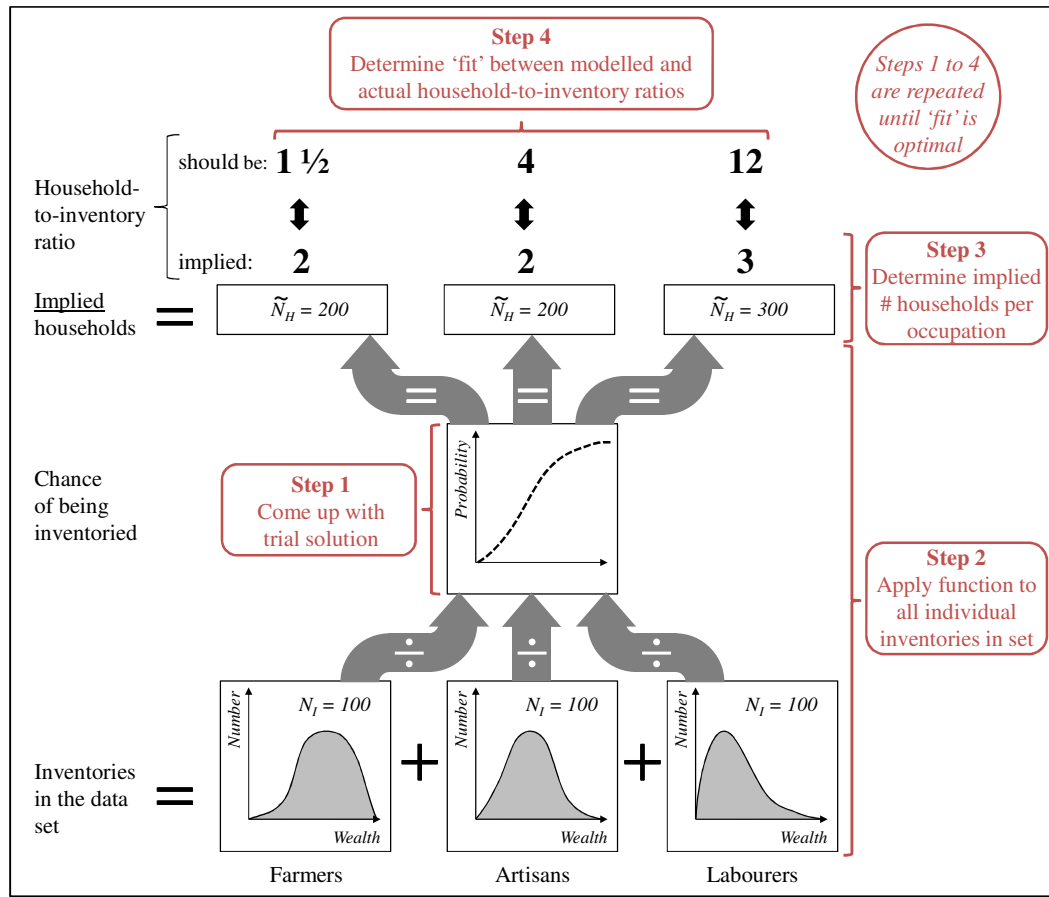


Illustration 6. A conceptual representation of the iterative process followed to recover the historical relationship between the deceased's wealth and the probability of his/her estate being inventoried

Step 1 consists of designing a trial version for the probability function. In step 2, this trial function is applied to every single inventory in the dataset to calculate the number of households that, on average, would have together left that one, single inventory *if the trial function were correct*. For example, suppose that inventory x in the dataset has an estate value of £10. Suppose furthermore that the trial function states that household heads which owned £10 in goods had a twenty per cent chance of being inventoried at death. The trial function then implies that inventory x corresponds statistically with five historical households. In step 3, these implied household numbers per individual inventory are combined per occupation, leading to implied household-to-inventory ratios per occupation. These are then, in step 4, compared to the *actual* ratios for these occupations, as presented in Figure 27. The better these two sets of ratios compare, the more the trial function resembles the actual, historical probability function.

The approach now returns to step 1, where a new variant of the trial probability function is generated. This is done by a computer algorithm; I used a generalized reduced gradient

optimisation algorithm, but other fit algorithms could also have been used.¹⁷³ Such algorithms, in one form or another, build on the results of step 4 to generate a new probability function in each cycle of the process in Illustration 6. If the new probability function turns out to be an improvement over the previous one, the algorithm will typically change the function's parameters 'in the same direction' in the next iteration, whilst doing the opposite if the new function turned out to be a change for the worse. The cycle is repeated until the fit between the modelled and actual household-to-inventory ratios can no longer be improved. The end result of the iterative approach is the best possible approximation of the actual, historical probability function. Running this approach on the Chester Diocese inventory set results in a very good match between model and historical reality, as Figure 28 demonstrates.

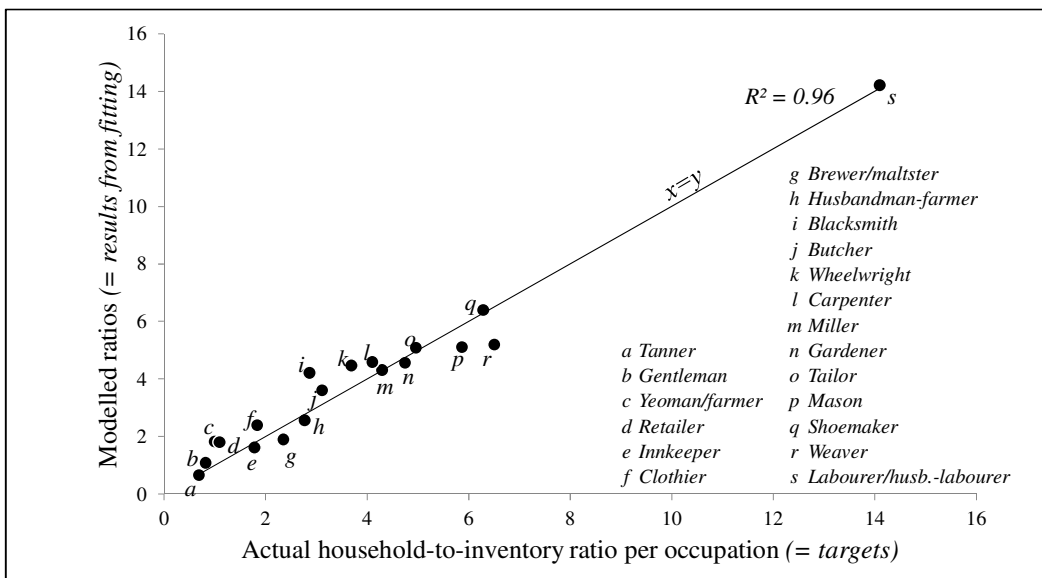


Figure 28. Household-to-inventory ratios – a comparison between actual figures (horizontal axis) and those resulting from the iteratively determined probability function (vertical axis) (Chester Diocese, c.1725)

The probability function thus determined for Chester Diocese in the early eighteenth century is depicted in Figure 29.

¹⁷³ Lasdon *et al*, 'Solving the pooling problem using generalized reduced gradient and successive linear programming algorithms', *SIGMAP Bull.*:27 (1979), pp. 9-15.

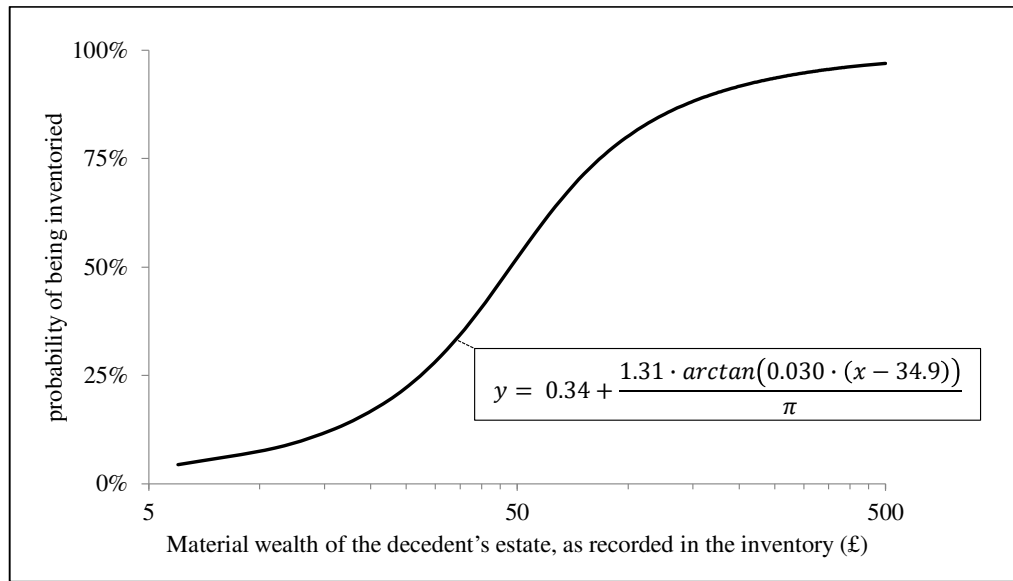


Figure 29. The probability of leaving an inventory as a function of wealth (Chester Diocese, c.1725)

Remark: for the definition of ‘material wealth’, see page 88.

Armed with the probability function from Figure 29, the historical process, as depicted in Illustration 3, can now be reversed, as has been done in Figure 30 for all agricultural inventories in Chester Diocese. Unsurprisingly, the household wealth distribution is, on average, shifted considerably to the left compared to the ‘raw’, uncorrected inventory wealth distribution, containing a much larger share of inventories at the lower end of the wealth spectrum, and a much smaller share at the upper end.

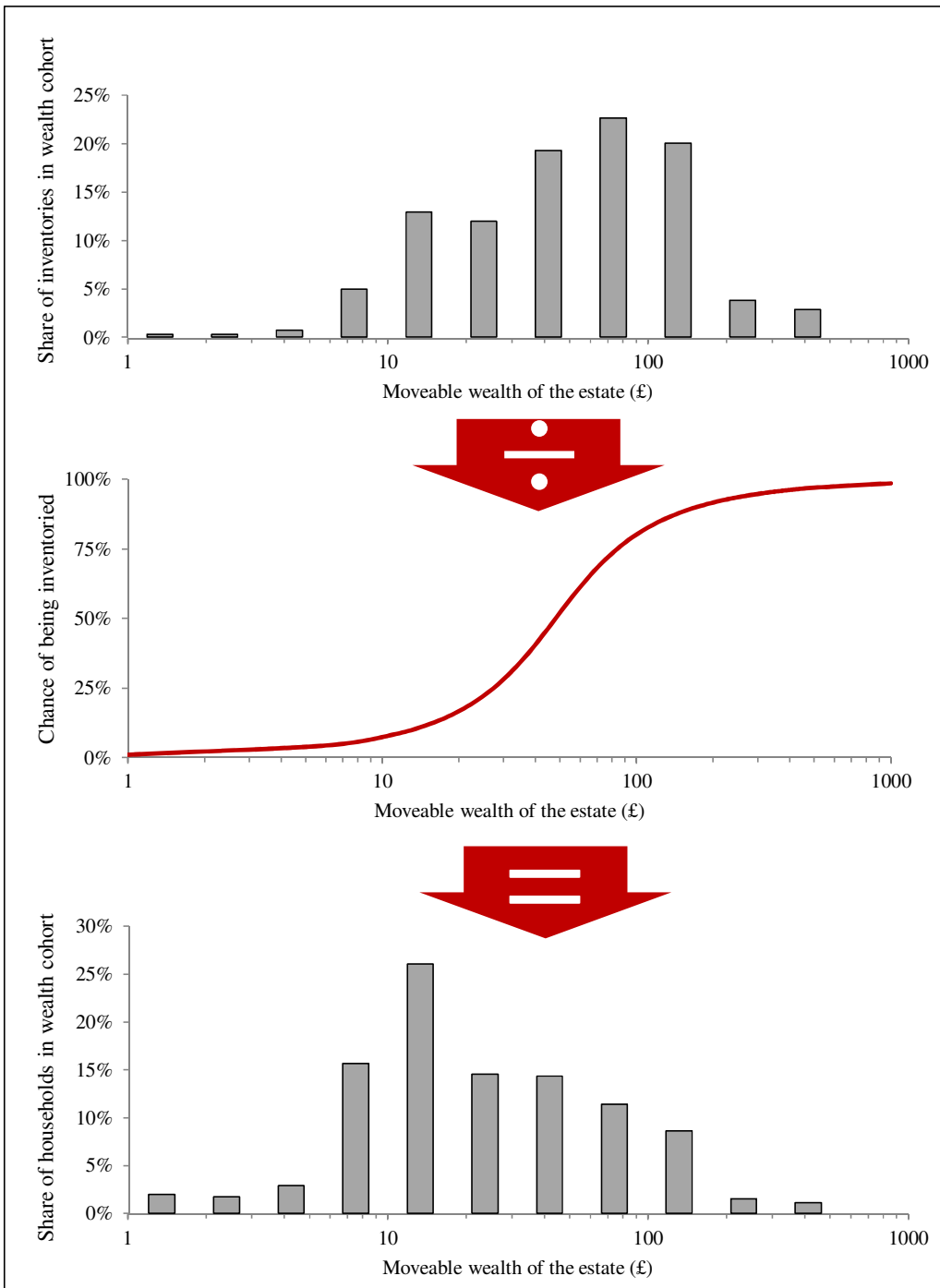


Figure 30. The reconstruction of the population of agricultural households (yeomen, husbandmen, labourers) from the probate data (Chester Diocese, c.1725)

The validity of the probability function can be tested by applying it to livestock numbers in Chester Diocese derived from probate inventories. As discussed on page 87, the probate evidence, taken at face value, strongly exaggerate averages livestock numbers per household and, thereby, the total number of livestock in a given area.¹⁷⁴ As shown in Figure 31, the number of cattle in Cheshire and Lancashire in the mid eighteenth century as suggested by the probate evidence greatly exceeds the actual numbers. But the numbers derived from the wealth-corrected probate evidence are in full agreement with the figures derived from independent, unbiased sources.

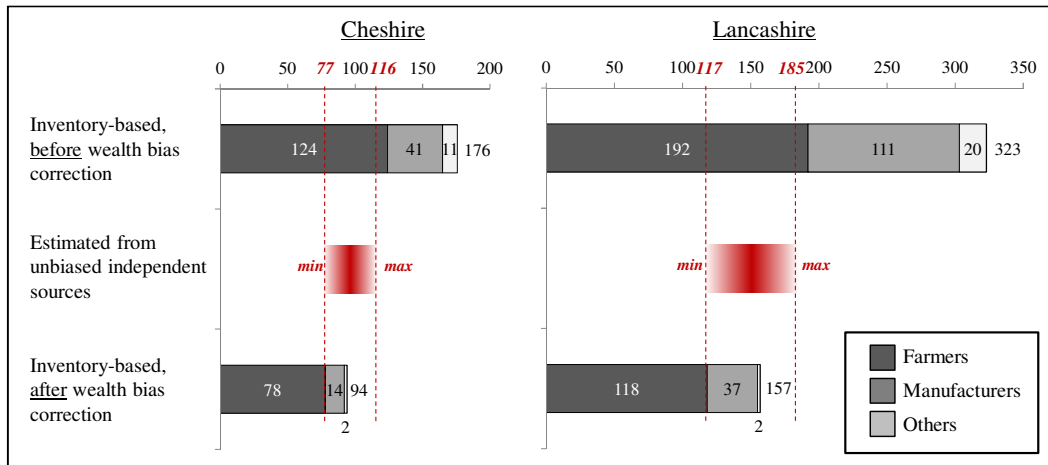


Figure 31. Total numbers of cattle in the counties of Cheshire and Lancashire, c.1760 as derived from probate data, compared to independent, unbiased estimates

Notes: For underlying assumptions and calculations of the independent and probate-based estimates, see Keibek and Shaw-Taylor, 'Rural by-employments', pp. 274-7.

Sources: Probate inventory dataset; probability function as depicted in Figure 29; agricultural censuses for 1871 and 1901; Wrigley, *Early censuses*; Wrigley and Schofield, *Population history*; Holland, *General view of the agriculture of Cheshire* (London, 1810); Holt, *General view of the agriculture of the county of Lancaster* (London, 1792); Rothwell, *Report of the agriculture of the county of Lancashire* (London, 1849); Turner, M., 'Counting sheep; waking up to new estimates of livestock numbers in England c.1800', *AgHR*, 46:2 (1998), pp. 142-61.

¹⁷⁴ Keibek and Shaw-Taylor, 'Rural by-employments', pp. 274-7.

By applying local probability curves to the inventory dataset for each county, the effect of wealth bias on by-employment incidence can be calculated, resulting in Figure 32. Probate inventories, as expected, turn out to severely exaggerate by-employment incidence in each county, often by a factor two or more. By-employments were not nearly as ubiquitous in early eighteenth century England as the ‘raw’ probate inventory record suggests.

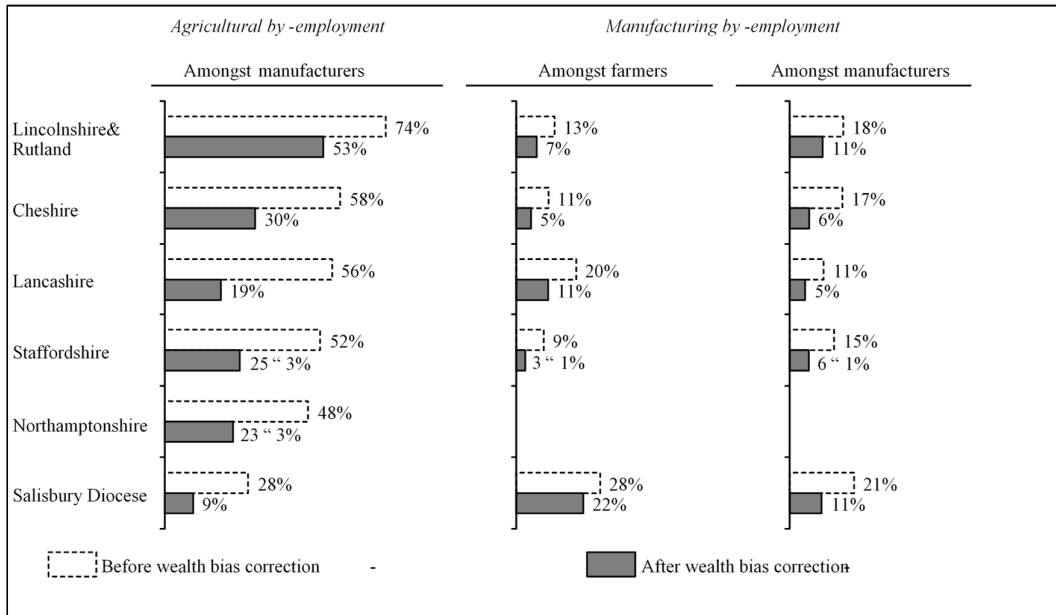


Figure 32. By-employment incidence before and after wealth bias correction (early eighteenth century)

Notes: The wealth-bias correction was carried out using local probability functions derived from comparing probate and parish register data in the same parishes in the early eighteenth century. However, for Staffordshire and Northamptonshire, no reliable parish register data were available for that period. Therefore, the probability functions derived for other the other regions were applied to these two counties, leading to a (manageable) range of values.

Although Figure 32 shows that the probate inventory record exaggerates by-employment incidence, on average, by a factor of two, the wealth-bias-corrected incidence figures remain substantial. They still suggest that, on average, twenty to thirty per cent of the secondary sector workers engaged in substantial agricultural activities and, therefore, that a non-trivial by-employment correction of the male occupational structure may still be necessary. However, as discussed in Section 4.4, even the wealth-bias-corrected estimates in Figure 32 represent, at best, an upper limit for individual male by-employment incidence, since probate inventories provide evidence on *households* rather than *individuals*. That is the topic of the next section.

4.6 Resolving problem 2: counting by-employed individuals rather than mixed-occupation households

As discussed above, the work-related goods listed in probate inventories are indicative of the gainful activities of the household, not merely of the male household head. Although other household members are not specified directly, probate inventories do provide some indirect evidence on the size of the household in the number of beds listed. It is not usually clear whether beds were used by a single or by several individuals, but in a large enough inventory sample it would seem justified to presume a strong (and linear) correlation between the number of beds and the size of the household. Examining by-employment incidence as indicated by inventories as a function of household size generates interesting results. As Figure 33 shows, there was a clear and positive relationship between the number of different activities which households engaged in and their average size, approximated by the number of beds listed in the probate inventory.

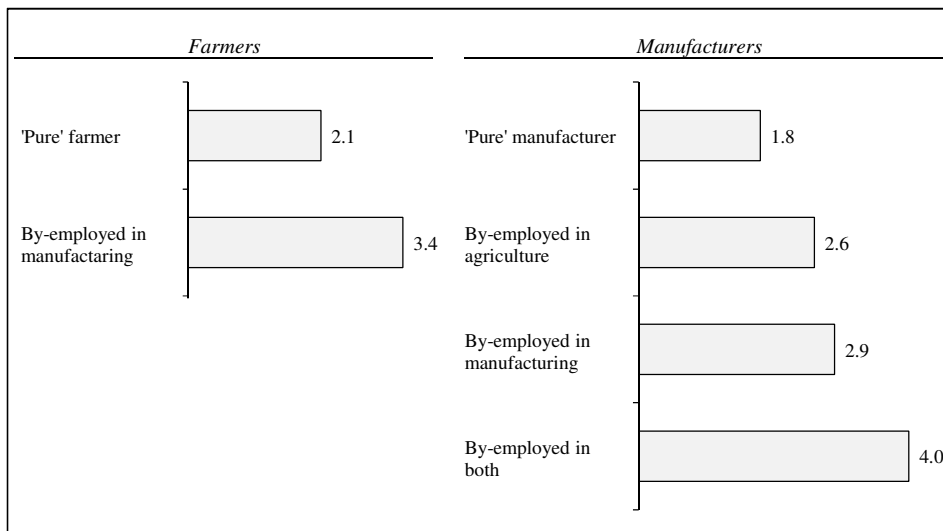


Figure 33. Beds per household as a function of the number of by-employments (Chester Diocese, early eighteenth century)

Very roughly, Figure 33 can be interpreted as indicating that for every bed added, an additional gainful activity is added as well. In other words, Figure 33 suggest that inventories with evidence of more than one gainful activity generally indicate households with different individuals engaged in different occupations. This means that interpretation B from Table 13 is likely to be the correct interpretation for most inventories indicating more than one gainful activity. Even the wealth-bias-corrected estimates depicted in Figure 32 severely exaggerate individual by-employment incidence. More evidence for this can be gained by focusing on agricultural activities. For these, not merely their presence or absence can be determined from probate inventories but their approximate scale as well, using the total value of agricultural assets listed in the inventory. This leads to Figure 34, which should be read clockwise, starting in the top left (panel A) with pure farmers.

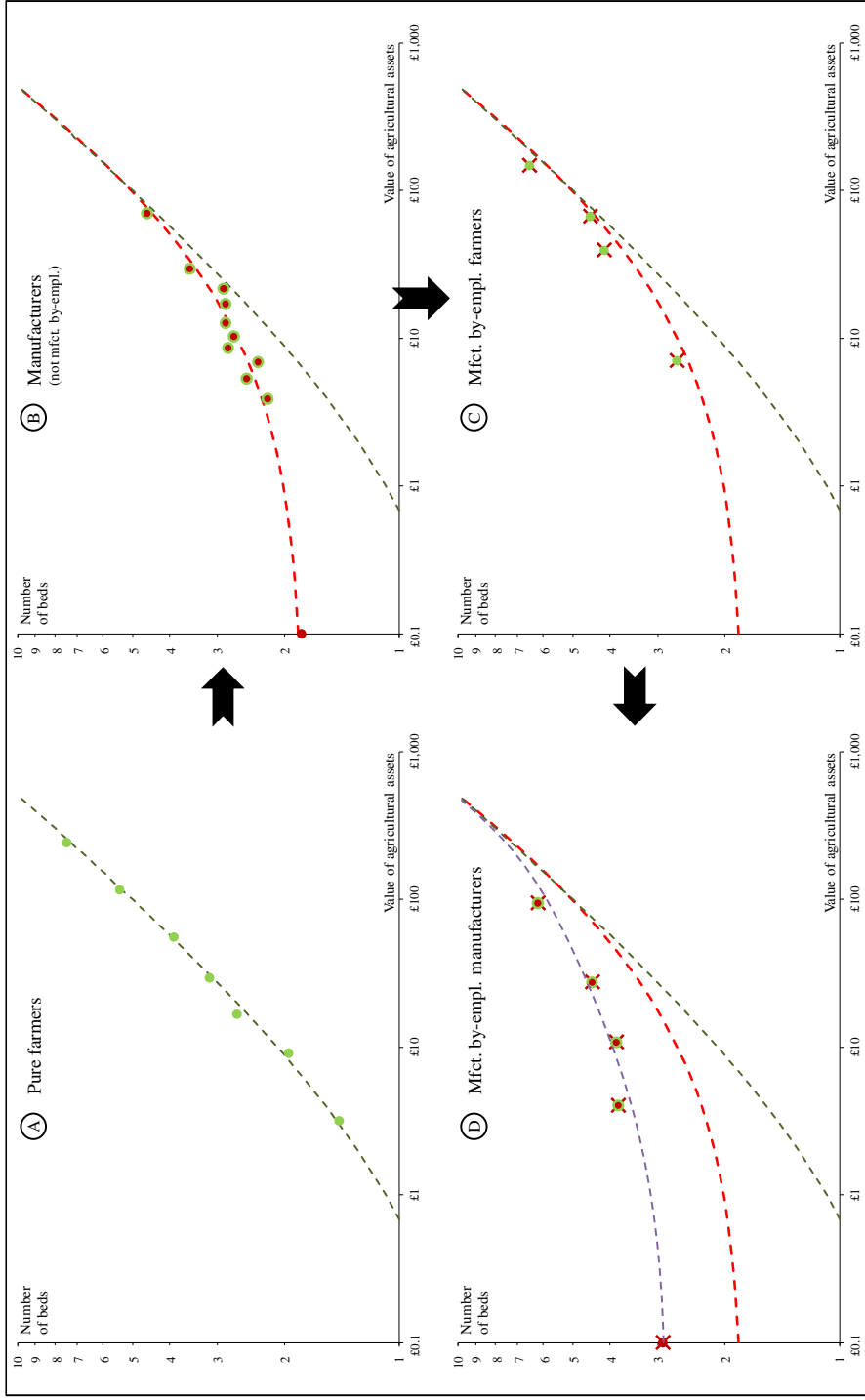


Figure 34. The relationship between farm size and household size for different types of households (Chester Diocese, early-eighteenth century)

Notes: the data points in the panels are the arithmetic average values for groups of inventories. A compromise needed to be reached between, on the one hand, the need to make these groups large enough for a meaningful average and, on the other hand, the need for a sufficiently large number of data points to visualise potential trends. Because the number of inventories differed strongly per panel, this compromise worked out differently too, resulting in different numbers of inventories per data point: 17 for pure farmers, 5 for farmers by-employed in manufacturing, 17 for agriculturally by-employed manufacturers and 12 for manufacturers by-employed in both manufacturing and agriculture.

It is clear from Figure 34 that farm size and household size were strongly correlated for pure farmers in the counties of Cheshire and Lancashire. This is entirely unsurprising as those counties were characterised by family farms which employed little outside labour. Next up, in panel B, manufacturers that were not by-employed in an additional form of manufacturing have been plotted. Again, household size and farm size were clearly correlated. Starting at 1.8 beds for pure manufacturers, household size increased with growing farm size, initially quite slowly but, for larger farms, increasingly similar to pure farmers. Indeed, manufacturers with *very* substantial farming activities would appear to have traced the pure farmers' trend line. This is not surprising, as for these households, agriculture must actually have been the dominant household activity, and one would therefore expect them to 'behave' like farmers' households.

Moving to panel C: farmers that were by-employed in manufacturing appear to have roughly followed the same trend line as the manufacturers from the previous panel. There was no fundamental difference between the households of farmers that were by-employed in manufacturing or, vice versa, manufacturers' households that were by-employed in agriculture, except for the fact that, on average, the former were much larger farmers than the latter. Again, this makes intuitive sense. Finally, in panel D, households that were involved in more than one manufacturing activity have been depicted. Starting at 2.9 beds for households with no agricultural activities, household size grew with farm size at increasing speed until, for very large farms, the pure farmers' trend line was traced again.

It is clear from Figure 33 and Figure 34 that both the *number* of different gainful activities and the *scale* of those activities were strongly and positively correlated to the number of people in the household. Larger households apparently – and quite logically – had more 'room' for different occupations than smaller ones. And the bigger the household, the larger in scale those by-employments could be. This is clear evidence that the so-called 'by-employments' were the preserve not so much of the male 'household head' but of his wife, children and/or living-in servants. They were not proper by-employments at all, but simply the result of different household members doing different things.

Comparing the evidence with contemporary sources on women's work – such as the frontispiece of Natham Bailey's 1736 *Dictionarium Domesticum* reproduced in illustration 2 – confirms that the most prevalent 'by-employments', namely livestock farming and dairying, brewing and baking lay very much in the female domain. They are not male by-employments at

all, but represent women's work, undertaken by the householder's wife and other women in the household.¹⁷⁵

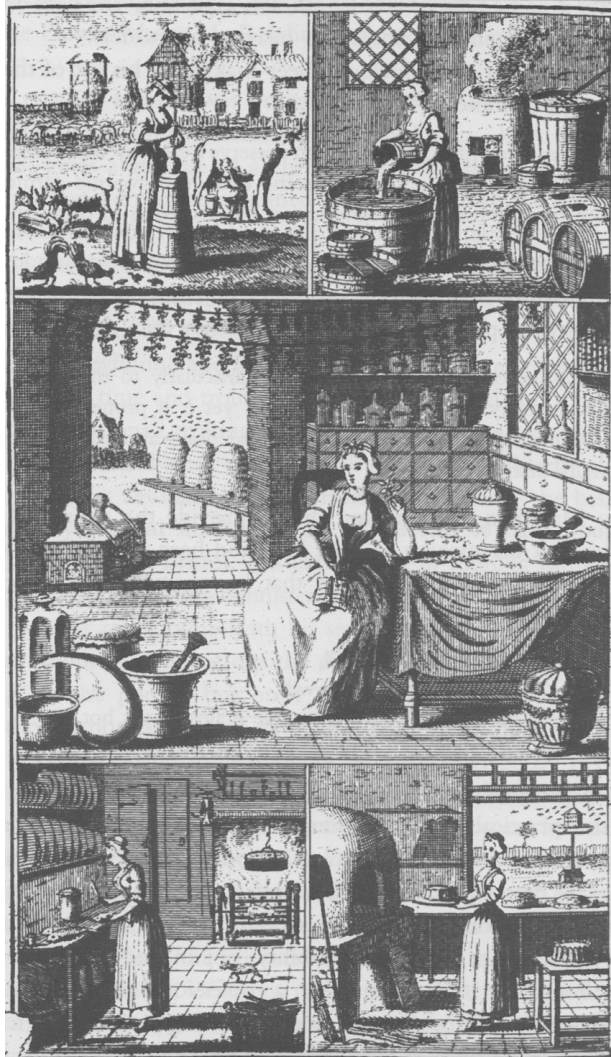


Illustration 7. Frontispiece of Natham Bailey's *Dictionarium Domesticum* (London, 1723), showing the female head of the household engaged in livestock farming, dairying, brewing, bee keeping, in the still room, preparing food and baking bread

Additional evidence can be found by examining the scale of the activities connected to the male decedents' principal, stated occupation. If probate inventories with several occupational indications were left by by-employed men, one would, on average, expect the scale of the 'principal' activities of these by-employed men to have been smaller than those of his non-by-

¹⁷⁵ For a similar contemporary overview of typically-female activities, see F., *The office of the good house-wife: with necessary directions for the ordering of her family and dairy, and the keeping of all such cattle as to her particular charge the over-sight belongs* (London, 1672). See also Wrightson, *Earthly necessities: economic lives in early modern Britain* (New Haven: Yale University Press, 2000), pp. 44-48; Verdon, "... Subjects deserving of the highest praise": farmers' wives and the farm economy in England, c. 1700-1850', *The Agricultural History Review*, 51:1 (2003).

employed colleague, since the latter was not forced to divide his time between the principal and subsidiary employment. This was not the case. On the contrary: in Chester Diocese, the average ‘by-employed’ farmer owned £30 in agricultural assets, compared to £23 for the average ‘pure’ farmer. Similarly, the average manufacturer whose inventory suggest that he was substantially by-employed in both agriculture *and* manufacturing owned £16 in agricultural assets, compared to £12 for his colleague whose inventory suggests agricultural by-employment only.

It can be concluded then that by-employment was a household rather than an individual phenomenon with the ‘by-employments’ – that is, the gainful activities other than the principal occupation of the male household head with which he was described in the inventory header – generally carried out by other household members. They were, in other words, not proper by-employments at all. It could therefore be argued that there is, actually, no compelling reason to apply *any* correction to the male occupational structure. However, it is still possible and perhaps even likely that some male household heads were involved in some of the ‘by-employments’. For example, Richard Millward, a collier from Shropshire, left ‘the management of the ground, in great measure, to his wife Jane’, but he did help out with some of the especially heavy digging at the start of the agricultural year ‘after his hours of ordinary labour’.¹⁷⁶ So technically, Richard Millward was by-employed, even though only to a limited degree as he was engaged in farming for only a small fraction of his working hours.

To express this in the terms introduced in Table 13 above, most inventories are probably correctly read along the lines of interpretation B. Nevertheless, as the example of Richard Millward above shows, interpretation will also, from time to time, have been the correct one. In those cases, a by-employment correction on the male occupational structure would still be necessary. For the sake of a model calculation, it is presumed in the next section that *all* inventories should be read along the lines of interpretation C, however unrealistic. In this way, an upper limit by-employment correction for the male occupational structure can be calculated.

4.7 Resolving problem 3: complementing incidence figures with a measure of the ‘size’ of by-employments

By-employment incidence alone is not sufficient to determine a by-employment correction on the occupational structure. It is also necessary to know the split in working hours between the principal and secondary employment. Fortunately, the trend lines in Figure 34 provide the means for estimating average share of the combined household working hours they employed. How this works has been depicted schematically in Illustration 8 for households of men whose

¹⁷⁶ Pulteney, ‘Account of a cottager’ in ‘Communications to the board of agriculture’, (London, 1805) , pp. 344, 345.

principal occupations fell in the secondary sector but whose inventories also show evidence of agricultural activities. For a given household i , the scale of these agricultural activities is measured on the horizontal axis, in the form of the total value of the agricultural assets of this household. It can be estimated how much labour – in terms of beds, on the vertical axis – was required for farming (LA_i), with the remainder of the household engaged in manufacturing (LM_i). By calculating LA_i and LM_i for all households in the dataset, the occupational importance of farming for these households can thus be determined as a straightforward average, its value depending on the distribution of households across the spectrum of farm sizes. The same approach can be followed for farmers whose inventories show evidence of manufacturing activities and, after switching to the upper, purple curve in panel D of Figure 34, for manufacturers whose inventories show evidence of both farming and (other) manufacturing activities.

It can thus be calculated that agricultural activities utilized around one-third of the combined ‘labour force’ of manufacturing households that were, in some form or scale, involved in farming. If the analysis is restricted to manufacturers’ households with *substantial* farming activities, in line with the definition of ‘true’ agricultural by-employments discussed on page 82, that share rises to nearly two-fifth. For farmers whose households were also engaged in manufacturing, circa one quarter of household labour was expended on manufacturing rather than agriculture. And for manufacturers whose households were involved in both farming and (additional) manufacturing, roughly one in four household members was, on average, working in agriculture and one in three in the manufacturing ‘by-employment’ – leaving only two-fifth of the household labour for the principal occupation of the male ‘household head’.

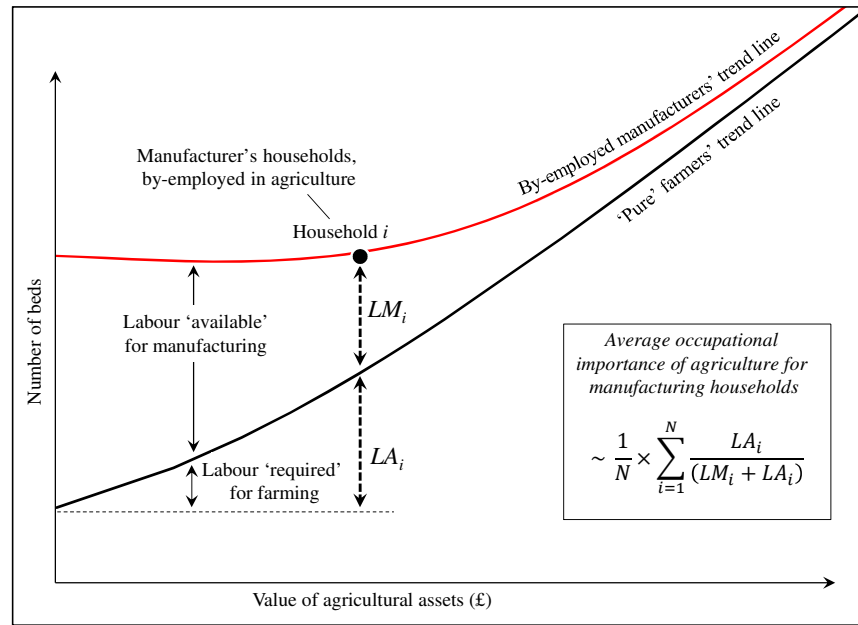


Illustration 8. Schematic description of the methodology to estimate the average occupational importance of agricultural activities in households for which the principle (i.e. stated) occupation of the ‘male household head’ is in the secondary sector

The labour force shares represent the entire household, not the ‘male household head’. As discussed in Section 4.6, it is likely that, in many households, the male household head was not involved in the ‘other activities’ at all and that in those households in which he did contribute to these activities, he did so for a much lower share of his time than other household members such as his wife and servants. But let us presume, for a moment, that he was as involved in these activities as the entire household. That, in other words, the labour force shares calculated above are representative not just of the household as a whole, but of the male household head too. It is then possible to calculate a by-employment correction on the principal-employment-only, male occupational structure. In Figure 35 this has been done, as an example, for the county of Cheshire. Because of the dominance of agricultural over manufacturing by-employments, the resulting occupational structure would be less industrial than the original one. However, the size of the correction is small, with only a three per cent overall shift from the secondary to the primary sector. So even using the entirely unrealistic assumption that the male household head was as involved in the household’s ‘other’ activities as the rest of his household, the by-employment correction would be very small.

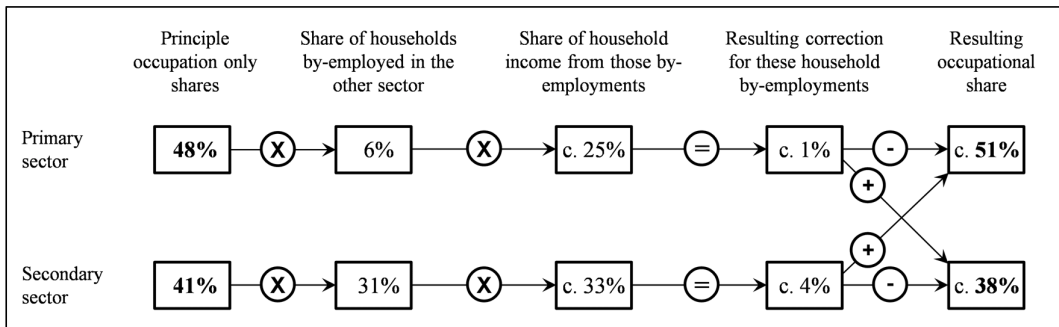


Figure 35. The by-employment correction to the male occupational structure if male ‘household heads’ are (incorrectly) presumed to have been involved in ‘other’ gainful activities (that is, other than his occupational denominator) to the same degree as other members of his household (Cheshire, c.1725)

4.8 Conclusion

The frequent indications of more than one gainful activity in probate inventories do not invalidate male occupational structures based on single, principal occupations only. Not only do probate inventories, as a result of their wealth bias, strongly exaggerate the number of such households, but it is clear that, in most cases, the male decedent for which the inventory was made did not himself engage in these ‘by-employments’ at all. Rather, they were the preserve of other household members. And even if he had, in all cases, engaged in these activities and had done so to the same degree as other household members – both highly unrealistic assumptions – the resulting by-employment correction on the male occupational structure would be very small. In short: for the purpose of generating reliable male occupational structures, by-employments can safely be ignored.

5 THE PROBATE DATASET

Before turning to the occupational estimates resulting from applying the methodologies discussed in the previous three chapters, it is necessary to provide an overview of the data used for those estimates. The main focus of this chapter is the probate dataset, collected and coded specifically for this research. It was constructed based on indexes to probate documents held in record offices across England and Wales. The information provided by these indexes was codified to standardized occupational categories and geographic units. The bulk of this chapter discusses the resulting dataset, in particular its geographic and temporal coverage.

5.1 Local/regional coverage

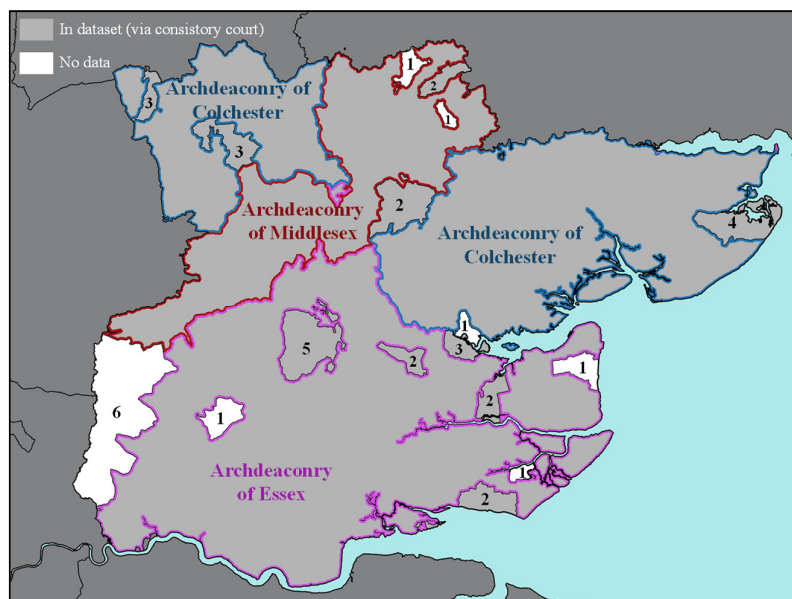
Except for the temporary centralisation during the Interregnum in the 1660s and until its final centralisation in 1858, the probate process was the responsibility of ecclesiastical courts, with the geographical location of the decedent's property determining which court should be used. These church courts formed a hierarchy, typically at the level of the archdeaconry, the diocese, and the archbishopric. The vast majority of decedents owned property in just a single probate jurisdiction and their will, inventory, and potential other testamentary documents were proved at the lowest level of the court hierarchy which could be an archdeaconry or, if the diocese had direct jurisdiction, a consistory court. The much smaller number of decedents who owned property in more than one archdeaconry but in one diocese would have had their wills proved in the consistory court of that diocese, whilst those with property in more than one diocese would have to turn to the prerogative courts of the archbishops of York or Canterbury. The latter court was also the court for decedents with property in both archbishoprics. To make matters even more complex, there existed a multitude of smaller jurisdictions, the so-called peculiars, which were exempt from the archdeaconry courts' authority, although usually not from that of the consistory court of the diocese.

The probate documents proved by the regional courts are, today, mostly held by county record offices, with the testamentary document collections of the prerogative held by the Borthwick Institute, in the case of York, and by the National Archives, in the case of Canterbury. In many cases, indexes have been created which summarise key elements of information from these documents, to make it possible to select and locate documents in the collections for further study. The decedents' occupations are, usually, one of these elements of information. This means that the indexes rather than the actual documents can be used as a conveniently accessible source of occupational information on hundreds of thousands of probated men. These indexes come with a geographic coverage determined by the courts on whose document collections they are based. Many of the archdeaconry and consistory courts closely followed the contours of the ancient counties of England and Wales, and those ancient counties are therefore one of the key geographical levels on which this dissertation is built. For some of these counties, a single index, from a single church court, covers the entire county. In the case of Chester, for example, the Chester Record Office's index to probate documents, derived from the document collection in the Consistory Court of Chester, covers every Cheshire parish. But in other counties, the situation is more complex. Neighbouring Lancashire, for example, was also partially covered by the Chester Consistory Court, but the probate jurisdiction north of the river Ribble fell to the Archdeaconry Court of Richmond and to two peculiar courts, namely that of the Dean and Chapter of York, and that of the Manor of Halton. Other counties had many more peculiars. The probate process in Hampshire, for example, was mainly the responsibility of the Court of the Bishop and Archdeaconry of Winchester, but there were no less than forty-five peculiar courts which, together, covered about a quarter of the county. However, in the case of Hampshire and in most other counties, the indexes for the peculiar courts are included in those for the consistory court under which (higher) authority they fell. Indeed, for most counties for which indexes were obtained for this dissertation, these cover the entire county or almost the entire county.

Nevertheless, understanding precisely which areas within a county are covered, and by which index is important, for two reasons. Firstly, there may be an issue of incomplete coverage, as some of the local courts may not be included in the index available for that county. For example, there is no index for the Dean and Chapter of York, and the index for Lancashire is therefore incomplete. Since the Court of the Dean and Chapter of York covered only a very small and lightly populated area in Lancashire, this is hardly a problem, but in some counties, the non-covered area is much more substantial. Shropshire, for example, was geographically divided into three dioceses – Lichfield, Hereford, and St Asaph – and seven additional peculiars. Separate indexes exist for all three consistory courts, but they all cover different time periods, with only the St Asaph index covering virtually the entire 1600-1850 period examined in this dissertation. In other words, understanding the precise geographical coverage of counties,

including the time periods for which that coverage exists, is necessary for understanding what part of a county is actually covered when using probate data for a specific year. Secondly, there is a potential issue of *incomparable* coverage if several indexes are involved. Even if a county, such as Lancashire, is almost fully covered by probate data, it is still important to recognize that more than one index is involved. The document survival rate, relative probability of being probated, or relevant local calibration factors could vary for the different indexes. Both of these issues – incomplete coverage and potentially incomparable coverage – mean that care has to be taken that calculations based on the available probate data for a county are representative of that county as a whole.

Maps were therefore produced for each county, detailing which probate courts had authority over which areas within that county, and whether or not these courts are included in the research database. These maps can be found in Appendix A. As an example, such a map has been reproduced below for Essex, a county with a fairly complex structure of church courts.



Map 4. Probate jurisdictions in the ancient county of Essex (before 1858 and excluding the Interregnum)

Notes: the numbers in the map denote peculiar courts, namely 1 = Peculiar of the Dean and Chapter of St Paul's, 2 = Peculiar of Deanery of Bocking, 3 = Peculiar of the Dean and Chapter of Westminster, 4 = Peculiar of the Liberty of the Sokens, 5 = Peculiar of Writtle with Roxwell, 6 = Commissary of the Bishop of London.

To test whether incomplete coverage significantly impedes the representativeness of results, comparisons were made, for each county, between the occupational structures of covered and non-covered areas in the 1813-20 period, profiting from the fact that full geographic coverage is available from parish register data for this period. Of course, even if such a comparison shows that the absence of the non-covered areas in the probate data is unproblematic for early-

nineteenth-century estimates, that does not provide absolute certainty that it is unproblematic in earlier time periods too, but at least it demonstrates the likelihood of this being the case. The same approach, with the same caveat, was used to examine the potential issue of incomparable coverage caused by one county being covered by several court indexes. How all this works in practice has been depicted in Table 15, for the county of Essex. As Map 4 showed, two peculiars were not included in the index provided by the county record office. Furthermore, the covered part of the county was divided between three archdeaconry courts and a number of peculiars.

Table 15 is split into two parts, one with actual occupational shares per (group of) probate courts, and one with simulated shares, illustrating what the occupational shares would have looked like if certain probate courts had been over- or underrepresented.

Table 15. Male occupational shares by (collection of) probate courts according to the 1813-20 parish register data for the ancient county of Essex

Background	Geographic area (corresponding court)	Share of all obs	Sectoral labour shares (%)		
			Primary	Secondary	Tertiary
Actual shares	Archdeaconry of Colchester	32	64	23	13
	Archdeaconry of Essex	40	60	23	17
	Archdeaconry of Middlesex + covered peculiars	<u>20</u> +	66	25	10
	All the above, all of which are covered	92	63	23	14
	Non-covered peculiars	<u>8</u> +	57	27	16
	Essex, all courts	100	62	24	14
Simulated shares	If the most agri. court were 100% overrepresented		63	24	13
	If the most agri. court were 50% underrepresented		62	24	15
	If the most tert. sec. court were 100% overrepresented		62	24	15
	If the most tert. sec. court were 50% underrepresented		63	24	13

Notes: for an explanation and interpretation of the table, see main text, below.

The top, ‘actual shares’ part of the table deals with the issue of incomplete coverage. As the table shows, almost two-thirds of Essex’s male labour force in c.1817 was covered by two large archdeaconry courts, namely those of Colchester and Essex, with one fifth covered by other probate courts. The remaining eight per cent of the male labour force lived in the two peculiars not covered in the index provided by the county record office. The labour share of the two peculiars missing in the probate index had a somewhat different occupational structure from that of the covered courts but, as the comparison between the fourth and sixth line in the table show, these non-covered peculiar courts represent too small a share of the labour force and differed too little in occupational structure from the rest of the county to materially affect the overall occupational structure; the sectoral composition in the covered parts of the county (line 4 of the table) was virtually identical to that of the county as a whole (line 6 of the table).

The potential issue of incomparable coverage is addressed in the bottom, ‘simulated shares’ part of the table. In it, the overall occupational structure of the county is calculated as it would have

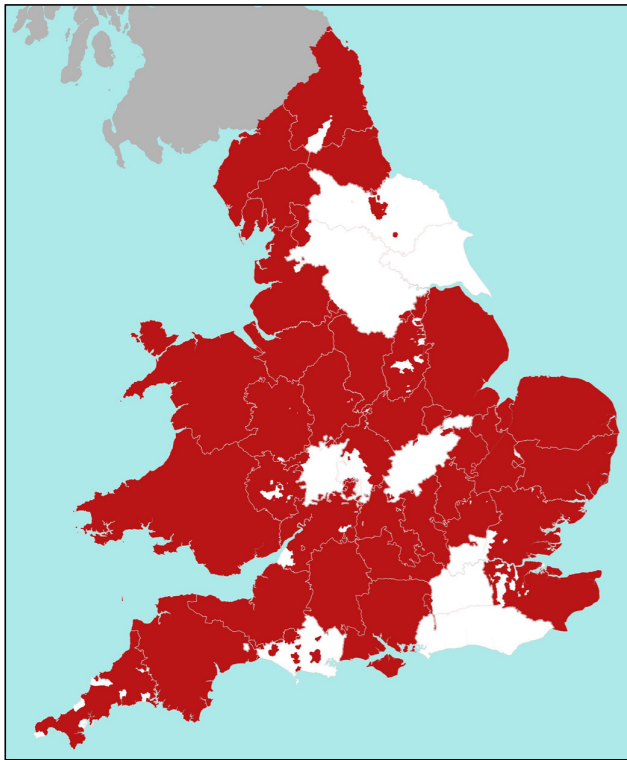
looked like if some of the courts had been heavily over- or underrepresented. As the results show, the differences in occupational structure between the (groups of) courts are insufficient to make much of a difference. In other words, if there were differences in comparative coverage between the courts in the probate data, even if these were quite extreme, the results for the overall Essex estimates would be small.

Similar comparisons were made for all counties. It was found that in most of them, the two potential issues with the local probate – incomplete or incomparable coverage – did not significantly affect the representativeness of the probate data for the county as a whole. There were, however, some exceptions. For Lancashire, it was found that there was a potential issue of the two major indexes covering the county, derived from the Consistory Court of Chester and from the Archdeaconry Court of Richmond, being not sufficiently comparable. Calculations for Lancashire were therefore split into the two indexes, which were subsequently recombined, to obtain reliable estimates for the county as a whole. A similar approach was chosen for Westmorland, which was divided into two major probate jurisdictions – the Archdeaconry of Richmond and the Diocese of Carlisle – with marked differences in occupational composition.

Less easily resolvable were the issues for Warwickshire and Dorset. In Warwickshire, about one fifth of the labour force lived in the part of the county covered by the Diocese of Worcester, for which no probate index with occupational information exists after 1652. This south-western part of Warwickshire was significantly more agricultural than the rest of the county, at least by c.1817, leading to an underestimate of the primary sector by five per cent by that year. Although the effect is likely to have been smaller in earlier time periods, the results for Warwickshire presented in this dissertation are probably somewhat too manufacturing heavy and insufficiently agricultural. The same is true for the Dorset results. Probate indexes for this county are only available for a number of peculiars within the higher jurisdiction of the Salisbury Diocese. These covered only one fifth of the population in c.1817, and underestimated the primary sector by four per cent. The Gloucestershire results miss Bristol and its direct surroundings, as these were covered by a separate court, for which no index with occupations exist. As a consequence, they somewhat underestimate the tertiary and, to a lesser degree, the secondary sector.

5.2 National coverage

Not all probate documents have been indexed. Some were indexed, but without occupations being recorded by those who constructed the index. And some of the indexes which do contain occupational information are in a form that makes them very difficult to digitise. As a result, occupational information from probate records is not available for the whole of England and Wales – as displayed in Map 5.



Map 5. Overall probate coverage of England and Wales

Notes: areas for which occupational information is included in the probate database used in this dissertation are indicated in red. Areas in white were not included. As discussed in the main text, this does not necessarily mean that no probate indexes existed for these areas, but only that this information was too incomplete or too difficult to access for them to be included in the database.

It should be noted here that information from the prerogative courts was not included in the database. The existing index for the Prerogative Court of York does not contain occupations, so could not be used anyway. But the Prerogative Court of Canterbury (PCC) probate index, created by the National Archives, does contain occupational information. It was nevertheless excluded as it would have added only a small number of relevant observations to the regional probate indexes since, except for the Interregnum, the overwhelming majority of probate documents was proved in the local church courts. Furthermore, given the (far) above average wealth of the decedents documented in the PCC index, the appropriate calibration factors would have been very low, leading to an even smaller contribution to *calibrated* observation numbers. The exceptionally large number of distinct occupational denominators in the PCC index, mostly caused by mariners, who were often described by the name of their ship, meant that occupational codification of the PCC index would have been a time-consuming endeavour. Given the very limited number of relevant observations in comparison to those in the regional indexes, the return on this time investment was considered too low.

Some of the ‘white areas’ on this map correspond to peculiars which happen not to be included in any of the existing indexes, for example those in Cornwall. As discussed above, this is

usually not a significant problem when estimating occupational structures at or above the geographic level of counties. But some of the ‘white areas’ are much more extensive and problematic. Very little occupational information can be gained from probate data for the three ridings of Yorkshire. Some indexes exist, in book form, and these contain occupational information, but they are in a difficult to digitise format and only exist up to the year 1688.¹⁷⁷ They were therefore not included in the probate database. Surrey, Sussex, and Middlesex, including London, form another large ‘white area’ in Map 5. Some probate indexes exist for London and Middlesex, but they cover only a small share of the area’s contemporary population, do so only for a limited time period, and contain little occupational information.¹⁷⁸ They were therefore also excluded from the database. Indexes for Sussex exist, but these contain too little occupational information to be useful.¹⁷⁹ Some printed indexes exist for Surrey.¹⁸⁰ Although they contain occupational information, they were excluded from the database as they were too difficult to digitise. For Northamptonshire, an extensive card index is available. This has recently been digitised by Findmypast.com but no answer was received on requests to use the digital data for academic research. The Worcestershire index, published by the British Record Society contains occupations, but only runs to 1652, and was therefore not digitised and included.¹⁸¹

The quality of the information from the probate indexes for the ‘red areas’ in Map 5 was not uniform. Most indexes were of high quality, but some were not. For Somerset, the only available index is one for probate inventories only, thus covering a significantly smaller share of

¹⁷⁷ Published in volumes 6, 11, 14, 19, 22, 24, 26, 28, 32, 35, 49, 60, and 68 of the Yorkshire Archaeological Society Record Series, published between 1888 and 1934, with Francis Collins and Ely Wilkinson Crossley as editors. These have not yet been digitised and included in the probate database used for this dissertation.

¹⁷⁸ Indexes exist for the Diocese of London Consistory Court (unfortunately highly incomplete up to 1780; containing c.10,000 usable observations of which only twenty per cent before 1780; covering parts of London, Middlesex, Essex, and Hertfordshire), the Archdeaconry Court of Middlesex (incomplete; mostly containing wills from the 1700-60 period; containing c.3,000 useful observations), and for the Archdeaconry Court of London (highly incomplete; covering the 1700-74 period; containing c.4,000 usable observations).

¹⁷⁹ The British Record Society has produced two printed indexes of Sussex wills, for the Consistory Court of Chichester (BRS vol. 49, published in 1915, covering the years 1482-1800) and for the Consistory Court of Lewes (BRS vol. 24, published in 1901, covering the years 1542-1652). Unfortunately, occupations were not recorded, so they were of no use for this research.

¹⁸⁰ A number of printed indexes has been created by the West Surrey Family History Society, edited by Cliff Webb, covering the period from 1660 for both the Archdeaconry and Commissary Court of Surrey. These have not yet been digitised and included in the probate database used for this dissertation.

¹⁸¹ They were published in BRS volumes 31 and 39 (*Worcester Wills, Vol. I and II*), published in 1904 and 1910 respectively.

the male labour force than would have been the case had wills been included.¹⁸² The probate documents for Devon and much of Dorset and Somerset were destroyed in the 1942 bombing of Exeter. An index was created for Devon from older, partial indexes and from information in the National Archives by volunteers of the Devon Wills Project, but this index contains many duplicates, particularly of documents held at the Prerogative Court of Canterbury, and is of much lower quality than those provided by local record offices for most other counties.¹⁸³ As discussed above, the Dorset index is based purely on probate documents proved in a number of peculiar courts in that county and covers only about one fifth of the contemporary population; although certainly useful, it is representative of the county as a whole is unclear, and the Devon results presented in this dissertation should be treated with caution.

Another issue with Map 5 is that for many of the 'red areas', coverage was not continuous for the entire 1600-1850 period, as will be discussed next.

5.3 Temporal coverage

The available indexes on which the probate database is built do not always cover the entire time 1600-1850 period, and some that do, do not provide occupational information for their entire run. The former is illustrated in the county of Staffordshire, the latter in the county of Leicestershire, as Figure 36 show. The Staffordshire index is derived from the probate index for the Consistory Court of Lichfield, which is being created from the original documents by the Lichfield Record Office; this process is incomplete, with the current index roughly covering the 1640-1760 period, with additional decades expected to be included in the coming years.

¹⁸² Webb, *Index of Somerset probate inventories*, 2nd. edn (Weymouth: Somerset & Dorset Family History Society, 2000).

¹⁸³ <http://genuki.cs.ncl.ac.uk/DEV/DevonWillsProject/>.

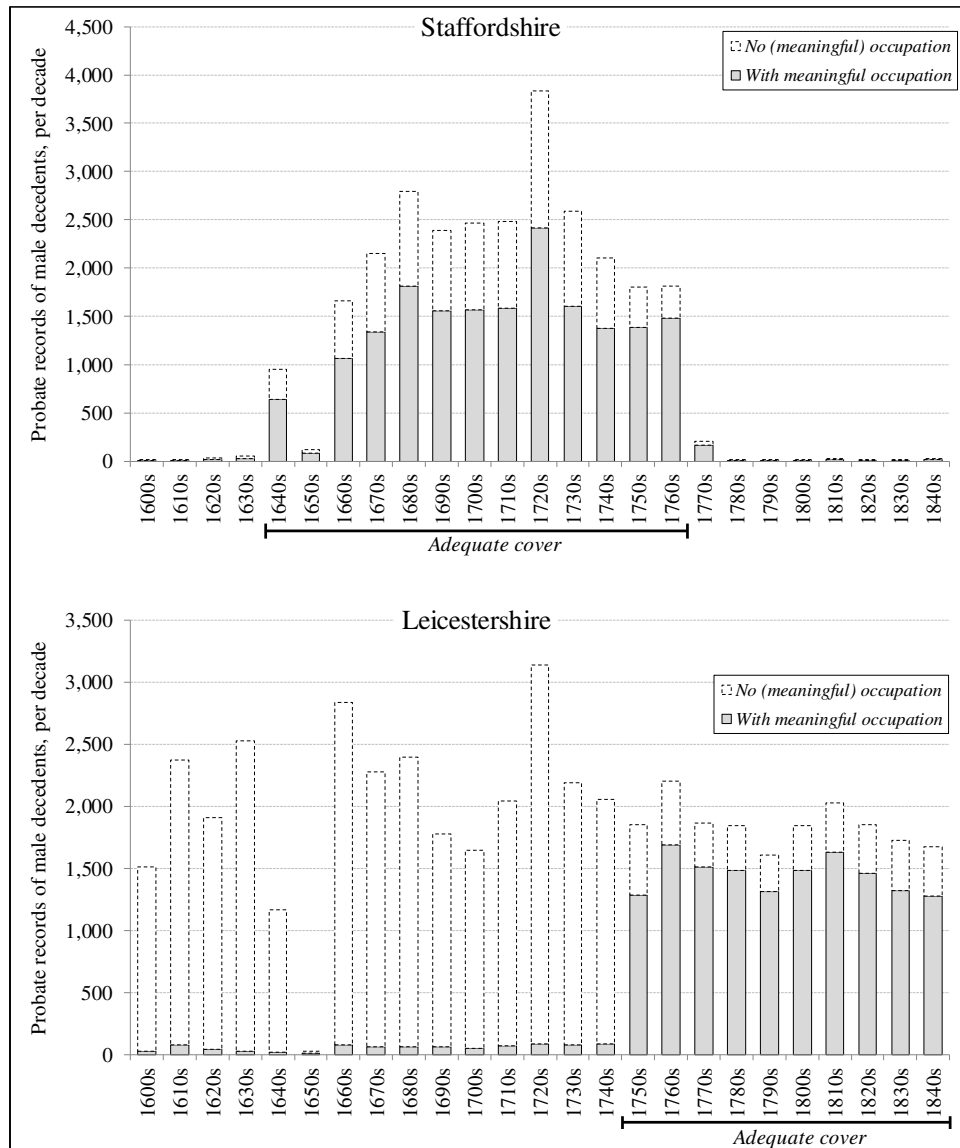
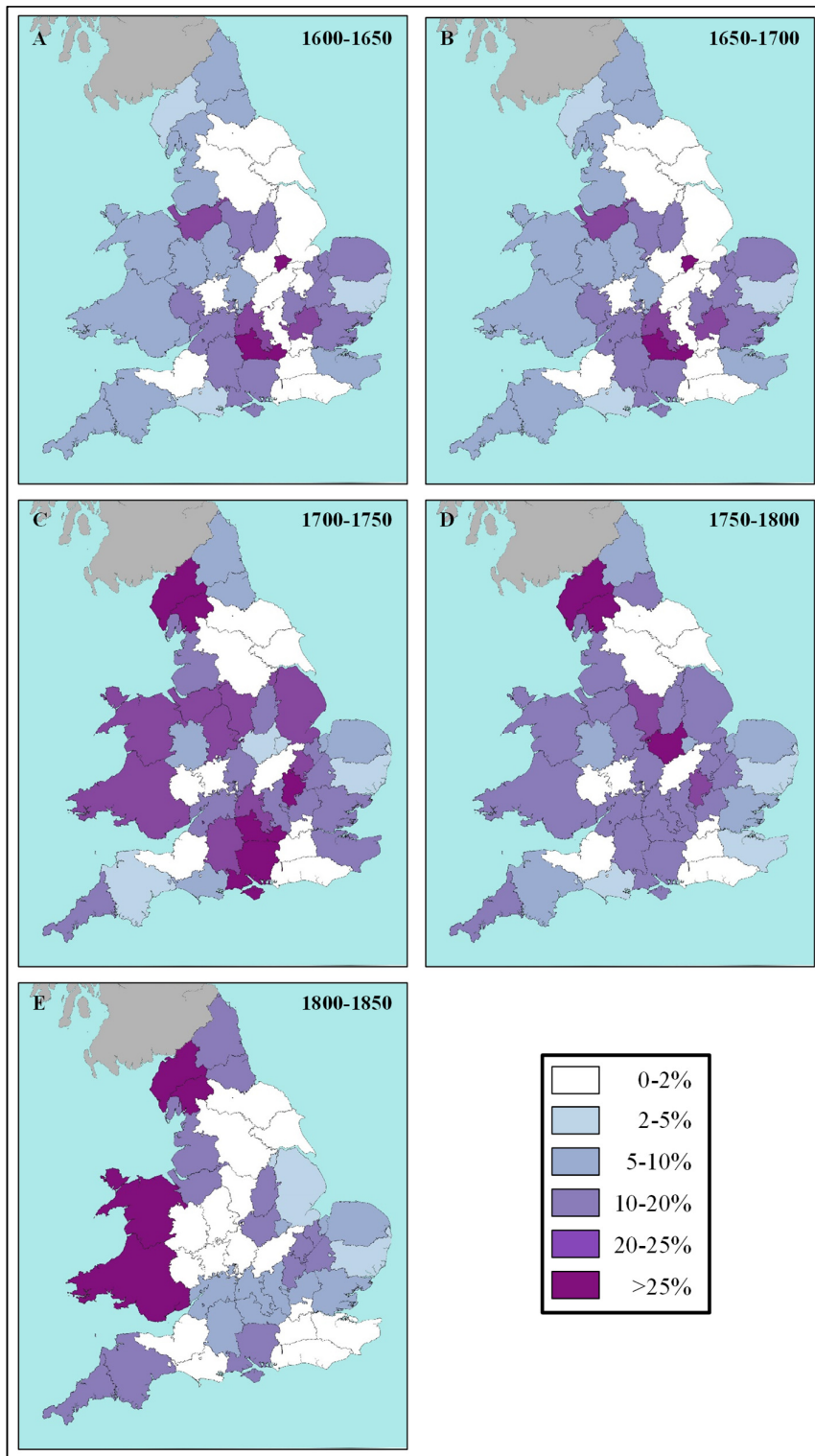


Figure 36. Number of probate records for male decedents by decade in two English counties (1600-1850)

A national overview of changes in coverage over time on a county-by-county basis is provided in Map 6 A-E. As is clear, coverage is discontinuous in a significant minority of counties.



Map 6 A-E. Share of adult male decedents whose occupation is recorded in the probate database, by county, by fifty-year time period (England and Wales, 1600-1850)

Notes: for calculation and sources, see Table 2.

5.4 Resulting numbers of observations

The total database of probate documents, as based on regional indexes to probate documents, and excluding the National Archives index on Prerogative Court of Canterbury proved documents, contains almost 2.3 million observations. However, not all of these observations are relevant. After subtracting references to decedents whose age of death lay outside the period under review, who were women, who are included more than once in the indices, for whom no occupation is provided, for whom only a title is provided, or who are described as capital owners rather than by an employment, 826,225 useful observations remain, as Figure 37 shows. These are the observations on which the calculations in this dissertation are based. Similar calculations are provided for each county in Appendix A.

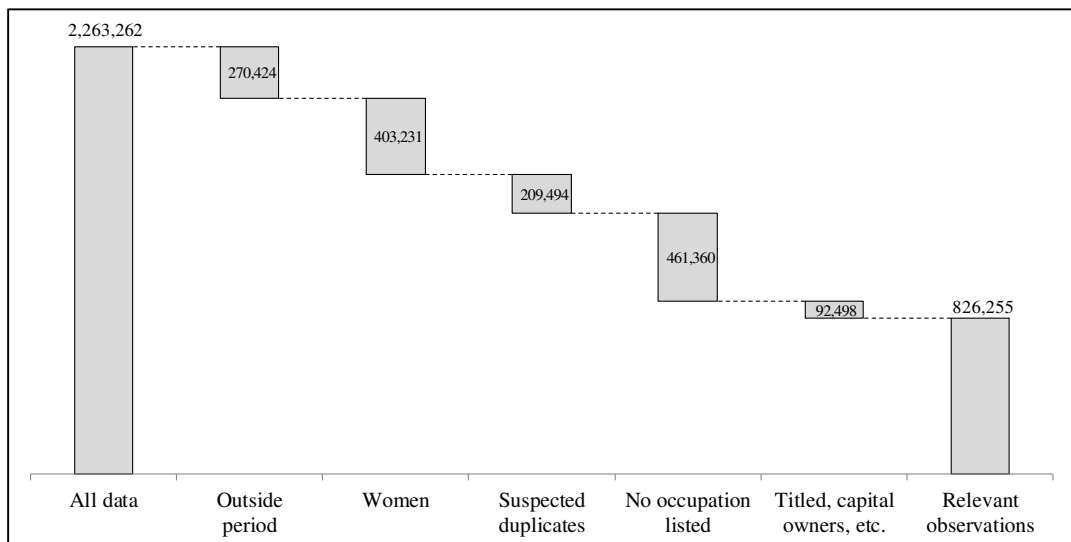


Figure 37. Observations recorded in the probate database

5.5 Standardization and classification

The probate database contains a large number of discrete occupational identifiers: 16,785 to be exact. These were standardised and coded, by hand, to the Cambridge Group's PST system, as described on page 14. As discussed on page 47, an auxiliary coding system was developed for this research, which clusters several PST codes into larger groups. These groups were chosen to optimise the calculation of calibration factors, isolating (groups of) occupations with sufficiently distinct calibration factors on the one hand, and ensuring adequate numbers of parish register and probate observation to guarantee accurate calculation of the calibration factors on the other hand. An overview of these groups was provided in Table 4. Although this fairly fine-grained occupational codification system was used as a basis for calculations, results in this dissertation are, usually, reported at the level of twelve sub-sectors: agriculture, mining, other primary sector, clothing, footwear, textiles, metal and tools, building, other secondary sector, dealers and sellers, services and professions, and transport. The number of observations

in the probate database, at the level of counties or below, and for the twenty-year time intervals used in the calculations, was usually too small for reliable results at lower occupational levels. At geographical levels finer than counties, reported results have, for the same reason, typically been restricted to the three top-level occupational sectors (primary, secondary, tertiary). In counties with a substantial mining sector, this was separated from the rest of the primary sector, resulting in a four-way split.

To be able to isolate male occupational data, observations in the probate database were categorised as either male or female. This categorisation was based on the decedent's first name or, when this proved ambiguous, on information on the decedent's status and/or occupation, leaving only 0.2 per cent of all observations as 'gender undecided'.

A challenging and time-consuming task was the standardisation and codification of geographical information. Partially owing to inconsistencies in spelling, the probate database contains no less than 140,000 discrete place names. These were coded, largely by hand, into a system of 11,443 geographic units, based on the Cambridge Group's system of 12,389 Anglican Registration Units (RUs), discussed on page 59. The reduction from 12,389 to 11,443 geographic units was brought about by the need to combine RUs in towns. Probate documents usually specify a place name rather than a parish. Since large towns typically consisted of several parishes, a match to a single RU was not normally possible for decedents from large towns. Therefore, RUs for large towns were combined into larger geographic units, covering the entire town.

The resulting Combined Anglican Registration Units (CRUs) differ greatly in size, both in terms of surface and population. Units in the north of England are typically much larger than those in the south of England and in Wales. For example, the average Lancashire unit is 22.5 km² in size and was the home to c.4,640 people in c.1817 whilst, in contrast, the average Norfolk unit is 7.4 km² in size, and populated by only c.460 people.¹⁸⁴ The small units in southern England and Wales cause a problem when used for mapping: they contain too few probate observations to make such maps reliable. Therefore, a different set of geographical units is used in the maps in this dissertation: the 1851 census sub-district, of which there were 2,194. This also ensures that maps for different counties have more comparable resolutions, and that a straightforward comparison could be made to the 1851 census results.

¹⁸⁴ Population data from the 1811 and 1821 census.

6 DEALING WITH MISSING DATA AND EXCEPTIONS TO THE GENERAL CALIBRATION APPROACH

The general calibration approach was described in Chapter 2 but, as announced on page 56, there are still some issues left when applying it to the probate data. The approach requires some adaptations for certain occupations, in certain time periods. For some occupations it does not work well at all, and alternative solutions have to be adopted. Furthermore, probate calibration can obviously only work if there are data to calibrate. As is clear from the discussion in Chapter 5, probate data are not available for all years in every English and Welsh county and for some counties, no data are available at all. Again, adaptations of the general approach are necessary. This chapter provides an overview of these issues, and presents solutions for them.

6.1 Problematic occupations

As will be shown, the general probate calibration approach requires an adjustment for certain occupations. Sometimes, this requirement is limited to certain time periods, such as for seventeenth-century farmers and textile workers. Sometimes, an adjustment is needed throughout the 1600-1850 periods, as is the case for domestic servants. And sometimes the probate-calibration method has to be replaced by an alternative approach altogether, such as for labourers, miners, and mariners. These cases are discussed one by one in this section.

6.1.1 Farmers before 1700

As discussed in Section 2.5, calibration factors can be ‘borrowed’ from other time periods, if no contemporary parish register data are available. Comparisons between occupational structures derived from calibrated probate data with those derived from the 1608 Gloucestershire muster list and the 1660 poll tax for Northwich demonstrated that this leads to reliable results in the seventeenth century. However, as already announced in that section, for some occupations, in some counties, calibration factors do change over time, in particular for farmers in agrarian

capitalist areas and, as will be discussed in the next section, for textile workers who were subject to technological and/or organisational change.

The increasing farm size over time in counties characterised by rising agrarian capitalism means that when one applies calibration factors ‘borrowed’ from later time periods, the number of farmers is underestimated. Farmers in, say, c.1817 were larger-scale, wealthier farmers than those in, say, c.1710 and therefore more likely to be probated, resulting in a (relatively) lower calibration factor. Figure 38 shows the degree to which the agricultural share of the male labour force would have been underestimated in the early eighteenth century if the c.1817 calibration factors had been applied to the c.1710 probate data, as a function of the increase in farm size over the 1710-1817 period.

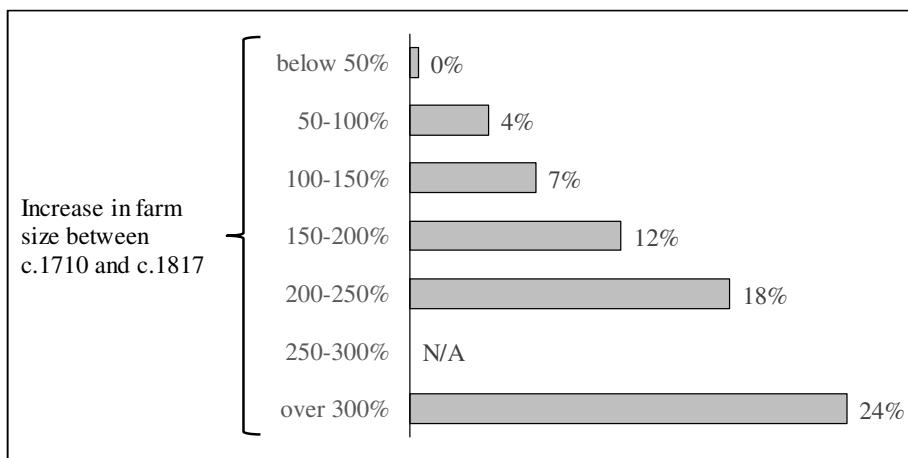


Figure 38. The difference between the actual agricultural labour share in c.1710 compared to the one calculated by applying c.1817 calibration factors to the c.1710 probate data

Notes: actual figures taken directly from the contemporary parish register data; calculated figures derived from application of the c.1817 calibration factors to the c.1710 probate data in the same parishes, i.e. only those for which contemporary parish register data exist, to ensure a one-on-one comparison. The increase in farm size was calculated on the basis of the number of farm labourers per farmer in c.1710 compared to c.1817. Most bars represent an average of several counties:

- below 50% = Wales, Lancashire, Cumberland, Westmorland, Durham, Northumberland, Lincolnshire
- 50-100% = Cheshire, Cambridgeshire, Huntingdonshire, Norfolk, Suffolk
- 100-150% = Nottinghamshire, Gloucestershire
- 150-200% = Bedfordshire, Buckinghamshire
- 200-250% = Oxfordshire, Wiltshire, Hampshire
- over 300% = Berkshire

As Figure 38 shows, the effects are quite pronounced in areas experiencing a sharp increase in agrarian capitalism. The most extreme case was Berkshire, which saw a 308 per cent increase in the number of farm labourers per farmer, from 2.2 to 8.9 over the c.1710-c.1817 period.

Berkshire had an agricultural male labour share of seventy-four per cent in the c.1710 parishes for which parish register data are available. But, applying the c.1817 calibration factors to the probate data in those same parishes only yields a fifty per cent share, a difference of twenty-four

per cent. Fortunately, when displayed as a scatter plot, the information from Figure 38, also provides the solution to the problem. Figure 39 shows the clear linear relationship between farm size increase and the degree to which the agricultural labour share is underestimated when ‘borrowing’ calibration factors from a later time period. Therefore, if the increase in the numbers of farm labourers per farmer is known, the linear relationship as depicted by the red line in Figure 39, provides the necessary correction. This eighteenth-century relationship between farm size increase and required corrections to the farmer’s calibration can now be applied to the seventeenth century probate data. It should be remarked that the actual increase in farm size during that century was much smaller than during the eighteenth century. The required correction is therefore also much smaller. The agricultural male labour share for the year 1600, calculated using early-eighteenth-century calibration factors, required an upward correction of, on average, only three percentage points.

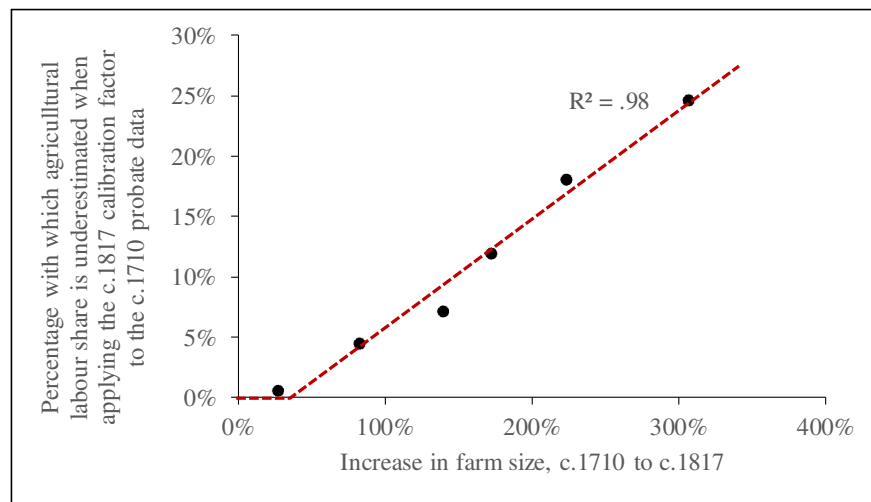


Figure 39. The required upward correction for the agricultural labour share in c.1710 when using c.1817 calibration factors, as a function of the increase in farm size over the period

Notes: each data point corresponds to one of the bars in Figure 38; see that figure for a description of the procedure, sources, and counties per data point.

6.1.2 Textile workers before 1700

Textiles saw significant technological and organisational changes during the period under review in this dissertation, particularly of course during the Industrial Revolution. Although weaving was still hardly mechanised in the 1813-20 period, applying c.1817 calibration factors derived for that period to early-eighteenth-century probate data in Lancashire and Cheshire results in an overestimate of the textiles male labour share of nine percentage points. This was, in fact, already visible in Figure 13: the textiles sub-sector is represented by the outlying data point in the c.1725 chart for Chester Diocese in this figure. The calibration factor for weavers in

Lancashire and Cheshire increases from 12.2 in c.1725 to 19.3 in c.1817.¹⁸⁵ This suggests that, relative to other contemporary occupations, weavers in the early nineteenth century left a less valuable estate than those a century before. As evidenced by the Luddite riots, the ‘golden age’ for weavers was rapidly coming to an end in cotton textiles by 1813. In a recent working paper, Robert Allen’s comparison of Feinstein’s earnings index for weavers and Gilboy’s index for building labourers suggest that by this time, weavers were earning weekly wages which were forty to fifty per cent lower than those of contemporary building and construction workers.¹⁸⁶ It is therefore not surprising that textiles calibration factors for c.1817 are too high to be applied to early-eighteenth-century data.

This is not, in itself, a problem since calibration factors for textiles occupations are available for that period. However, it does raise the question whether eighteenth-century calibration factors, even when derived from data early in that century, can be applied to the seventeenth century, when no parish register data are available and no contemporary calibration factors can, therefore, be calculated. The comparison to the Gloucestershire muster list in Table 6 suggested that applying such calibration factors to early-seventeenth century probate data would result in a significant exaggeration of the number of textile workers in that leading textiles county. To bring the calibrated probate data in line with the muster list, a correction factor of 0.75 would need to be applied to the number of textile workers. Since no data are available for other years in the seventeenth century and for other counties, it was presumed that this same correction factor is applicable to all counties at the start of the seventeenth century, and that it linearly increases to unity over the course of that century.

6.1.3 Labourers after 1700

Applying local calibration factors to the number of labourers in the probate record works less well than for other occupations, particularly in areas dominated by family farms. Firstly, in family farming areas such as Wales and the north and south-west of England, the number of labourers in the probate record is very small. For example, the Durham Diocese probate records, covering Durham and Northumberland, contain only four labourers for the years 1700-25, a mere 0.2 per cent of all useable observations for this time period. Such low numbers severely diminish the reliability of local calibration factors for labourers in the two counties. Secondly, even if one were to ‘borrow’ more reliable labourer calibration factors from other areas, the low

¹⁸⁵ As always, relative to yeoman farmers, for whom the calibration factor is set at unity.

¹⁸⁶ Allen, ‘The hand-loom weaver and the power loom: a Schumpeterian perspective’ (Working paper, Oxford, 2016), figure 1, p. 12; Feinstein, ‘Wage-earnings in Great Britain during the Industrial Revolution’ in Begg and Henry (eds), *Applied economics and public policy* (Cambridge: Cambridge University Press, 1998), p. 189; Gilboy, *Wages in eighteenth century England* (Cambridge, MA: Harvard University Press, 1934), pp. 280-2.

numbers of observations in combination with high calibration factors would make for unreliable results. Thirdly, there are reasons to suspect inconsistencies between parish registers and probate records in the use of the terms 'labourer' and 'husbandmen', at least in certain counties. As discussed on page 67, the term 'husbandman' was an ambiguous one, whose interpretation varied over time and place. Although usually understood to have indicated a small farmer, Figure 21 made clear that by the early nineteenth century, men called 'husbandman' then were essentially agricultural labourers. But this seems to have partially been the case a century earlier too. When searching for the occupations mentioned in early eighteenth-century burial registers by men who called themselves 'husbandman' in their will, about one in seven of them turned out to have been registered as a 'labourer' rather than 'husbandman' by the parish clerk.¹⁸⁷ Perhaps this was caused by a degree of 'title inflation', with agricultural labourers giving themselves the somewhat grander descriptor of husbandman whereas parish clerks used the less prosaic term 'labourer'. Whatever the reasons, such differences make matching probate and parish register records difficult for labourers, particularly when calibration factors derived from such a comparison are applied to other areas or time periods, for which the mismatch might be more or less pronounced.

An alternative approach was therefore used for labourer numbers. Agricultural labourers per farmer were calculated on the basis of the local ratios found in rural parish registers, using the relationship shown in Figure 23, demonstrating that these were (virtually) all farm labourers. These ratios were subsequently applied to all farmers in the calibrated probate data, including those in urban parishes. The numbers of non-farm labourers were calculated and allocated to occupations using the regression parameters calculated for the c.1817 regression. The parish register data, in which the total number of labourers is, of course, known, allow one to confirm the reliability of this approach, as demonstrated in Figure 40 for c.1710. This scatter plot compares the number of farm labourers per farmer in the parish register data calculated in two different ways. On the x-axis, the number of labourers per farmer in rural parishes is plotted – as discussed above, these were (virtually) all farm labourers. For the y-axis, farm labourers were calculated as the residual after subtracting non-farm labourers from total labourer numbers, with non-farm labourers calculated in the manner described above, that is, by applying the c.1817 regression parameters per non-farming occupation.

¹⁸⁷ Of an admittedly small sample of twenty-five men. Obtaining a larger sample proved impossible, because occupations were very rarely recorded in the burial registers.

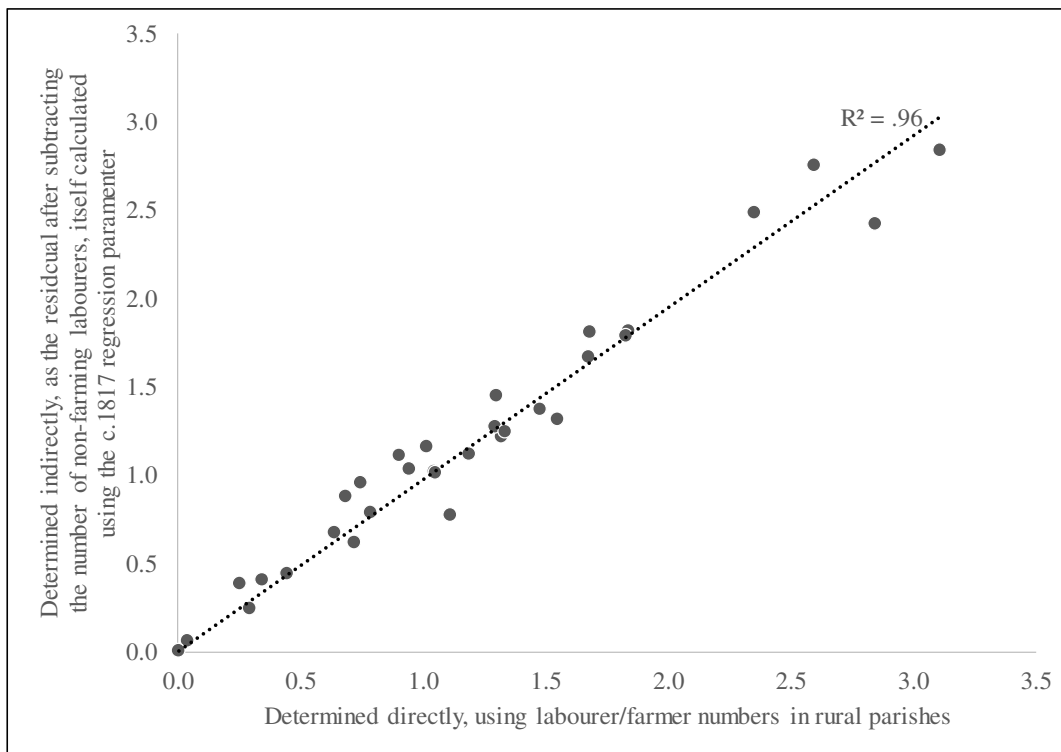


Figure 40. Farm labourers per farmer at the county level, calculated in two different ways from the parish register data (England and Wales, c.1710)

Notes: each 'dot' represents a county or, in some cases, a combination of counties (south Wales, north Wales, Lincolnshire and Rutland). Only counties with more than minimal coverage of parish register data in the early-eighteenth-century dataset were included. As a result, Cornwall, Devon, Dorset, Essex, Middlesex, Kent, Staffordshire, Durham and Northumberland were not included.

6.1.4 Labourers before 1700

Since the approach in the previous section relies on the availability of parish register data, it does not work for calculating labourer numbers per farmer in the seventeenth century. Nor can labourer calibration factors from the eighteenth century be simply presumed to hold during the seventeenth century. It is clear from Shaw-Taylor's matching of land tax records with occupational information and from his analysis of contemporary comment that the great majority of labourers did not have significant common rights.¹⁸⁸ However, the small minority of labourers who had access to land are heavily overrepresented in the probate record. The dataset

¹⁸⁸ Shaw-Taylor, 'Parliamentary enclosure and the emergence of an English agricultural proletariat', *The Journal of Economic History*, 61:3 (2001), pp. 640-62; Shaw-Taylor, 'Labourers, cows, common rights and parliamentary enclosure: the evidence of contemporary comment c. 1760-1810', *Past & Present*:171 (2001), pp. 95-126.

of probate inventories used for the by-employment analyses in Chapter 4 contains 96 labourers' inventories, roughly half of which listed agricultural assets such as crops or livestock. Although the median domestic wealth of these inventories is similar to that of the other half, the median total inventory value is nearly three times as high.¹⁸⁹ In other words, labourers with access to land were much more capital-rich, making them much more likely to leave testamentary evidence than other labourers. Thus, a declining proportion of labourers with access to land must have translated in a much more rapidly declining share of *all* labourers leaving testamentary evidence, since labourers with access to land formed such a large fraction of the will-making population of labourers.

This means that applying eighteenth-century calibration factors to seventeenth-century probate data would result in significant overestimates of labourer numbers. Indeed, if one would apply the early-eighteenth-century Gloucestershire calibration factors to the 1601 probate data, the suggested number of agricultural labourers per farmer would be 1.4, which is higher than the parish-register-derived figure of 1.2 in 1703. Not only is it extremely unlikely that Gloucestershire became less agrarian capitalist over the course of the seventeenth century, a direct comparison between the probate-derived figure of 1.4 to the 0.5 ratio between farmers and labourers found in the 1608 muster list also demonstrates the exaggeration.

Rutland, a second county for which earlier data exists, also experienced a rise in the number of labourers per farmer in the run up to the eighteenth century. The 1522 muster list for this county shows a ratio of 0.5, compared to 1.5 in the 1703 parish register data. The Rutland and Gloucestershire muster lists thus exhibit a compounded annual growth rate of between 0.58 and 0.89 per cent in the number of labourers per farmer in the run up to 1703. In other counties, lacking direct evidence on labourer-to-farmer ratios at pre-1700 dates, I have applied a 0.73 per cent per annum growth rate, being the average of the Rutland and Gloucestershire figures. In Bedfordshire, for example, the average farmer employed 2.8 labourers in 1708 according to the parish register data. Applying the above 0.73 per cent annual growth backwards to this figure leads to an estimated 1.4 labours per farmer in 1601, 1.6 in 1621, 1.8 in 1641, etcetera.

Of course, this approach is far from ideal. Although it is likely that the number of labourers per farmer was lower in the early seventeenth century than in the early eighteenth century in all English and Welsh countries, there is no evidence that the annual growth in that ratio was the same everywhere. Indeed, even the two countries for which evidence exists experienced different growth rates. A sensitivity analysis applying the lower of these growth rates (0.58 per

¹⁸⁹ The median material value of labourers' inventories listing agricultural assets is £16.00, compared to £5.70 for those not listing such goods. For the definitions of the different wealth measures derived from probate inventories, see page 86.

cent per annum) would have resulted in an estimate for the primary sector labour share in England and Wales two percentage points above the one based on the 0.73 per cent figure; an estimate based on the higher of the two figures (0.89 per cent per annum) would have resulted in an estimate three percentage points lower. In other words, the lack of information on labourer-to-farmer ratios before 1700 noticeably affects the accuracy of seventeenth-century occupational structure estimates, but not to such a degree that the range of results becomes unmanageably big.

6.1.5 Sailors, mariners, seamen

Testamentary documents are not ideal sources of information on crew members of ships. Determining reliable calibration factors is difficult, because matching local observations from probate documents with those from parish register is not straightforward. Testamentary data often only mention a sailor's ship and the port in which that ship was registered, whereas parish registers are organised by parish of domicile. Furthermore, both sources do not normally specify whether sailors were employed on merchant or Royal Navy ships, making it impossible to allocate them unambiguously to the 'transportation' and 'services and professions' sub-sectors. Also, the number of sailors in the testamentary record exhibits very strong fluctuations over time which seem to be linked to periods of naval warfare, caused either by higher-than-usual numbers of maritime deaths or by a higher proportion of sailors taking the precaution of making a will in times of war. As a consequence, an alternative source of information has to be found for determining numbers of mariners before Rose's Act.

In this dissertation, therefore, numbers of seamen have been calculated using registered shipping capacities and labour productivity estimates. As Figure 41 shows, the total merchant shipping capacity increased greatly over the 1650-1850 period. This is not, however, a linear reflection of the number of merchant seamen, since ships became more efficient over time, partially because of the growing size of the average vessel, with larger vessels requiring fewer crew members per ton of cargo, and partially through improvements in shipping technology. As Figure 43 shows, ships in 1850 were, on average, three times as (labour) efficient as those in 1600. By combining the information from both figures, the development of total numbers of seamen over time can be estimated – resulting in Figure 43. As this shows, seamen number increased ninefold over the period. As a share of the male total labour force, the increase was less spectacular, rising nationally from 0.8 per cent in 1600 to 2.0 per cent two-and-a-half centuries later.

Since reliable figures for registered tonnages are only readily available at the national level, and since labour productivity depended on the mix of ships used, which is difficult to ascertain for individual ports, I have not attempted to generate local or regional estimates for the numbers of mariners, as these would almost certainly have been highly unreliable. Therefore, all regional

and local estimates presented in this dissertation explicitly exclude seamen, which are only ‘added in’ at the national level.

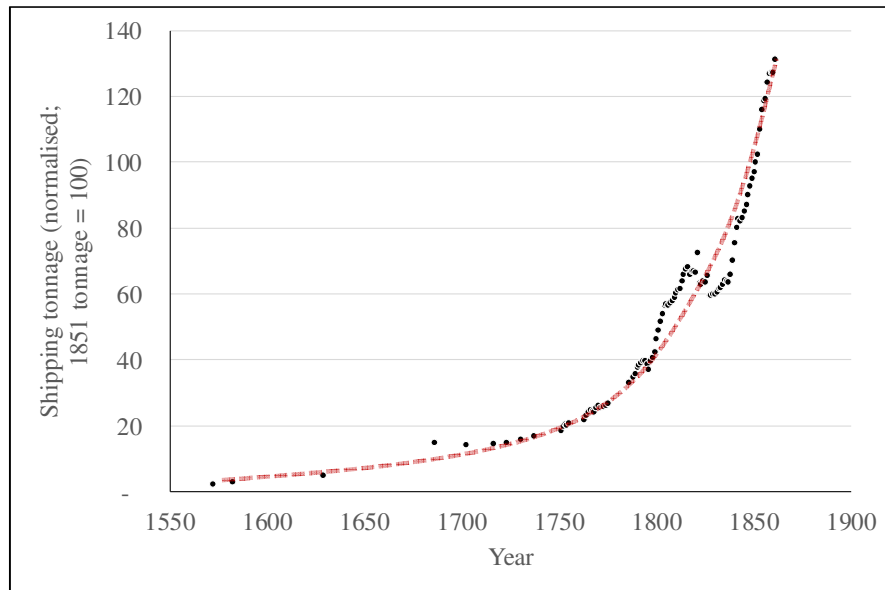


Figure 41. Total tonnage recorded in English and Welsh ports from 1572 to 1861 (normalized; 1851 tonnage = 100)

Notes: several measures of tonnage were employed in the original statistics (tons burden before 1773, measured tons between 1773 and 1836, cubic-capacity-based tonnage after 1836) with some overlap. These were reconciled by matching begin and start points of the different series.

Sources: Mitchell, *British historical statistics* (Cambridge: Cambridge University Press, 1987), pp. 529-36; Usher, ‘The growth of English shipping 1572-1922’, *Quarterly Journal of Economics*, 42:3 (1928), pp. 465-78.

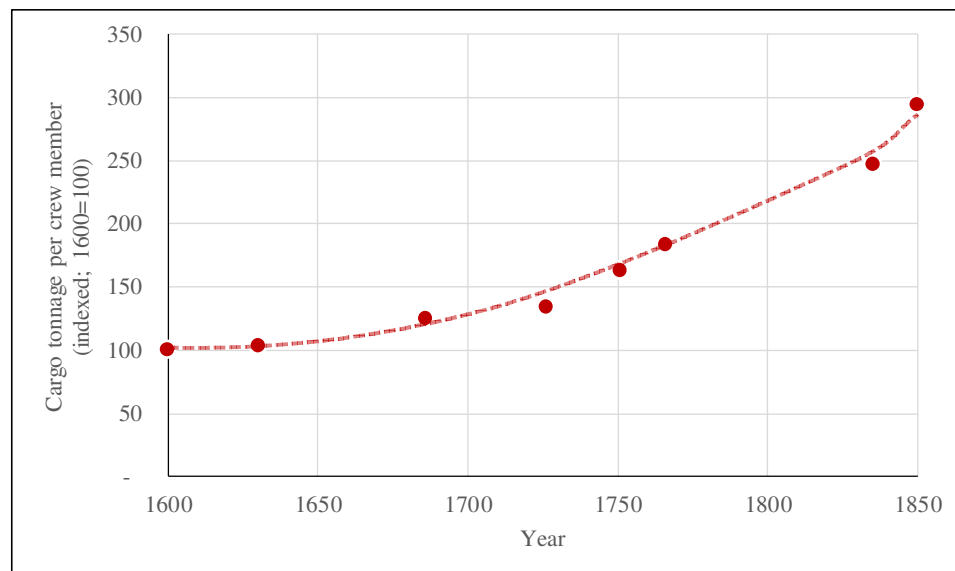


Figure 42. Development of cargo capacity per crew member for English sailing ships (indexed; 1600=100)

Notes: created by combining a number of time series from the papers below.

Sources: Davis, *The rise of the English shipping industry* (London: MacMillan & Co, 1962), pp. 58-80; North, 'Sources of productivity change in ocean shipping, 1600-1850', *Journal of Political Economy*, 76:5 (1968), pp. 953-70; Harley, 'Ocean freight rates and productivity, 1740-1913: the primacy of mechanical invention reaffirmed', *JEH*, 48:4 (1988), pp. 851-76; Ojala, 'Productivity and technological change in eighteenth- and nineteenth-century sea transport: a case study of sailing ship efficiency in Kokkola, Finland, 1721-1913', *International Journal of Maritime History*, IX:1 (1997), pp. 93-123.

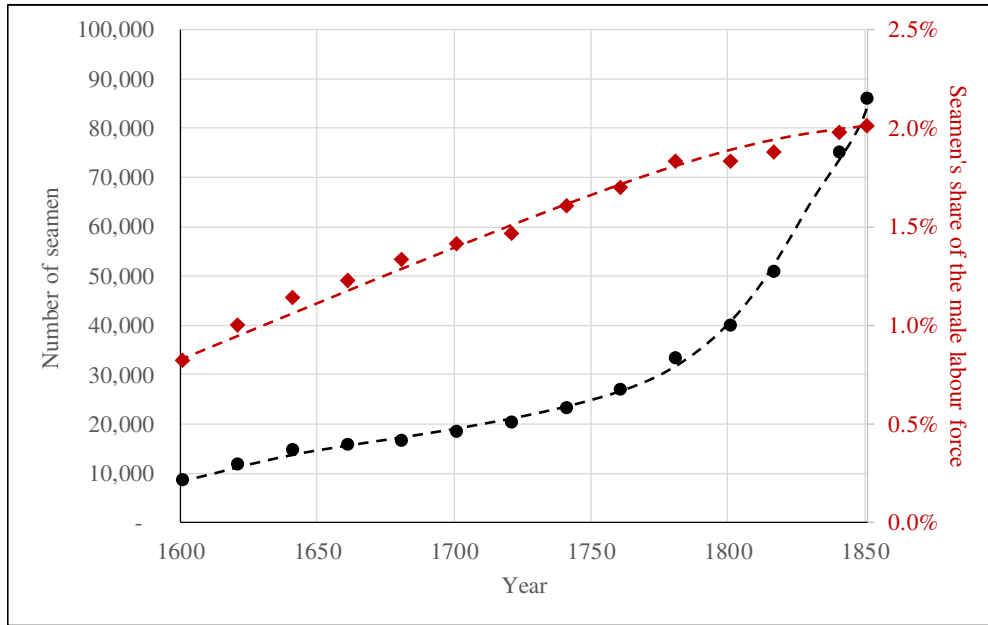


Figure 43. Estimated development of the number and male labour share of seamen (England and Wales)

Sources: see Figure 41 and Figure 42. Also, parish register database.

The 1851 estimate of 86,000 seamen in Figure 43 is somewhat higher than the 69,000 recorded in the census of that year. However, that does not invalidate the analysis. Indeed, if anything, it is reassuring because seamen are undercounted in the census. Of seamen on board their ships, only those arriving in or departing from British seaports between 15 days before and 31 days after 30 March, the date the census was taken, were recorded.¹⁹⁰ This means that many of those involved in the long-distance trade were missed.

6.1.6 Miners

The number of miners in the probate dataset shows a steady increase over time, which is unsurprising. But in certain core mining regions, miners start appearing rather later in the

¹⁹⁰ Higgs, *Making sense of the Census: the manuscript returns for England and Wales, 1801-1901* (London: HMSO, 1989), p. 41; Burton, 'A floating population: vessel enumeration returns in censuses, 1851-1921', *Local Population Studies*, XXXVIII (1987), pp. 36-43.

testamentary record than one would expect. Whereas hundreds of decedents described themselves as ‘miner’ or ‘collier’ in seventeenth-century East and West Midlands’ wills, only a few did so in the North-East of England and in Cornwall before the second half of the eighteenth century. The late appearance of miners in the probate record in these regions is not in line with what we know about the local development of the industry, with the Great Northern Coalfield and the Cornish tin deposits having been worked since the Middle Ages. One can speculate about the reasons for the lack of miners amongst earlier probate documents. Perhaps mining was more of a by-employment in the seventeenth and early eighteenth century, and therefore hidden behind the ‘official’ occupation mentioned in the probate documents. Or perhaps, in contrast, mining was initially rather entrepreneurial, with miners owning several small mines. In the complex geography of probate jurisdictions in Cornwall, these could have easily been in different probate jurisdictions, which would have obliged miners’ wills to be proven in the Consistory rather than in the Archdeaconry Court. Since only the latter is covered in the Cornwall index, such entrepreneurial miners would be invisible in the dataset. But whatever the reasons, the fact remains that the probate dataset is a problematic source of occupational information on the mining sub-sector, at least in certain important mining regions.

Fortunately, because of its importance for industrialisation and economic development, mining has been carefully studied by economic historians. This is particularly true for coal mining, for which several sets of regional output estimates exist.¹⁹¹ If one compares such output estimates around 1817 to the number of miners in contemporary parish registers, and those around 1851 to the number of coal miners in the census of that year, the strong correlation between (labour) input and (coal) output is evident, as depicted in Figure 44.

¹⁹¹ Notably in Hatcher, *The history of the British coal industry, Volume I. Before 1700: towards the age of coal* (Oxford: Clarendon Press, 1993); Flinn, *The history of the British coal industry. Volume 2, 1700-1830: the Industrial Revolution* (Oxford: Clarendon Press, 1984); Pollard, ‘A new estimate of British coal production, 1750-1850’, *The Economic History Review*, 33:2 (1980), pp. 212-35; Warde, *Energy consumption in England & Wales, 1560-2000* (Rome: Consiglio nazionale delle ricerche, 2007).

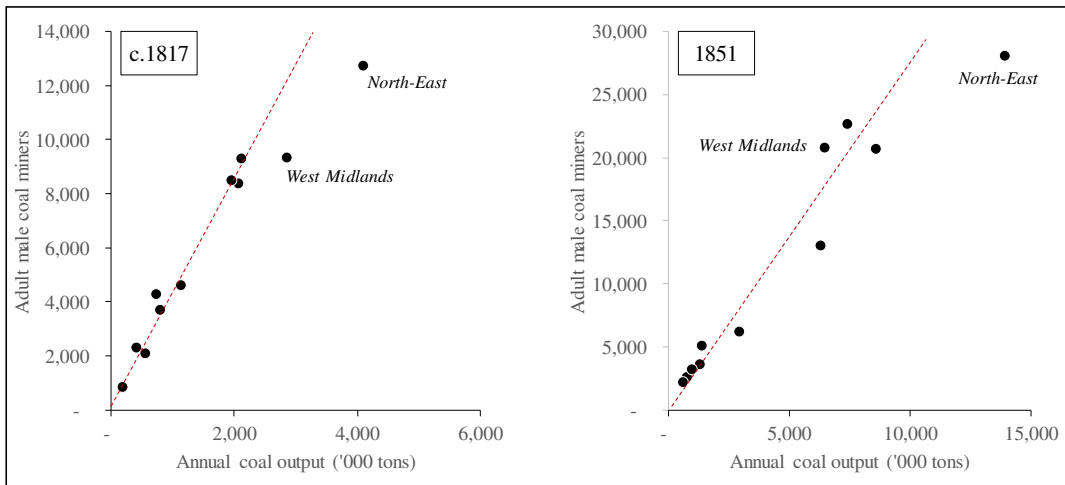


Figure 44. Coal production compared to the size of the adult male labour force in all major English and Welsh coal regions (1817, 1851)

Sources: Coal output figures from Pollard, 'A new estimate', p. 229, table 14. Labour force figures from the parish register dataset and the 1851 census.

Figure 44 also shows that there were some differences in labour force productivity between the various coal mining areas. In c.1817, the number of men required per ton of coal would appear to have been significantly lower in the West Midland and in the North East than elsewhere. In 1851, again, coal production in the North East appears to have been more efficient, in terms of the number of adult male men employed per ton of coal produced. Consequently, dividing annual production by a national production figure is unlikely to yield accurate estimates for the size of the regional labour force employed in mining. Therefore, regional indexes of coal production over time were created by linking up several existing time series. These indexes, depicted in Figure 45, were applied backwards to the in 1817 parish-register-derived miners' numbers.

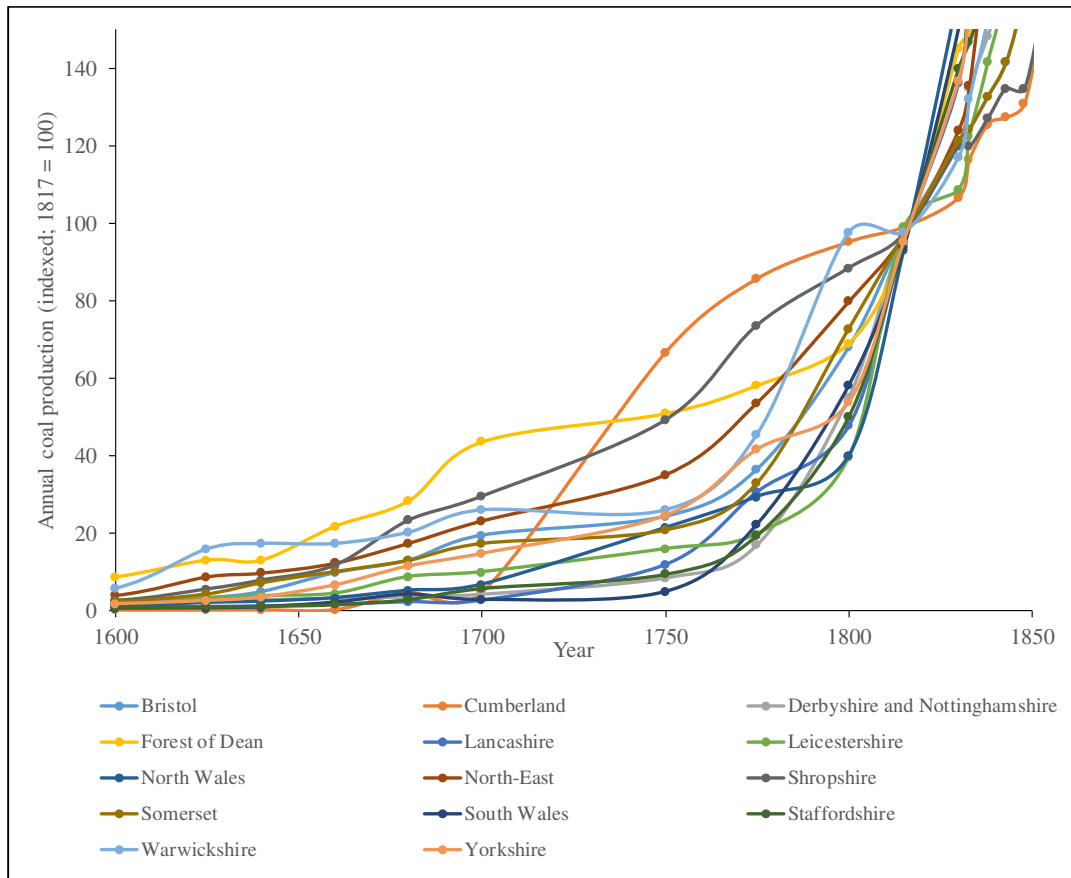


Figure 45. The development of annual production volumes over time in all major English and Welsh coal regions (indexed; 1817 = 100)

Sources: production figures up to 1700 were made available to me by Paul Warde, for which I would like to express my gratitude. They are based on Hatcher, *Coal industry* and on Warde's own work. Production figures for 1700 to 1830 are from Flinn, *Coal industry*, pp. 24-7, tables 1.1 to 1.4. From 1830, production figures are from Pollard, 'A new estimate', p. 229, table 14. These sources do not always line up particularly well in terms of absolute numbers, and were linked up by the author of this dissertation by equalizing end- and start values of subsequent times series.

Although using regional indexes rather than a fixed ton/man figure ensures that local differences in labour productivity are taken into account, the backward-indexing approach does, of course, make an important assumption: that *temporal* differences in labour productivity were negligible. In other words, it is presumed that a coal miner in the Forest of Dean in, say, 1700 produced a roughly equal quantity of coal each year than a miner in the same area in 1817. Whether this assumption is valid, and whether it is so in each mining region is not quite clear. It has generally been presumed that labour productivity growth in seventeenth- and eighteenth-century coal mining was fairly limited. Progress in mining technology was made, with Newcomen-engine-driven pumps the most famous innovation, but such advances were primarily aimed at overcoming problems that arose when the most easily accessible seams had been exhausted, and not at making mining more labour efficient. Unfortunately, hard data on labour productivity is

limited, and the assumption of negligible labour productivity growth before 1817 is therefore difficult to substantiate.

Indeed, labour productivity does appear to have increased after 1817, as becomes clear when the 1817 and 1851 data depicted in Figure 44 are compared. At the national level, average output per miner seems to have risen from 260 tons per adult male in 1817 to nearly 400 tons in 1851. Labour productivity growth over the period was not uniform. In the West-Midlands, the average adult male miner appears to have produced 310 tons in 1851, virtually identical to the 305 tons in 1817. But in the Great Northern Coalfield, the country's most important and productive mining area, output would seem to have increased from 310 to nearly 500 tons per adult male miner per year. It should be noted, therefore, that if the mining sub-sector also experienced labour productivity growth before 1817, its share of the labour force going backwards in time will be understated in this dissertation.

For miners in Cornwall who, as discussed are also conspicuous by their absence in the probate record in the seventeenth and early eighteenth century, coal production indexes are obviously of little relevance. To allow back-projection from 1817 in this county, therefore, an index for tin production was constructed using the quantities recorded in the annual coinage dues, depicted in Figure 46.

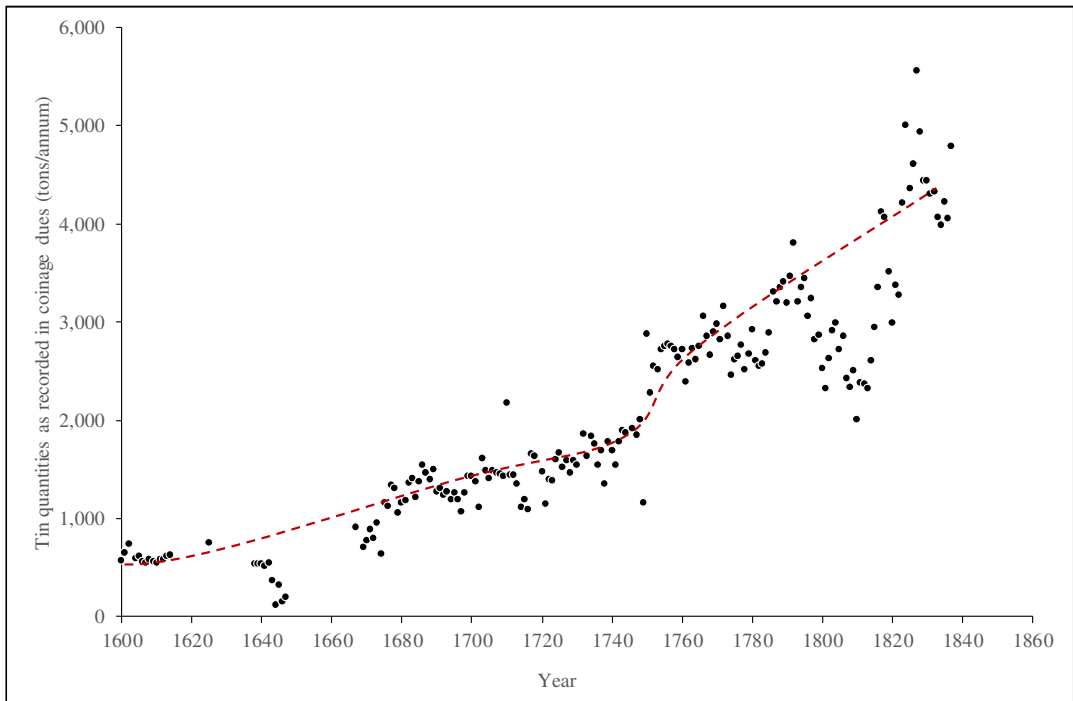


Figure 46. Annual tin production volumes (tons) as recorded in the coinage dues (1600-1834)

Sources: Mitchell, *Statistics*, pp. 302-7, who derives the figures for this period from Lewis, *The stannaries: a study of the English tin miner* (Cambridge MA: Harvard University Press, 1908) and from Hunt, *British mining: a treatise on the history, discovery, practical development and future prospects of metalliferous mines in the United Kingdom* (London: C. Lockwood, 1884).

6.1.7 Domestic servants

Farm servants were highly unlikely to be married and are therefore underrepresented in the parish registers. As discussed on page 44, this is unproblematic since they turn up as labourers in the parish register and probate datasets. Domestic servants were also less likely to marry and, therefore, to father children. Contrary to farm servants, this was not life-stage driven and therefore leads to an actual undercount. Kitson *et al*'s comparison to the 1841 census demonstrated that domestic servants are undercounted by a factor of 1.86 in the parish register data.¹⁹² This was therefore applied as a correction factor to the domestic servant numbers in the parish register data and the calibrated probate data presented in this dissertation.

6.2 Creating national estimates despite missing local data

The national estimates presented in this dissertation are built from the bottom up, that is, they are the population-weighted sum of county-level occupational structures. However, as already discussed, probate data are not available for the entire time period in all counties. This section discusses the approach taken to deal with this issue.

6.2.1 Years for which no probate data are available

As examined in Appendix A on a county by county basis, probate coverage is not always continuous. The index for the Archdeaconry Court of Leicester, which covers 95% of Leicestershire's surface area, lists decedents for the whole 1600-1850 period but only mentions their occupations from the 1750s onwards. The index for the Lichfield Consistory Court and its peculiars, which covers Staffordshire, Derbyshire, and large parts of Shropshire and Warwickshire is a work in progress by the Lichfield Record Office, currently only listing the documents proved from 1640 to 1770. In the county-level results presented in this dissertation, such as those in Appendix B, only those time periods are included for which sufficient testamentary data exist. But if we were to restrict our national results to the periods for which sufficient probate data exist in all counties, there would be no results to report, even if one ignored counties which are entirely missing from the probate dataset, such as Northamptonshire and Sussex.

In some cases, the solution adopted for including missing decades in the national estimates is simply interpolation. For example, the 1781 and 1801 estimates for Staffordshire incorporated in the national estimates have been derived by linear interpolation between the probate-based 1761 estimate and the parish-register-based result for 1817. Interpolation, however, only works if start and end estimates actually exist, and it only works well if the period of missing data is

¹⁹² Kitson *et al*, 'Creation', pp. 11-3.

not overly long. For example, interpolation cannot provide Leicestershire estimates for 1741 and before. And it would be a sub-optimal solution for estimating Somerset's eighteenth-century figures, given the long period between the last probate-based estimate (1701) and the parish-register based results (1817) for that county. In those cases, therefore, developments in other, neighbouring or comparable counties were taken as a guide to developments. For example, Leicestershire figures were calculated by assuming similar developments to those in Nottinghamshire whilst Somerset's estimates were determined using Gloucestershire's developments as a guide.

6.2.2 Counties for which no probate data are available

An extreme case of missing local data are counties which are (as good as) entirely absent from the dataset, because no index to testamentary document is available, or because the existing index does not record occupation. This is the case for Yorkshire, except for small areas within the jurisdiction of the Diocese of Durham and the Archdeaconry of Richmond, and for Northamptonshire, Middlesex, Surrey, Sussex, and Worcestershire. Together, these counties represent almost a quarter of the population of England and Wales in 1700. Furthermore, they encompass areas of particular economic-historical importance, namely the West Riding and London. The good news is that parish register data are available for these counties, that those data's coverage is particularly good for Yorkshire, and that an alternative reliable source of occupational information is available for London during the first half of the eighteenth century, which is discussed in more detail in section 6.2.3, below.

The availability of significant numbers of occupational observations from parish registers in the missing counties makes it possible to pursue a different approach to estimating their occupational composition. It should be noted up front that this approach is not sufficiently reliable and precise for isolated occupational estimates at the county level. But, as will be shown, its results are good enough for incorporating these counties in national estimates. Supposing one aims to estimate the occupational structure in year X, with some parish register coverage, the approach works by establishing growth between year X and c.1817 per sub-sector by using the set of parishes for which parish register data exists for year X, and subsequently applying those growth figures backwards to the full c.1817 dataset, as depicted schematically in Illustration 9. Thus an estimate for the occupational structure is created for year X.

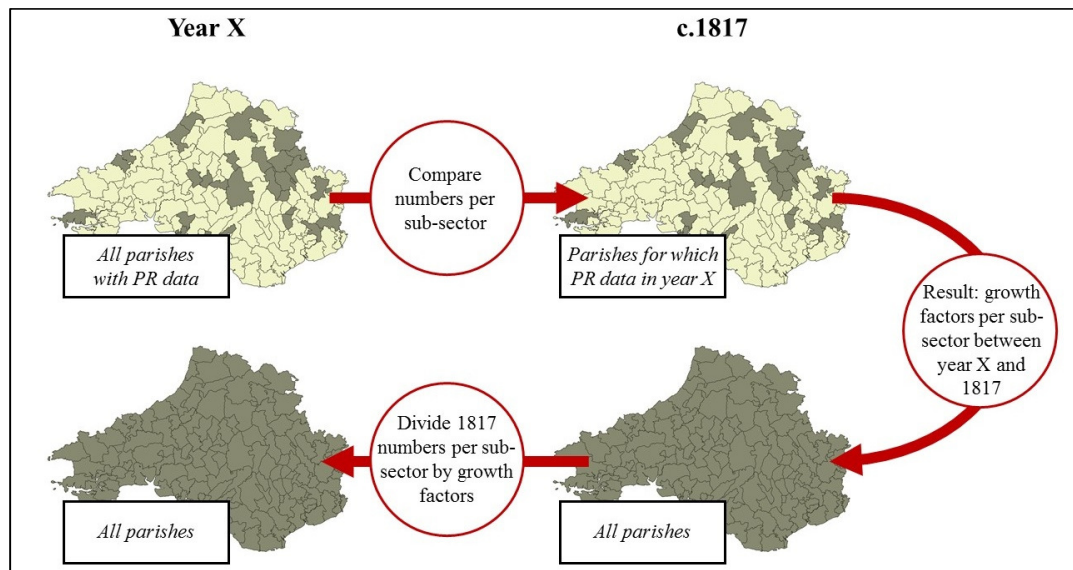


Illustration 9. Schematic depiction of the back-projection approach

The assumption in this approach is, of course, that the growth per sub-sector in the sample of parishes covered in year X is representative of the growth per sub-sector in *all* parishes.

Whether this is generally the case can be tested by applying the back-projection approach to counties for which a probate-based estimate can be made in year X and for which, therefore, the back-projection results can be compared to the calibrated-probate results. This has been done in Table 16, for c.1710. As is clear, the accuracy of the back-projection results varies from very high – as in Bedfordshire and Lancashire – to rather poor – as in Gloucestershire. On average, though, the method appears to work well, as is borne out by the last comparison in Table 16, for the combination of all counties with both probate and parish register data in c.1710.

Table 16. Comparing back-projected parish-register estimates to those from the calibrated probate approach in counties in which both data types are available

	Bedfordshire (1708) (%)		Lancashire (1723) (%)		Oxfordshire (1707) (%)	
	<i>From (calibrated) probate data</i>	<i>From parish register back-projection</i>	<i>From (calibrated) probate data</i>	<i>From parish register back-projection</i>	<i>From (calibrated) probate data</i>	<i>From parish register back-projection</i>
Primary sector	64%	65%	36%	41%	52%	55%
Agriculture	63%	65%	33%	38%	51%	55%
Mining	0%	0%	3%	2%	0%	0%
Rest of primary	1%	0%	0%	0%	1%	0%
Secondary sector	29%	27%	56%	51%	41%	34%
Clothing	4%	4%	7%	4%	4%	4%
Footwear	3%	3%	3%	3%	3%	3%
Textiles	3%	2%	24%	25%	5%	3%
Metal manufacture and products ^b	3%	3%	6%	3%	2%	2%
Building and construction	7%	7%	9%	8%	9%	8%
Rest of secondary sector	9%	9%	8%	8%	17%	15%
Tertiary sector	7%	8%	8%	8%	8%	10%
Dealers and sellers	2%	3%	3%	2%	2%	3%
Services and professions	5%	5%	4%	4%	4%	7%
Transport and communications ^c	0%	1%	1%	1%	2%	1%

	Essex (1710) (%)		Gloucestershire (1703) (%)		All counties^a (c.1710) (%)	
	<i>From (calibrated) probate data</i>	<i>From parish register back-projection</i>	<i>From (calibrated) probate data</i>	<i>From parish register back-projection</i>	<i>From (calibrated) probate data</i>	<i>From parish register back-projection</i>
Primary sector	59%	57%	45%	32%	50%	49%
Agriculture	58%	55%	44%	27%	48%	47%
Mining	0%	0%	1%	4%	1%	1%
Rest of primary	1%	1%	0%	1%	0%	0%
Secondary sector	32%	40%	49%	60%	41%	42%
Clothing	2%	1%	5%	6%	5%	5%
Footwear	1%	4%	2%	3%	3%	3%
Textiles	9%	19%	20%	19%	11%	12%
Metal manufacture and products ^b	2%	1%	4%	3%	4%	4%
Building and construction	5%	6%	8%	13%	7%	7%
Rest of secondary sector	12%	9%	10%	16%	12%	11%
Tertiary sector	9%	3%	6%	8%	9%	9%
Dealers and sellers	2%	0%	2%	3%	2%	2%
Services and professions	5%	2%	4%	4%	5%	5%
Transport and communications ^c	2%	0%	1%	1%	2%	2%

Notes: ^a All English and Welsh counties, excluding Yorkshire, London, Middlesex, Surrey, Sussex, Northamptonshire, Leicestershire, and Worcestershire. The counties were weighted by the number of parish registers in c.1710, to produce an average which is an accurate representation of the total body of parish register data in the early eighteenth century.

^b Including tools and machine making

^c Excluding seamen

6.2.3 London

Field and Shaw-Taylor have shown, in new, persuasive, but as yet unpublished research, that the occupations of grooms recorded in the marriage registers of the Fleet Chapels form a reliable basis for occupational estimates for London.¹⁹³ They demonstrate this by comparing Fleet-register-based figures with parish-register-based figures for the same London parishes, and finding the two sources to generate very similar figures. By weighting the Fleet-register-based figures by parish population, Field and Shaw-Taylor were able to construct reliable estimates for the whole of London in c.1711 and c.1751. In Table 17, these estimates have been combined with figures for 1817 (from parish registers) and 1851 (from the census).

Table 17. Development of the male occupational structure of London

	1711	1751	1817	1851
	(%)	(%)	(%)	(%)
Primary sector	2.4	2.4	1.7	2.5
Agriculture	2.1	2.1	1.5	2.3
Mining	0.0	0.0	0.0	0.1
Other	0.2	0.2	0.2	0.1
Secondary sector	69.9	64.5	58.0	56.7
Clothing	9.4	7.6	5.1	5.1
Footwear	6.0	6.3	5.4	4.6
Textiles	11.9	9.1	4.6	2.4
Metal trades & tools	6.5	6.9	4.9	5.3
Building	9.8	10.8	12.9	14.4
Other	26.3	23.8	25.1	25.0
Tertiary sector	27.7	33.1	40.3	40.7
Dealers and sellers	9.0	11.5	12.0	9.2
Services & professions	12.5	13.5	20.4	21.8
Transport*	6.3	8.1	7.8	9.7

*excluding seamen

Sources: Field and Shaw-Taylor, ‘The Male Occupational Structure of London, c.1710-52: a new perspective’ (Unpublished paper, Cambridge, 2016), table 6; parish register database; 1851 census. *Notes:* the figures in this table differ somewhat from those report in the working paper by Field and Shaw-Taylor because sailors were taken out, and labourers were allocated to sub-sectors.

Field and Shaw-Taylor’s estimates were used as the ‘input’ for London in the bottom-up calculation of the national estimates presented in this dissertation. Intermediate years were obtained by simple interpolation. For estimates preceding 1711, a sensitivity analysis was performed, using a range of possible values, as depicted in Figure 47. At one extreme of the range, the growth rates per sub-sector for the 1711 to 1751 period were projected backwards,

¹⁹³ Field and Shaw-Taylor, ‘The Male Occupational Structure of London, c.1710-52: a new perspective’ (Unpublished paper, Cambridge, 2016). I am grateful to Field and Shaw-Taylor for making their results available to me.

leading to a presumed secondary sector share of 85 per cent in 1601. For the other extreme of the range, growth rates at only one third the 1711-51 level were presumed, leading to a secondary sector share of 74 per cent. The London figures were incorporated in the national estimates using population estimates derived from Wrigley's famous 1967 paper on London and from the census.¹⁹⁴ It was found that at the national level, the resulting difference between labour shares at sub-sector level in the two scenarios was less than 0.2 per cent in 1601, whilst the difference at tri-sector level was less than 0.5 per cent. An intermediate scenario halfway between the two extremes was chosen for the national estimates as presented in this dissertation. But as the analysis above showed, the national figures are fairly insensitive to the actual choice made.

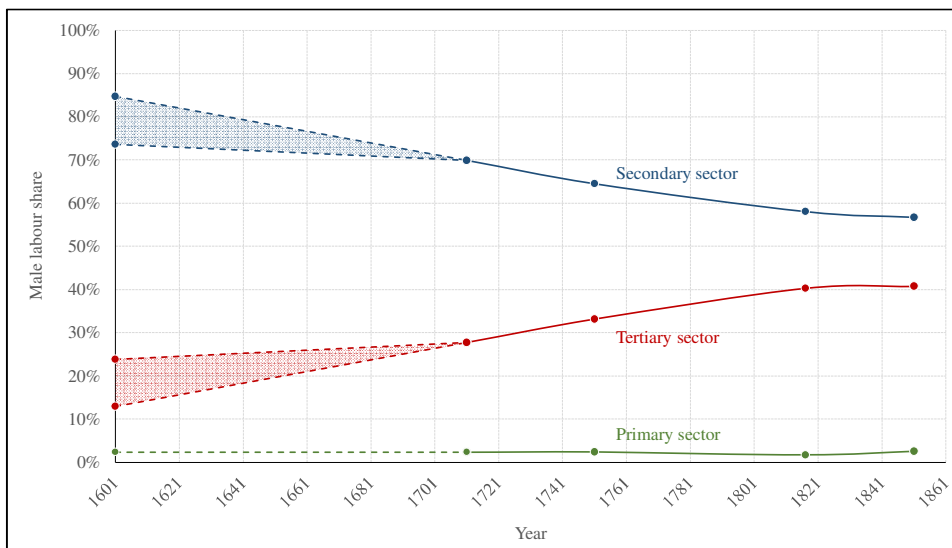


Figure 47. The development of London's male occupational structure at sector level, and an illustration of the range of values used in the pre-1711 sensitivity analysis

6.3 Consequences for the accuracy of the occupational estimates

Some of the adaptations and additions to the general approach discussed in this chapter may become unnecessary in the future, if and when new data become available. For example, if occupations registered in coroners' reports or quarter sessions are collected and digitised in greater numbers, and if careful examination shows them to be representative of the contemporary population, they would provide calibration information for seventeenth- and even sixteenth-century probate data. Alternatively, they could fill the current geographic and

¹⁹⁴ Wrigley, 'A simple model of London's importance in changing English society and economy 1650-1750', *Past & Present*, 37:1 (1967), pp. 44-70.

temporal gaps in the probate data directly. There is, as discussed, also scope for extending the current body of probate evidence, either through digitising data currently only available in printed book or manuscript form, or even by the manual indexing of original probate documents. The former is possible for Surrey, for Northamptonshire, and for seventeenth-century Yorkshire and Suffolk; the latter, though time consuming and expensive, would be well worth undertaking for eighteenth-century Yorkshire.

However, awaiting new data, the methods discussed in this chapter provide, an adequate, temporary solution, as model calculations bear out. By ‘playing around’ with a range of choices for the input-parameters the methods use – such as the precise evolution of the secondary and tertiary sector in eighteenth-century London, or the exact size of the farmers’ and weavers’ corrections for the early seventeenth century – it can be estimated how much the overall accuracy of the occupational structure estimates presented in this dissertation are affected by them. Such sensitivity analyses demonstrate that the national figures presented in the next chapter come with non-trivial but manageable error margins. For example, the sensitivity analyses suggest that the calculated primary sector share of 60.8 per cent for England and Wales in 1601 should properly be interpreted as 60.8 ± 3.5 per cent, whilst the national labour share of 10.7 per cent for the textiles sub-sector in 1701 comes with an error margin of less than one per cent. At the level of individual counties, error margins can be smaller or larger, depending on the quality of the local probate data and the volume of parish register data available for calibration. As will be discussed, calculations for geographical units smaller than counties come with significant error margins, but that is primarily a consequence of statistical problems caused by small sample sizes rather than by the issues discussed in this chapter.

Building on the methodological foundations laid in this and the previous chapters it is now, finally, time to turn to the figures resulting from applying all these major and minor allocation and correction approaches to the probate data – in Chapters 7 and 8 – and to discuss their consequences for our understanding of the occupational and economic development of England and Wales – in Chapter 9.

7 RESULTS AT THE NATIONAL LEVEL

The previous chapters were methodological in character, focussing on approaches to overcome general and specific defects of the parish register and probate data. This chapter is, finally, about results. What image of occupational developments emerges from the application of the new approaches to the data? How does this image differ from older estimates of the male occupational structure in England and Wales? Can the differences be explained? Can the new estimates be corroborated independently? These and other questions will be addressed in this chapter. However, questions about the potential implications of these national results for the wider discussion on occupational and economic development are left to Chapter 9, as these are best examined in tandem with those of the new regional estimates, the subject of Chapter 8.

7.1 The new national estimates

In this section, the male occupational estimates are presented and briefly discussed. Of course, men were only one part of the labour force. Therefore, although it is not the primary focus of this dissertation, some rough estimates for the overall adult labour force will also be provided, resulting from combining the male estimates with female estimates derived from those male estimates. Although these overall estimates are of considerably lower accuracy and reliability than the men-only estimates, they will still prove to be valuable in the later discussion on implications in Chapter 9.

7.1.1 Male labour shares between 1601 and 1851

Using the general approaches discussed in Chapters 2 to 4 and the solutions to more specific problems discussed in Chapter 6, and applying these to the probate dataset discussed in Chapter 5, new estimates for the adult male occupational structure of England and Wales, at twenty-year time intervals have been calculated. These are presented in Table 18. In Figure 48, the same results are presented in a more visual way, per individual (sub-)sector.

Table 18. New estimates for the male occupational structure of England and Wales (1601-1851)

	1601	1621	1641	1661	1681	1701	1721	1741	1761	1781	1801	1817	1841	1851
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Primary sector	64.6	61.0	57.0	53.4	49.8	46.8	46.4	41.9	42.3	43.5	42.6	41.3	34.3	33.2
Agriculture	63.8	60.2	56.1	52.5	48.5	45.3	44.7	39.9	39.9	40.7	39.4	37.4	29.9	27.5
Mining	0.4	0.4	0.5	0.6	0.9	1.1	1.3	1.5	1.9	2.4	2.8	3.3	3.9	5.1
Other	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0.5	0.6
Secondary sector	28.0	30.6	34.1	37.4	39.9	41.7	41.6	43.9	43.1	41.9	42.0	42.7	44.1	44.7
Clothing	3.7	4.7	5.1	5.0	5.1	4.8	4.6	4.6	4.6	4.1	3.7	3.3	3.6	3.4
Footwear	1.9	2.1	2.3	2.6	2.9	3.1	3.1	3.7	3.7	3.6	3.6	3.8	4.2	3.9
Textiles	7.7	8.2	9.4	9.9	10.0	10.7	10.1	9.3	8.7	8.1	8.2	7.8	7.0	6.8
Metal trades & tools	2.8	2.7	3.2	3.5	4.0	4.2	4.1	4.5	4.5	4.5	4.7	5.1	5.5	6.3
Building	4.3	4.5	5.1	5.8	6.4	6.6	7.4	8.2	8.4	8.5	9.1	9.7	9.7	9.0
Other	7.6	8.3	9.0	10.6	11.4	12.3	12.3	13.5	13.2	13.2	12.7	12.9	14.0	15.3
Tertiary sector	7.4	8.3	9.0	9.2	10.4	11.5	12.0	14.3	14.6	14.6	15.3	16.1	21.5	22.1
Dealers and sellers	1.4	1.6	2.0	2.1	2.6	2.7	2.7	2.9	2.9	2.8	3.0	3.3	4.9	4.7
Services & professions	4.1	4.5	4.7	4.5	4.9	5.5	6.0	7.5	7.5	7.5	7.8	7.7	11.5	10.2
Transport	1.9	2.2	2.3	2.6	2.9	3.3	3.4	3.9	4.2	4.2	4.5	5.1	5.2	7.2

Sources: the main sources for this table were the probate and parish register datasets described in the main text, combined with county and national population series from Wrigley, *The early English censuses*. For mining and seamen (included in transport), alternative approaches were used, the sources of which are described in Figure 41, Figure 42, Figure 43, Figure 44, Figure 45, and Figure 46. Certain seventeenth-century corrections were derived from the Gloucestershire and Rutland muster lists described in Sections 6.1.1 and 6.1.2.

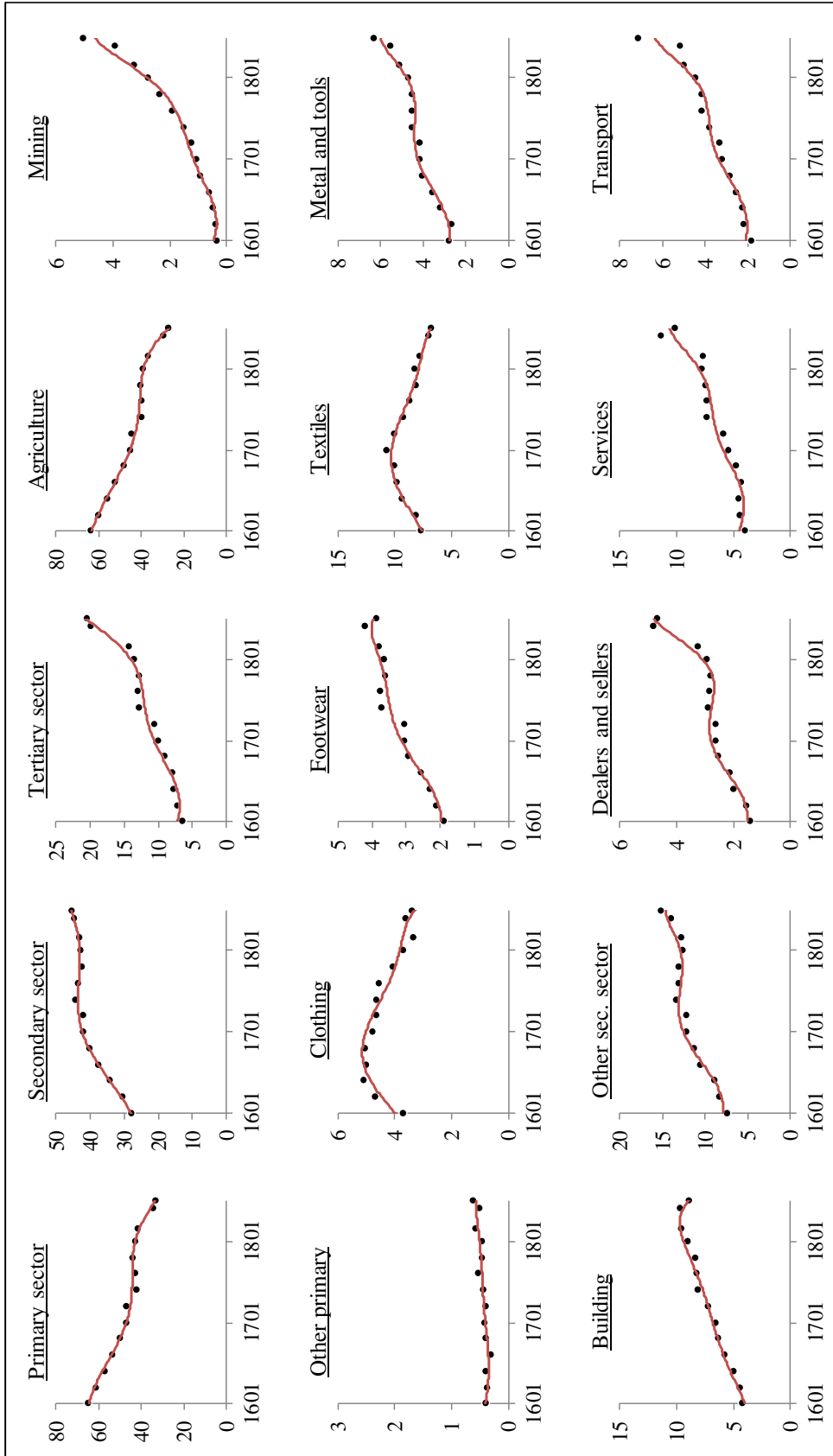


Figure 48. Developments in the male occupational structure of England and Wales, by (sub)sector (1601-1851)

Sources: see Table 18, above.

As discussed above, the implications of these new estimates for interpretations of wider historical developments over the time period will be explored in Chapter 9. Nevertheless, it is valuable to try and identify the most striking features of the new figures here. They show a steady decline of the relative occupational importance of the primary sector. Employing nearly two out of every three men in 1601, by 1741, this had been reduced to two out of five. Indeed, by that year the primary sector had been overtaken in occupational importance by the secondary sector, although it continued to provide employment to a large share of English and Welsh men during the remainder of the period. The seventeenth century was clearly one of rapid structural change. But structural change was far less dramatic in the eighteenth century. Indeed, there was no further increase in the secondary sector share of the male labour force after 1741; both in that year and at the end of the period, in 1851, the secondary sector fell just shy of forty-five percent. The primary sector remained relatively stable and only resumed its earlier trajectory of rapid decline after 1817. The tertiary sector grew steadily over the period, employing fewer than one in eleven men in 1601, compared to more than one in five by 1851.

Within the three sectors, interesting developments are also apparent. The decline of the primary sector, described above, is unsurprisingly entirely the result of that of agriculture. It is worth noting here that agriculture's decline in occupational importance was essentially limited to the years before 1741 and after 1817, with two-thirds of the decline in the pre-1741 and one-third in the post-1817 period. During the time period of the Industrial Revolution, using the popular start and end years of 1760 and 1830, agriculture's decline in occupational importance was modest, from forty per cent to circa thirty-three per cent of the male labour force.¹⁹⁵ Mining's share increased more than tenfold over the 1601-1851 period, although it remained of modest occupational importance at the national level, providing employment for only one in twenty 1851 men. But with mining being a geographically highly concentrated activity, the picture was quite different at regional and, especially, at local levels, as will be discussed in Chapter 8.

The tertiary sub-sectors – dealers and sellers, services and professions, transport – followed largely parallel growth paths, but within the secondary sector, the various sub-sectors developed in a much less uniform manner. The clothing sub-sector increased in importance until nearly the end of the seventeenth century, but from then on its male labour share declined. Footwear, however, continued growing its labour share virtually throughout the whole period. The interesting difference in development between these two apparel sub-sectors is related to a shift in the gendering of work, as will be discussed in Section 7.1.3. The metal, tools, and machine trades as well as the building trades experienced fairly continuous growth, as did the various

¹⁹⁵ The thirty-three per cent estimate for 1830 resulting from a linear interpolation between the 1817 and 1841 figures.

‘other’ secondary sector trades. Textiles, however, did not and, remarkably, appears to have reached its zenith in terms of male labour share in the early eighteenth century.

7.1.2 Developments in absolute numbers of working men per (sub-)sector

The labour share developments discussed above took place against a background of significant population growth during the period, particularly during the nineteenth century, as depicted in Figure 49.

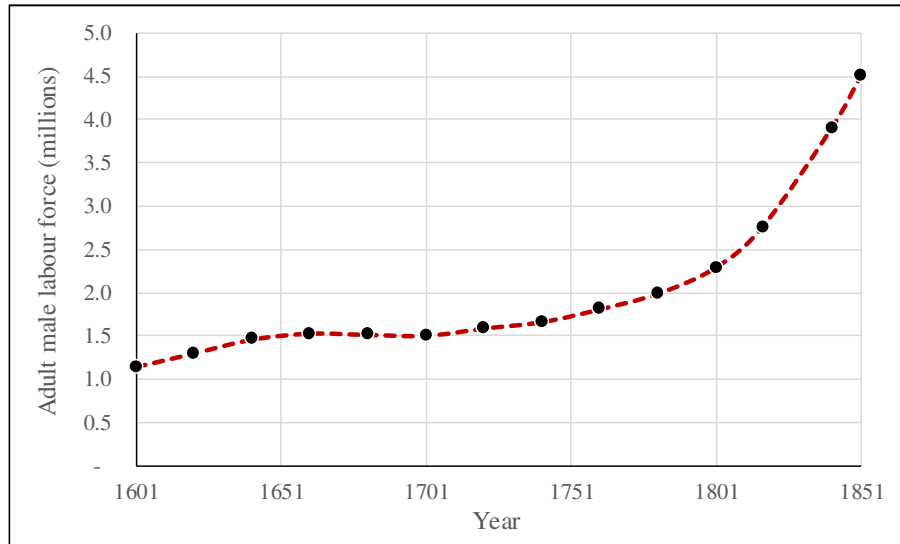


Figure 49. The number of working men aged twenty and above in England and Wales (1601-1851)

Sources: Wrigley et al, *Family constitution* (1997), table A9.1; Wrigley and Schofield, *Population history* (1981), table A3.3; Rickman, *Abstract of answers and returns*, BPP 1843 xxii-1 (for the Welsh population figures only); 1841 and 1851 censuses.

Notes: Calculations are based on population totals for England and Wales, combining non-gender-specific age tables for each year with gender-ratios for the over-20 population derived from the 1841 census. An approximate correction was made for adult men outside of the labour force, such as rentiers, pensioners, and the unemployed, based on information on these categories of men from the 1841 and 1851 censuses.

Therefore, a decline in the labour share of sub-sector X might only be a relative one, and represent an increase in the number of men working in that sub-sector. It is therefore of interest to examine developments in absolute numbers also. Furthermore, when occupational information is to be combined with output data per (sub-)sector to determine developments in labour productivity, absolute numbers are essential. The development of the adult male labour force in absolute terms has been summarised in Table 19. As depicted in Figure 50, every sub-sector saw an increase in absolute numbers, even agriculture despite its marked decline in relative occupational importance.

Table 19. The number of men aged twenty or above that are active in the labour force, per (sub-)sector (England and Wales, 1601-1851)

	1601	1621	1641	1661	1681	1701	1721	1741	1761	1781	1801	1817	1841	1851
	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)
Primary sector	741	796	834	818	756	706	737	697	767	866	978	1,139	1,341	1,495
Agriculture	733	786	821	803	735	683	711	664	722	809	904	1,033	1,167	1,238
Mining	4	6	8	10	14	16	20	25	35	47	64	90	154	229
Other	4	5	6	5	6	6	6	7	10	9	11	16	20	28
Secondary sector	321	399	499	573	605	628	661	730	781	835	965	1,177	1,722	2,014
Clothing	43	61	75	77	77	72	74	77	83	81	85	92	142	153
Footwear	22	28	34	39	44	46	49	62	68	72	84	104	165	175
Textiles	89	107	138	151	152	161	160	154	158	162	188	216	273	306
Metal trades & tools	32	35	47	54	61	63	66	75	82	90	109	142	215	286
Building	49	59	74	89	97	100	117	136	152	168	208	268	380	407
Other	87	109	132	163	173	186	196	225	239	262	292	356	548	688
Tertiary sector	85	108	131	141	157	173	191	237	264	290	352	444	841	998
Dealers and sellers	17	21	30	33	39	40	42	49	53	56	68	91	190	212
Services & professions	47	59	68	68	74	83	95	124	135	150	180	214	448	462
Transport	22	29	33	40	44	49	53	64	76	84	104	140	203	324

Sources: see Figure 49 and Table 18, above.

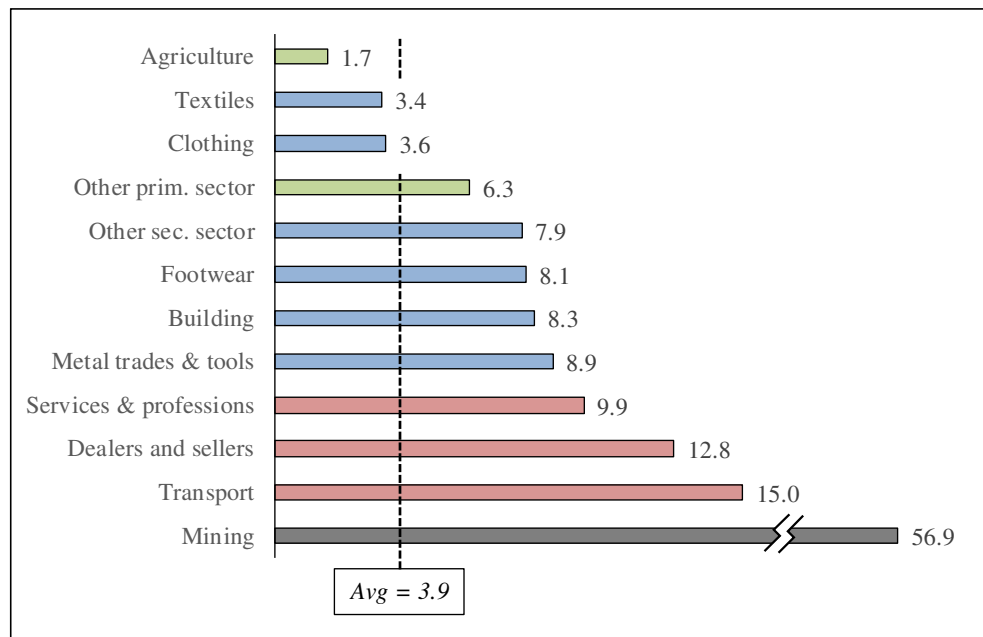


Figure 50. The ratios between the sub-sectoral labour forces in 1851 and 1601 (England and Wales)

Source: Table 19, above.

Notes: the ratios are simply the result of dividing the number of adult males working in a specific sub-sector in 1851 by the corresponding number in 1601. Thus, the ratio of 15.0 for transport indicates that this sub-sector grew fifteen-fold over the period. The ratios have been colour coded by sector to make the chart easier to interpret. The average ratio of 3.9 represent the total growth of the male labour force during the period.

7.1.3 Including women in the national picture

This dissertation investigates developments in the male occupational structure. However, it is clear that for interpreting the implications of occupational developments for the wider economic history of England and Wales, male-only occupational structures can only provide an incomplete guide. A significant share of the labour force was made up of women, whose distribution across occupational sectors differed from that of men. Unfortunately, as discussed, information on women's work is much rarer than on that of men before the Victorian censuses. Where many historical sources describe men with a direct reference to their occupational identity, this is much rarer for women. Anglican Baptism registers are entirely silent about female occupations, and whilst probate documents provide some information, most women are either not given an occupational or status denominator at all, or are merely described with unhelpful terms like 'widow', 'singlewoman', or 'wife'; less than one per cent of the women in the probate dataset have a meaningful occupational denominator.

Several members of the Cambridge Group are currently working on collecting, transcribing, and interpreting female occupational information from other sources. However, there is something

which can be done until this labour bears fruit. Shaw-Taylor and Xuesheng You have recently developed an approach to estimate female labour shares from those of their male counterparts.¹⁹⁶ The approach builds on the reasonable assumption that although female and male occupational structures differed, there was a logical relationship between them. In essence, the approach attempts to capture this relationship via a system of female-to-male employment ratios. Using information on male and female employment from the 1851 to 1911 censuses, ratios between female and male full-time-equivalent workers are calculated per sub-sector and, where necessary, for individual occupations. For most sub-sectors and occupations, these ratios are subsequently presumed to hold in earlier years, when no information on female employment exists. However, for some occupations and/or sub-sectors it is clear that the pre-1851 ratios between female and male workers are likely to differ materially from those of the census years. For example, because of the mechanisation of spinning, starting with the introduction of the Spinning Jenny in 1764, female-to-male ratios in textiles are likely to have fallen considerably at the end of eighteenth century, with female spinners being partially replaced by machines whilst weaving, a predominantly male occupation, remained largely unaffected by mechanisation until the impact of power looms started to bite in the early nineteenth century. For such sub-sectors and occupations therefore, an array of additional sources is used to revise the 1851 ratios when applying them to earlier years; this is done for farmers and agricultural labourers and for the clothing and textiles' sub-sectors.

Shaw-Taylor and You kindly made the resulting ratios available to me, for which I would like to express my gratitude. By applying these ratios to the new male labour force estimates, as presented in Table 18, and combining the thus-calculated female estimates with the male ones, an occupational estimate for the development of the entire adult labour force is created, as presented in Table 20 and Table 21. Unavoidably, the reliability and accuracy of these tables is considerably lower than the male-only ones, but they do provide a best-available estimate of the full adult labour force and are therefore valuable for interpreting the implications of occupational developments for our understanding of the economic history of England and Wales during the period – to be discussed in Chapter 9.

¹⁹⁶ Shaw-Taylor and You, 'Female occupational structure in England and Wales 1700-1911', paper presented at the ESSHC, Valencia, 2016

Table 20. Combined (female and male) labour force shares by sub-sector (England and Wales, 1601-1851)

	1601	1621	1641	1661	1681	1701	1721	1741	1761	1781	1801	1817	1841	1851
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Primary sector	57.8	53.9	49.2	46.3	43.0	39.6	40.0	36.5	37.5	38.7	37.7	36.6	28.8	27.5
Agriculture	57.4	53.4	48.7	45.8	42.3	38.8	39.0	35.4	36.0	36.9	35.6	34.0	25.8	23.6
Mining	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.2	1.5	1.8	2.2	2.6	3.5
Other	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.4
Secondary sector	33.5	36.5	40.6	43.6	45.6	47.7	46.1	46.0	44.4	42.4	41.7	41.6	41.2	42.5
Clothing	5.3	6.7	7.2	7.1	7.2	6.8	7.0	7.4	7.7	7.3	7.0	6.7	7.5	7.5
Footwear	1.6	1.7	1.9	2.1	2.4	2.5	2.6	3.3	3.4	3.4	3.5	3.8	4.2	4.0
Textiles	18.3	19.1	21.8	23.0	23.5	25.1	22.4	19.3	16.8	14.5	13.3	11.6	9.4	9.1
Metal trades & tools	1.6	1.6	1.8	2.1	2.3	2.4	2.5	2.8	2.9	3.0	3.3	3.7	3.9	4.6
Building	2.3	2.4	2.7	3.1	3.5	3.6	4.1	4.7	5.0	5.2	5.8	6.4	6.3	6.1
Other	4.5	4.9	5.3	6.2	6.7	7.3	7.5	8.5	8.6	8.9	8.9	9.3	10.0	11.2
Tertiary sector	8.7	9.6	10.1	10.1	11.4	12.7	13.9	17.4	18.2	18.9	20.5	21.8	30.0	29.9
Dealers and sellers	1.0	1.1	1.4	1.5	1.8	1.9	1.9	2.2	2.2	2.3	2.5	2.8	4.1	4.1
Services & professions	6.6	7.3	7.5	7.2	8.0	9.0	10.1	13.0	13.4	14.0	15.1	15.5	22.5	20.9
Transport	1.0	1.2	1.2	1.4	1.6	1.8	1.9	2.3	2.5	2.6	2.9	3.4	3.4	4.9

Sources: Table 18 above; Shaw-Taylor and You, 'Female occupational structure'.

Notes: for the procedure used in creating these figures, see the main text.

Table 21. The number of men and women aged twenty or above that are active in the labour force, per (sub-)sector (England and Wales, 1601-1851)

	1601	1621	1641	1661	1681	1701	1721	1741	1761	1781	1801	1817	1841	1851
	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)
Primary sector	1,230	1,311	1,358	1,327	1,216	1,111	1,144	1,060	1,148	1,253	1,363	1,531	1,737	1,848
Agriculture	1,222	1,301	1,344	1,313	1,196	1,088	1,117	1,026	1,103	1,195	1,287	1,423	1,560	1,586
Mining	4	6	8	10	14	17	20	26	36	48	65	92	157	234
Other	4	5	6	5	6	6	6	7	10	9	11	16	20	28
Secondary sector	714	888	1,121	1,250	1,289	1,340	1,321	1,337	1,359	1,371	1,507	1,739	2,488	2,855
Clothing	113	163	198	203	203	192	200	215	236	237	254	281	456	503
Footwear	33	42	51	60	68	70	74	95	104	110	128	159	251	268
Textiles	389	466	602	660	664	706	642	562	516	471	478	485	565	612
Metal trades & tools	35	38	51	59	66	68	71	82	89	98	118	153	233	309
Building	49	59	74	90	98	100	117	137	152	169	208	269	381	408
Other	95	120	145	179	190	204	215	248	262	287	320	390	602	755
Tertiary sector	185	235	280	291	321	356	398	506	556	613	741	910	1,814	2,008
Dealers and sellers	22	27	39	43	51	53	56	64	69	74	89	119	249	278
Services & professions	141	178	207	207	225	253	288	377	410	454	546	648	1,357	1,400
Transport	22	29	34	41	45	50	54	66	77	85	106	142	207	330

Sources: Table 19 and Table 20, above.

To facilitate a comparison to the male-only figures, charts of the combined estimates have been provided per (sub-)sector in Figure 51, and compared to the male-only trend lines from Figure 48, here depicted as a blue dotted line. As this figure shows, the female-included occupational structure was less agricultural, with a significantly more important tertiary-sector. The primary sector appears to have been overtaken by the secondary as the most important employer of men and women as early as the 1670s, with the tertiary sector also overtaking the primary sector in the 1830s. The charts suggest that the secondary sector peaked in occupational importance around 1700, and then started on a slow and limited decline – apparently caused entirely by the decline of employment in textiles. Contrary to the male-only figures, the charts show clothing retaining a fairly constant share of total employment. It should be noted here, however, that this is not an independent result, but rather a ‘result by design’ of the Shaw-Taylor/You approach; they chose eighteenth- and early-nineteenth-century female-to-male ratios for this subsector on the explicit assumption that clothing did not decline in overall labour share. This may serve as an example of the care that should be taken when using these figures. They are perhaps best described as temporary, best-effort estimate, designed to plug a gap which will, hopefully, eventually be filled using independent female estimates.

7.2 Placing the male estimates in a longer time perspective

This dissertation is principally aimed at understanding occupational developments between 1600 and 1850. However, it is of obvious interest to place this period into a wider perspective, if such a perspective is available. Fortunately, it is. Extending the time period post 1850 is easily achieved, given the availability of reliable national censuses. But occupational information before 1600 is also available, albeit of much lower detail and reliability. In Figure 52 below, data points at the level of the tri-sectors and mining are included for 1381 and for c.1525. Before discussing the developments depicted in Figure 52, it is necessary to discuss how these data points were derived.

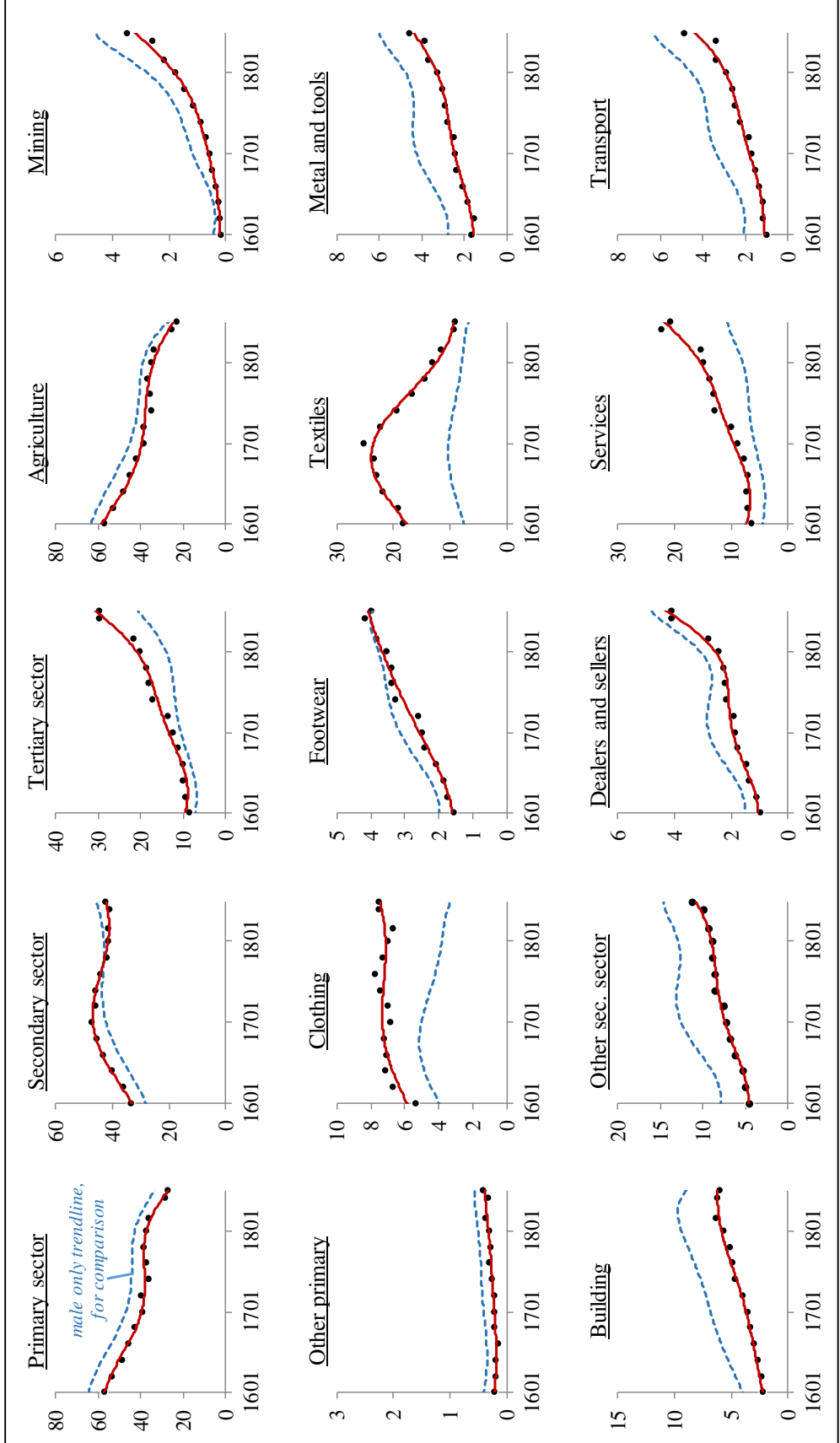


Figure 51. The development of the combined labour shares per (sub-)sector, compared to the male-only trends (England and Wales, 1601-1851)

7.2.1 The background to the 1381 estimate

The 1381 estimate is the result of the work of Richard Smith on analysing the poll tax returns in that year. His results, presented at a number of conferences, have not yet been submitted for publication, but were graciously made available to me by Smith for the purposes of this dissertation – for which I would like to express my thanks. Carolyn Fenwick’s efforts have made the poll tax returns of 1377, 1379, and 1381 available to historians by organising and transcribing these sets of documents, many of which are in poor condition and very difficult to read.¹⁹⁷ These returns provide information on a significant number of English men and women, and have been used by historians before to examine the occupational composition of the late medieval labour force before, notably by Clark, for his analysis of the long-term development of the agrarian labour share, and by Broadberry et al in their recent reconstruction of Britain’s historical national accounts.¹⁹⁸ Both use the 1381 returns, with Clark also exploiting information from the 1379 returns. The poll tax of 1381 was aimed at all individuals of fifteen years and older, except for the poor and those in holy orders. Many of the returns have survived, although often in a poor state, and some contain occupations. Broadberry et al state that the returns provide occupational information on ‘30,292 individuals (approximately 2 per cent of all adults)’ living in 892 vills from many parts of England, with the fact that many of these individuals are women being ‘a particular strength’.¹⁹⁹ It is these individual observations which form the basis of Broadberry et al’s occupational estimates. Clark’s figures are based on a slightly lower number (26,279) tax payers, from a sub-set of 335 vills and, treated separately, from the cities of Oxford and York.

As Smith notes, however, both sets of estimates are problematic. Much of the problematic nature of the estimates is the direct result of the similarly problematic nature of the occupational information provided in the poll tax returns. It is, for example, clear that women are underrepresented, but establishing an integral, male-and-female occupational structure is difficult as it requires assessing female labour force participation in Full Time Equivalents (FTE) terms, for which no firm data are available. However, Smith argues, Clark and Broadberry et al show insufficient appreciation of the problematic nature of the returns and, at

¹⁹⁷ Fenwick, *The poll taxes of 1377, 1379 and 1381. Part 1, Bedfordshire-Lincolnshire* / edited by Carolyn C. Fenwick (Oxford: Oxford University Press for the British Academy, 1998); Fenwick, *The poll taxes of 1377, 1379 and 1381. Part 2, Lincolnshire - Westmorland* / edited by Carolyn C. Fenwick (Oxford: Oxford University Press for the British Academy, 2001); Fenwick, *The poll taxes of 1377, 1379 and 1381. Part 3, Wiltshire-Yorkshire, unidentified documents and additional data* / edited by Carolyn C. Fenwick (Oxford: Oxford University Press for the British Academy, 2005).

¹⁹⁸ Clark, ‘1381 and the Malthus delusion’, *Explorations in Economic History*, 50:1 (2013), pp. 4-15; Broadberry et al, ‘When did Britain industrialise?’, pp. 17-8; Broadberry et al, *British Economic Growth*, pp. 346-50.

¹⁹⁹ Broadberry et al, *British Economic Growth*, p. 346.

times, have exacerbated the problems by the choices they make, resulting in sub-optimal estimates. Broadberry et al, for example, appear to have simply presumed that servants must have been domestics whereas, in reality, the vast majority is in fact likely to have been employed as farm servants. This leads to a significant exaggeration of the tertiary sector in the Broadberry et al estimates. Clark allocated servants whose master was known to that master's occupation. However, for many servants, the master is unknown and, as discussed in Section 2.5 on the Gloucestershire 1608 muster list, even many of the servants working for non-farmer masters are likely to have been farm servants, as a significant proportion of these non-farmer masters owned or had otherwise access to agricultural land. The main issue with Clark's estimates is, however, that the villis in the sample he uses suffer from, as Smith phrases it, 'some unfortunate biases towards regions or settlement mixes' which lead to them being 'significantly misrepresentative of the counties of which they are a part'. In practice, this means that they seriously underestimate agricultural employment in the counties which Smith has examined. Smith therefore revised agricultural labour shares on a county-by-county basis. In this, he paid special attention to small towns as their sizeable presence has played a central role in revisionists accounts of British medieval economic history, reacting to the conventional view of a – relative to other European countries – under-urbanised and economically under-developed late-medieval England.²⁰⁰ Combined with an improved allocation of servants to occupational sectors, this leads to estimates which differ considerably from those of Clark and Broadberry et al – as depicted in Table 22.

Table 22. Male occupational estimates for 1381

	Smith (%)	Broadberry et al (%)	Clark (%)
Agriculture	76-79	67	61 to 62
Industry	15-17	15	} 38 to 39
Services	4-9	18	

Sources: see main text.

The problematic nature of the poll tax returns mean that any estimate occupational estimate derived from them carries a significant degree of uncertainty, but it is clear that Smith's estimates are far superior, and it is them, therefore, which I have used.

²⁰⁰ For an example of such revisionist efforts see, for example, Dyer, 'How urbanised was medieval England?', in Duvosquel and Thoen (eds), *Peasants and townsmen in medieval Europe: studia in honorem Adriaan Verhulst* (Ghent: Snoeck-Ducaju & Zoon, 1995), pp. 169-83; Hilton, *English and French towns in feudal society: contemporary study* (Cambridge: Cambridge University Press, 1995).

7.2.2 The background to the c.1525 estimate

The c.1525 data point in Figure 52 is based on two sources. One of these are the surviving 1522 muster lists for Rutland, the Suffolk hundred of Babergh, and the city of Coventry, which Broadberry et al use as a basis for their own occupational estimates for that year. Combined, these list 5,083 men of which 3,918 have been given a meaningful, clear occupation. Obviously, this is a small number, representing only about half a per cent of the contemporary adult male population, and providing extremely selective geographical coverage. In order to generate a national estimate from this numerically and geographically limited sample, Broadberry et al consider Rutland to stand in for rural England and Wales whilst Babergh Hundred and Coventry are presumed representative for semi-rural and urban England and Wales, respectively.²⁰¹ I have followed them in this approach, but have deviated from their treatment of servants. As in their 1381 estimates, discussed above, it appears that Broadberry et al have allocated servants overwhelmingly or even entirely to the service sector, although they do not discuss this explicitly; it is, however, the only way in which I can account for the number of men they list as working in that sector.²⁰² This leads, for example, to domestic servants making up nine per cent of the male occupational structure of Rutland in 1522. A comparison to the 1851 census which, in a much wealthier and developed economy list just three per cent of Rutland's men as domestic servants, shows how unlikely the nine per cent figure is. Indeed, when forced to add in domestic servants to the 1688 social table as created by Gregory King – who omitted domestic servants as his table was based on households rather than individuals – Broadberry et al themselves choose a figure representing only two per cent of the male labour force.²⁰³ Broadberry et al's servants' allocation leads to an understatement of the agricultural sector, which is exacerbated by, subsequently, allocating labourers to agriculture in that sector's proportion of non-labourers – a dubious approach in its own right, as discussed in Section 1.5.2. An illustration of the unlikely results to which all of this leads is that they end up with an impossibly high ratio of 0.75 labourers per non-labourer working in the secondary sector – compared to, for example, 0.12 in the 1851 census for that sector, and compared to 0.35 in their own estimates for agriculture in 1522. I have therefore allocated servants to sectors in line with the approach used in the analysis of the Gloucestershire 1608 muster list in Section 2.5 and labourers using the ratios derived in Chapter 3.

Before discussing the results of these, I would argue, more sensible allocations, it is necessary to discuss a second source of early-sixteenth-century occupational information, namely the reports by coroners on accidental deaths, collected by Gunn and Gromelski, and discussed

²⁰¹ Broadberry *et al*, *British Economic Growth*, pp. 349-50.

²⁰² *Ibid*, in Table 9.03, p. 350.

²⁰³ *Ibid*, Table 9.04, pp. 353-4.

earlier in Section 1.4. Shaw-Taylor realised the potential value of these reports as an early occupational data source. The current dataset of observations from these reports, kindly made available to the Cambridge Group by Gunn and Gromelski, list only some six hundred observations for the 1500-60 time period. Although this number is (even) smaller than that in the 1522 muster lists, the coroners' reports have much wider geographic coverage. The representativeness of the observations is still an open question, so any resulting occupational estimates derived from them need to be treated with caution. They have been depicted in Table 23, and compared to the muster list estimates.

Table 23. Comparison between estimates for the male structure of England and Wales, c.1525

	1522 muster list		
	Broadberry et al (%)	Keibek (%)	Corroners' reports (%)
Agriculture	65	71	68
Industry	21	19	22
Services	14	10	10

Sources: see main text.

An average of the figures from the reworked muster list and coroners' reports was used as a best estimate for c.1525. It is probably unnecessary to stress here that this is of very limited reliability and accuracy, compared to the probate-and-parish-register-based estimates from 1601 and, even, compared to the poll-tax-based estimate for 1381. It has mainly been included in Figure 52 because it is, currently, the only intermediate estimate, however inadequate, between 1381 and 1601, and because Broadberry et al have used a 1522 estimate in their calculations.

7.2.3 The emerging picture of long-term developments

Figure 52, below, is the result from placing the 1601-1851 national male estimates in between the 1381 and c.1525 data points described above, and the later nineteenth-century census.

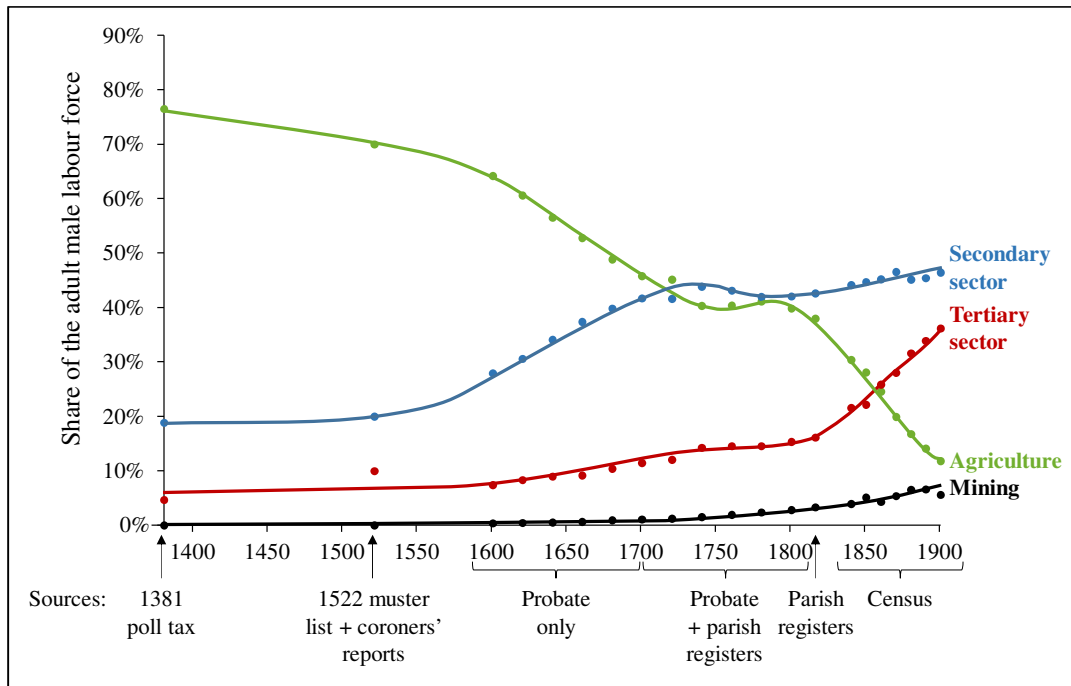


Figure 52. The longer-term development of the male occupational structure (England and Wales, 1381-1901)

Sources: see main text.

As the figure shows, it would appear that some structural change occurred before 1600, mainly from agriculture to the secondary sector, but the pace greatly accelerated during the seventeenth and early-eighteenth century, with the tertiary sector increasing its share of the male labour force continuously but increasingly rapidly during the entire 1381 to 1911 period. However, analysing such developments over so many years is aided by dividing the period up into smaller, more manageable and uniform intervals. This has been done in Illustration 10.

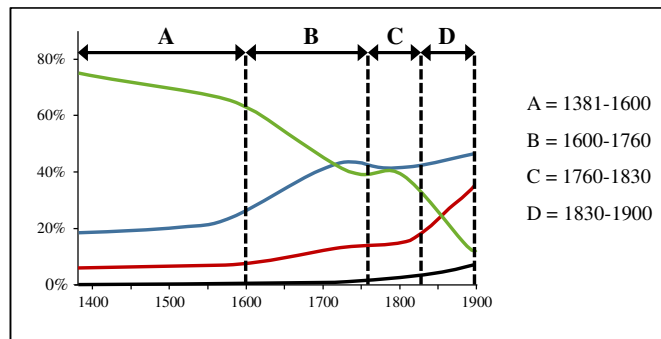


Illustration 10. The division of the 1381 to 1901 time period into four shorter intervals

Of course, other choices of time intervals would have been possible and, in some respects, might have been preferable. Period C, covering the years between 1760 and 1830, may not, at

first sight, appear the most logical in terms of occupational developments alone, from the trends in sectoral labour shares; these suggest that a start in 1700 and end in 1800 would have led to intervals with more uniform developments. However, the fact that the interval between 1760 and 1830 corresponds to traditional temporal boundaries of the First Industrial Revolution was given precedence here.

The finer periodisation now allows one to analyse developments more quantitatively. In Figure 53, growth per sector is expressed in terms of the gains or losses in labour shares during each of the four time intervals defined in Illustration 10. To keep things comparable, given the time periods' different lengths, this has been expressed per decade – so the secondary sector's rise from nineteen to twenty-eight per cent between 1381 and 1600 translates into an average 0.4 per cent per decade.

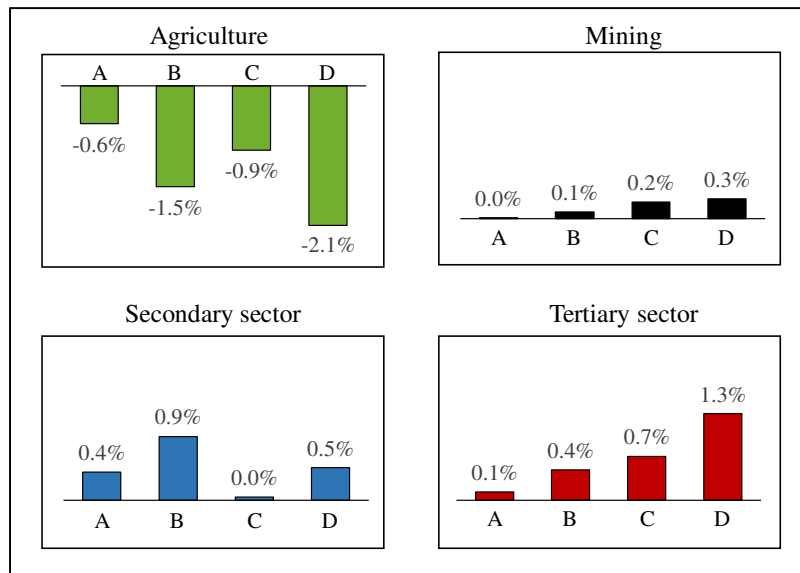


Figure 53. Male labour share gains or losses per decade for the time periods defined in Illustration 10 (England and Wales, 1381-1900)

Sources: Figure 52 and Illustration 10.

Notes: the letters denote the following time periods: A=1381-1600; B=1600-1760; C=1760-1830; D=1830-1900.

As Figure 53 shows, mining and the tertiary sector increased their share of the labour force in all four time intervals, and did so increasingly rapidly. Things are a bit more complicated and interesting for agriculture and the secondary sector. The former unsurprisingly lost labour share to the other sectors in all four time intervals, and saw its decline in occupational importance accelerate after 1600 and, especially, after 1830. The 'Industrial Revolution interval', however, represented a clear, temporary deceleration. The secondary sector experienced its most rapid growth in labour force share in the run-up to the Industrial Revolution whilst, remarkably,

exhibiting no net growth in male occupational share at all during the classical period of the Industrial Revolution; a discussion of repercussions for our understanding of historical economic developments is left for Section 9.2. Arguably less remarkable but nevertheless worth noting is that Figure 53 also suggests that secondary sector growth before 1760 was significantly faster than after 1830; indeed, in the 1830 to 1900 interval, the shift towards the secondary sector was only marginally more rapid than between 1381 and 1600.

Of course, the validity of these conclusions depend on the accuracy of the 1601 to 1851 figures. It is therefore now time to examine the degree to which they differ from existing male labour force estimates, and why I think the new estimates are more likely to represent historical reality.

7.3 A comparison to existing national estimates

Some existing occupational estimates have already been discussed, such as those for the agricultural share of the labour force, derived from Gregory King's 1688 social table by a range of economic historians, depicted in Figure 2. However, comparing the new male occupational structure estimates to these figures is not entirely straightforward. The King-derived estimates in Figure 2 are generally intended to represent all men and women in the British labour force, even though King's table only covers England and Wales and was constructed on the basis of households rather than individuals, with those households, presumably, classified according to the status or occupation of their male 'household head'. But the historians whose estimates are presented in Figure 2 have, to various degrees, attempted to recreate the integral, male-and-female occupational structure. Crafts, for example, included '10 per cent additional labour inputs into domestic service on the basis of nineteenth-century evidence', partially to make King's figures more representative of the combined male and female labour forces, although he did not feel it was necessary to correct the table for King's omission of Scotland since 'the proportions in agriculture and manufacturing in Scotland were very similar to those in Britain as a whole'.²⁰⁴ For these reasons, the estimates in Figure 2 are perhaps best compared to the new integral labour force estimates, rather than the (much more reliable) new male estimates from which the integral estimates were derived. This has been done in Figure 54.

²⁰⁴ Crafts, *British economic growth*, pp. 14-5.

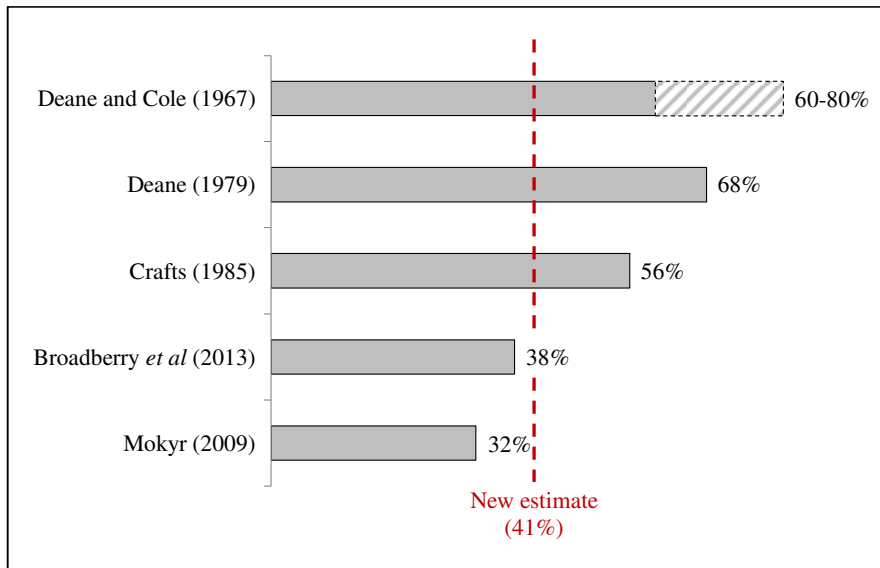


Figure 54. A comparison between existing agricultural labour share estimates for 1688, derived from Gregory King’s social table, with the new integral occupational estimate

Sources: See Figure 2 and main text.

As is clear from Figure 54, the new estimate is significantly lower than all but two of the existing figures. It is placed between Crafts’s and Broadberry *et al*’s occupational estimates, and it is these to which I shall now turn for a more precise and detailed comparison.

7.3.1 A comparison to Crafts

As discussed above, Crafts intended his occupational estimates to represent Britain rather than England and Wales, and to include women rather than only the male fraction of the labour force. However, in practice, his estimates for 1688, 1759, and 1801/3 are all derived from households-based social tables, more directly representative of the male than the integral occupational structure. Furthermore, none of those social tables include Scotland. Crafts’ correction of including ‘10 per cent additional labour inputs into domestic service’ only very partially resolves the lack of direct information on female workers. Only for his 1841 estimates, borrowed from Deane and Cole, can it credibly be claimed that they cover men and women, in England, Wales, and Scotland. It is therefore not entirely clear whether Crafts’s figures are best compared to my male-only or to my integral estimates, and Table 24 therefore contains both.

Table 24. A comparison with Crafts's occupational estimates (1688-1841)

	1688			1759		
	<u>This dissertation</u>			<u>This dissertation</u>		
	Crafts (%)	Male (%)	M&F (%)	Crafts (%)	Male (%)	M&F (%)
Primary sector, excl. mining	55.6	47.8	41.3	48.0	40.4	36.2
Secondary sector & mining	18.5	41.5	46.9	23.8	45.1	45.7
Tertiary sector	25.9	10.8	11.8	28.2	14.5	18.1
	1801/3			1841		
	<u>This dissertation</u>			<u>This dissertation</u>		
	Crafts (%)	Male (%)	M&F (%)	Crafts (%)	Male (%)	M&F (%)
Primary sector, excl. mining	41.7	39.7	35.8	22.2	30.4	26.2
Secondary sector & mining	24.7	44.9	43.6	40.5	48.0	43.8
Tertiary sector	33.6	15.4	20.6	37.3	21.5	30.0

Sources: Crafts, *British economic growth during the Industrial Revolution* (Oxford: Clarendon, 1985), pp. 14-5; Shaw-Taylor, L., and E.A. Wrigley, 'Occupational structure and population change', in Roderick Floud, Jane Humphries and Paul Johnson (eds), *The Cambridge Economic History of Modern Britain. Volume 1. Industrialisation, 1700-1870* (Cambridge: Cambridge University Press, 2014), p. 56; Table 18 and Table 20, above.

Notes: I have gratefully used Shaw-Taylor's work in collecting Crafts's figures into a single table in his and Wrigley's chapter for the CEHMB. The 'M&F' columns refer to my combined (male and female) labour force estimates. The reason to include both male-only and combined estimates is explained in the main text.

Crafts's figures differ considerably from mine, whether compared to the male-only or male-and-female estimates. Surprisingly, even the 1841 figures do not match up terribly well, although Crafts's estimates for that year are, ultimately, based on the same source as mine: the 1841 census. Crafts's 1841 estimates, borrowed from Deane and Cole, include Scotland as well as children whilst mine do neither, which may explain some of the difference. But it is difficult to resolve the difference entirely, partially because Deane and Cole, who themselves built on the much earlier work of Charles Booth, are rather vague about how they determined their figures.²⁰⁵ What is clear, however, is that the census's information on female employment was used whereas that is not the case in my new integral estimates, in which the female component is recreated using the system of female-to-male ratios described in Section 7.1.3; following the Cambridge Group's lead on this, I considered the census's female occupational information too unreliable to be of value.

²⁰⁵ Booth, 'Occupations of the people of the United Kingdom, 1801-81', *Journal of the Statistical Society of London*, 49:2 (1886), pp. 314-444; Deane and Cole, *British economic growth*, p. 142.

Whatever the reasons for the differences in the 1841 figures, however, the gap with Crafts’s earlier, social-tables-based estimates is much larger and more consequential. His pre-1841 estimates are all considerably more agricultural than mine, but the secondary sector differences are particularly striking, both in terms of their values in any of the three years, and in their development over time. Craft’s estimate for the secondary sector occupational share in 1688 is less than half that in my new estimates, and whereas Crafts’s estimates suggest more than a doubling of that occupational share over the 1688 to 1841 period, most of which takes place after 1801, the new male estimates show only modest growth in secondary sector labour shares, whilst the combined male-and-female estimates even suggest a modest *decline* over the 1688 to 1841 period, resulting mainly but not exclusively from a decline in secondary sector employment amongst women caused by the mechanisation of spinning. As discussed in Chapter 1, the structural shift between agriculture and industry plays a central role in Crafts’s interpretation of the Industrial Revolution, and is arguably the main reason for what I there called ‘one of the most counter-intuitive elements’ of the Crafts-Harley view, namely the slow productivity growth in industry, ‘slower indeed than in agriculture’. In the new estimates, the structural shift between agriculture and industry has almost completely disappeared. Therefore, if one were to use Crafts’s sectoral output figures, the resulting labour productivity growth estimates in industry and agriculture would differ dramatically from those presented in his analyses – as will be discussed in Section 9.2. Since Broadberry et al have recently attempted to improve upon Crafts’s output estimates, it is to their estimates to which we shall turn now.

7.3.2 A comparison to Broadberry et al

Broadberry et al’s estimates for 1688, 1759, and 1801/3 are based on exactly the same sources as those of Crafts, yet they differ greatly, as Table 25 shows.

Table 25. A comparison between the social-table estimates of Crafts and Broadberry et al (England and Wales, 1688-1801/3)

	1688			1759			1801/3		
	Broadberry et al			Broadberry et al			Broadberry et al		
	Crafts (%)	Male (%)	M&F (%)	Crafts (%)	Male (%)	M&F (%)	Crafts (%)	Male (%)	M&F (%)
Primary sector, excl. mining	55.6	46.0	38.9	48.0	43.0	36.8	41.7	35.7	31.7
Secondary sector & mining	18.5	32.3	34.0	23.8	32.3	33.9	24.7	35.9	36.4
Tertiary sector	25.9	21.7	27.2	28.2	24.7	29.3	33.6	28.4	31.9

Sources: Table 25, above; Broadberry et al, *British economic growth*, pp. 351-60.

Notes: although Crafts’s figures are intended to cover Britain as a whole, his estimates are, in fact, based on the social tables of King, Massie, and Colquhoun, which cover England and Wales only, and are not corrected by Crafts to make good the omission of Scotland. Similarly, Crafts’s measures to correct for the (effective) omission of female labour from the social tables are, at best, partial, as described in the main text. Therefore, both the male-only and the combined male-and-female estimates of Broadberry et al have been provided for comparison, the latter being displayed in the ‘M&F’ columns.

Broadberry et al provide little in the way of comment on the reasons for why they arrived such different figures than Crafts, despite using the exact same sources. In Chapter 1, I speculated that the reason they derive such a much less agricultural occupational structure from the social tables than Crafts and others did before may be related to Broadberry et al having had access to Shaw-Taylor’s preliminary occupational estimates from parish register data. But whatever the reason, Table 25 stresses once again that the fact that the social tables can give rise to such different interpretations should, in effect, disqualify them as credible sources of occupational information. Since they do form the basis of the Broadberry et al’s labour productivity calculations, it is nevertheless important to compare them to the new estimates – which has been done in Table 26.

Table 26. The new male estimates compared at the sectoral level to Broadberry et al’s (England and Wales, 1688-1801/3)

	1688			1759			1801/3		
	Broadb. et al (%)	Keibek (%)	Delta (%)	Broadb. et al (%)	Keibek (%)	Delta (%)	Broadb. et al (%)	Keibek (%)	Delta (%)
Primary sector, excl. mining	46.0	47.8	1.8	43.0	40.4	-2.6	35.7	39.7	4.0
Secondary sector & mining	32.3	41.5	9.2	32.3	45.1	12.8	35.9	44.9	9.0
Tertiary sector	21.7	10.8	-10.9	24.7	14.5	-10.2	28.4	15.4	-13.0

Sources: Broadberry et al, *British economic growth*, pp. 351-60; Table 18, above.

Notes: the ‘delta’ columns present the result of subtracting the Broadberry et al from the new estimates, to indicate the size of the difference.

The top-level difference in the agricultural labour shares are small, but the same cannot be said for the secondary and tertiary sectors. Since Broadberry et al provide information on how they arrived their sectoral occupational estimates, it is possible to slightly increase the detail of the comparison – resulting in Table 27.

Table 27. A slightly more detailed comparison to Broadberry et al’s male occupational estimates (England and Wales, 1688-1801/2)

	1688			1759			1801/3		
	Broadb. et al (%)	Keibek (%)	Delta (%)	Broadb. et al (%)	Keibek (%)	Delta (%)	Broadb. et al (%)	Keibek (%)	Delta (%)
Primary sector, excl. mining	46.0	47.8	1.8	43.0	40.4	-2.6	35.7	39.7	4.0
Agricultural labourers	29.5	20.9	-8.6	18.5	23.3	4.9	20.1	26.1	6.0
Others	16.5	26.9	10.4	24.5	17.1	-7.4	15.7	13.7	-2.0
Secondary sector & mining	32.3	41.5	9.1	32.3	45.1	12.8	35.9	44.9	9.0
Manufacturing labourers	13.8	3.8	-10.0	8.6	5.1	-3.5	9.4	4.1	-5.2
Others	18.6	37.7	19.1	23.7	40.0	16.3	26.5	40.8	14.3
Tertiary sector	21.7	10.8	-10.9	24.7	14.5	-10.2	28.4	15.4	-13.0
Traders and sellers	9.3	2.6	-6.7	13.0	2.9	-10.1	10.1	3.0	-7.1
Services and transport	12.4	8.1	-4.3	11.7	11.6	-0.1	18.3	12.4	-5.9

Sources: see Table 26.

Notes: this table presents the highest level of detail at which a comparison to the published figures by Broadberry et al is possible.

As Table 27 shows, the ostensible agreement between the Broadberry et al and the new agricultural male labour share estimates largely disappears at sub-sectoral levels. This level also provides a clue for the difference between the Crafts and Broadberry et al agricultural figures. The relatively low agricultural male labour share in the latter result largely from allocating a significant share of labourers to manufacturing, compared to Crafts, who allocated them all to agriculture. As discussed in Section 3.3, although Crafts's allocation is sub-optimal, it is actually closer to historical reality than Broadberry et al's who for, frankly, mysterious reasons allocate labourers in 1688, 1759, and 1801/3 on the basis of non-labourer ratios in 1522. This leads to peculiar results. In Broadberry et al's figures, the number of farm labourers per farmer declines from c.1.85 in 1688 to about 1.45 in 1801/3, via a trough of only c.0.83 in 1759 – as depicted in Figure 55, and compared to the trends emerging from the new estimates.

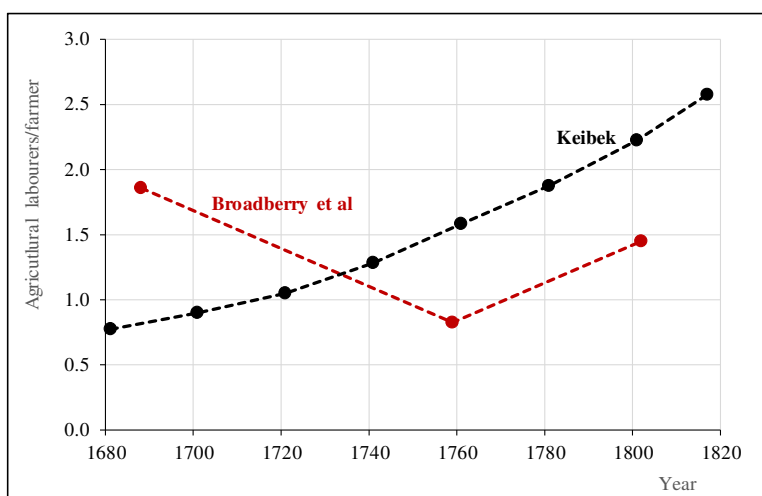


Figure 55. The number of agricultural labourers per farmer, according to the Broadberry et al figures and the new male occupational estimates (England and Wales, 1681-1817)

Sources: Broadberry et al, *British economic growth*, pp. 351-60; my own analyses.

Notes: Broadberry et al do not provide direct estimates of the numbers of farmers, but only for the number of all non-labourers in agriculture, which are overwhelmingly but not all farmers. I therefore estimated the farmer numbers used for the Broadberry et al data points using the share of farmers within all non-labourer workers in agriculture in my own figures. These were 97%, 88%, and 81% for 1688, 1759, and 1801/2, respectively.

Similarly, the number of manufacturing labourers is improbably high, particularly in 1688, and their relative decline over time is the main reason why Broadberry et al's secondary sector shares show little growth over time; amongst secondary-sector non-labourers, the Broadberry et al's figures actually suggest a similarly fast growth in numbers as the Crafts figures. The most substantial differences with the new estimates lie in the secondary and tertiary sector, as Table 26 shows and, as Table 27 shows, particularly in the non-labourers in the secondary sector and

in the number of traders and sellers.²⁰⁶ It is illustrative to compare the Broadberry et al estimate for the latter category of male workers with the 1851 census: the fact that in the, by this time, much more commercialised and urbanised 1851 economy, less than five per cent of men were employed in this sub-sector indicates how improbably high the Broadberry et al estimates of, for example, thirteen per cent in 1759 are.

The discussion above confirms a conclusion already reached on other grounds in Chapter 1: that the social tables provide far too shaky a foundation for such exercises in economic arithmetic. The same cannot be said of the existing, parish-register-based estimates generated by Shaw-Taylor and others in the Occupational Structure of Britain project – to which my new estimates will now be compared.

7.3.3 A comparison to Shaw-Taylor’s CEHMB figures

Shaw-Taylor’s estimates as published in his chapter, co-written with Wrigley, in the recent Cambridge Economic History of Modern Britain, provide sectoral as well as sub-sectoral figures, thus allowing a detailed comparison – presented in Table 28.

Table 28. A comparison to Shaw-Taylor’s figures, as published in the CEHMB (England and Wales, men only, c.1710-1851)

	c.1710			c.1817			1851		
	LST (%)	Keibek (%)	Delta (%)	LST (%)	Keibek (%)	Delta (%)	LST (%)	Keibek (%)	Delta (%)
Primary sector	50.8	46.6	-4.2	39.4	41.3	1.9	32.4	33.2	0.8
Agriculture	49.8	45.1	-4.7	35.7	37.4	1.7	26.9	27.5	0.6
Mining	0.6	1.2	0.6	3.2	3.3	0.1	4.9	5.1	0.2
Other	0.4	0.4	0.0	0.5	0.6	0.1	0.6	0.6	0.0
Secondary sector	37.2	41.7	4.5	42.1	42.7	0.6	44.6	44.7	0.1
Clothing	4.5	4.7	0.2	3.4	3.3	-0.1	3.4	3.4	0.0
Footwear	3.2	3.1	-0.1	3.8	3.8	0.0	3.9	3.9	0.0
Textiles	7.5	10.4	2.9	7.8	7.8	0.0	6.8	6.8	0.0
Metal trades & tools	4.3	4.1	-0.2	4.1	5.1	1.0	5.4	6.3	0.9
Building	6.1	7.0	0.9	7.4	9.7	2.3	7.5	9.0	1.5
Other	11.6	12.3	0.7	15.6	12.9	-2.7	17.6	15.3	-2.3
Tertiary sector	12.0	11.7	-0.3	18.5	16.1	-2.4	22.8	22.1	-0.7
Dealers and sellers	2.5	2.7	0.2	3.4	3.3	-0.1	4.7	4.7	0.0
Services & professions	5.1	5.7	0.6	8.7	7.7	-1.0	10.4	10.2	-0.2
Transport	4.4	3.3	-1.1	6.4	5.1	-1.3	7.7	7.2	-0.5

Sources: Shaw-Taylor, L., and E.A. Wrigley, ‘Occupational structure and population change’, in Roderick Floud, Jane Humphries and Paul Johnson (eds), *The Cambridge Economic History of Modern Britain. Volume 1. Industrialisation, 1700-1870* (Cambridge: Cambridge University Press, 2014), p. 59, table 2.2; Table 18, above.

Notes: Shaw-Taylor’s figures are presented in the ‘LST’ columns, with the ‘Delta’ column presenting the result of subtracting these figures from the new estimates, listed in the ‘Keibek’ columns. Shaw-Taylor’s

²⁰⁶ Called ‘commerce’ in Broadberry et al’s original figures.

sub-sectors of 'Iron and steel manufacture and products' and 'Machines and tools, making and operation' have here been combined into 'Metal trades & tools'.

Since the c.1817 and 1851 figures in the 'LST' and 'Keibek' columns are both derived from the same datasets, namely the parish-register-based c.1817 quasi-census and a PST-coded and GIS-linked version of the 1851 census returns, created by Shaw-Taylor and others in the past years, it is not surprising that the differences here are small. That there are nevertheless *some* differences is the result of dissimilar approaches followed by Shaw-Taylor and myself in attributing labourers to (sub-)sectors, as discussed in Chapter 3. It should be noted here that Shaw-Taylor chose to allocate all secondary-sector labourers to the 'other' category in this sector, whereas I have attributed them to sub-sectors, with many of them allocated to 'building'; this is the main reason for the higher 'building' and lower 'other' secondary-sub-sectoral figures in the new estimates compared to those published in the CEHMB. The more important differences between the new and Shaw-Taylor's CEHMB estimates are to be found in c.1710.

The first comment to make about the two sets of c.1710 estimates should be that they are largely in agreement. Nevertheless, the Shaw-Taylor estimates represent a moderately more agricultural economy, with a correspondingly smaller secondary-sector; indeed, the tertiary sector would also have been smaller in the CEHMB set of estimates had the same labourer-allocation approach been followed as in the new estimates. As discussed in Section 1.5.1, Shaw-Taylor's estimates for c.1710 are derived from parish register data only, reweighted for the over-representation of urban parishes and, within the rural set of parishes, of parishes from Lancashire, Cheshire, and the West-Riding of Yorkshire. There are three potential problems with this approach.

Firstly, it presumes that the parishes *within* the three reweighted sub-sets of parishes (urban, rural Lancashire/Cheshire/West-Riding, rural other) are representative of all English and Welsh parishes belonging in that sub-set. Secondly, Shaw-Taylor's approach requires knowing which weights to use in the reweighting procedure. The urban share of the population in c.1710 can only be established approximately. The share used in the calculations for the CEHMB estimates consists of two components, namely that of a small number of large towns for which the populations were estimated individually, and that of circa 700 small towns whose combined population was estimated collectively. The large towns are estimated to have provided a home to seventeen per cent of the c.1710 population in England and Wales, with small towns doing the same for fourteen per cent. The seventeen per cent estimate for large towns, based on Wrigley's work on urban populations, is unlikely to be far from the truth.²⁰⁷ But the reliability

²⁰⁷ Wrigley, 'Urban growth', p. 162.

of the collective, fourteen per cent estimate for the circa 700 small towns, derived from Peter Clark's work, is much more uncertain; Clark, who derives his estimate from Gregory King, calls the percentage 'almost impossible to calculate'.²⁰⁸ Since fourteen per cent of the c.1710 population corresponds to c.750,000 people, the suggested average population per small town is 1,150. This sounds low, since Clark describes these as places 'with a few thousand inhabitants'.

Thirdly, the reweighting technique ignores the inclusion of 'rural hinterland' in the urban parish registers. The urban weights are based on the populations of the actual towns, but the occupational structures are derived from parish registers which not always only covered the actual towns themselves but, quite often, also the rural villages and hamlets in the town's vicinity. For example, the parish of Ashton-under-Lyne covered the town of that name but also the rural villages and hamlets of Alt, Althill, Audenshaw, Bardsley, Broadcar, Crowthorne, Fairbottom, Hazlehurst, Lees, Little Moss, Luzley, Osterlands, Ridghill, Rosbotham, Sillinghurst, Smallshaw, Taunton, Windybank, and Woodhouses. It is difficult to determine the precise share of the overall parish population made up by this rural hinterland but it is likely to have been substantial, as indicated by the fact that more than forty per cent of the probate records for Ashton-under-Lyne parish give one of these hamlets as the domicile of the deceased.

Even in a large town like Chester, one in eight probate records in the early eighteenth century stem from villages and hamlets surrounding the city. And this figure underestimates the severity of the problem. Some of the city's parishes – Chester St. Oswald, Chester St. Mary on the Hill – are more properly described as semi-rural than urban. Since these two parishes both recorded occupations in the early eighteenth century, whereas many of Chester's more purely urban parishes did not, nearly two-thirds of the observations in the c.1710 parish register dataset for that city stem from those two parishes. It is not surprising, therefore, that the parish register database suggests a twenty per cent agricultural share for Chester's early-eighteenth-century occupational structure. In nearby Manchester, occupations were recorded only in the semi-rural parish of Manchester St Mary, leading to a suggested primary sector share of twenty-five per cent for that city.

Because the urban occupational structure used in the CEHMB reweighting technique is 'contaminated' with rural hinterland and, therefore, too agricultural, the urban-rural-reweighting approach exaggerates the national agricultural share. It may, however, be possible to remedy this defect of the approach. This would require that *either* observations from the rural hinterland be removed from the urban parishes *or* that the populations of the towns' rural hinterland be included in the urban weights. The former solution is impossible, since the parish registers do

²⁰⁸ Clark, 'Small towns in England 1550–1850: national and regional population trends' in Clark (ed.), *Small towns in early modern Europe* (Cambridge: Cambridge University Press, 1985), pp. 90-120.

not include information on domicile and, therefore, cannot provide finer geographical detail than the name of the parish. But the latter solution offers potential. For 114 small towns, baptism registers are available for c.1710, at an average of 520 per town. With a contemporary crude birth rate of 31 per 1,000 and an estimate 9 per cent under-registration of baptisms, 520 baptisms suggest an average town population of 2,300 people – compared to only 1,150 suggested by Clark’s small-town-population-share estimate, as discussed above. Parish registers are not an ideal source of population data, but the difference between these two figures is too great to be a mere coincidence. Using a figure of 2,300 rather than 1,150 would lift the population share of the 700 small towns *including their rural hinterland* from the 14 per cent used in the CEHMB calculations to 28 per cent. With this percentage, Shaw-Taylor’s reweighting technique would result in a national primary sector share of forty-four rather than fifty-one per cent, and a secondary sector share of forty-one rather than thirty-seven per cent, both of which are very close to the new estimates.

In conclusion, it is, if anything, comforting that the CEHMB figures are somewhat more agricultural than the new estimates, as this was to be expected and does not suggest a problem with the new estimates. Indeed, if we attempt to remedy the ‘rural hinterland’ defect, the difference between the CEHMB and the new estimates largely disappears. Nevertheless, it would be nice to have some additional independent evidence of the validity of the newly estimated occupational shares – which is the subject of the next section.

7.4 Independent support for the new estimates

The new estimates, presented above, are the results of a bottom-up calculation, using county populations to combine county-level estimates into national ones. In the final section of this chapter, these bottom-up calculations will be compared to the results of two independent top-level approaches – to discover whether the latter can provide independent support for the former.

7.4.1 From acres to agricultural workers

In the labourer-allocation technique discussed in Chapter 3, agricultural labourers were distinguished from non-agricultural labourers using a constrained multivariate regression approach. A similar approach can be applied to discover the relationship between the *total* number of agricultural workers (N_A) – yeomen, husbandmen, labourers, market gardeners, specialist agricultural workers – and acreage by land quality, elevation, and latitude, leading to the following expression:

$$N_A = \left[(1 + C_{Lat} \cdot Lat) \cdot \sum_i^{land\ types} C_{S,i} \cdot S_i \right]$$

with Lat representing latitude, S_i representing the surface area per type of land quality and elevation, with the equation to be resolved for predictor variables C_{Lat} and $C_{S,i}$ and with all $C_{S,i}$ constrained to values greater than or equal to zero.

When applying this to the c.1710 parish register dataset, an excellent fit is found, as is clear from the comparison between actual and ‘predicted’ numbers of agricultural workers in Figure 56, in which each data point represents a county.

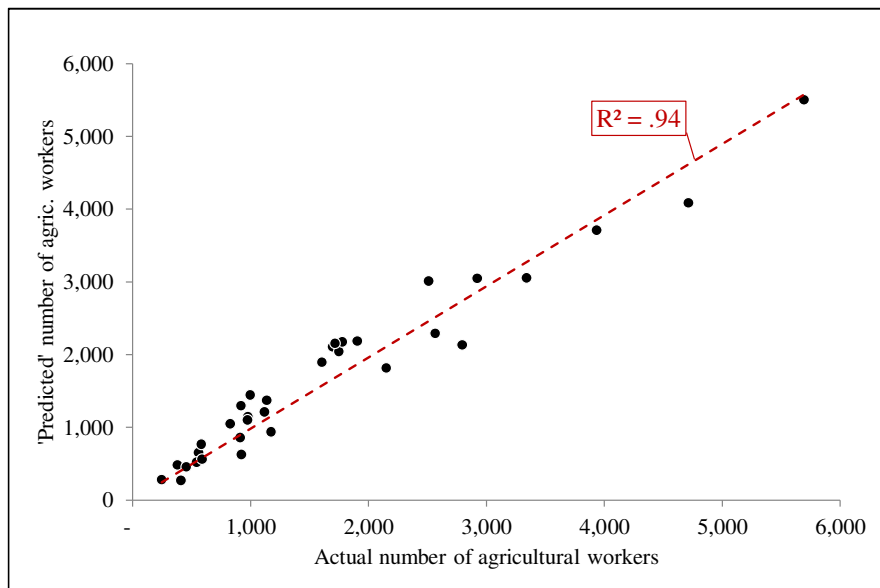


Figure 56. Results of the regression analysis at the county level (England, c.1710)

Sources: parish register dataset; Agricultural Land Classification Surveys for 1966, as published by Natural England (<http://publications.naturalengland.org.uk/publication/35012>); the Cambridge Group’s GIS.

Naturally, only counties for which parish register data are available in the early nineteenth century are included in Figure 56, and for each county, only the actually covered parishes are included. But the missing counties, and the missing parishes in the included counties can now be estimated, using the predictor variables calculated via the regression analysis. After all, we may not have contemporary occupational information for the missing areas, but we have exactly the same information on land quality and latitude which we have for the included parishes. Or, to express it differently, N_A may only be known for a *sample* of parishes in c.1710, but S_i and Lat are known for *all* parishes, and so are C_{Lat} and $C_{S,i}$ resulting from the regression analysis. It

can thus be estimated that, had all English parishes been covered in the c.1710 dataset, it would have contained 522,000 baptisms in England with an agricultural worker as the father. Since the dataset covers eight years, this corresponds to 65,250 baptisms of children of English farm workers per year. The figure has been limited to England here because, as will become clear, accurate population figures are required for the calculations, which are not available for Wales.

The 65,250 figure can now be compared to the total estimated number of English baptisms in c.1710. Given a contemporary population of 5,357,000 people, with a crude birth rate 31 per 1,000 and under-registration of baptisms at 9 per cent, the total number of English Anglican baptisms in c.1710 can be estimated to have been 151,171.²⁰⁹ The available parish registers suggest that seven per cent of men in c.1710 should be excluded from the labour force, being gentlemen, pensioners, providers of capital, invalids, unemployed, etcetera, reducing the number of relevant baptisms to 141,267 per year – of which English farm workers, as calculated above, made up 65,250, or 46 per cent. This is remarkably close to the bottom-up 45.1 per cent estimate from the calibrated probate approach.

7.4.2 From ‘reversing’ Shaw-Taylor’s reweighting approach

A second top-down estimate can be realised by, in a sense, reversing Shaw-Taylor’s reweighting approach. This, as will become clear, has the significant benefits of not requiring population estimates for urban, rural, or north-west-England in c.1710, and of being unaffected by any ‘rural hinterland contamination’ in the urban sub-set of parishes. It thus bypasses the two main problems of the reweighting approach, discussed above.

The approach consists of a number of steps, depicted Figure 57. In step 1, the c.1817 male labour force of England and Wales is divided along two axes – rural versus urban, north-west England versus the rest of England and Wales – into four groups, each of which is subdivided into the three occupational sectors, thus creating a matrix (A) of twelve cells. In step 2, a similar division is applied to the c.1710 male labour force for which occupational information is available in the parish registers, that is, who lived in the parishes that were part of the c.1710 parish register sample, resulting in a second matrix (B). The c.1817 labour force living in that same sub-set of parishes is divided in step 3, resulting in matrix C. In step 4, the corresponding cells in matrix B and C are compared one by one, to calculate the growth of the labour force per cell, expressed in terms of numbers of parish registers over the c.1710-c.1817 time period, collected in matrix D. In step 5, the inverse of the values in matrix D is applied to the corresponding cells in matrix A which, via step 6, results in a final matrix, E, representing the

²⁰⁹ Wrigley and Schofield, *The population history of England 1541-1871: a reconstruction* (London: Edward Arnold, 1981), pp. 531-62.

entire male labour force in c.1710. Determining the resulting estimate for the overall occupational structure in c.1710 is now simply a matter of adding up all the cells in matrix E which belong to one and the same sector, resulting in an estimated primary sector share of forty-two per cent, a secondary sector share of forty-three per cent, and a tertiary sector share of fifteen per cent. This is comfortably close to the national sectoral shares calculated via the bottom-up, calibrated-probate approach presented earlier.

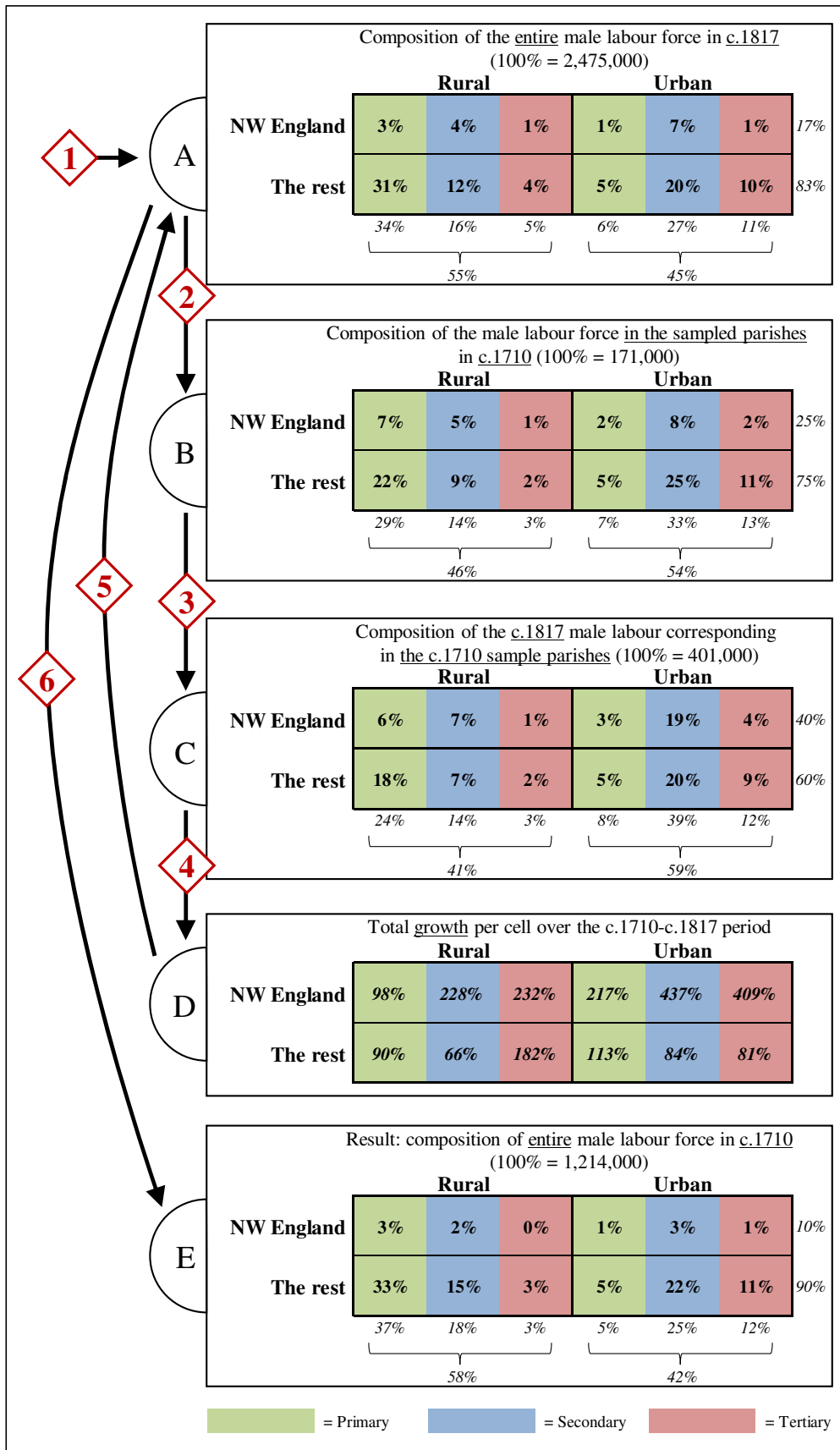


Figure 57. Description of the 'reversed reweighting' approach

As is clear from the above, the approach, in a sense, reweights the same three major components of the parish register dataset which were, explicitly, reweighted in the Shaw-Taylor approach, namely the urban parishes, the rural parishes in north-west England – i.e. Lancashire, Cheshire, and the West Riding – and the rural parishes in the rest of England and Wales. However, it does not require any c.1710 population estimates for these three groups of parishes, as it works entirely on the basis of growth factors, as calculated in step 4, and reverse applied in steps 5 and 6 of the approach. Nor is rural contamination of the urban sample a problem. This was a problem in the original reweighting approach because it makes it impossible to create a one-on-one match between the (purely) urban population shares and the (contaminated) urban occupational structures to which they were applied. However, in the ‘reversed’ approach, the match is automatic, since both the weights – implicitly created by the application of the growth factors in steps 5 and 6 – and the occupational structures are derived from the exact same subsets of parishes.

It should be noted that there is one important underlying assumption to this reversed approach: that the growth factors per cell, as determined in step 4 from parishes covered in both c.1710 and c.1817, are applicable to all the parishes in that cell, including those not covered in c.1710 by parish register data. This is a similar assumption underpinning the back-projection approach for counties without probate data, discussed in Section 6.2.2. As the discussion in that section showed, this assumption may be expected to be valid if the datasets to which it is applied are sufficiently large, which should be the case for all of the matrix cells in Figure 57.

8 EXPLORING REGIONAL DIVERSITY

The national estimates, discussed in the previous chapter, are constructed bottom-up from county-level estimates, weighted by contemporary county populations. Counties are a logical building block when using probate data since ecclesiastical jurisdictions largely followed county boundaries – as borne out by a quick glance at the maps in Appendix A – which is reflected in the many county-based datasets from which the probate database was constructed. But the building blocks themselves are arguably as interesting as the national edifice fashioned from them. They are explored in Appendix B, individually, in forty-one short chapters. In each chapter, the development of the male occupational structure in a given county is presented in twenty-year time intervals, in a table and a set of figures identical in design to those for the national occupational structures in the previous chapter. Furthermore, nearly seven hundred maps are provided to allow exploring occupational developments at even smaller geographical scales, albeit at the expense of occupational detail.

Undoubtedly to the examiners' relief, a PhD dissertation does not provide room for a discussion of the results per county. Therefore, this chapter will focus on employing the county-level results for investigating in which way they modify the impressions left by the national picture. By necessity, the national accounts approach treats Britain as a uniform entity but, as already quoted in Chapter 1, Crafts and Harley themselves commented that 'exploring [regional] diversity offers the potential of a set of quite different and valuable insights into the experience of the industrial revolution.'²¹⁰ The aim of this chapter is to demonstrate that the much more detailed material provided in Appendix B can be used for such a purpose.

²¹⁰ Crafts and Harley, 'Restatement', p. 721.

8.1 Disparate regional trajectories

Figure 58 charts the development of the agricultural and secondary-sector labour shares in four counties over the period examined in this dissertation. As the stylised trend lines show, there were stark differences in how these shares developed in each county. And none of them developed in line with the national trends. Economic developments, reflected in the development of the composition of the labour force, were far from uniform, and the national economic developments are a poor guide to understanding them – as a closer look at Figure 58 illustrates, starting with the percentage of men working in agriculture.

Although this percentage started out somewhere in the low fifties to mid sixties in all four selected counties in 1600, Staffordshire and Lancashire's had dropped to around forty per cent by 1700, whilst Berkshire's had not moved much at all. In Norfolk in that year, however, less than thirty per cent of men was still employed in agriculture. Yet, in the early nineteenth century, Norfolk's agricultural labour share had risen again to levels exceeding those of two-hundred years earlier. By then, in Staffordshire, only one in four men was still working in agriculture, whilst in Lancashire, that figure had dropped to less to one in five. Meanwhile, in Berkshire, the relative decline in importance of agriculture as a male employer was only just beginning.

Developments in the secondary sector were equally varied. Lancashire and Berkshire's labour shares in this sector started out virtually at the national average of twenty-eight per cent, but where the former rose rapidly and continuously until the early eighteenth century, peaking just below seventy per cent, Berkshire's remained essentially flat. Staffordshire's secondary labour share started out slightly higher than in the former two counties, rose fairly rapidly but levelled off in the mid-eighteenth century just shy of sixty per cent, after which it experienced a slow decline. The decline in Norfolk was much more dramatic and came half a century earlier.

Around 1700, Norfolk's secondary-sector labour share peaked at sixty-three per cent, higher than any other county in England and Wales, and exceeding Lancashire's by eight per cent. But from being England and Wales' most industrialised county in 1700, Norfolk had developed into one of the more agricultural counties by the early nineteenth century, when its secondary labour share was less than half that of Lancashire's, and ten per cent below the national average.

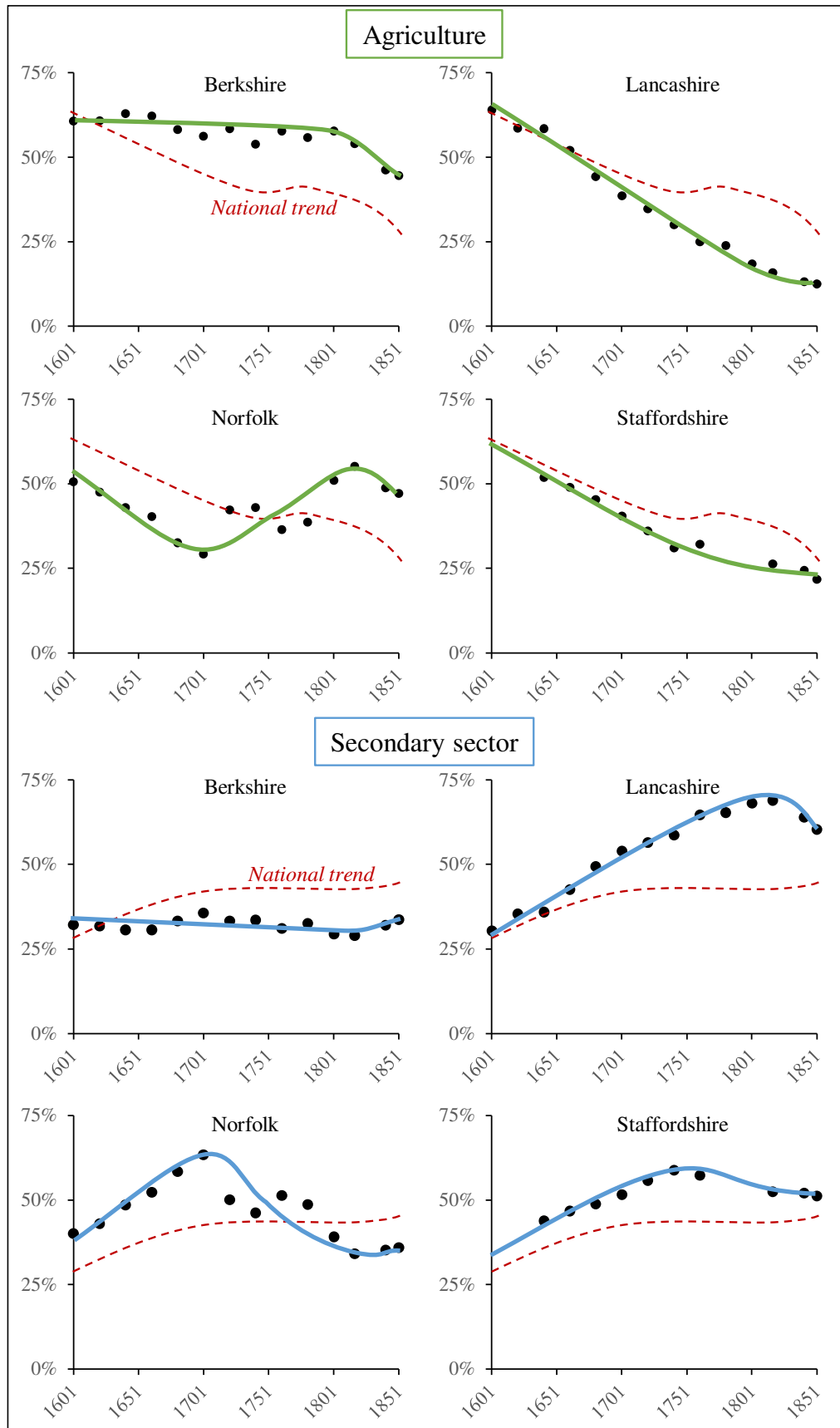


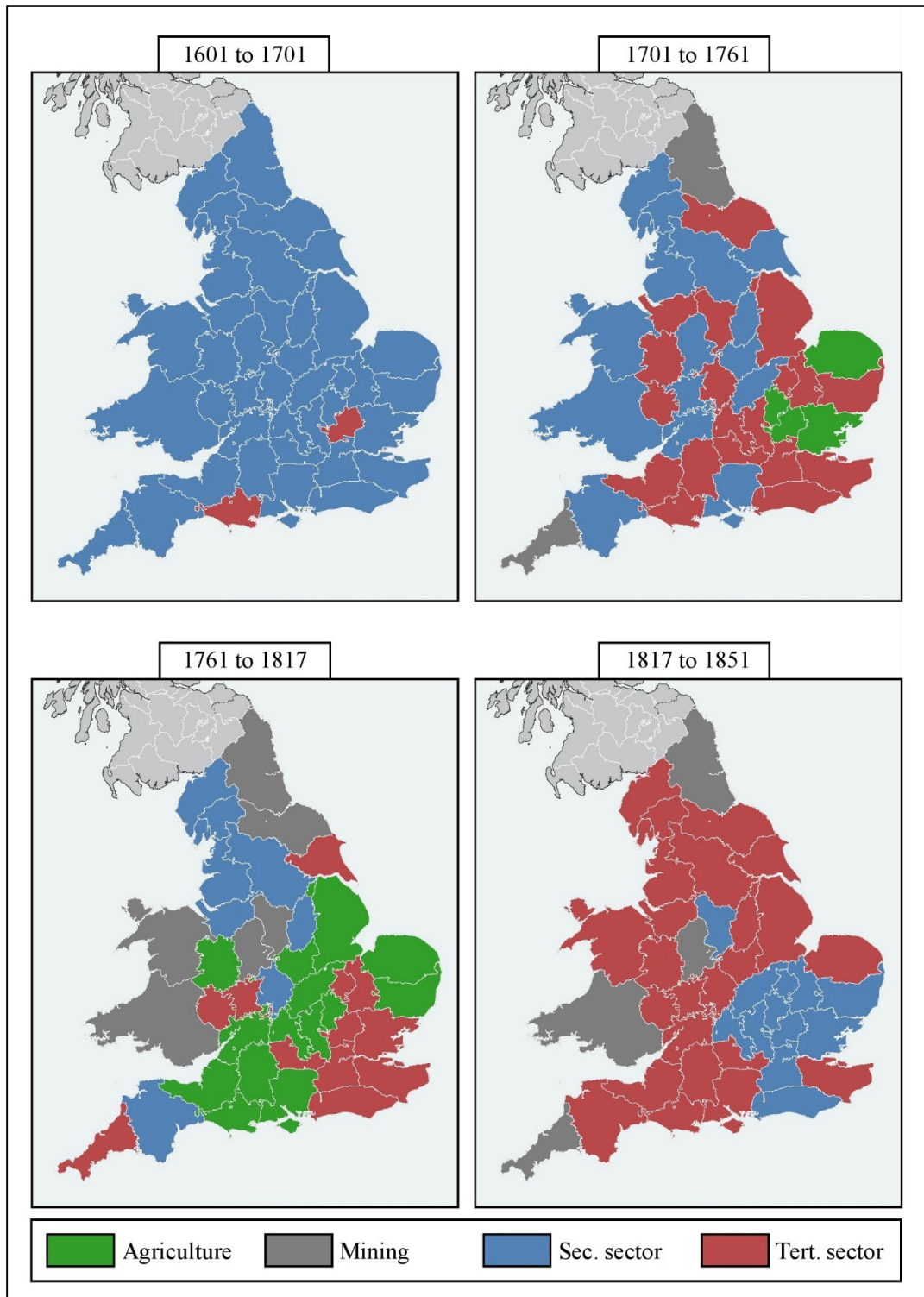
Figure 58. Labour share developments in four counties, compared to national trends (1601-1851)

Economic developments in most of the above counties have received a great deal of scholarly attention, and local historians may recognise many developments in ‘their’ county, depicted in Figure 58 – although a closer comparison between the trend lines and the literature may provide food for discussion. The relative decline in the importance of the secondary sector as an employer of Staffordshire men after 1750, the steepness, suddenness, and early timing of the decline in Norfolk, and the (superficial) lack of any kind of high-level occupational change at the sectoral level in Berkshire, may all differ somewhat from the existing narrative. But discovering, let alone explaining ‘regional surprises’ is not the goal of this chapter. Instead, Figure 58 is included here to illustrate the great variation in regional economic trajectories in this period.

Map 7, depicting the sector with the largest labour share growth per county over four subsequent time intervals, illustrates the same point. Labour share growth has here been defined, straightforwardly, as the difference between the labour share of a sector – expressed as a percentage of the overall labour force – at the beginning and end of a time interval. So, if sector A grew from 20 to 40 per cent in period X, whilst sector B grew from 5 to 20 per cent in the same period, sector A is considered higher-growth than B. Alternative definitions of labour share growth would have been possible, which would have led to somewhat different maps. As the map shows, development still appears to have been fairly uniform in the seventeenth century, with the secondary sector the principal benefactor of intra-sectoral shifts in labour share. But this apparent uniformity is no longer evident in the map section for the 1701-1761 period, during which the secondary sector remained the main growth sector in only a third of all (combinations of) counties. In half of the counties it was now the tertiary sector which gained the most in labour share over the period, with the remaining quarter of counties split between agriculture and mining.

During the 1761-1817 period, representing the first phase of the Industrial Revolution, the secondary sector lost its prominence as the main growth sector in all but a few counties, concentrated in the heartlands of the Industrial Revolution: the north-west of England and the West Midlands. But in some of the West Midlands’ counties it was mining which had become the main growth sector, as was also the case in Wales, Durham and Northumberland, and the North Riding. Most remarkable, however, are the large patches of green in the map for this period: although nationally, agriculture moderately declined over this period, in a third of all counties, it was the most important growth sector, demonstrating the degree to which industrialisation and de-industrialisation went hand-in-hand during the Industrial Revolution. It should be remarked that in many of the ‘red’ counties in the south- and south-east of England in

map section for that period, agriculture also gained some labour share, just not as much as the tertiary sector.



Map 7. Sector experiencing the largest growth in labour share, by county and time period (England and Wales, 1601-1851)

Sources: probate dataset; parish register dataset; 1841 and 1851 censuses.

Notes: the following counties were combined: Durham & Northumberland; Lincolnshire & Rutland; Middlesex & Surrey (including the parts of London in both counties, but not the limited parts of London in Kent); the southern Welsh counties (Brecknockshire, Cardiganshire, Carmarthenshire, Glamorganshire, Monmouthshire, Pembrokeshire, and Radnorshire); the northern Welsh counties (Anglesey, Caernarvonshire, Denbighshire, Flintshire, Montgomeryshire, and Merionethshire). Most labour shares before 1817 were calculated using the calibrated-probate approach, except for those counties for which no probate data were included in the dataset, and for time periods not covered in that dataset – as described in Chapter 6. The selection of the highest-growth per county was made, straightforwardly, as the one with the largest growth in terms of share of the labour force between beginning and end of the period. So, if sector A grew from 20 to 40 per cent in period X, whilst sector B grew from 5 to 20 per cent in the same period, sector A is considered higher-growth than B. Alternative selection methods would have been possible, which would have led to somewhat different maps.

Only in the 1817-1851 period did the secondary sector regain its prominence in that, formerly de-industrialising part of the country, indicating the degree to which industrialisation spread more widely again in the later phases of industrialisation. However, in the clear majority of counties – including those in the aforementioned heartlands of the Industrial Revolution, by now significantly urbanised – it was the tertiary sector which, mimicking national developments, benefitted most strongly from shifts in the male labour share.

In short then, the picture which emerges from Figure 58 and Map 7 suggests an approximate split into three reasonably distinct periods. During the seventeenth century, developments were relatively uniform, characterised by a structural shift of the labour force from agriculture to industry in virtually every county. During the eighteenth- and early nineteenth century, however, developments were anything but uniform, with some counties rapidly industrialising whilst agriculture regained ground in others. But the tertiary sector also, for the first time, became the principal benefactor of labour share shifts in many counties, whilst in certain counties – Cornwall, Staffordshire, South Wales, Durham and Northumberland – it was mining which fulfilled this role. Succeeding this period of disparate trajectories, developments regained some of their former uniformity, with the tertiary sector now the growth sector in most counties, except – unsurprisingly – for counties with particularly large mineral deposits, and for the formerly de-industrialising south-east of England which appears to have been on a catch-up trajectory to the rest of the county in terms of secondary sector share.

This interpretation can be further substantiated by calculating what I will call an ‘unidirectionality index’ for each period, defined as follows:

$$U_x = \frac{|N_{\uparrow} - N_{\downarrow}|}{N_{\uparrow} + N_{\downarrow}}$$

with N_{\uparrow} indicating the number of counties in which the labour share of sector X grew, and N_{\downarrow} that in which it shrunk. So if, in a given period, the labour share of sector X moved in the same

direction in all counties – that is, increased everywhere or decreased everywhere – this translates into U_X being one. If, however, sector X increased in labour share in half of the counties but decreased in the other half, the resulting unidirectionality index value is zero. An U_X of 0.5 indicates a situation in which sector X's labour share moved in one direction in three-quarter of all counties, and in the opposite direction in the other quarter. The calculated values, for all sectors individually and averaged across all three sectors, are depicted in Figure 59. It confirms the interpretation of Figure 58 and Map 7, above: whilst labour shares moved virtually entirely in the same direction during the seventeenth century and after 1817, in the intermediate period, representing the run-up to and first stages of the Industrial Revolution, labour share developments could scarcely have been less uniform, particularly in the primary and secondary sectors. Put differently, this was a country with increasing regional specialisation during this period – as will be discussed in the next section.

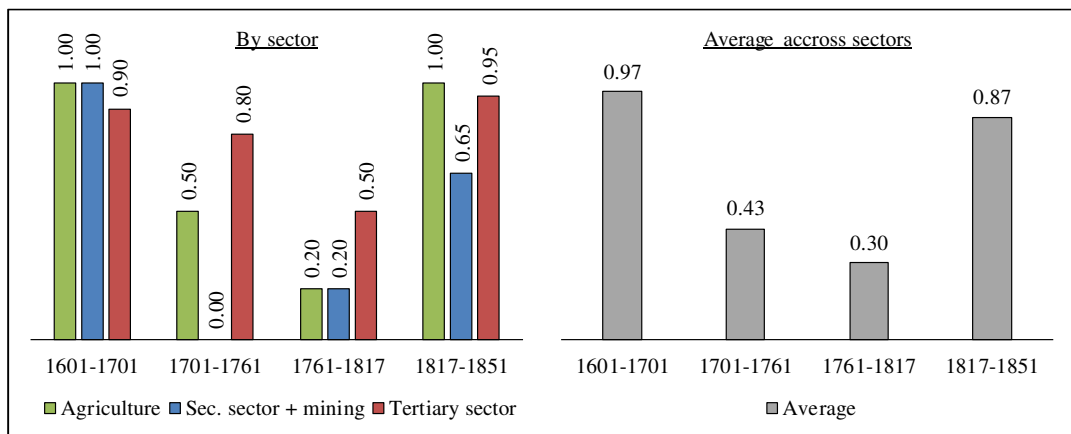


Figure 59. Unidirectionality index values per sector and period (England and Wales, 1601-1851)

Sources: see Map 7.

Note: for the definition and interpretation of agreement scores, see main text.

8.2 Spatial concentration of economic functions

There are two developments in which area X in country Y will see its portion of the overall country Y's total labour force in sector Z increase: if the overall population growth in area X exceeds the average for country Y, or if the composition of the labour force in area X shifts towards sector Z more rapidly than in general in country Y. In the Section 8.1, it was discussed that labour shares did, indeed, not develop uniformly throughout England and Wales during the 1600-1850 period, that local labour shares shifted more rapidly in some counties than they did in others. And it was found that during the eighteenth and early nineteenth century, these shifts were often even in opposite directions: where some counties industrialised, others became more

agricultural. Spatial differences in population growth were not discussed in Section 8.1 but these were considerable too; between 1700 and 1820, England's population doubled, but in Lancashire, Cheshire and the West-Riding it quadrupled, whereas in, for example, East-Anglia, it grew with 'only' sixty per cent. These two developments – spatial differences in population growth and in the direction of labour share shifts – must have created a degree of spatial concentration of economic functions. Figure 60 and Figure 61, below, provide more direct and quantitative evidence of this.

In the several sub-charts in these figures, the English and Welsh labour force in agriculture and the secondary sector (Figure 60) and in selected sub-sectors of the secondary sector (Figure 61) has been divided into geographical areas, and tracked over the 1600-1850 period. Several lessons can be drawn. Firstly, although the increase of geographic diversification was not limited to the eighteenth and early nineteenth century, it was clearly much more intense during this period. Southern England substantially increased its portion of the male agricultural labour force over the period studied in this dissertation, but all of this increase took place during the years between 1701 and 1817, when it grew from thirty-three per cent to forty-one per cent. The proportion of secondary sector workers living in the 'industrial heartlands' – Lancashire and Cheshire, the West-Riding, and the West Midlands – grew continuously over the time period this growth too accelerated after 1701 and decelerated after 1817. The clothing, textiles, and metal wares sub-sectors, depicted in Figure 61, largely adhered to this pattern; it is particularly striking that in all three sub-sectors, spatial concentration appears to have peaked around 1817, and decline thereafter, suggesting dissemination of production technologies pioneered in the 'heartlands' to other areas in the more mature phases of industrialisation.

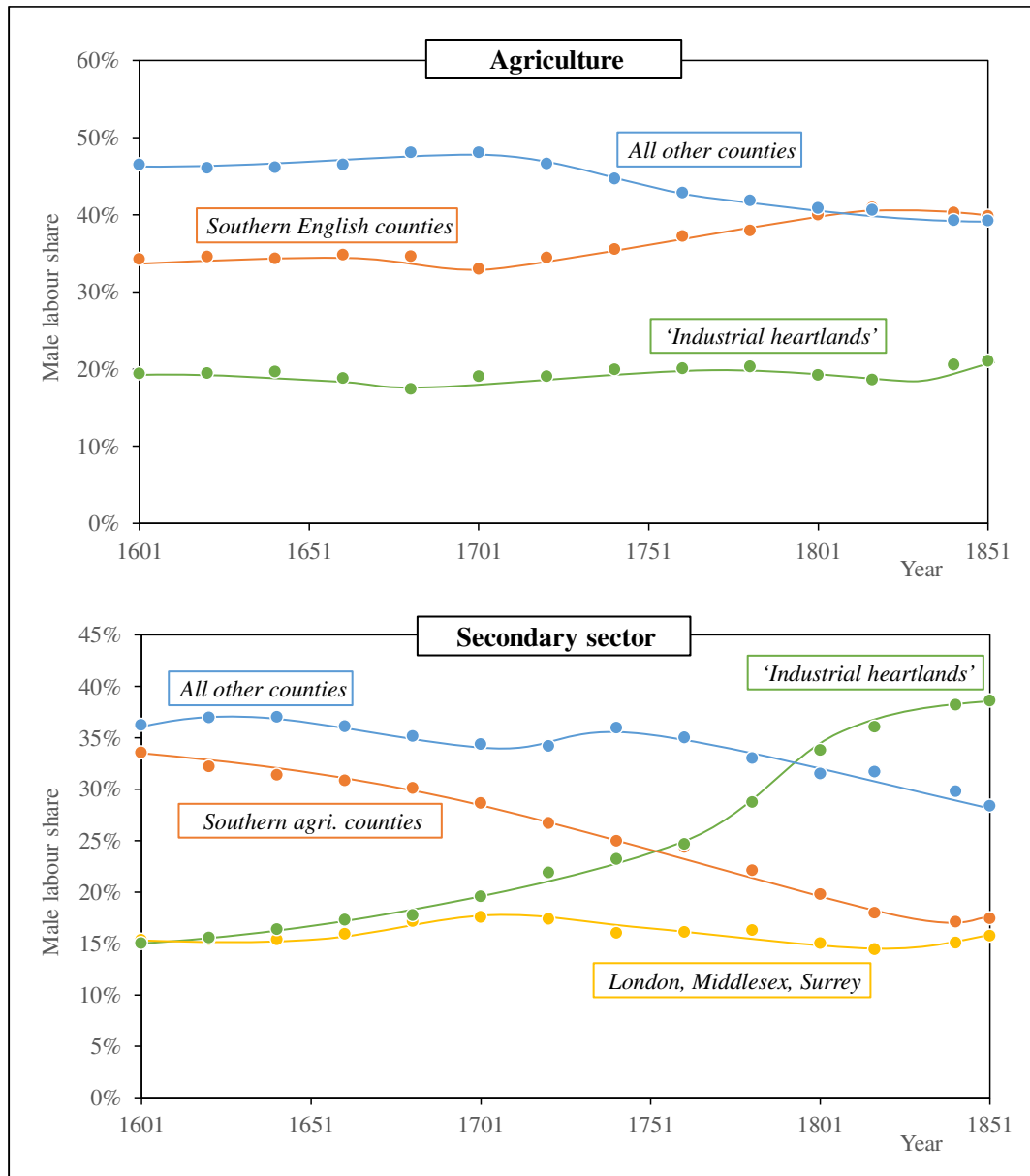


Figure 60. The geographical distribution of the male labour force across selected groups of counties, for three (sub-)sectors (England and Wales 1601/1701-1851)

Sources: probate dataset; parish register dataset; 1841 and 1851 censuses.

Notes: the 'industrial heartlands' in the top and bottom chart refer to Lancashire, Cheshire, the West-Riding, Staffordshire, Derbyshire, and Warwickshire.

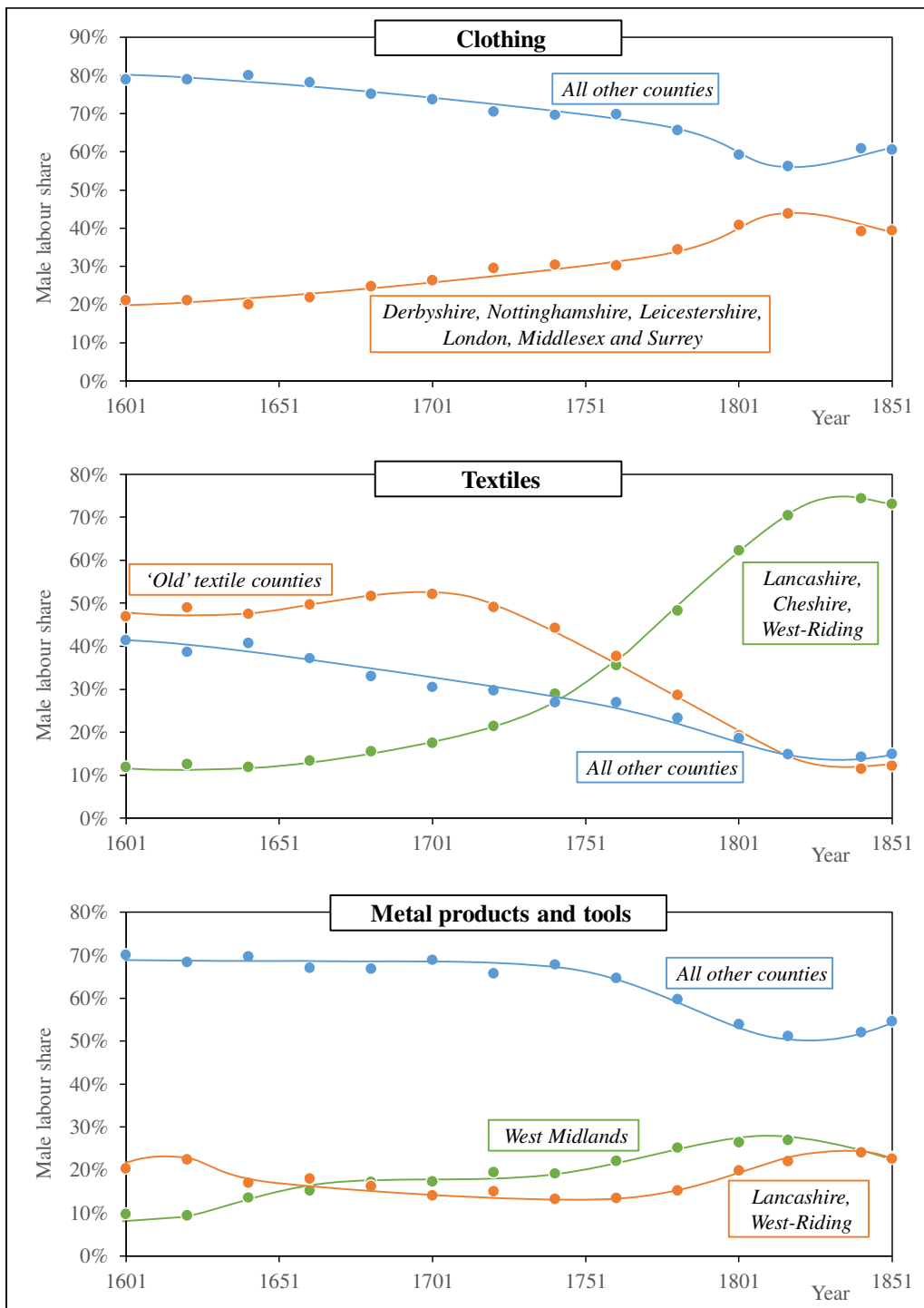


Figure 61. The geographical distribution of the male labour force across selected groups of counties, for three sub-sectors in the secondary sector (England and Wales 1601/1701-1851)

Sources: see Figure 61.

Secondly, the degree to which economic functions were concentrated in specific areas was not only dependent on the time period – peaking in c.1817, diminishing thereafter – but also on the

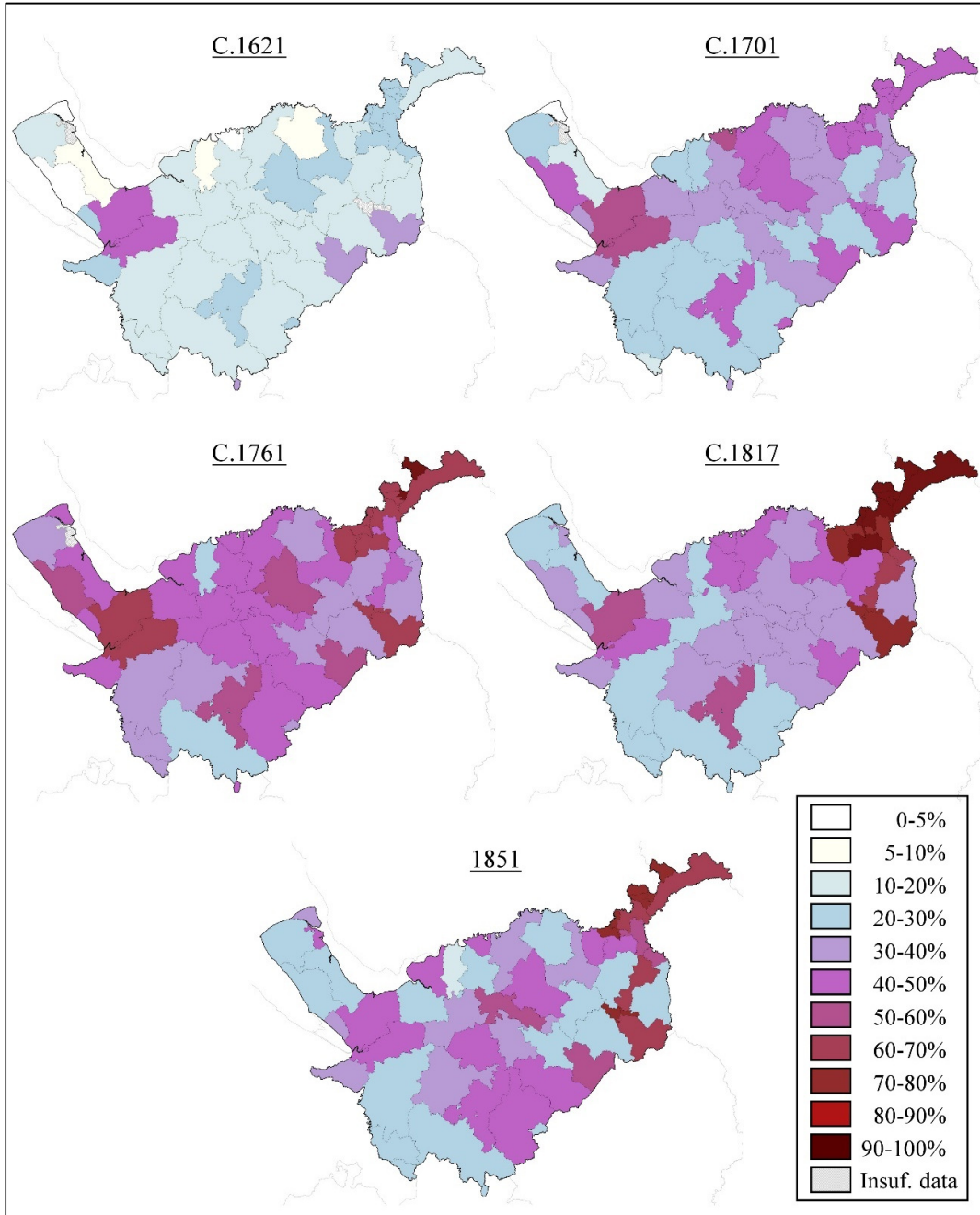
specific (sub-)sector. Textiles, the poster child of the Industrial Revolution, had become very highly concentrated indeed by c.1817, with Lancashire, Cheshire, and the West-Riding increasing their share of the total male labour force from just over ten per cent in 1601 to almost seventy-five percent in the early decades of the nineteenth century. However, textiles were a highly concentrated industry in the seventeenth century too. Indeed, the growth of the new textile counties came to a significant degree at the expense of the more traditional textiles areas – Norfolk, Suffolk, Essex, Gloucestershire, Somerset, Dorset, Wiltshire, as well as London – which saw their combined share decline from fifty-two per cent in 1701 to eleven per cent in 1841. Spatial concentration appears to have been much lower in clothing and metal wares. This is perhaps not very surprising; many of the workers in the clothing sector were bespoke tailors, by necessity living near their geographically dispersed customer base, and the many general blacksmiths in the metal industry were similarly in need of proximity to their customers. Nevertheless, it is clear that the textiles industry presents an extreme example of functional concentration, not achievable in most other industries.

Thirdly, it is clear that differential population growth was a factor which, as expected, intensified but, to a degree, also moderated spatial concentration. In relative terms, the male labour force in Lancashire, the West-Riding and, to a lesser degree, Cheshire experienced a strong structural shift away from agriculture throughout the 1600-1850 period. However, ‘relative’ is the operative term here. As the agricultural chart in Figure 60 shows, the overall portion of the English and Welsh agricultural labour force working in these three counties did not, actually, decrease, standing at nineteen per cent in 1601 compared to twenty-one per cent in 1851. The rapid population increase in these three counties created strong demand for food stuffs, most of which was undoubtedly met by counties increasingly specialising in agricultural production, amongst which many were former competitors in the textiles industry such as Norfolk and Wiltshire. Nevertheless, given the cost and difficulties of transporting fresh produce, it also created demands which could better be met locally – evident in the rapidly growing market gardening activities surrounding the new urban centres.²¹¹ And it also provided increased opportunities for specialised agricultural production, such as Cheshire cheese, which could be exported to other areas in England and Wales, profiting from improved transport links, themselves partially the result of the export (and import) needs of the textiles industries.

But there may have been another reason also. The old textile counties may have been reduced to food producers for surging Lancashire, Cheshire, and the West-Riding, but on a smaller scale, within these three rapidly rising counties, manufacturing also became more spatially concentrated – as is clearly visible in Map 8, depicting local developments in the secondary –

²¹¹ As discussed extensively in Scola, *Feeding the Victorian city: the food supply of Manchester, 1770-1870* (Manchester: Manchester University Press, 1992).

sector labour share in Cheshire. Just like Norfolk, Wiltshire, and other traditional textiles' counties 'lost out' in the competition with, amongst others, Cheshire, so manufacturing declined in large parts of Cheshire itself, with the county's textile industry rapidly concentrating in the eastern areas of the county, around Stockport, Macclesfield, Congleton and, particularly in the north-eastern corner of the county, bordering Manchester in neighbouring Lancashire.



Map 8. Male secondary sector labour sector per registration sub-district (Cheshire, 1621-1851)

Sources: probate dataset; parish register dataset; 1841 and 1851 censuses.

A more precise measure of the increasing spatial concentration within Cheshire is provided in Figure 62: the eastern part of Cheshire, described above, coincided with Macclesfield hundred which, as the figure showed, was home to no fewer than eighty-six per cent of the county's textile workers by c.1817.

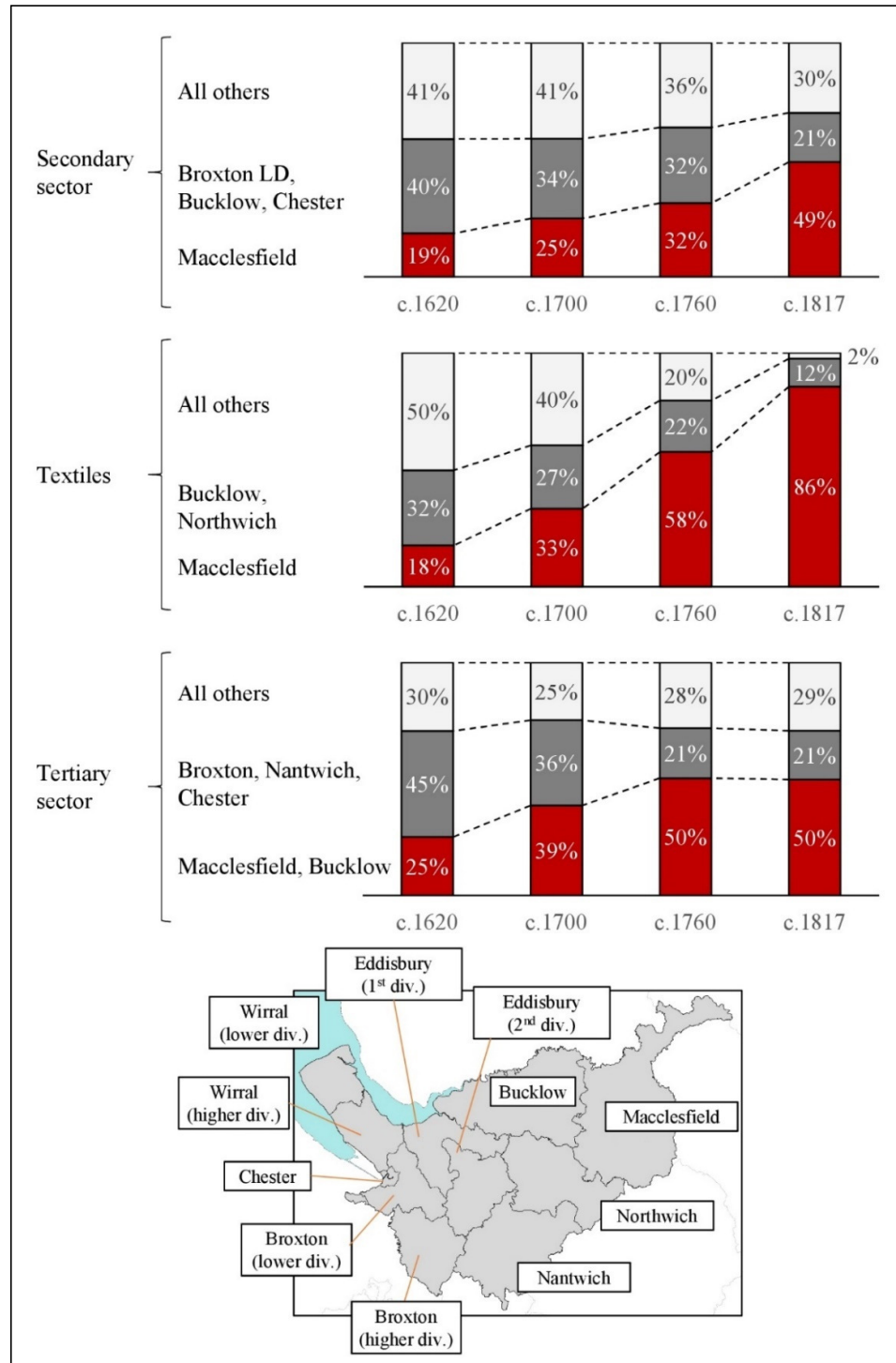
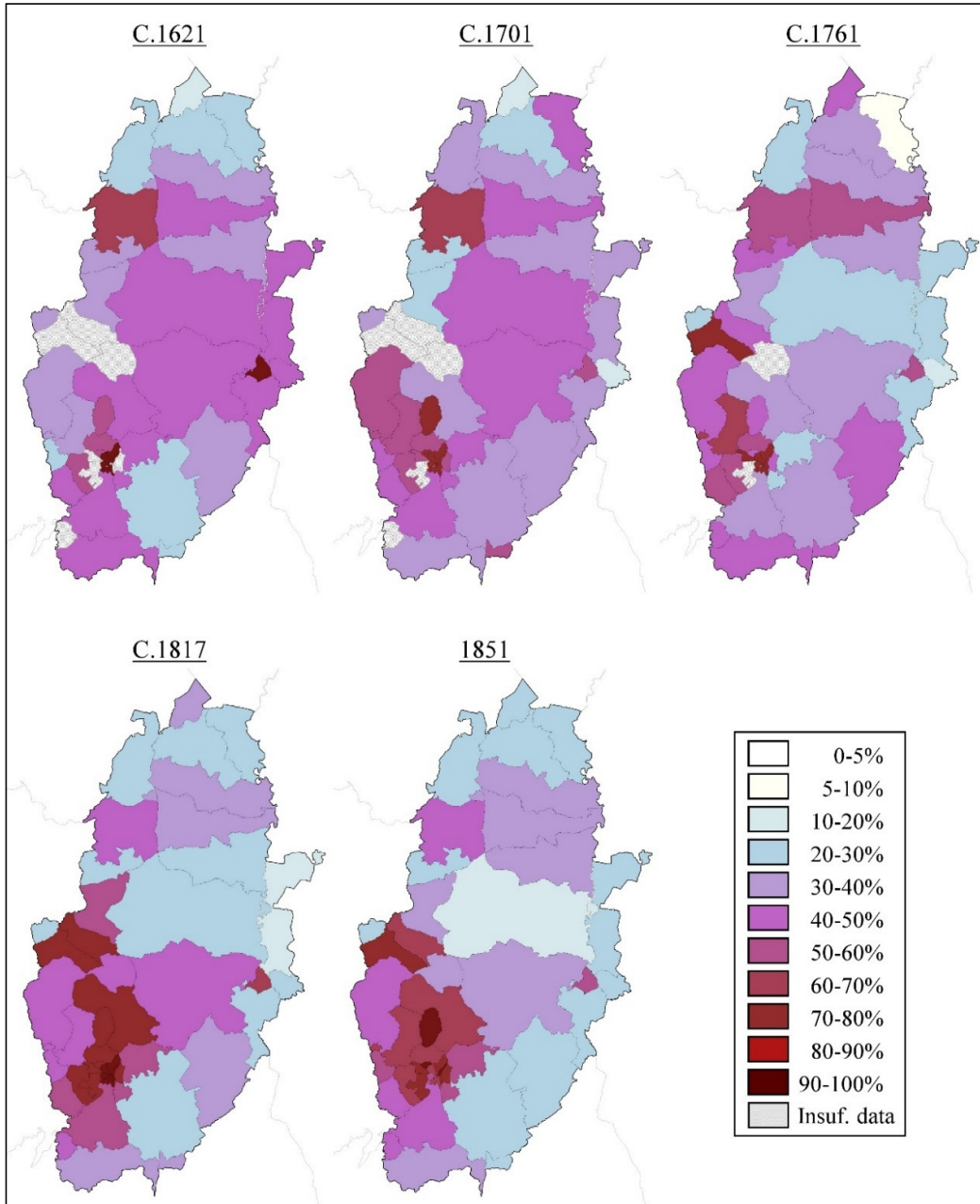


Figure 62. Labour shares for selections of hundreds (Cheshire, c.1620-c.1817)

As a consequence, agriculture regained importance in other parts of Cheshire, which de-industrialised. Thus, national developments were mimicked on a smaller scale within the county. Other counties experienced a similar increase of industrial concentration during the eighteenth and early nineteenth century – as Map 9 and Figure 63 illustrate for Nottinghamshire.



Map 9. Male secondary sector labour sector per registration sub-district (Nottinghamshire, 1621-1851)

Sources: probate dataset; parish register dataset; 1841 and 1851 censuses.

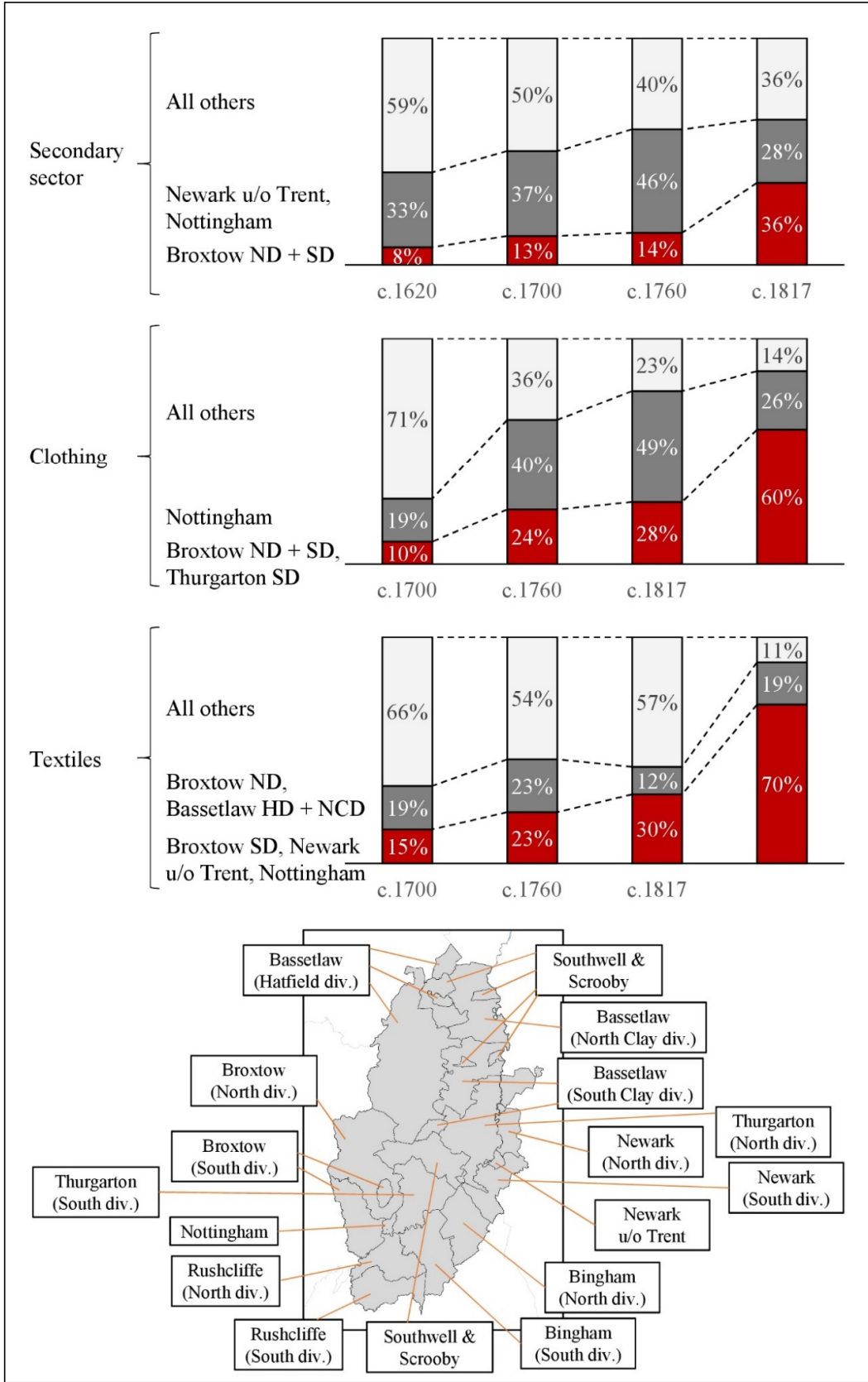


Figure 63. Labour shares for selections of hundreds (Nottinghamshire, c.1620-c.1817)

The urban-rural occupational divide provides another venue for examining the importance of local developments. Many of the industrial concentrations emerging during the eighteenth and early nineteenth century were, or gave rise to towns. When analysing the relative roles played by town and countryside in economic developments, it is necessary to know, at least approximately, how the rural and urban occupational structures differed from one another, and how they each developed over time. Estimating the urban occupational structure for England and Wales is not as straightforward as it may seem, however. As discussed earlier, urban parishes were often not purely urban, being 'contaminated' with villages and hamlets from the towns rural hinterland. So, if one were to simply add up the occupational structures of all 'urban' parishes, many rural areas would inadvertently be included in the combined total as well. Things are simpler for rural areas. By excluding all parishes with even a potential town in them, one can be sure to end with a collection of parishes which were purely rural. Since lists of (market) towns are available for many time periods, determining the rural occupational structure is fairly straightforward.

But this then provides a solution for calculating the urban occupational structure too, provided the overall urban and rural population shares in England and Wales are known. The overall occupational structure of England and Wales is the average of the occupational structures of rural and urban England and Wales, weighted by their relative population shares. Therefore, since the weights are known, as well as both the overall and rural occupational structures of England and Wales, the national urban occupational structure can be calculated. This was done for the early eighteenth and the early nineteenth century, using the same urban and rural shares used by Shaw-Taylor and Wrigley in their CEHMB chapter, leading to Table 29, below.

Two things are immediately clear from the table. Firstly, and entirely unsurprisingly, there were stark differences in occupational structure between rural and urban England and Wales. Secondly, and more interestingly, the shifts in labour share occurring within the rural and urban sections of England and Wales were largely to the benefit of the primary sector in the rural parts, and to the benefit of the tertiary sector in the urban parts of the country. One could say that, in occupational structure terms, the country side became more purely rural and the towns more clearly urban in character.

Since this coincided with a significant overall shift in population from the countryside to the towns, this being a period of significant urbanisation, this had important consequences for the relative numbers of rural and urban workers within the secondary and tertiary sectors – as depicted in Figure 64. Whereas one in every two secondary sector worker in the early eighteenth century lived in the countryside, this was the case for only one in three a century later. And the rural proportion of tertiary sector workers declined from one-third to one-eighth over the same period.

Table 29. Urban and rural occupational structures at two points in time
(England and Wales, c.1710-c.1817)

	Rural		Urban	
	c.1710 (%)	c.1817 (%)	c.1710 (%)	c.1817 (%)
Primary sector	63	70	4	5
Agriculture	62	64	3	4
Mining	1	5	1	1
Other	0	1	0	0
Secondary sector	31	26	68	62
Clothing	4	2	7	5
Footwear	2	2	5	5
Textiles	7	4	17	13
Metal trades & tools	4	3	9	7
Building	7	8	10	12
Other	7	7	20	20
Tertiary sector	6	4	28	33
Dealers and sellers	1	0	7	7
Services & professions	3	2	11	16
Transport	2	2	10	10

Sources: probate dataset; parish register dataset; urban share estimates from Wrigley, 'Urban growth and agricultural change: England and the continent in the early modern period', *The Journal of Interdisciplinary History*, 15:4 (1985), pp. 683-728; Clark, 'Small towns in England 1550–1850: national and regional population trends', in Peter Clark (ed.), *Small towns in early modern Europe* (Cambridge: Cambridge University Press, 1985), pp. 90-120.

Notes: for the way in which these shares were calculated, see main text.

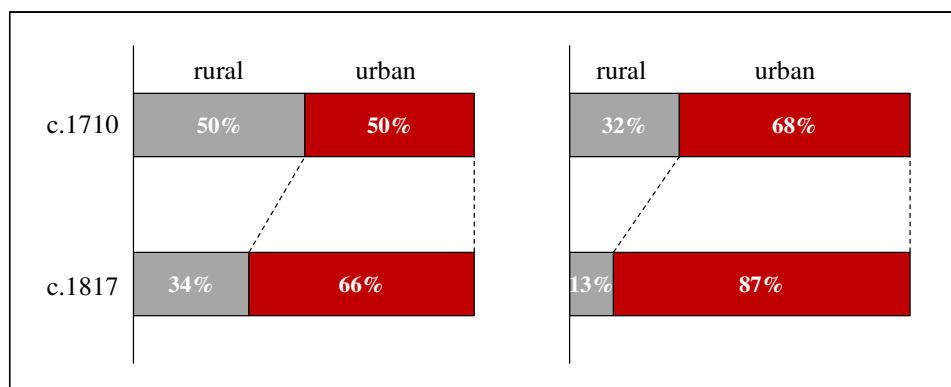


Figure 64. Share of urban and rural workers per sector
(England and Wales, c.1710-c.1817)

Sources: see Table 29.

Developments in the rural-urban split at sub-sectoral level were equally dramatic. Over the

c.1710-c.1817 period, the percentage of rural workers dropped from 47 to 26 in textiles, from 55 to 30 in clothing, from 40 to 15 in services and professions, and from 20 to 5 amongst dealers and sellers.

In summary then, the surface-level calm suggested by the national figures for the 1701-c.1817 period, presented in Chapter 7, are rather misleading. Below the surface, at regional and local scales, developments could hardly have been more turbulent. What all of this means for our understanding of the longer-term economic of England and Wales will be discussed in the next, final chapter.

9 CONCLUSIONS

The research for this dissertation is built on an extensive foundation of earlier work in the Occupational Structure of Britain project, envisioned, initiated, and led by Shaw-Taylor and Wrigley. It utilizes the project's occupational and geographical codification systems, as well as the parish register and census datasets created by other members of the project. Even the probate data which form my analyses' main data source had partially already been collected before I joined the project. This allowed me to focus much of my attention on addressing a number of methodological challenges, and on applying the resulting approaches to the aforementioned probate data. The major 'take-away' from the methodological chapters in this dissertation must be that probate and parish register data complement one another beautifully. In combination, in the form of calibrated probate data, they provide temporally and spatially detailed information on male occupational structures for most English and Welsh counties during the 1600-1850 period.

It therefore proved possible to use the calibrated probate data as the basis for a set of estimates of male occupational structure, at the level of sectors and sub-sectors, at twenty-year time intervals. These estimates are at the national level as well as, in many cases, for individual counties, though not always over the entire 1600-1850 period. Similar estimates, albeit it at reduced temporal and occupational detail, were created at the levels of regional sub-districts, and are included in this dissertation in the form of a large number of maps.

Occupational estimates like these provide a uniquely reliable and detailed basis for analysing economic developments in the 1600-1850 period. For example, when and where credible estimates of economic (sub-)sectoral output are available, the occupational estimates allow one to determine (sub-)sectoral labour productivity which, in turn, provides a measure of the effects of technological and organisation innovations. This example was not chosen randomly. The current occupational basis for labour productivity calculations before the nineteenth century,

consisting largely of so-called social tables, is fatally flawed; not only are these tables unreliable in what they record, but translating the categories employed in them into occupational sectors requires considerable guess-work.

But fine-grained occupational data have other major advantages over social-tables-style data beyond their 'mere' reliability. They provide continuous, year-by-year coverage over time and, thereby, allow one to accurately pinpoint moments of economic change. They cover all economic activities, and do not require reconstructing economic (sub-)sectors from a small set of commodities for which historical information happens to exist, for example because they were subject to a specific tax. Most importantly, such information 'provides the raw material for a closer understanding of regional economic specialisation and economic integration, one of historical geography's liveliest debates', as Glennie wrote.²¹²

The national accounts literature has been of tremendous value in improving our understanding of Britain's transition to modern economic growth. But, by its very nature, it can only hope to do so at the level of the national economy. Occupational data allow one to view the historical economy from national, regional, and local angles. Switching between these angles is in some ways similar to an astronomer switching between visible light, radio, and infrared telescopes. Each of these instruments provides an image of the universe which is perfectly accurate within its own range of wavelengths, and much that is seen in one instrument is visible in the others too. But each instrument also reveals things which the others miss; where one shows only darkness, the other uncovers a cluster of embryonic stars. And each instrument has strengths which the others lack; where one can survey large swaths of deep space but at limited resolutions, another can be brought in to provide detail now that the astronomer knows at which exact point in space to point it. Only by combining images and measurements from all three can the astronomer fully analyse and, hopefully, in time, understand the universe.

The national and regional/local perspectives, having been discussed in Chapters 7 and 8 respectively, are briefly summarised in conjunction in Section 9.1. Subsequently, in Section 9.2, the headline implications for our understanding of the economic developments in England and Wales between 1600 and 1850 are discussed. Finally, in Section 9.3, some next steps are proposed since, fortunately or unfortunately, 'a historian's work is never done'.²¹³

²¹² Glennie, *Distinguishing men's trades*, p. 8.

²¹³ Miller, 'No rest for the weary – or: A historian's work is never done – or: One damned thing always leads dubiously to another', *History in Africa*, 40:s1 (2013), pp. s19-s22.

9.1 Brief overview of the main results

The national and regional results, presented in Chapters 7 and 8 paint a vivid but multi-faceted, complex picture of the developments in the male occupational structure of England and Wales during the 1600-1850 period. The temporal, spatial, and sub-sectoral detail which make them such a valuable source of information also make them difficult to recapitulate. For the sake of a structured overview therefore, the level of detail is deliberately reduced in this section, by grouping sub-sectors, occupations, and years together. The latter is achieved by breaking up the two-and-a-half centuries between 1600 and 1850 into four shorter time intervals, each with distinct characteristics, at both the national and regional level. These four periods are (a) the seventeenth century, (b) the run-up to the Industrial Revolution, between 1700 and 1760, (c) the first phase of the Industrial Revolution, between 1760 and c.1817, and (d) the years after c.1817. Figure 65 provides an overview of the speed with which the occupational sectors developed in these time intervals at the national level and for some logical groupings of counties.

During the first period in Figure 65, coinciding with the seventeenth century, the secondary sector saw its national share of the male labour force increase from twenty-eight to forty-two per cent, largely at the expense of the agricultural labour share. This national development was mimicked at regional levels, with every single county experiencing a decline in importance of agriculture, and a rise of the secondary sector. The tertiary and mining sectors also increased their share of the male labour force in this century but remained relatively small at the national level (although both could be important employers of men at the local level).

Developments were more complex and less uniform in the eighteenth century. The second period in Figure 65 was chosen to end just before the traditionally-defined start of the Industrial Revolution. It was during this period that the secondary sector overtook the primary sector as the largest employer of men, sometime during the 1730s. Yet, the pace of decline of agriculture, at the national level, actually halved during this period, compared to the previous one. And two-thirds of agriculture's decline in labour share now went to mining and the tertiary sector rather than, as had been the case during the seventeenth century, overwhelmingly to the secondary sector. Another new development was that regional developments started to diverge from the national ones during this period. In southern England, the secondary sector share, for the first time, declined and although it continued to grow in other parts of England and Wales, that growth started to concentrate in the counties traditionally associated with the Industrial Revolution: North-West England (including the West Riding) and the West Midlands.

The third period in Figure 65 runs from the 1760s to the early nineteenth century, coinciding with the first phase of industrialisation. Remarkably, during this period, the secondary sector actually lost (some) labour share at the national level. Indeed, it did so everywhere except for

the textile counties. The relative decline of the secondary sector was particularly significant in southern England, which experienced a substantial increase of the agricultural labour share.

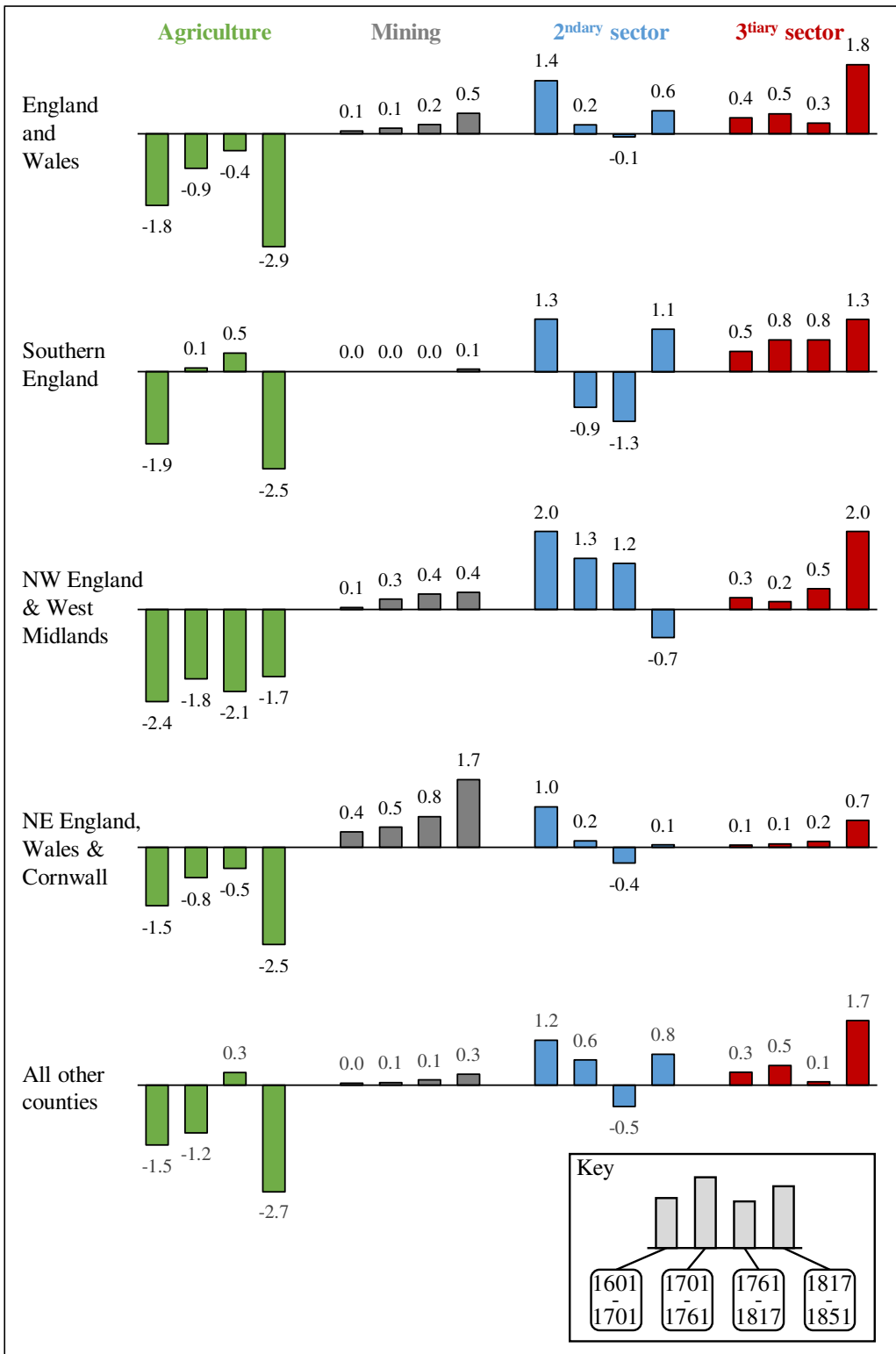


Figure 65. Average in/decreases in labour share per decade, per sector (1601-1851)

Sources: Table 18; Appendix B.

In the final period in Figure 65, the male labour force started shifting rapidly towards the tertiary sector and, locally, towards mining. Both sectors experienced continuous growth throughout the 1600 to 1850 period, but this growth now accelerated greatly. In many parts of the country, the secondary sector also experienced renewed growth in labour share. However, in the areas traditionally associated with the Industrial Revolution – north-west England and the West Midlands – the overall labour share of the secondary sector declined. Agricultural labour shares declined rapidly and universally during this period.

A consequence of the regional differences in the speed and, even, the direction of structural change, combined with regional variations in population growth was the spatial concentration of occupational (sub-)sectors, in particular during the run-up to and first phase of industrialisation, roughly between 1700 and 1815. Textiles saw the most extreme degree of concentration, with nearly seventy-five per cent of all textile workers employed in just three counties (Lancashire, Cheshire, and the West Riding) by 1800. But spatial concentration of functions was also clearly visible in clothing and metal wares, and even at the level of entire sectors such as agriculture and the secondary sector.

This concentration of sectors and sub-sectors in limited geographic areas could also be observed within counties; here, too, industrialisation of some areas could go hand-in-hand with de-industrialisation of others. In Cheshire, for example, eighty-six per cent of textile workers in the early nineteenth century lived and worked in a single hundred: Macclesfield. Local textile production in all other Cheshire hundreds, which had employed two out of every three textile workers in 1700, experienced rapid decline during the eighteenth and early nineteenth century. Yet another manifestation of concentration of function was visible in the increasing urbanisation of secondary and tertiary sector workers; whereas in the early eighteenth century, one in two secondary sector workers and one in three tertiary sector workers lived in the countryside, this had been reduced to one in three and one in eight, respectively, by the early nineteenth century.

At the national level, it is possible to place the 1600-1850 period within a longer-term perspective, from the end of the fourteenth to the beginning of the nineteenth century. Figure 66 depicts the total labour force shifts per sector during each of the four shorter time periods discussed above, complemented with pre-1600 and post-1850 national data.

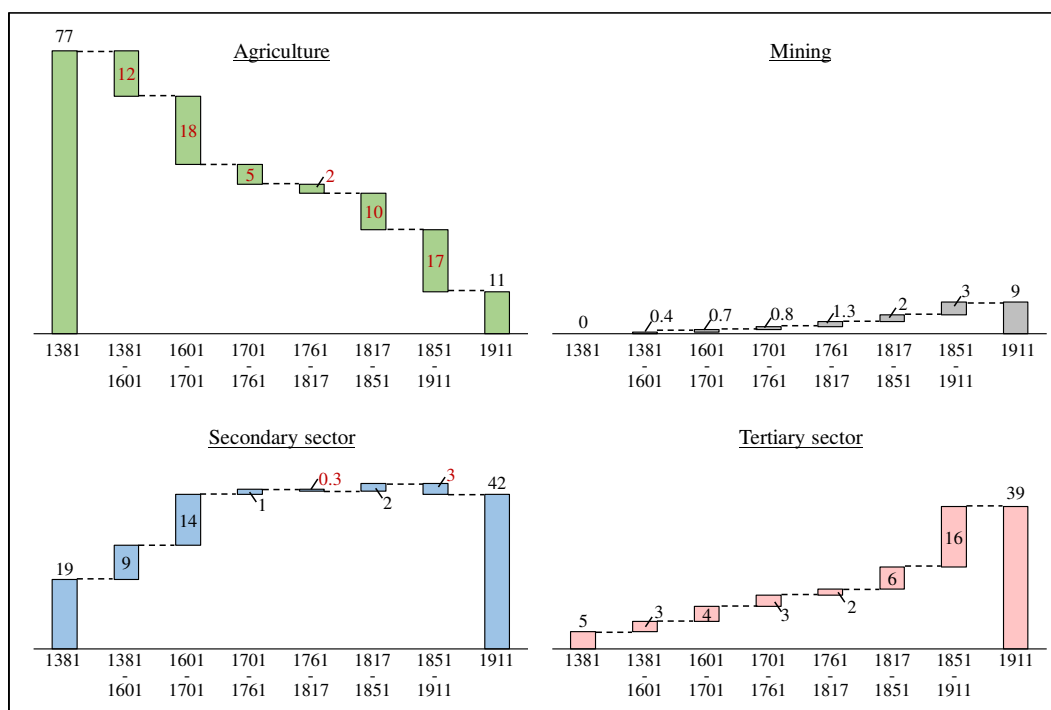


Figure 66. The development of sectoral labour shares between 1381 and 1911, divided into discrete time intervals (% of the overall male workforce in England and Wales)

Sources: see Figure 52 and Figure 65.

Notes: figures in red indicate negative values.

Figure 66 suggests that a moderate degree of structural change, consisting of a shift from agriculture to the secondary sector, had already taken place before the period under review in this dissertation. But it also shows that this shift accelerated significantly during the seventeenth century, being fifty per cent larger in that century than in the 220 years preceding it. Figure 66 also, again, shows that by 1700, the secondary sector was reaching its peak in terms of male labour share, remaining largely stable in the following two centuries. Structural change regained national significance from the 1820s, but now consisted primarily of a shift from agriculture to the tertiary sector, accelerating greatly in the second half of the nineteenth century.

In short, Figure 66 reconfirms, from a longer-term perspective, that the eighteenth and early nineteenth century were characterised by their top-level occupational stability. Indeed, no other period in Figure 66 saw so little structural change, at least at the national level. This, of course, runs counter to much of the historiography discussed in Section 1.1. It is to this to which we shall turn next.

9.2 Headline implications for our understanding of economic developments during the period

As discussed in Section 7.3.3, for both the early eighteenth century (c.1710), the early nineteenth century (c.1817), and the mid nineteenth century (1851), the new national occupational estimates are fairly close to Shaw-Taylor and Wrigley's CEHMB figures, which were themselves fairly close to earlier estimates by Shaw-Taylor et al, documented in a number of working papers.²¹⁴ For c.1817 and 1851, this is entirely unsurprising, as Shaw-Taylor's and my own estimates for these two years are based on the same sources, and only differ in their allocation of labourers to sectors – and even then mostly in the approach rather than in the actual allocation factors used, as discussed in Section 3.3. The c.1710 estimates were derived from different sources and methodologies, and exhibit moderate differences: the new estimates suggest a somewhat larger secondary and, consequently, a somewhat smaller primary sector.

The reasonable similarity between the new estimates and Shaw-Taylor et al's older figures is important because these older figures form the basis of Shaw-Taylor's critique of the commonly presumed relationship between structural change and the transition to modern economic growth, discussed in Section 1.4, as well as of the eighteenth and early-nineteenth century productivity estimates generated by the national accounts literature. This critique follows from the high secondary sector labour shares in Shaw-Taylor's c.1710 and c.1817 estimates, which leave much less room for structural change than had previously been presumed, or had been derived from flawed occupational sources such as social tables. He writes that 'major structural change now appears to have preceded the onset of modern economic growth after 1830 by well over a century.'²¹⁵ And since 'most of the growth in the relative importance of secondary sector employment, normally associated with the post 1750 period, in fact preceded the eighteenth century ... the increase in the productivity of the secondary sector was much larger than has been argued in the national accounts literature'.²¹⁶

Since the new estimates suggest an even larger secondary sector in c.1710 than the one Shaw-Taylor's critique was based on, they further strengthen this revisionism. But because these new estimates are not limited to periods with (reasonable) parish register coverage, they enable one to not just conclude that 'Crafts has very substantially under-estimated the growth in the

²¹⁴ See Shaw-Taylor and Wrigley, 'Occupational structure and population change' in Floud *et al* (eds), *Cambridge Economic History*, pp. 53-88; Shaw-Taylor *et al*, 'The occupational structure of England and Wales c.1817-1881' (Cambridge, 2010), <http://www.geog.cam.ac.uk/research/projects/occupations/britain19c/papers/paper4.pdf>; Shaw-Taylor *et al*, 'Occupational structure 1710-1817'.

²¹⁵ Shaw-Taylor and Wrigley, 'Occupational structure and population change', p. 61.

²¹⁶ Shaw-Taylor *et al*, 'Occupational structure 1710-1817', p. 1.

productivity of the secondary sector and over-estimated the growth in the productivity of the agricultural sector' but also to calculate by how much.²¹⁷ Using Crafts's labour shares, it can be established that he must have presumed a total increase of 203 per cent in the secondary sector labour force between 1760 and 1831, and one of precisely 0 per cent in the agricultural labour force.²¹⁸ The new occupational estimates, for men and women combined, project a very different picture, with the number of secondary sector workers growing with only 58 per cent over the same period, and the number of agricultural workers with 38 per cent.²¹⁹ Combining Craft's sectoral output figures with the new labour force figures leads to estimated labour productivity growth figures of 1.7 per cent per annum for the secondary sector, and 0.3 per cent per annum for agriculture during the 1760-1831 period.²²⁰

It is not suggested here that these productivity growth estimates are reliable as this is, obviously, not just dependent on the accuracy of the occupational estimates but also on the reliability of Crafts's output growth estimates, an assessment of which falls outside the scope of my research. But they *can* serve to investigate how Crafts's own conclusions would have differed from those in his 1985 book, had he had access to the new occupational estimates. Crafts does not provide labour productivity estimates, but given the dominance of labour as a production factor in this period, a comparison to his total factor productivity (TFP) estimates should nevertheless provide worthwhile insights.²²¹ For the 1760-1831 period, Craft's TFP figures are 0.2 per cent per annum for the secondary sector, and 0.5 per cent per annum for agriculture.

Crafts's low productivity growth estimates in the secondary sector between 1760 and 1830, coinciding with the 'classical' definition of the Industrial Revolution, has always been one of the most contentious elements of his, at the time, revisionist interpretation of Britain's path to modern economic growth.²²² The exercise above, providing productivity estimates of nearly two per cent per year for this sector, demonstrates the degree to which Crafts's TFP figures were built on misleading, social-tables-based occupational estimates. The exercise thus confirms the validity of Shaw-Taylor's critique on this issue, discussed above. Furthermore, it raises

²¹⁷ Shaw-Taylor *et al*, 'occupational structure 1817-1881', p. 26.

²¹⁸ Crafts, *British economic growth*, p. 11-7.

²¹⁹ Since in Crafts's definition, mining is included in the secondary sector, this has been replicated in the labour force figures used for these calculations as well. If male-only figures had been used, which are perhaps more analogues to Crafts's since his figures only nominally include, the growth estimates would have been 92 and 56 per cent, respectively.

²²⁰ Crafts, *British economic growth*, p. 32 (table 2.7) and p. 42 (table 2.10).

²²¹ Presented in *ibid*, p. 159, table 8.1.

²²² For example, in Temin, 'Two views', pp. 63-82.

significant doubts about one of Crafts's results which has always been rather puzzling: that agriculture's productivity growth during the Industrial Revolution exceeded that of industry.

In short, then, the new estimates reinforce Shaw-Taylor et al's critique of existing narratives of Britain's transition to modern economic growth: that the shift from agriculture to the secondary sector clearly preceded rather than coincided with the Industrial Revolution; that this type of structural change was firmly located in the sixteenth and seventeenth centuries rather than in the eighteenth and nineteenth; that, therefore, productivity estimates during the Industrial Revolution in all likelihood require a substantial upward correction for the secondary sector; and that this, in turn, creates the need for a positive re-evaluation of the economic impact of technological innovation during this period.

The new occupational estimates also lend support to another important criticism of the national accounts literature, one which, in Chapter 1, was called the 'regional critique'. Although Crafts and Harley never suggested that the developments in the 1760-1850 period should not be considered revolutionary, the surprisingly modest growth figures for GDP per capita and total factor productivity resulting from their national accounts framework painted a distinctly less glamorous image of Britain during the Industrial Revolution than that of a country swept by 'a wave of gadgets'.²²³ And the national accounts literature did lead some historians to declare the 'discontinuity' interpretation of the Industrial Revolution a 'dead horse not altogether willing to lie down'.²²⁴ One response of adherents to this discontinuity interpretation was to criticize the high level of geographical agglomeration at which the national accounts approach operates which, it was claimed, overlooked much more sudden and dramatic changes at regional levels. As Sidney Pollard had remarked as early as 1981, 'the national statistics which are normally used to illustrate economic growth cannot bear the enormous weight which is usually placed on them'.²²⁵ Or as Maxine Berg and Pat Hudson wrote, 'macroeconomic indicators fail to pick up [the] regional specialization and dynamism which was unique to this period and revolutionary in its impact. The industrial revolution saw the sectoral specialization of regions and the growth of regionally integrated economies some of which were clearly experiencing an industrial revolution, no matter how this term is defined.'²²⁶ However, the lack of regional and local data which could rival the national accounts framework in its ostensible quantitative 'hardness' has left the regional critique somewhat speculative.

²²³ Ashton, *Industrial Revolution*, p. 48.

²²⁴ Jones, *Growth recurring*, p. 19.

²²⁵ Pollard, *Peaceful conquest*, p. 10.

²²⁶ Berg and Hudson, 'Rehabilitating', p. 39.

The occupational estimates presented in this dissertation, containing comparably detailed information at national and regional levels, present a unique, quantitative basis for a rigorous test of the regional critique. First signs are that such an assessment will yield largely positive results, although it may well also provide challenges to the presumed timing and, to a lesser degree, the geography of the regional critique. As discussed in the previous section and, in more detail, in Chapter 8, the new occupational estimates show clearly divergent regional trajectories, but also show that this divergence started well before the (classically defined) Industrial Revolution, and gradually diminished in intensity during the first decades of the nineteenth century, and that it was perhaps even more geographically confined than generally presumed in the regional critique. The occupational figures paint a picture of counties, regions within counties, even individual towns specialising heavily and rapidly in a small range of economic activities during the eighteenth century and, to a lesser degree, even during the seventeenth. And these economic activities were not necessarily restricted to the secondary sector. A county like Norfolk – characterised by exceptionally productive agricultural practices and, as discussed, developing from being the most heavily secondary-sector dominated English county in the early eighteenth century to being one of the most agricultural a century later – also provides an compelling example of regional specialisation.

The fact that such rapid geographic concentration of function was accompanied by continuous growth of the transport sector is probably not a coincidence. The likely role of the growing network of canals in enabling and speeding up regional specialisation has been remarked upon by, for example, John Langton when writing about ‘the canal based economies [becoming] more specialized, more differentiated from each other and more internally unified’.²²⁷

Regional specialisation in the eighteenth century did not go unnoticed at the time either. As the always perceptive Daniel Defoe wrote in 1704, ‘the manufactures of England are happily settled in different corners of the kingdom, from whence they are conveyed by the circulation of trade to London by wholesale ... and from thence disperse in lesser quantities to the other parts of the kingdom by retail’.²²⁸ Defoe also noticed the potentially destructive effects of geographical concentration when he bemoaned the decline of stocking knitting in Norwich and weaving in Canterbury as ‘the effects of transposing manufacturers’.

²²⁷ Langton, ‘Regional geography’, p. 162.

²²⁸ Defoe, ‘Giving alms no charity, and employing the poor a grievance to the nation’, 1704, reproduced in Martin (ed.), *Country life in England* (London: Macdonald & Co., 1966), p. 102, as cited in Jones, *Locating the Industrial Revolution: inducement and response* (Singapore: World Scientific Publishing, 2010), p. 240-1.

Of course, as Eric Jones has argued, such local declines of specific industries may also have had positive reasons, owing more to increasing focus on local, in this case, agricultural strengths than to ‘losing out’ to competition elsewhere in the Kingdom.²²⁹ This is an important argument, as it stresses that regionalisation was, likely, anything but a zero-sum game. When cheap transport enables regions to focus on activities for which they are particularly well-positioned – because of soil, climate, labour skill and wage levels, the availability of coal, iron, running water, etcetera – this lifts national productivity overall and, thereby, incomes. Furthermore, by creating regional concentrations of specific activities, it intensifies local scale, knowledge exchange, and competition – all of which, in turn, stimulate experimentation and create the conditions in which successful outcomes of such experiments can be rapidly disseminated. In other words: Britain’s precocious economic success may well have owed something, perhaps even a great deal, to its comparatively high levels of functional concentration – particularly if regional specialisation did indeed, as the occupational data suggest, precede the Industrial Revolution by at least half a century.

The new occupational estimates also cautiously suggest that the nineteenth century saw, at the sectoral level of abstraction, a partial reversal of regional specialisation trends, as discussed in Chapter 8. The railways are often, and quite logically, credited with further improving possibilities for functional concentration, by reducing the costs of exporting the output of specialist production and importing goods no longer produced locally. Yet, the occupational data appear to show a partial re-industrialisation of formerly de-industrialising counties in the south-east of England, as well as a slow-down in secondary-sector growth precisely in the pioneering counties of the Industrial Revolution. Perhaps, in tandem with English technology and industrial forms of organisation being exported from Lancashire and the West Riding to Belgium, Switzerland, and France, it was also exported to areas much closer to home. However, at the moment, this is pure speculation and therefore, properly, part of the last section of this dissertation, which deals with ‘next steps’.

9.3 Next steps

These can be divided into four groups. Firstly, the set of occupational estimates presented in this dissertation should be extended and improved. Opportunities for enlarging the probate dataset should be realised, by digitising and codifying existing but not yet included indexes for Surrey, Northamptonshire, seventeenth-century Suffolk and Worcestershire, and, most importantly, for seventeenth-century Yorkshire. Given the importance of that latter county, particularly of the West-Riding, actually creating a new index from the original probate documents should be seriously considered, particularly for the early- and mid-eighteenth century. Methods for

²²⁹ Jones, *Locating*, p. 241.

deriving estimated female occupational structures from male ones are currently being developed by Shaw-Taylor and You; a preliminary version was employed in this dissertation, but future, improved versions should be exploited to improve Table 20's integral occupational estimates.

Secondly, the probate-based estimates should be supplemented with occupational estimates from quarter sessions and coroner's inquests, particularly for counties in which the probate data are weak, such as Devon and Somerset, or missing altogether, such as Sussex. A thorough comparison should be made between the regional estimates resulting from these sources, the probate-based figures, and those from other occupational datasets such as late-eighteenth-century militia lists. A first comparison to quarter-sessions-based estimates for Cheshire and Lancashire with the probate-derived estimates is highly encouraging, but much more work can and should be done.²³⁰

Thirdly, the regional and local details provided by the occupational estimates should be exploited for a series of regional studies on the Industrial Revolution, not unlike those in the Pat Hudson edited 'Regions and industries', but with a much more quantitative outlook – for which the occupational data can provide the basis.²³¹ A number of regional studies is already underway in the Cambridge Group, and more are likely to be started soon, for which the new regional estimates will be highly valuable.

Finally and, arguably, most importantly and urgently, more work is required on evaluating the implications of the material presented in this dissertation for our understanding of the Industrial Revolution and our confidence in national-accounts-based narratives of that most important of economic transitions. Each of the three groups of next steps presented above will help to strengthen the basis for doing this. But even the occupational data currently at our disposal, as presented in this dissertation and in existing publications and working papers by Shaw-Taylor and other members of the Occupational Structure project, offers, I believe, a strong foundation for a critical evaluation of the results of the national accounts approach, of the regional critique, and of other key sections of the literature on the Industrial Revolution. Thirteen years ago, Shaw-Taylor and Wrigley set out to build a comprehensive collection of detailed and reliable occupational datasets which, they envisaged and promised, would enable us to finally study the transition to modern economic growth in all its national, regional, and local complexity. As a result of their vision, initiative, and hard work, as well as that of other members of the Occupational Structure project, we are, today, tantalisingly close to realising this promise. I hope this dissertation may have brought us even closer.

²³⁰ These quarter-sessions-based estimates are presented in Rudnicki, *Northwest England*, pp. 40-8.

²³¹ Hudson (ed.), *Regions and industries: a perspective on the industrial revolution in Britain* (Cambridge: Cambridge University Press, 1989).

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