

The Occupational Structure of England c.1750-1871 A Preliminary Report

Leigh Shaw-Taylor and E.A. Wrigley

Cambridge Group for the History of Population and Social Structure, Department of
Geography, University of Cambridge
(2008, 2006).

An ESRC Funded Project

*Male Occupational Change and Economic Growth 1750-1851
RES-00023-01231*

Project website: <http://www-hpss.geog.cam.ac.uk/research/projects/occupations/>

Grant Holders

Leigh Shaw-Taylor (Principal Investigator) and Tony Wrigley (Co-investigator)

Database Construction

Ros Davies and Peter Kitson

GIS/Cartography

Max Satchell

Data Collection

Joe Barker, Richard Churchley, Alec Corio, Peter Kitson, Mandy Jones, Vicky Masten, Niraj Modha,
Tom Nutt, Silvia Sovic, Rebecca Tyler, Matt Ward, Ali Warren, Matt Westlake

Abstract

It is widely supposed that the industrializing regions of north-west England (Lancashire and the West Riding) experienced a rapid increase in the relative importance of secondary sector employment between 1760 and 1830. However a large-scale analysis of occupational data for the period 1750-1871 shows that in fact the rise in the relative importance of secondary sector employment in the north-west took place during the early modern period and actually declined slightly over the classic 'industrial revolution' period. After 1815, some other parts of the country experienced the rapid increase in secondary sector employment usually assumed to have characterised the industrial districts between 1760 and 1830. In contrast, the growth of service sector employment (especially transport) was dramatic and continuous in all regions of England from the late eighteenth century onwards. Nationally there was more growth in the secondary sector between 1500 and 1750 than there was between 1750 and 1850. These findings necessitate some rethinking of the first industrial revolution, its causes and its consequences. Not least, these findings finally resolve the long-standing controversy as to whether the first industrial revolution was a relatively short dramatic event or a more protracted process. The evidence in favour of the latter view is now overwhelming.

A note to readers

This is a preliminary report on an ongoing research project rather than a finished paper or a draft of a paper for publication for two reasons. Firstly, the presentation of the data is somewhat provisional because (a) the technical treatment of the data is incomplete in several respects and (b) the occupational coding scheme is currently in the process of revision. However, neither of these issues will fundamentally alter the broad results presented here. Secondly, we are only in the first stages of analysing a very large and very complex body of data and it may take some years to work through the full implications of the datasets. The historiographical discussion and referencing are currently incomplete. This report was written in 2006. An error relating to the national occupational structure derived from the 1871 census was corrected in 2008 but the report was not updated to reflect the further work undertaken since 2006.

The structure of this document

Section 1 of this document sets out the overall scope of the research program. Section 2 provides some historiographical background. Sections 3.1 to 3.3 describe the first funded phase of research and present some of the county level datasets. Sections 3.4 to 3.8 provide some preliminary interpretations and conclusions based on these datasets. Section 4 set out some future research plans. The key conclusions are summarised on pages 33 and 38-9.

1 The scope of the wider research program

Leigh Shaw-Taylor and Tony Wrigley held a three-year research grant from the Economic and Social Research Council (ESRC) to reconstruct the evolution of England's Male Occupational Structure from 1750 to 1851.¹ This came to an end on February 28th 2005. The bulk of this report presents a preliminary analysis of some of the datasets collected as part of that project.

That project is the first stage of a longer-term research program, *The occupational structure of Britain 1379-1911*, the aim of which is to provide a broad overall picture of the development of England's occupational structure from the late Middle Ages through to the culmination of the industrial revolution during the nineteenth century. The ESRC have now funded a further three year project on *British occupational structure c.1820-1911* to take advantage of the readily available spatially comprehensive data for male and female occupations during the 'drive to maturity' of the first industrial revolution.² We are also awaiting the outcome of a third funding application to the Leverhulme Trust to extend the project back from the eighteenth century through to the late medieval period and sideways to cover women's work in the pre-census period.³ International comparative work has been initiated with scholars working on Belgium, Brazil, Germany, India, Japan, the Netherlands, Spain and Sweden. An application has also been made to the *European Science Foundation*

¹ *Male occupational change and economic growth 1750-1851*, funded by the ESRC RES-00023-01231; £597,000. Leigh Shaw-Taylor was principal investigator, E.A. Wrigley was co-investigator.

² *The changing occupational structure of nineteenth century Britain*: funded by the E.S.R.C. RES-000-23-1579, £741,000. Leigh Shaw-Taylor is principal investigator, E.A. Wrigley is co-investigator. The phrase 'the drive to maturity' is, of course, Rostow's but this does not imply subscribing to his broader model of British industrialisation: Rostow, *Stages*.

³ *The occupational structure of England and Wales 1379-1725*. Application to the *Leverhulme Trust* for £496,000.

which would allow an expansion of the project to a pan- European level.⁴ Initial comparative work on some of these countries will be presented at the International Economic History Congress in Helsinki in August 2006.

Further information on this program of research, examples of mapping for a number of projected historical atlases and a series of reports and papers covering some of the findings in greater detail than is possible here can be found on the project website at <http://www.geog.cam.ac.uk/research/projects/occupations/>

2 Historiographical background

The British industrial revolution remains of abiding historical interest because it marks a fundamental dividing line in human history. Following Britain's early start industrialisation spread first to other parts of north-western Europe and North America. Globally the process of industrialisation is incomplete but ongoing with rapid development taking place in China and India in recent years. Prior to the industrial revolution, grinding mass poverty characterised all human societies and life expectancies were universally low (with life expectancies at birth below 40 in all societies). The industrial revolution ushered in a world in which living standards in the 'developed' world, which itself covers an ever increasing share of the global population, are both constantly increasing (with minor caveats) and unimaginably high by pre-industrial standards and in which life expectancies have almost ubiquitously risen to unprecedented levels.⁵ Industrialisation was not merely an economic transition but also transformed political, social and cultural life.⁶ It has, of course, come with other problems, most notably the long-run impact on the environment but these issues are beyond the scope of the present paper. Surprisingly, key features of the first industrial revolution and the breakthrough to modern economic growth remain poorly understood, though we know much more than we used to and our knowledge is steadily accumulating.

Over the last three decades the literature on the industrial revolution has stressed much slower economic growth between 1700 and 1850 than had been argued by an earlier generation of historians.⁷ The corollary of this, illustrated in figure one below, is that GDP per capita (average income) must have been much larger in 1700 than was formerly supposed.

This carries the further implication, indicated by the dashed lines in figure 1 that much economic development preceded 1700.⁸

However, beyond this, we lack any overall map of the timing and geography of change between the early sixteenth and the early nineteenth centuries. We know a great deal, in much detail, about some industries and some localities in particular sub-

⁴ This bid is to create labour force and population datasets comparable with those so far created for Britain across the whole of Europe. Lead researcher: Leigh Shaw-Taylor. This is part of a wider invited bid to the European Science Foundation Research Infrastructure (E.S.F.R.I.) co-ordinated by Peter Doorn and Jan Luiten van Zanden to create a pan-European digital infrastructure for the Historical Sciences.

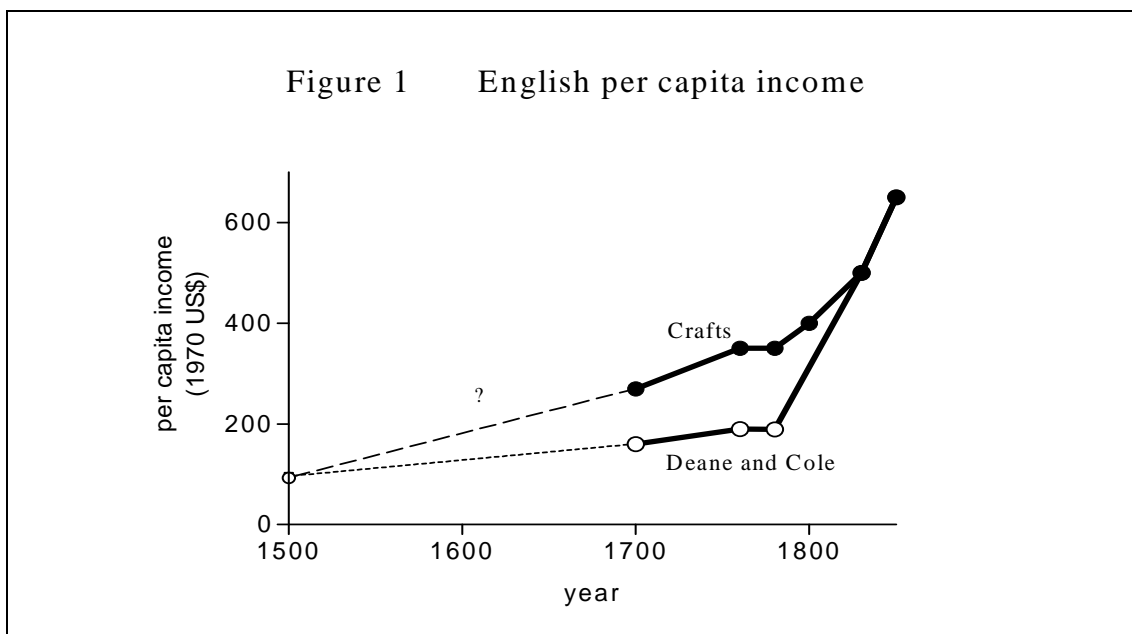
⁵ Life expectancies in the highest performing societies have risen by three years in every decade since the 1840s and show no signs of decelerating. On present trends half of all females born in Britain in 2006 will live to be over 100 years of age. Oeppen and Vaupel, 'Broken limits.'

⁶ See Berg and Hudson, 'Rehabilitating the industrial revolution.'

⁷ Rostow, *Stages*; Deane and Cole, *British economic growth*, Crafts, *British economic growth*; Crafts and Harley: *A restatement*.

⁸ The datapoint for 1500 is essentially illustrative but derives from Angus Maddison's work.

periods though nothing about some surprisingly important industries.⁹ But we have no satisfactory overall narrative.



However, if it were possible to know the occupational structure of the economy and how it changed over time: that is, how many men and how many women were employed in each sector of the economy and how this changed in different sub-periods then we would have an overall template to which all the detailed studies that have accumulated could be fitted. It would also pinpoint the areas where further research is most needed. Much effort has been expended over many decades on attempting to explain the first industrial revolution and the origins of ‘modern’ economic growth (i.e. real growth in GDP per capita which is continuously sustained rather than episodic in nature).¹⁰ However, in the absence of a detailed and accurate quantifiable description of what happened, when it happened and where it happened, it is unsurprising that only limited progress has been made to date. This project by providing a long-run quantitative account of the economy which is sectorally and geographically comprehensive but which can also be disaggregated, both sectorally and spatially, promises to transform our understanding of the origins of modern economic growth.

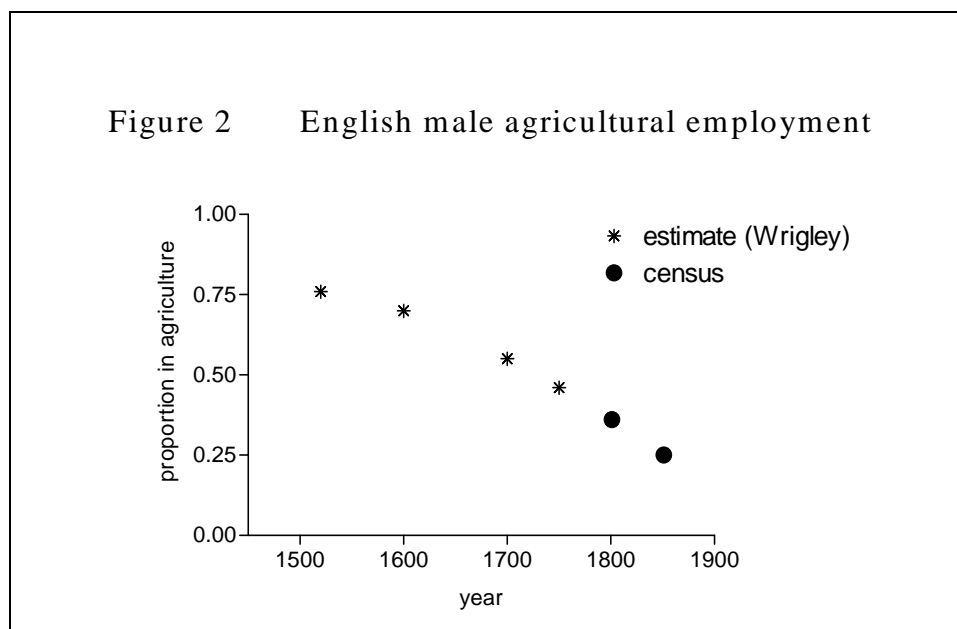
We do, of course, have some sense of the key trends in occupational structure over time and figure 2 shows estimates made some years ago by Tony Wrigley of agriculture’s share of adult male employment over time.¹¹ The first census was not taken until 1801 and that tells us little more than that only 40 per cent of the English population worked in agriculture. This is remarkable in itself because at this time

⁹ Leather is an example of an important industry about which we know virtually nothing. Crafts estimates that the leather industry accounted for 22.3 per cent of added value in British industry in 1770, 15.5 per cent in 1801 and 8.7 per cent in 1851: *British economic growth*, p. 22. Yet, so far as I am aware, the two articles by Clarkson are the only real contribution on this industry: Clarkson, ‘Organization’; Clarkson, ‘Leather crafts.’

¹⁰ Flinn, *Origins*; Hartwell, *The industrial revolution*; Wrigley, *Continuity, chance and change*.

¹¹ Wrigley, ‘Urban growth.’

elsewhere in Europe the figure varied from 60 per cent to 80 per cent.¹² Only with the censuses of 1841 and 1851 do we finally get a clear picture of the occupational structure of the economy – and this is why there is no dispute about the structure of the economy from the middle of the nineteenth century onwards.



Before 1800 we have no reliable figures for the relative sizes of different economic sectors. We can say that the proportion of the population engaged in agriculture fell from an estimated 75 per cent in 1500 to 40 per cent in 1800. But the pre-1800 figures shown on figure 2 are estimates rather than hard data. The implied rise in agricultural productivity revolutionised the economy by enabling the proportion of the workforce not engaged in agriculture to rise from 20 per cent to 60 per cent.¹³ To date it has not been possible to specify reliably either the timing or the regional patterning of this development.

3 The occupational structure of England c.1750-1881

The first three year phase of our longer-term research project was funded by the ESRC and was primarily concerned with male occupations from c.1750 to 1851 simply because these are relatively well documented and this has provided a secure anchor point from which we can now move backwards towards 1500 and sideways to look at female employment. The first project consisted of three main elements, which are summarised in figure 3.

Firstly, the core of the project was an attempt to reconstruct the evolution of the male occupational structure of England from the mid eighteenth through to the mid/late nineteenth centuries. A description of this core element of the first project and its outcomes forms the bulk of the rest of this report.

¹² As late as 1870 50 per cent of the German workforce worked in the primary sector, 49 per cent of the French. In Italy and Spain the figures were 55 per cent and 56 per cent as late as 1910. The English figure was 25 per cent in 1851. See Crafts, *British economic growth*, pp. 57-8.

¹³ Wrigley, *Continuity, chance and change*; Crafts, *British economic growth*, chapter 6, Crafts and Harley, 'An equilibrium approach.'

Secondly, a series of pilot studies were effected aimed at identifying suitable sources which could be used to extend the scope of the project back into the early modern period. This work formed the basis for the application to the Leverhulme Trust.¹⁴

Thirdly, two sets of pilot studies have been carried out on sources for female occupations. One of these, carried out by Leigh Shaw-Taylor, has re-assessed the value of the mid and late nineteenth century censuses for documenting women's work. Contrary to much that has been written the census remains the best and the most comprehensive source available on female labour in the nineteenth century. Yet the censuses have hardly been used due to a series of mis-perceptions of the nature of the source material.¹⁵ Building on this pilot work will form a key part of the second funded project: *changing occupational structure of nineteenth century Britain*. The second set of pilot studies has been concerned with identifying suitable sources of female occupational data for pre-census England. This work has been undertaken by Amy Erickson in conjunction with Shaw-Taylor and will form the basis for much of the work to be done if the Leverhulme application for the project on *The occupational structure of England and Wales 1379-1725* is successful.

Figure 3 The Occupational Structure of England 1500 - 1850		
Males	1750-1850	ESRC funded major project* 1801 & 1841 censuses militia ballot lists baptismal registers
	1500-1750	pilot projects funded by ESRC* testamentary evidence poll tax records baptismal registers
Females	1500-1850	pilot projects funded by ESRC* church court depositions probate accounts
*ESRC Award RES-000-23-013 £597,000		

The critical importance of the first project is that it has enabled us, for the first time, to quantify, in very considerable detail, the structure and geography of the English economy in the 1750s at the beginning of the classic industrial revolution period.

3.1 Sources

Before presenting some preliminary datasets it may be helpful to describe briefly the sources from which they have been derived. The key sources will be discussed in reverse chronological order.

¹⁴ *The occupational structure of England and Wales 1379-1725*, £496,000.

¹⁵ For substantiation of these arguments see: L Shaw-Taylor, *Diverse experiences: the geography of adult female employment in England and the 1851 census*, forthcoming in N. Goose (ed) *Women's work*. An early version of the argument is currently downloadable as paper 12 at <http://www.geog.cam.ac.uk/research/projects/occupations/abstracts/> For further critiques of the overly-negative view of the census see: Anderson, 'Mis-specification'; idem 'Mid Victorian Censuses and McKay 'Married women and work.'

At the end of our period we are principally using the published 1851 and 1871 census material from which detailed occupational data are available at both national and at county level. In addition we are using the published registration district level data for 1851.¹⁶ All these data have been made machine-readable as part of the project. In due course, as part of the second project on the period from c.1820 to 1911, we will incorporate the published registration district, county and national data from the 1861 census and will be creating comparable county and registration district datasets deriving from the 1881 manuscript census material.¹⁷

The second key source is Anglican baptism registers from 1813-20. In 1812 Rose's Act decreed that Anglican baptism registers should record the occupations of fathers whenever a child was baptised. This was almost universally practiced at parish level. By abstracting fathers' occupations for the years 1813-20 it is possible to produce a snapshot of male occupational structure a generation before the 1841 census for any parish in the country.¹⁸ Because the data are available at parish level they can be aggregated to produce any larger unit which is analytically convenient.

Prior to 1813 we are dependent on two different sources of occupational data. The first of these are militia ballot lists.¹⁹ These are documents which were compiled between 1757 and 1831 as part of the process of selecting men to serve in the militia. Parish constables were required to draw up lists of adult males initially aged 18-50 and later 18-45 and to record their occupations. Some categories of men were exempt but they were supposed to be recorded and then ruled through. These lists were then used as the basis for a ballot to select men to serve in the militia. Wherever these documents survive on a reasonable scale we have abstracted the occupational information.

Unfortunately militia ballot lists are very rare for Lancashire and the West Riding of Yorkshire – the two foremost industrialising counties. But fortunately in these and some other northern counties it was not uncommon to record fathers' occupations in baptism registers well before 1813. Such registers form our second set of pre-1813 sources. Each of our sources has its own potential sources of bias. Space precludes a detailed discussion of the various issues here. However it should be noted that the work we have undertaken to date, comparing occupational data abstracted from parish registers between 1829 and 1836 with the 1841 census, suggests that the baptismal data give a very similar picture of occupational structure to that obtained from data abstracted from the 1841 census.²⁰ Further work, by ourselves and others,

¹⁶ The registration district was an administrative unit intermediate between the parish or township and the county. There were 576 registration districts in England in 1851. We have made all of these data fully-machine-readable for the first time together with all the county level material for 1851 and 1871 with the full age-breakdowns.

¹⁷ This is possible because the entirety of the 1881 Census Enumerators Books for the whole of Britain, comprising 26 million records, have been made machine-readable by the Mormon Church. An enhanced version with occupational coding created by Kevin Schurer and Matthew Woollard is available from the AHDS: *1881 Census for England and Wales, the Channel Islands and the Isle of Man* (Enhanced Version), Schurer, K. and Woollard, M, SN 4177.

¹⁸ A period of eight years has been chosen because it is short enough, for present purposes, to be considered as a moment in time but long enough that any man in a fertile marriage is almost certain to appear in the baptism register at least once.

¹⁹ For further information on militia ballot lists, see Gibson and Medlycott, *Militia Lists*; and Glennie, *Mens' Trades*.

²⁰ We chose the period 1829-1836 for comparison with the 1841 census enumerators' books material rather than a period centred on 1841 because (a) the introduction of civil registration in 1837 may

demonstrates that occupational data abstracted from militia lists corresponds very closely to that abstracted from parish registers.²¹ Work on early eighteenth century probate inventories by Shaw-Taylor indicates that by-employments are unlikely to distort the picture generated by occupational data for the period 1720-1850 seriously.²²

3.2 Categorising the occupational data

The number of distinct occupational descriptors in use in eighteenth and nineteenth century England was very large. Table one shows some of the occupational descriptors collected from Lancashire parish registers for the period 1813-20 with the most common in the top panel and the tail end of the distribution in the bottom panel. Occupational data were abstracted from a total of c.215,000 baptisms. As can be seen from the table below, this yielded a total of 1,636 different occupational descriptors. Nationally we have come across around 12,000 different occupational descriptors from a total of around one million baptism and over 20,000 occupational descriptors in total. To analyse such data obviously requires them to be coded to an appropriate scheme of occupational classification.

The best known and most widely used scheme for English historical occupational data is the 'Booth-Armstrong' system.²³ Recently a new scheme, Historical International Standard Classification of Occupations (HISCO) tailored for the requirements of international comparisons has been developed.²⁴ For our project Wrigley has developed a new coding scheme, Primary, Secondary, Tertiary (PST). In its simplest form this allows us to code all the occupational descriptors to either the primary sector (essentially agriculture, fishing and mining), the secondary sector (manufacturing, construction, etc.) or the tertiary sector (services, which include transport, retailing, dealing personal and professional services)²⁵. We are in the process of creating look-up tables which will allow the underlying data to be coded to Booth-Armstrong and HISCO as well. Different schemes serve different analytical purposes.

render the baptism registers unrepresentative of the wider population from that year and (b) the two dates are close enough that any change in occupational structure is likely to be very limited.

²¹ Mid-Wharfedale Local History Research Group, 'Craven'; Shaw-Taylor and Jones, 'Northamptonshire' (available as paper 5 at <http://www-hpss.geog.cam.ac.uk/research/projects/occupations/abstracts/>).

²² This work is based in a detailed analysis of over three hundred probate inventories from early eighteenth century Northamptonshire. The period before 1700 may be quite different in this regard. See, for instance, Swain, *Industry before the industrial revolution*, who argues that in the early modern period the importance of industrial by-employments amongst farmers is likely to lead to an understatement of the importance of manufacturing employment in north-west England in occupational descriptors. However, both Walton in his study of Lancashire and Rowlands in her study of the West Midlands conclude that this was no longer the case by the middle of the eighteenth century.

²³ See Armstrong, 'The use of information about occupation.'

²⁴ van Leeuwen et al, HISCO; <http://www.iisg.nl/research/hisco.php>.

²⁵ A fuller sense of the the primary, secondary and tertiary sectors can be obtained from table two below.

Table One: Raw Occupational Data from Lancashire 1813-20

	<i>Father's Occupation</i>	<i>Number of Baptisms</i>
1	weaver	53,584
2	labourer	18,902
3	illegitimate	13,895
4	farmer	11,016
5	spinner	5,948
6	husbandman	5,525
7	collier	4,455
8	joiner	3,740
9	hatter	3,212
10	mariner	2,973
11	tailor	2,613
12	shoemaker	2,605
13	cordwainer	2,334
14	cotton spinner	2,281
15	blacksmith	2,237

1628	earthenware manufacturer	1
1629	rag merchant	1
1630	razor grinder	1
1631	reclifier	1
1632	reeler	1
1633	regiment of foot	1
1634	reverand	1
1635	enameller	1
1636	excise-man	1
1637	quartermaster	1

Wrigley explains the analytical logic of PST thus:

The new scheme [PST] reflects a different approach [to Booth-Armstrong]. It represents an attempt to categorise occupations in a way which relates closely to the structure of demand rather than the process of production. Hence the initial division between primary, secondary, and tertiary occupations. In general, it is true that the income elasticity of demand for primary products is less than unity, and that for secondary products, though above unity, [is] nevertheless lower in general than that for the products of tertiary employment. As a result the differential rates of growth in each of these three main categories may be expected to mirror changes in the structure of aggregate demand, which in turn will reflect changes in the purchasing power of individual consumers (though the existence of export demand will complicate this over-simple picture). As already noted, it is a commonplace that in conditions of acute poverty the great bulk of income is spent on the necessities of life – food, shelter, clothing, and fuel – and that of the four food is the most important by a very wide margin. It follows that the great bulk of employment will be in agriculture. With rising real incomes there is a differentially rapid rise in the demand for industrial products and a corresponding shift in occupational structure. The increased demand for pots and pans, tables and chairs, cups and saucers, sheets and blankets leads to growth in employment in the industries producing them. If the trend continues, though from small beginnings, the focus of the fastest growth will eventually move from goods towards services and the number of those employed in retail and wholesale trade, transport and communication, health and education services, finance, personal services, public administration, and the like will expand the most rapidly of all. As a result, in advanced economies today

tertiary employment is as dominant within the workforce as a whole as agriculture was in centuries gone by.²⁶

Wrigley's arguments about the relationship between occupational structure and the structure of domestic demand may prove controversial in some respects. Three areas stand out in particular. Firstly, and as Wrigley himself notes, the model needs some modification to take into account the importance of exports and imports. Secondly, differential changes in productivity rates between the three sectors clouds the relationship between the changing distribution of employment and the changing structure of demand. In particular parts of the secondary sector experienced unprecedented increases in labour productivity from the 1760s, though before that date this problem is likely to be less of an issue. Thirdly, much tertiary employment was an adjunct to secondary production and not therefore an indicator of tertiary demand. Space precludes a more detailed discussion of the issues here. Nevertheless, as can be seen from figure 4, it is abundantly clear, in the contemporary world, that the least developed economies are dominated by agricultural employment whilst the most developed are dominated by tertiary employment.

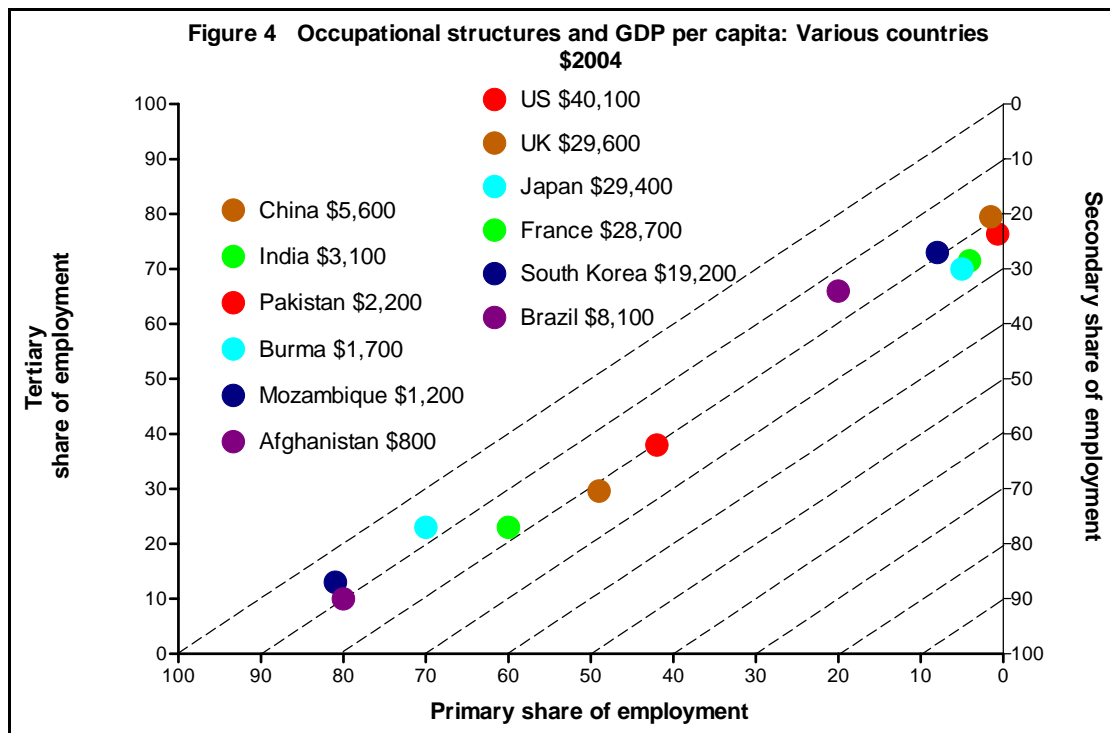


Figure 4 shows the relative importance of primary, secondary and tertiary employment for a number of modern economies.²⁷ The percentage share of tertiary

²⁶ Wrigley, *Poverty*, p. 135. Chapter 5 in Wrigley, *Poverty*, 'The occupational structure of England in the mid-nineteenth century' and Chapter 11, 'Country and town: the primary, secondary and tertiary peopling of England in the early modern period' contain further discussions of the rationale behind the scheme. Since then the scheme has been revised and extended. Further details can be found on the project website at <http://www.geog.cam.ac.uk/research/projects/occupations/categorisation/pst.pdf>

²⁷ I am grateful to Peter Kitson for suggesting this way of representing the primary, secondary and tertiary shares of employment. The data on this graph were sourced from the CIA World Fact Book. See <http://www.cia.gov/cia/publications/factbook/>. Unfortunately the CIA appears to be poorly informed on how to code occupational data and the degree of dominance of the tertiary sector in high-income countries is somewhat understated. Consequently this graph needs to be re-plotted with data

employment is shown on the vertical axis in conventional form. The percentage share of primary employment is shown on the horizontal axis but the conventional direction of the axis is reversed with 100 per cent at the left-hand end and zero per cent at the right-hand end. Since the percentage shares of primary, secondary and tertiary employment must add up to 100 per cent any given combination of primary and tertiary employment fixes the share of secondary employment. It is therefore possible to plot lines on the graph which indicate all the combinations of primary and tertiary shares which give a particular secondary share. The dashed diagonal lines indicate constant shares of secondary employment. These shares are indicated on the right hand vertical axis but the values on the right hand axis need to be read along the diagonal lines NOT horizontally as is conventional. Thus Afghanistan (shown in purple) has 10 percent of its workforce in tertiary employment and 80 percent in primary employment. Following the diagonal line up to the top right we can also see (as is already implicit) that 10 per cent of the Afghan workforce is in the secondary sector.

The relationship between high levels of economic development on the one hand and low levels of employment in the primary sector and high levels of employment in the tertiary sector on the other hand is clear. Rich countries today are characterised by very low levels of primary employment and very high levels of tertiary employment.²⁸

One intuitively attractive feature of this way of displaying the data is that the trajectory of long-term economic development is from the bottom left-hand corner to the top-right hand corner. The most primitive Neolithic economies would be close to bottom left-hand corner of the graph whereas, if current trends continue, the advanced parts of the world economy will eventually end up in the top right-hand corner. This would not be a helpful way of displaying occupational change at either extreme. Thus the Neolithic revolution would scarcely register (because it was a revolution within the primary sector).²⁹ Equally this is unlikely to be a useful way of representing change in the advanced economies in the future where the most important future changes are likely to take place within the tertiary sector. However, this is a helpful way of representing long-run change over, say, the last millenium, or across industrialisation, because the structural development of one or more regional or national economies over very long periods of time can be compared on a single graph. It is possible to incorporate further information, though it has not been done here, by making the area of the individual points proportional to GDP per capita or population levels.

Although nearly all of the analysis in the rest of this report aggregates the occupational data at the level of the simple tripartite division between the primary, secondary and tertiary sectors it is important to emphasis that:

- (1) PST allows a highly disaggregated analysis of occupational structure. Table two gives a partial listing of the categories at the second level (or second

from a higher quality source. However, this will not change the basic point this figure is intended to illustrate.

²⁸ Tertiary employment is in fact understated here. See the preceding footnote.

²⁹ Though the Neolithic did see the development of (very limited) craft specialisation and (very limited) movement of goods.

point) of PST. A full listing of the three point level and an indication of the four point level can be found on the project website.³⁰

- (2) All of the original descriptors (though not the full idiosyncrasies of variant spellings) have been retained.
- (3) The data could therefore be recoded via look-up tables to any other classificatory system desired. Wrigley and Ros Davies are in the process of creating look-up tables for both HISCO and Booth-Armstrong.

Table Two The PST System

The Primary Sector	
The products of land and water	1, 1
Mining and quarrying	1, 2
The Secondary Sector	
Food, drink, and tobacco	2, 3
Clothing and footwear	2, 4
Textiles	2, 5
Wood industries	2, 6
Furnishing	2, 8
Paper industries	2, 9
Printing and publishing	2,10
Earthenware, pottery manufacture	2,11
Glass manufacture	2,12
Building and construction	2,24
The Tertiary Sector	
Dealers in the raw products of land and water	3, 1
Sellers of food, drink, tobacco	4, 3
Transport	5, 1
Hotels, restaurants, public houses ...	5, 2
Domestic service	5, 5
Financial, commercial, administrative services	5, 6
Owners, possessors of capital	5, 7
Professions	5, 8
Public, government, church service	5, 9
Titled, gentleman	5,11
Armed forces	5,10

3.3 County level case studies

The core of the project consists of case studies of a number of counties for which there are good sources of male occupational data for the eighteenth century. We have currently analysed occupational datasets for Lancashire (the most important and most precocious industrial county) for the West Riding of Yorkshire (the second most important industrial county), Northumberland (dominated by coal-mining and agriculture), London (the pre-eminent service centre and the largest manufacturing town), Hertfordshire (agricultural), Bedfordshire (agricultural) and Northamptonshire (de-industrialising proto-industrial). We also have datasets we have not yet analysed for the East and North Ridings of Yorkshire as well as the counties of Cheshire, Devon, Worcestershire, Durham, Oxfordshire, and Westmorland. Data collection is

³⁰ At <http://www-hpss.geog.cam.ac.uk/research/projects/occupations/categorisation/pst.pdf>

currently underway in Devon, Warwickshire and Staffordshire. Figures 5 and 6 give a very clear indication of the central importance of Lancashire, the West Riding of Yorkshire and London for any understanding of England's economic development 1750-1851.

Figure 5 shows the percentage of adult males employed in the secondary sector in each of England's 576 registration districts in 1851. Whilst a conventional cartographic representation of this sort shows clearly the areas within which secondary sector employment was important, it does not show the importance of these areas to national employment patterns because the data are not weighted for relative population size.

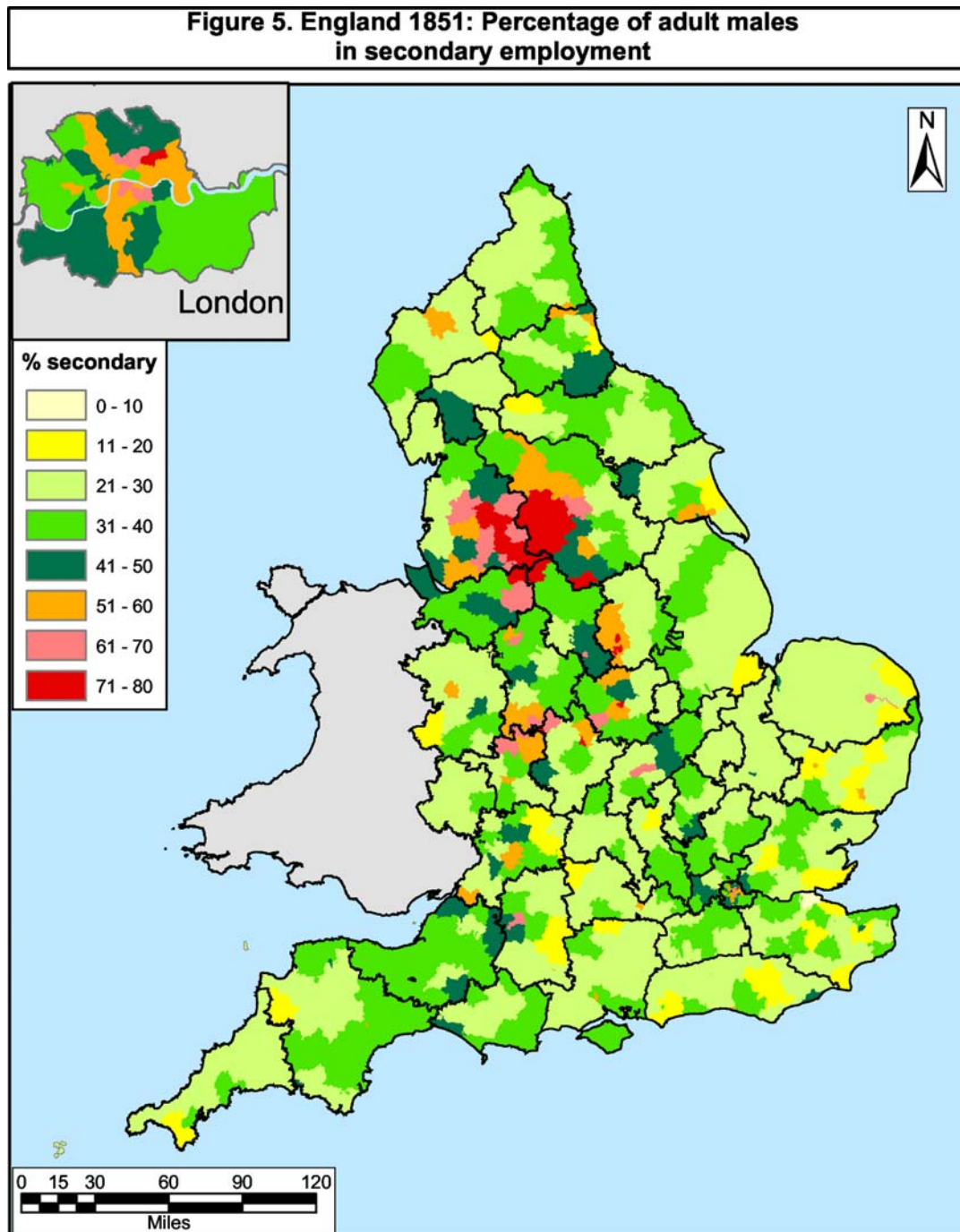
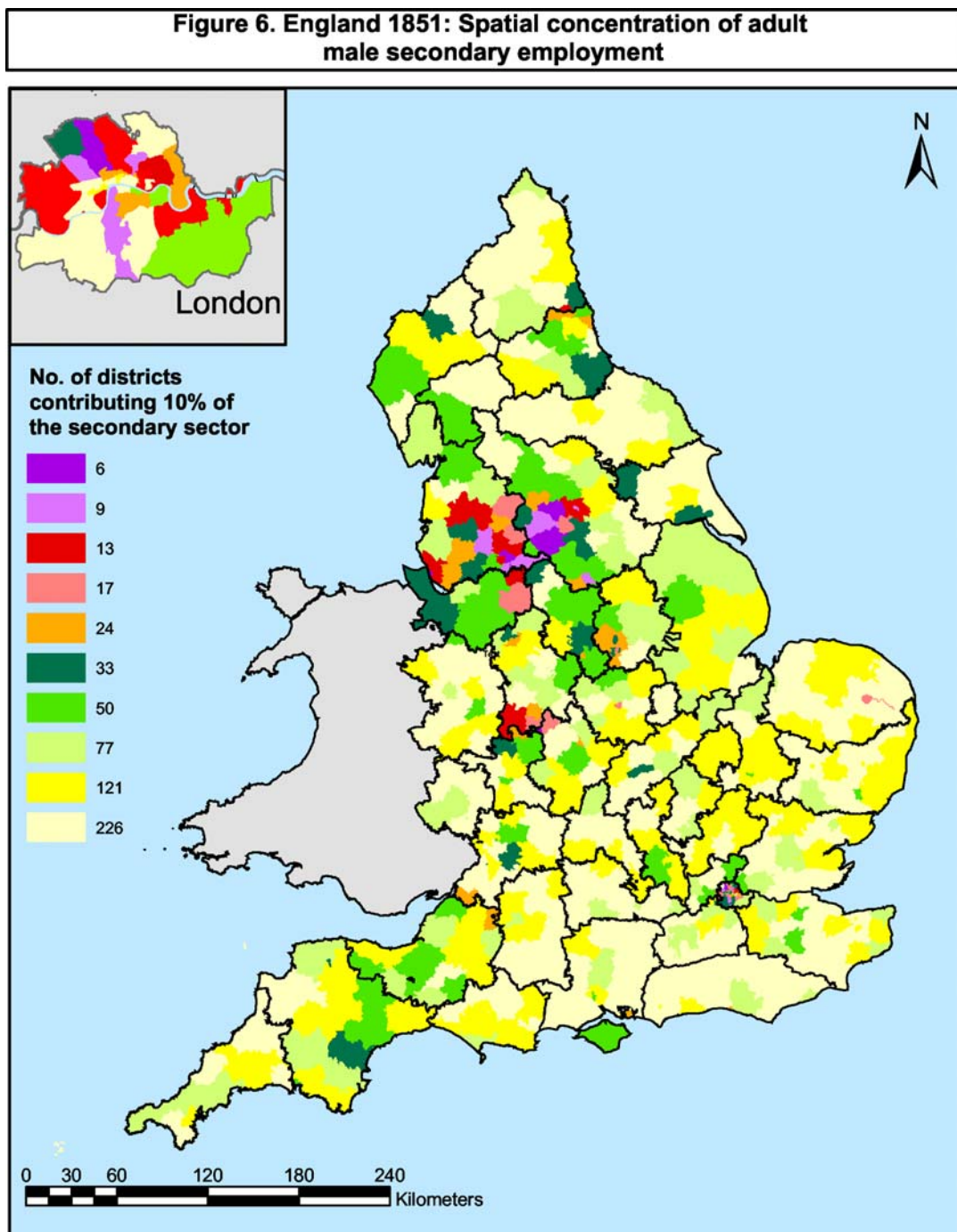


Figure 6 is a map of spatial concentration showing the relative national importance of each of the 576 registration districts to total adult male employment in the secondary sector in 1851. The registration districts in any given colour between them accounted for 10 per cent of adult male employment in the secondary sector in 1851. The numbers on the key next to each colour record the number of registration districts in each decile. The registration districts where employment was most concentrated are those shown in dark purple at the top of the scale. Thus the six dark purple registration units (Liverpool, Manchester, Bradford, Huddersfield, Birmingham and St Pancras) between them accounted for ten per cent of all adult male employment in the secondary sector in 1851.



At the other end of the scale 226 light yellow registration districts also accounted for 10 per cent of adult male employment. As can be seen the textile district of south-eastern Lancashire and north-eastern Cheshire, the textile district of the West Riding, London and the Birmingham area formed the only really important concentrations of adult male secondary sector employment in 1851. Although secondary employment was found throughout the country and rarely fell below twenty per cent of occupied adult males these four areas contained the vast majority of those producing ‘tradable’ secondary sector products for non-local markets.³¹

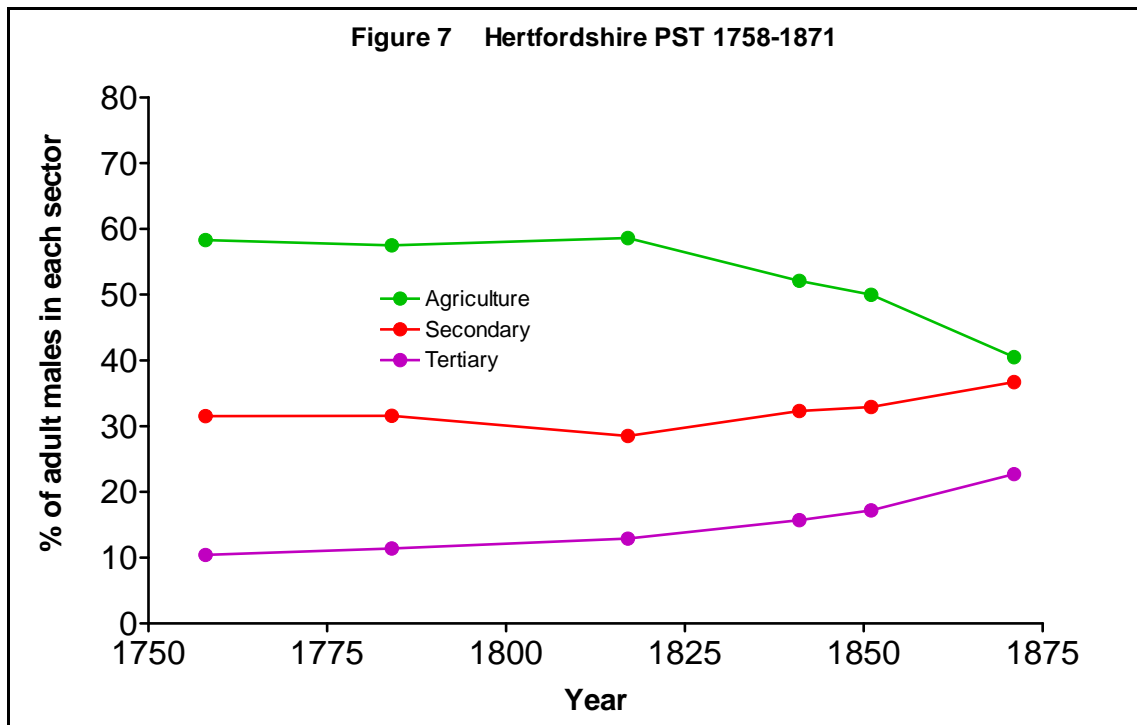
This report does not contain a detailed text for the individual county-level case studies but does include, on the following pages, some key figures which summarise the evolution of the primary, secondary and tertiary sectors for the counties of Hertfordshire, Lancashire, the West Riding, Northamptonshire, and London together with some very brief accompanying notes. Much more detailed case study papers on these counties plus papers on Bedfordshire and Northumberland can be found on the <http://www-hpss.geog.cam.ac.uk/research/projects/occupations/abstracts/> Readers who want less rather than more information may prefer to skip over the graphs and comments on the individual county case studies and move straight to section 3.4.

3.3.1 Hertfordshire

Figure 7 shows the trends in the percentages of adult males in the agricultural, secondary and tertiary sectors in Hertfordshire between 1758 and 1871.³² Hertfordshire was by English, though not by European, standards a fairly agricultural county in the second half of the eighteenth century with just under sixty per cent of adult males employed in agriculture at mid-century. Agricultural employment was remarkably stable over the next six decades. The secondary sector was also remarkably stable down to 1815 at around 30 per cent of adult male employment.

³¹ The term ‘tradable’ is used to denote goods and services which can be consumed at a distance from where they are produced. Non-tradable goods are those which must be consumed where they are produced. Until relatively recently almost all service sector outputs were non-tradable. The construction sector remains essentially non-tradable to this day (despite recent announcements by IKEA that they intend to sell modular kit homes in the UK) – ie. houses must be built where they are to be used.

³² The primary sector was virtually co-terminus with agriculture in Hertfordshire.

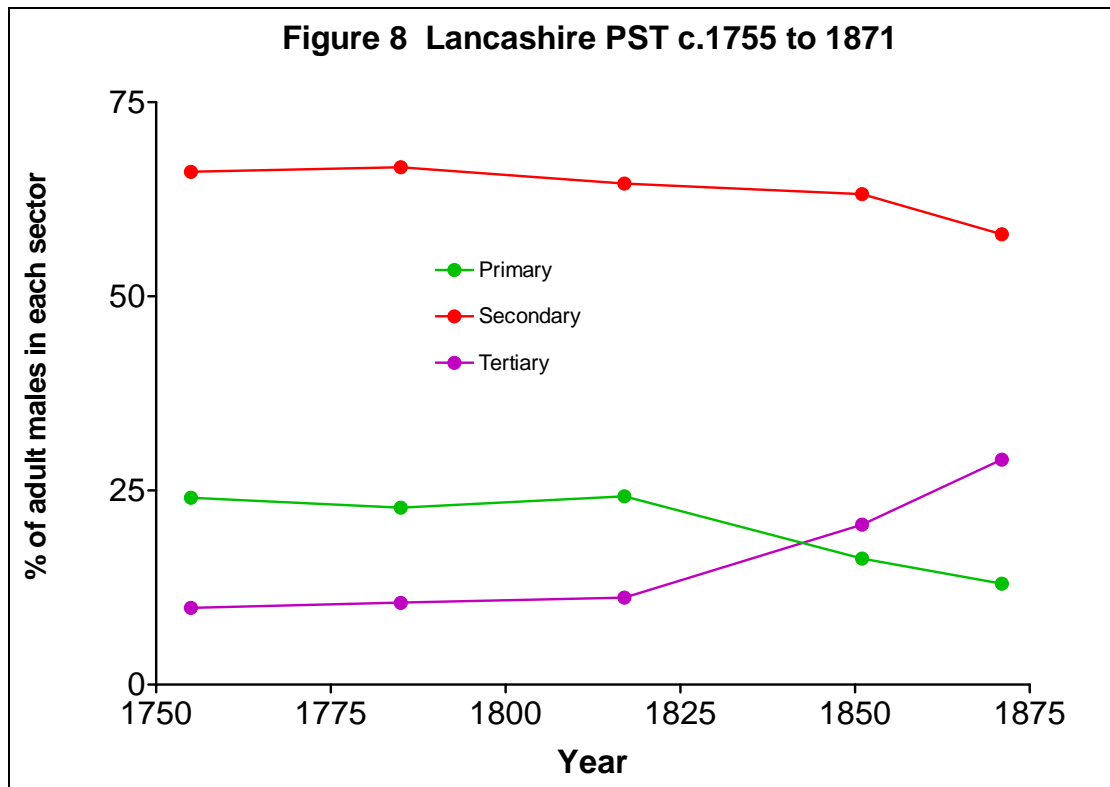


After 1815 agriculture steadily declined in its share of adult male employment diminishing to around 40 per cent by 1871. Over the same period the secondary sector grew steadily from around 30 per cent to around 37 per cent. Much the most dynamic sector across the both periods was the tertiary sector which more than doubled in size from 10.4 per cent in 1758 to 22.7 per cent in 1871

3.3.2 Lancashire

Figure 8 shows trends in the relative shares of adult male employment for the primary, secondary and tertiary sectors in Lancashire from c.1755 to 1871. Perhaps the most surprising feature of this graph is the astonishingly high level of secondary sector employment already reached in the middle of the eighteenth century (66 per cent) before the onset of the classical industrial revolution period. Moreover, there was no increase in this figure over the next 120 years but in fact a slight decline. Of course, there were large increases in the absolute numbers of adult males employed in the secondary sector in Lancashire throughout the period under consideration here because the population of the county was growing rapidly. Lancashire was the fastest growing English county throughout the period 1761 to 1851.³³ This implies major immigration into the county, an issue to which we will return in section 3.6. The

³³ For details of the population growth rates of English counties 1761 to 1801 see Wrigley, 'English county populations in the later eighteenth century' which is forthcoming in the *Economic History Review* but currently available as paper 9 on the project website at <http://www.geog.cam.ac.uk/research/projects/occupations/abstracts/> For population growth in the period 1801 to 1851 see figure 19 in this paper.



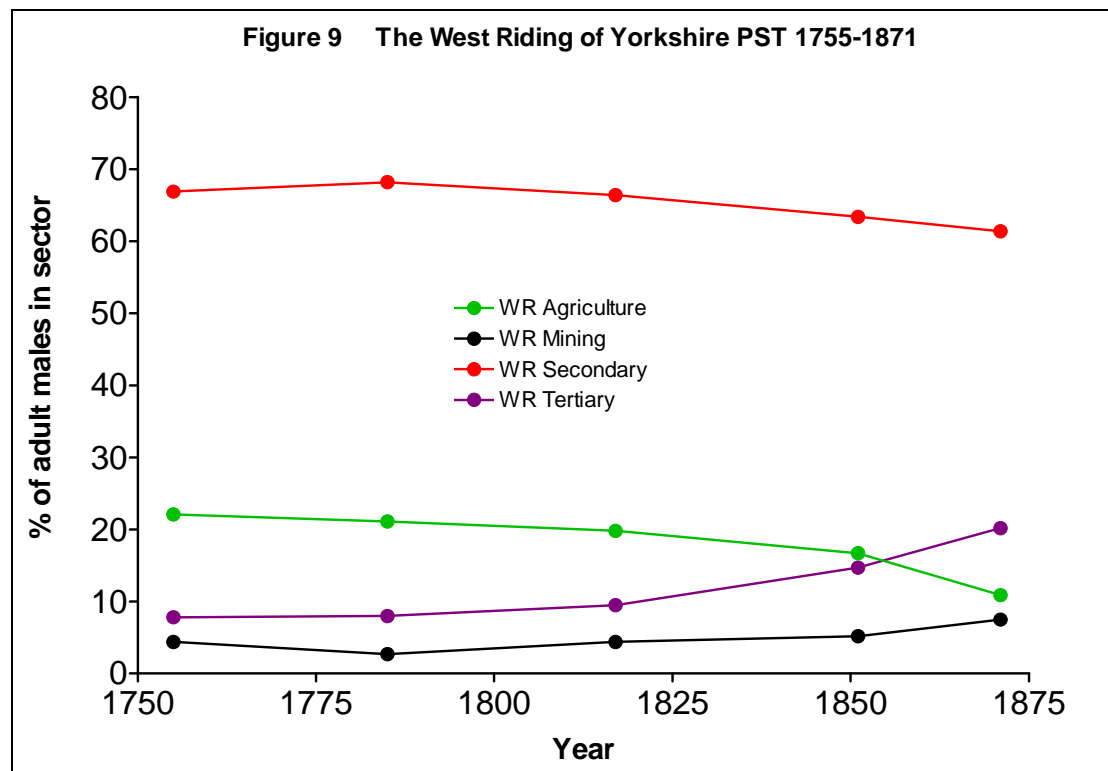
primary sector only accounted for 25 per cent of adult male employment in c.1755, the figure reached in the country as a whole in 1851. The primary sector hardly changed in size between c.1755 and c.1815 and then went into steady decline, roughly halving by 1871. The tertiary sector as in Hertfordshire was the most dynamic sector. In Lancashire tertiary growth was even more impressive with a tripling in relative importance from about 10 per cent in c.1755 to 29 per cent in 1871, though growth in the eighteenth century was muted.

3.3.3. The West Riding of Yorkshire

Figure 9 shows the development of adult male employment in the primary, secondary and tertiary sectors in the West Riding of Yorkshire c.1755-1871. The primary sector has been separated out into agriculture and mining because the West Riding contained a significant coal mining sector. The picture is remarkably similar to that for Lancashire. The secondary sector was very large (67 per cent) at an early date and then declined slowly but steadily in relative importance over the next 120 years. As in Lancashire the absolute numbers in the secondary sector would have been growing rapidly as the county experienced very rapid population growth. Agriculture's share of adult male employment remained more or less constant at around 20 per cent down to 1815 and then declined steadily halving, by 1871. The tertiary sector tripled in relative importance from 8 per cent of adult male employment in c.1755 to 24 per cent in 1871.

The levels of secondary sector employment reached by the middle of the eighteenth century in both the West Riding and Lancashire – approximately two-thirds of adult male employment – are remarkable and entirely unexpected. Two important questions of great interest naturally arise. Firstly, when did Lancashire and the West Riding reach these levels of adult male secondary sector employment? It is a safe assumption that they did not look like this in 1500. At the moment it seems likely that

these very high figures were an achievement of the period between 1650 and 1720 or 1750. We hope to have sufficient data with which to resolve this question in the next twelve months.



The second question, of great interest, is comparative. Did any other European proto-industrial regions look like this in the middle of the eighteenth century? At present we cannot say, but a firm empirical answer to this question would go a long way towards clarifying when England's industrial development first started to diverge in fundamental ways from that elsewhere in Europe. Again, we would hope to be able to answer this question, certainly with respect to the Dutch Republic and possibly for some other parts of Europe over the next twelve months.

At this point it is necessary to reconsider the importance of by-employments alluded to earlier. By-employment refers to the widespread tendency in pre-industrial societies for one individual to have more than one occupation.³⁴ Could widespread by-employments in some way inflate the importance of secondary sector employment at an early date? This is unlikely. John Swain has argued, based on a study of sixteenth century probate inventories in Lancashire, that in the sixteenth century there was a high level of involvement of farming households in textile production and that in consequence reliance upon occupational descriptors would *understate* the importance of secondary sector production. By-employments were greatly diminished in importance by the early eighteenth century and unlikely to have been of any real importance by the nineteenth century.³⁵ But suppose that Swain's sixteenth century findings did hold true for Lancashire and the West Riding in the mid eighteenth century. The impact of this on figures 8 and 9 would be that the high

³⁴ On by employments see Everitt, 'Tudor and Stuart farm workers'; Langton, 'Prometheus prostrated'; Overton et al, *Production and consumption*.

³⁵ Walton, 'Lancashire.'

levels of secondary employment in the mid-eighteenth century understated the true situation. Thus, the real levels would be even higher than two-thirds of adult male employment. Since at the end of period we may safely assume that by-employment was of very limited importance, the overall consequence would be that secondary sector employment c.1755 was even higher than argued here and that it fell *more* sharply over time than argued here.

However, these are complex issues and further empirical research is currently underway by Shaw-Taylor on early eighteenth century Lancashire probate inventories aimed at clarifying the nature and importance of by-employments. Initial inspection of inventories suggests that most farmers, yeomen and husbandmen were still involved in textile production in the early eighteenth century. However, there were much larger numbers of specialised weavers, though some of these had a small-scale involvement in agriculture, typically the ownership of one cow.

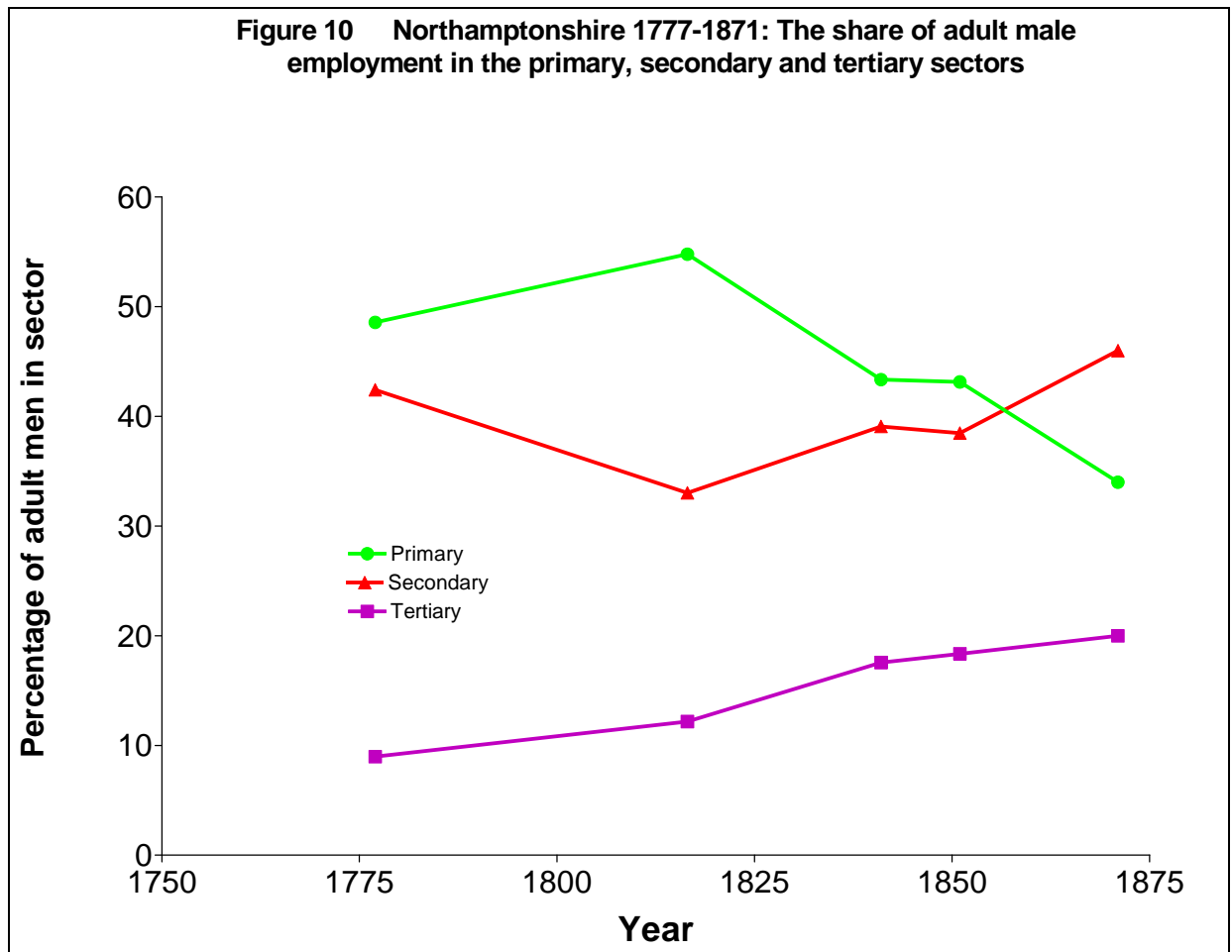
It therefore follows that whilst the involvement of farmers in textile production is indeed hidden from view by their occupational descriptors, it is equally true that the involvement of many weavers in agriculture is also hidden from view. The net scale and direction of any effect is therefore unclear. Further analysis of a large sample of inventories, currently being made machine-readable, will allow some quantitative estimates of the net effect. However, it does not, at present, seem likely that this will have any major impact on the arguments presented in this paper.

3.3.4 Northamptonshire

The county of Northamptonshire in the south-east Midlands is the only area for which we have so far found evidence for a significant change in the relative importance of adult male secondary sector employment between 1750 and c.1815. As can be seen from figure 10, there was a sharp contraction in the relative importance of secondary sector employment and a corresponding *increase* in the relative importance of agricultural employment. The reason is straightforward: the county experienced significant de-industrialization due to the spectacular collapse of its proto-industrial worsted industry between about 1790 and 1815. This was almost certainly caused by the mechanisation of the West Riding's worsted industry in the same period.³⁶ It is clear that ex-weavers were forced into agricultural labour in substantial numbers while many migrated out of the area.³⁷

³⁶ For further details see Shaw-Taylor and Jones, 'The occupational structure of Northamptonshire 1777-1881.' This paper can be downloaded from the project website as paper 5 at <http://www-hpss.geog.cam.ac.uk/research/projects/occupations/abstracts/>

³⁷ Data on hundredal level population data produced by Wrigley shows that the weaving area experienced much lower population growth at the turn of the eighteenth and nineteenth centuries than the surrounding region. For a provisional map of hundredal population growth in the south-east Midlands 1761-1841 see the project website at <http://www-hpss.geog.cam.ac.uk/research/projects/occupations/populationgrowth1761/counties.html>



After the end of the Napoleonic wars the county's economy began to recover and, as in Hertfordshire, the secondary sector began to increase in relative importance, rising from a nadir of 33 per cent in c.1815 to reach 45 per cent by 1871. This was due largely to the continuing expansion of the proto-industrial shoemaking industry in and around the city of Northampton and, after, 1857, its shift to mechanised steam powered factory production.³⁸ As elsewhere the relative importance of agricultural employment declined steadily after c.1815, falling from a high point of 55 per cent to reach 34 per cent by 1871.

As in every other case study, the tertiary sector expanded across the whole period, more than doubling in relative importance from 9 per cent in 1777 to 20 per cent in 1871. Again, growth was more pronounced in the nineteenth century than in the eighteenth century.

Figure 3.3.5 London

Figure 11 shows the trends in the relative importance of the primary, secondary and tertiary sectors of adult male employment in London (taking London to be the area

³⁸ For further details see Shaw-Taylor and Jones, 'The occupational structure of Northamptonshire 1777-1881', p. 8.

defined as the Metropolis in the 1851 census report) over the period to 1871.³⁹ However, the degree of reliability of the 1750 data-points has yet to be established



empirically.⁴⁰ *A priori* the 1750 data points appear to be highly plausible because they match later trends closely. London was, and remained, as Schwarz has noted, the largest manufacturing town in Britain across the whole period.⁴¹ However, as figure 11 makes clear, the relative importance of secondary sector employment in the nation's capital was continuously declining from the middle of the eighteenth century through to the late nineteenth century as the tertiary sector steadily grew in relative importance, to the point where, by 1871, it was clearly poised to overtake the secondary sector.

³⁹ For a more detailed sectoral and geographical analysis of trends in London's male employment structure over the nineteenth century see Shaw-Taylor, 'London' which can be downloaded as paper 3 from the project website at <http://www-hpss.geog.cam.ac.uk/research/projects/occupations/abstracts/>

⁴⁰ The 1750 data derive from the Fleet Marriage registers. Approximately half of all London's marriages took place within the precincts of the Fleet prison at this date and the vast majority of them recorded the groom's occupation. They therefore *appear* to be a good source from which to reconstruct London's male occupational structure in the mid eighteenth century. However further work, to be undertaken over the next few months by Shaw-Taylor and Eli Schacher will test their representativeness against a number of other sources. I am grateful to Gill Newton for bringing the utility of these sources to my attention.

⁴¹ Schwarz, *London*.

The long-run development of the secondary sector bears some resemblance to that in Lancashire and the West Riding. In the mid eighteenth century (if we can rely on the Fleet Registers) 66 per cent of London's adult males worked in the secondary sector. This declined to 51 per cent by 1871. Whilst the starting point is virtually identical with the industrial north-west, the subsequent decline is much steeper. This is because the tertiary sector grew rapidly but started at a much higher level rising from a figure of 30 per cent of adult male employment in 1750 to reach 47 per cent by 1870.

The primary sector was small and declining over time, falling from 6 per cent in 1750 to 2 per cent in 1871. The decline occurs because the data have been taken from a consistently defined geographical area (using the 1851 census definition of the Metropolis) and parts of this area were in fact rural in 1750 but the rural areas diminished in size and relative importance over time as the real metropolitan area expanded. Some primary employment remains in the mid and late nineteenth century because of the continuing presence of market gardening and dairying.⁴²

3.4 Summarising the county case studies

The rest of this report offers some preliminary conclusions. They are tentative for three reasons. Firstly, we have no comparable datasets for changes over time in female and child employment. Secondly, we do not have data for the whole country. Thirdly, we have not finalised our own treatment of the data. However, none of these factors is likely to affect fundamentally the broad conclusions presented below.

Although we are not yet in a position to offer final estimates on national trends for the pre-census period the appendix to this paper documents a very preliminary attempt at estimating the sectoral employment shares c.1750. In due course this will be refined in three respects. Firstly, we will incorporate more data. Secondly, we need to refine the existing datasets in a number of ways. Thirdly, we will experiment with a number of different ways of combining the various datasets to produce national estimates. That said these refinements are unlikely to make any radical difference to the overall picture. These national estimates are indicated in blue in figures 12 to 14 below.

3.4.1 The primary sector

Figures 12, 13 and 14 below summarise the county-level datasets we have currently analysed and respectively show trends in the percentage shares of adult male employment of the primary, secondary and tertiary sectors. In each case the lower panel uses a logarithmic scale to facilitate visual comparison of growth rates.

Figures 12a and 12b summarise the data presently available on county-level trends in the primary sector. As can be seen, in the West Riding and Lancashire (shown respectively in red), the share of adult male employment in the primary sector was constant down to c.1815. In contrast in Bedfordshire, Hertfordshire and Northamptonshire (shown in khaki, green and black respectively) there was a rise in the importance of primary (which was overwhelmingly agricultural) employment

⁴² But also because the census records where individuals were on census night *not* where they were normally resident. Thus farmers and farm labourers delivering produce to Smithfield and other London markets on census day appear in the census for London. Similar concentrations of agriculturalists can be found in the census returns in Manchester and Birmingham.

across the eighteenth and early nineteenth century. Each of three southern counties experienced some de-industrialisation, as small proto-industrial textile industries were wiped out around the turn of the eighteenth and nineteenth centuries. In Northumberland (excluding Newcastle, North Durham and Berwick) the primary sector declined slightly (despite the presence of the coal-mining industry) over this period.⁴³ After 1815 the relative importance of the primary sector went into steep relative decline virtually everywhere for the rest of the nineteenth century.

The blue line shows the preliminary estimated national rates of adult male employment in the primary sector (see appendix for the means by which these were derived). This shows a decline across the whole period from the mid eighteenth century which became progressively sharper over time. The national decline is steeper than that experienced by any individual county. This is because those counties where agricultural employment was low in c.1755 (such as Lancashire and the West Riding) experienced much more rapid population growth over the whole period than did counties where agricultural employment was high in c.1755 (such as Bedfordshire, Hertfordshire and Northamptonshire). In other words the population of the country as a whole was increasingly concentrated in the non-agricultural counties over time.

⁴³ Newcastle, North Durham and Berwick are excluded here because no occupational data are available for 1762. For further discussion see Kitson, 'Northumberland' which can be downloaded as paper 6 from the project website at <http://www-hpss.geog.cam.ac.uk/research/projects/occupations/abstracts/>

Figure 12a The decline of the primary sector

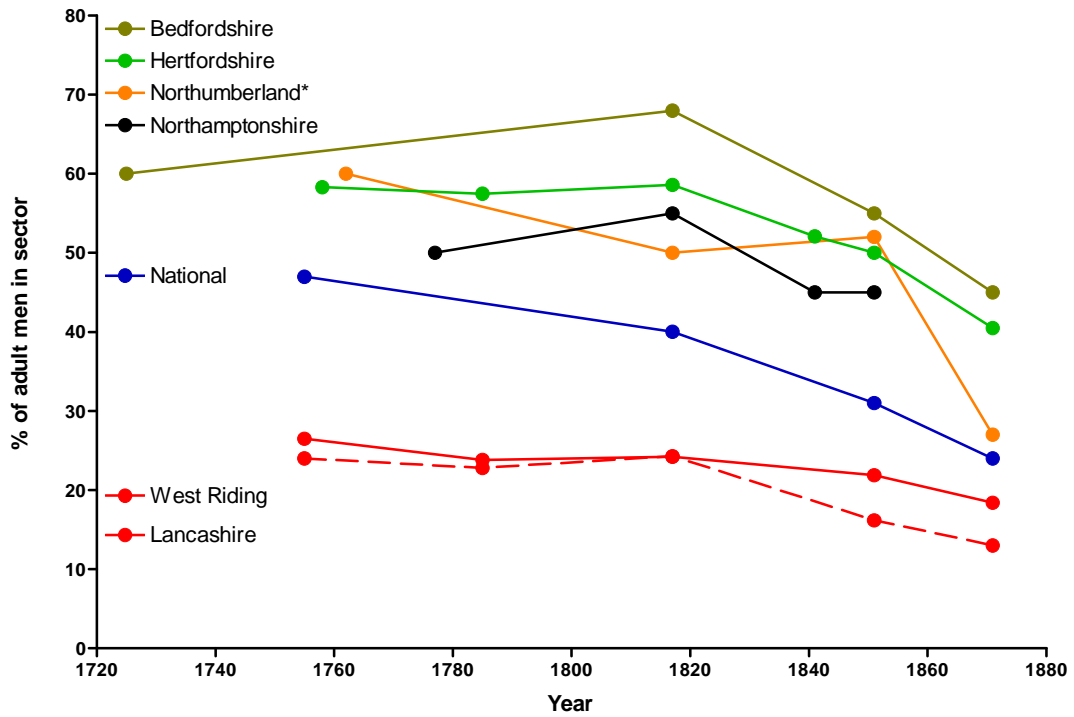


Figure 12b The decline of the primary sector

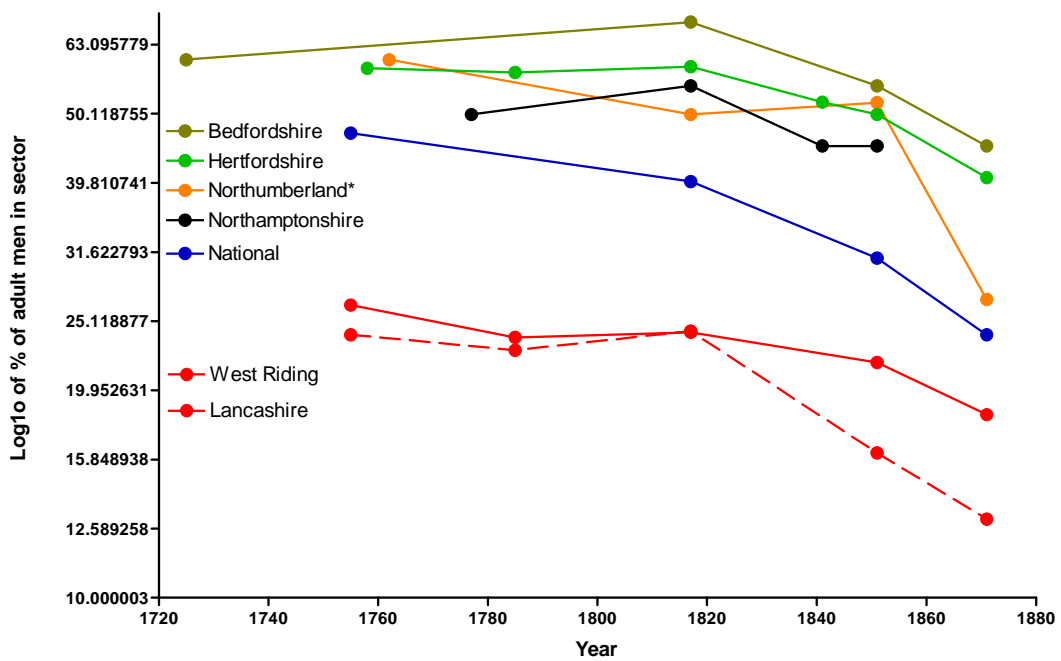


Figure 13a The growth of the secondary sector

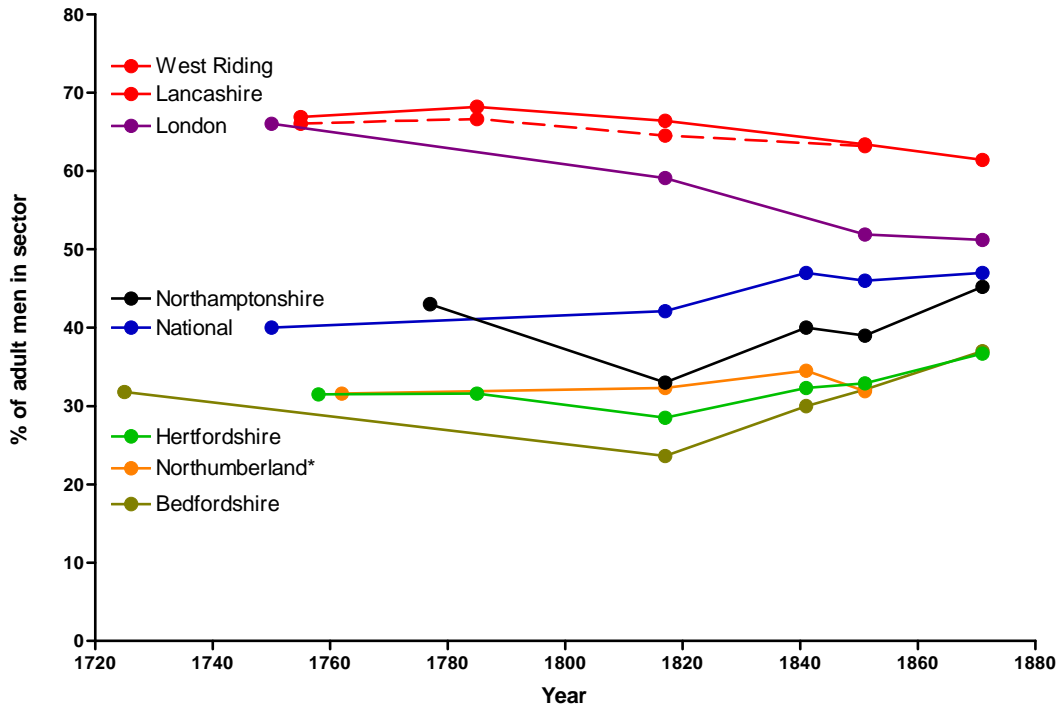
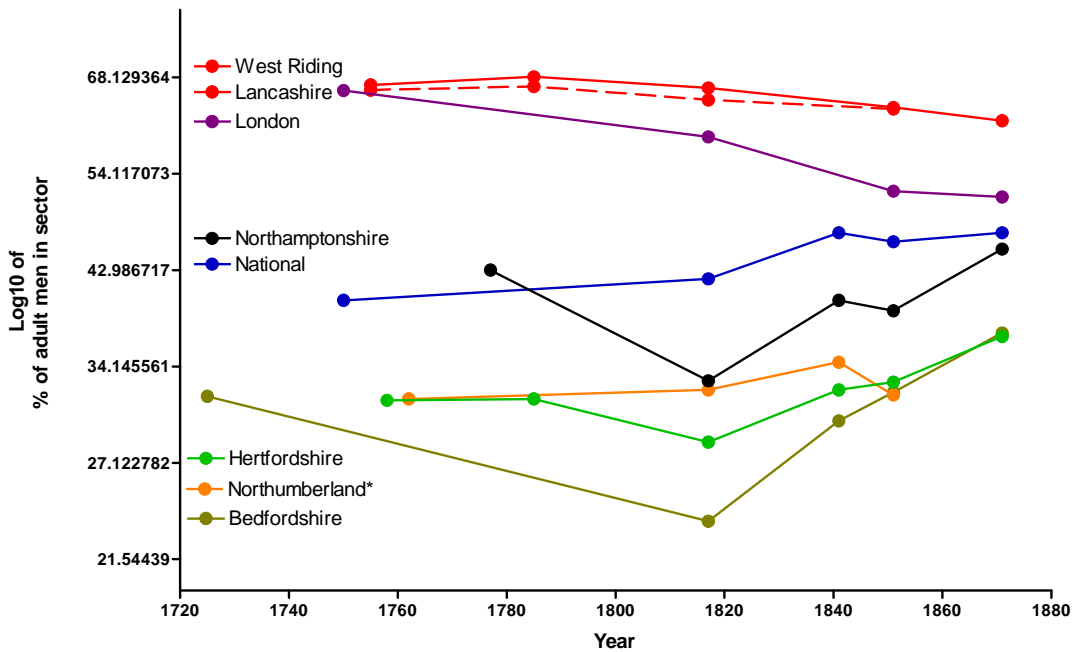


Figure 13b The growth of the secondary sector



3.4.2 The secondary sector

Figures 13a and 13b shows changes in the relative importance of secondary sector employment for adult males for various counties from the mid eighteenth century to 1871. As can readily be seen from the graph the proportion of men employed in the secondary sector was falling almost everywhere between 1750 and c.1815. However, the absolute levels were very different in different parts of the country by 1750. Areas such as Lancashire, the West Riding and London, with high levels of secondary sector employment at the beginning of the period experienced much higher levels of population growth over the period 1750-1871 than heavily agricultural areas such as Bedfordshire, Hertfordshire and Northamptonshire. Hence it was still possible for the percentage of adult men employed in the secondary sector between 1750 and c.1815 to grow nationally (as indicated by the blue line), albeit fairly slowly, despite falling in individual counties and regions. After 1815 a remarkable change in the pattern of regional development can be seen. Whilst the relative importance of secondary sector employment in London and the industrial north-west continued its earlier decline, all those areas formally characterised by relatively low levels of secondary sector employment experienced a relatively rapid increase in the relative importance of secondary sector employment. What we are seeing here may be characterised as a second wave of industrialisation outside of London and the industrial north-west. The preliminary estimate of the national trend (shown in blue) also turned upward after 1815.

3.4.3 The tertiary sector

Figures 14a and 14b show the changes in the relative importance of the tertiary sector in adult male employment from the mid eighteenth century to 1871. The tertiary sector emerges as the most dynamic sector from the late eighteenth century. That this was so in the late nineteenth century was demonstrated some years ago by C.H. Lee.⁴⁴ That this was also the case as early as the late eighteenth century is entirely novel. The absence of appropriate data on the service sector obliged Crafts, in making estimates of British economic growth over the period 1700-1801 to assume that the proportion of total employment in the service sector was constant.⁴⁵ On these data, service-sector employment grew by nearly 50 per cent over this period which will necessitate some upward revision of the Crafts' figures for GDP per capita growth 1700-1801.⁴⁶

The regional uniformity of service sector growth is remarkable. Space precludes a detailed analysis of service sector growth here, though this will be the subject of a number of further articles. All areas of the service sector underwent major expansion including, shop-keeping, wholesaling, the public sector, financial and professional services, the transport sector.

⁴⁴ Lee, 'Service sector'; idem, 'Regional growth.'

⁴⁵ Crafts, *British economic growth*, p. 35

⁴⁶ Though many other adjustments will be needed too, some of which may push growth rates in the opposite direction. It is emphatically **NOT** my suggestion that these data will substantially undermine the basic Crafts story that GDP per capita growth was relatively low in this period. Nevertheless, some revisions will need to be made to the Crafts/Crafts and Harley figures.

Figure 14a The growth of the tertiary sector

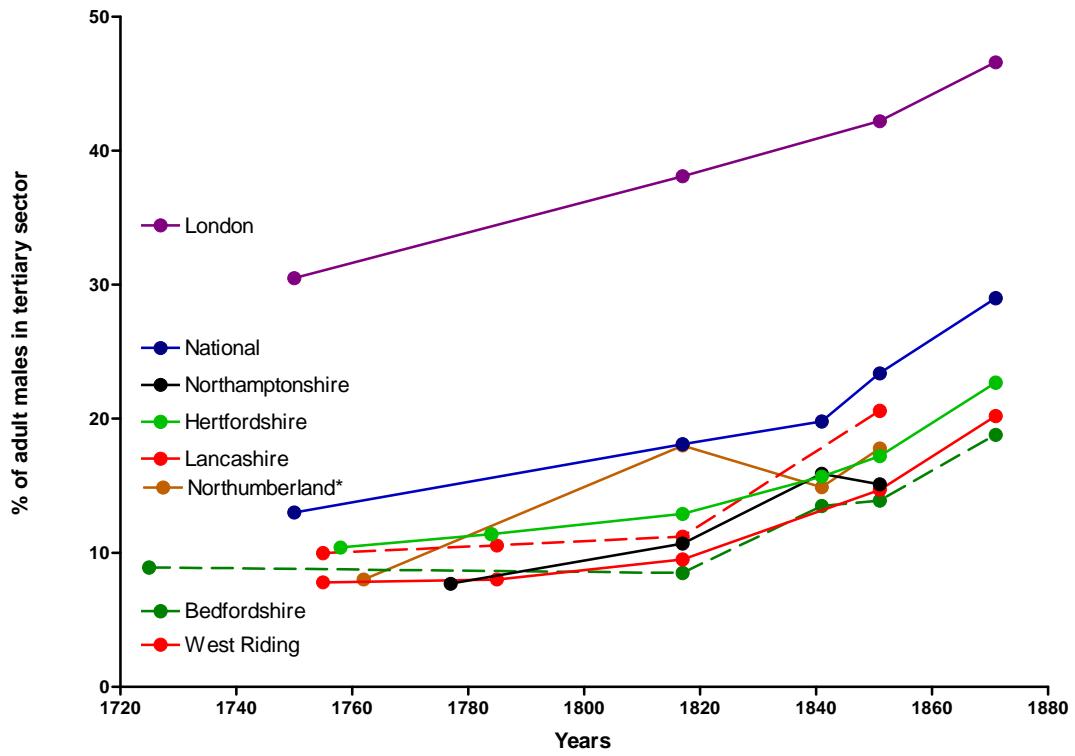
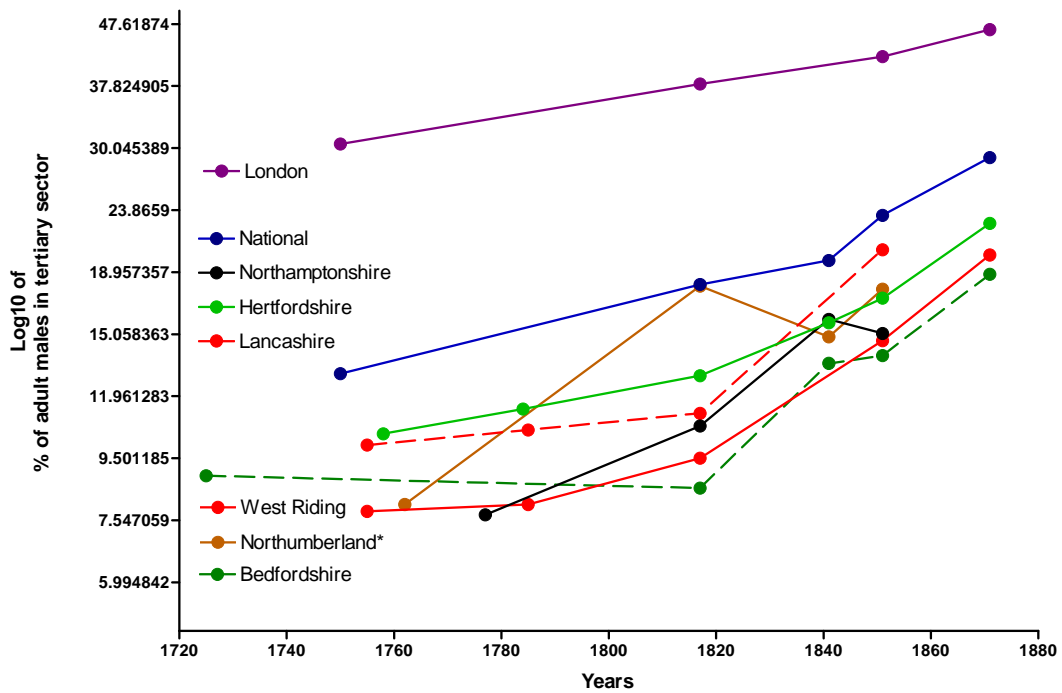


Figure 14b The growth of the tertiary sector



One centrally important finding that should be mentioned here is that the transport sector was much the largest single component of the tertiary sector and made up around one third of all the growth in the sector. This provides dramatic confirmation of the view that developments in the transport sector were fundamentally important to British industrialisation, and this will be a key avenue for further research in future phases of the project. Building local occupational and population datasets together with comprehensive data on transport infrastructure into a geographical information system (GIS) will allow us to move beyond the sterile impasse left behind in the wake of studies based on the econometric social-savings methodology.⁴⁷

The universal growth of the service sector may well be an indicator of increasing levels of average affluence for the reasons given by Wrigley and cited earlier. However, much of the service sector was simply servicing secondary sector production and a more detailed analysis of the service sector is required before such a conclusion can be reached.

3.5 Some preliminary implications

Much has been written in the last couple of decades about the importance of regional development during the industrial revolution.⁴⁸ It has been suggested that reliance on national aggregate measurements of national growth rates in GDP per capita have obscured profound structural changes taking place at the regional level.⁴⁹ In particular it has been argued that manufacturing areas experienced major structural change between 1750 and 1850.

This may be true of some aspects of the manufacturing process. However, as can be seen in figures 12 to 14 the evidence presented here suggests a different view with respect to occupational structure. At the regional (or more correctly, the county) level, changes in male occupational structure turn out to have been surprisingly muted at least until the end of the Napoleonic wars and in the industrial districts well beyond that. As figure 13 indicates, so far we have found no evidence anywhere of a marked growth in the proportion of adult males employed in the secondary sector before c.1815. In fact London, Lancashire and the West Riding actually experienced a slight decline, whilst Northamptonshire and Bedfordshire experienced significant, albeit temporary, de-industrialisation. After 1815 the secondary sector did begin to grow in relative importance, for the first time since 1750 in most parts of the country, but not in the north-western manufacturing districts or in London.⁵⁰ In fact, the regional growth in the relative importance of secondary sector employment after 1815 took place exclusively outside the areas traditionally associated with the industrial revolution.

However, since counties with high concentrations of non-agricultural employment experienced much more rapid population growth than relatively agricultural counties (see figure 15), it follows that there was a significant change in the male occupational

⁴⁷ A first phase of this work, re-examining the impact of railway development, forms a central plank of the second project on *The changing occupational structure of Britain c.1820 to 1911*. Geographical Information Systems are powerful statistical packages which allow the spatial integration of different datasets, the statistical analysis of geo-referenced datasets and expedite rapid and accurate mapping of datasets.

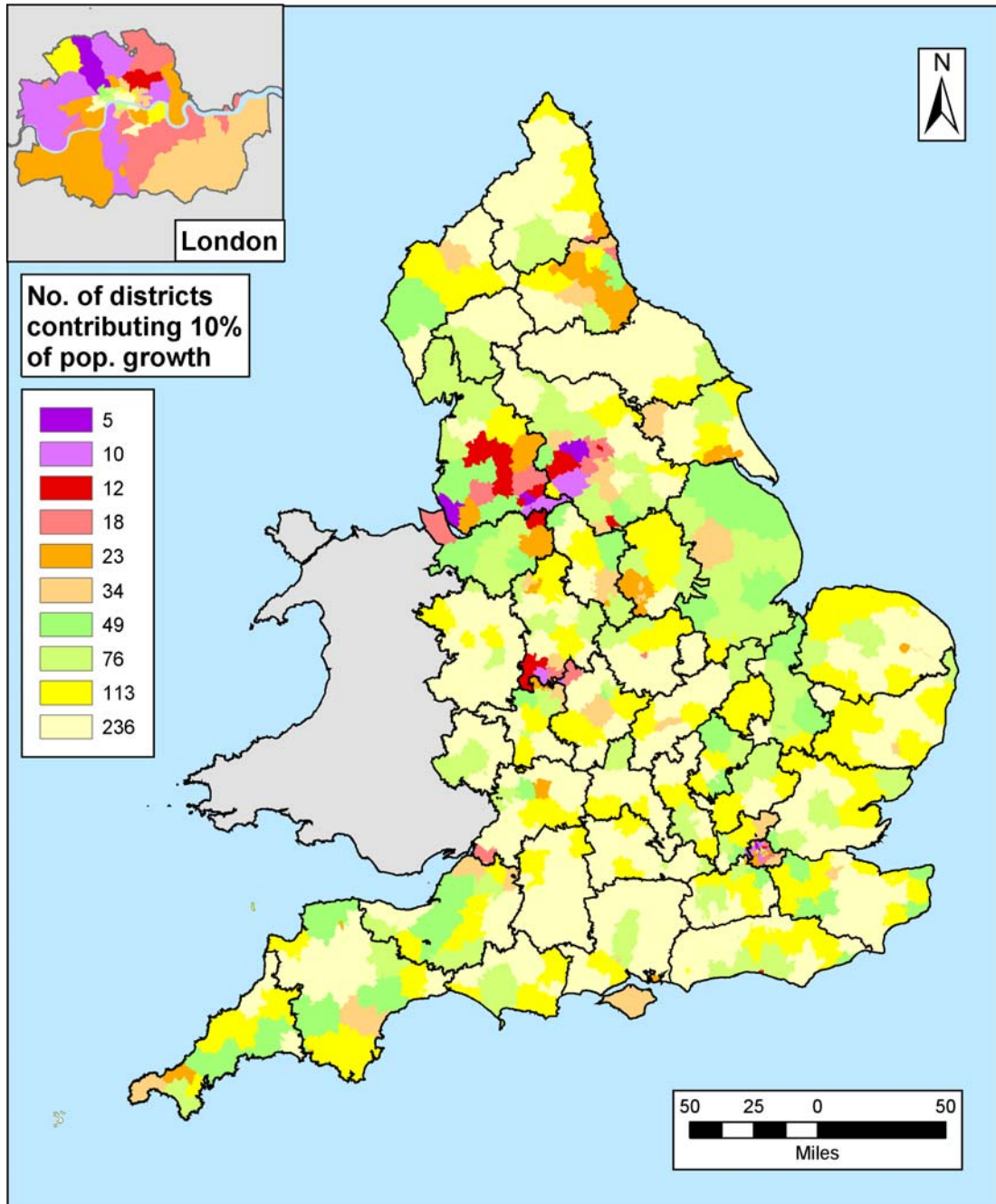
⁴⁸ Pollard, *Region und industrialisierung*; Pollard, *Peaceful conquest*; Langton, 'Industrial revolution and regional geography'; Gregory, *Regional transformation*; Hudson, *Regions and industries*; Berg and Hudson, 'Rehabilitating'; Crafts and Harley, 'A restatement'.

⁴⁹ Hudson, *Regions and industries*; Berg and Hudson, 'Rehabilitating'.

⁵⁰ It is possible, though unlikely, that this growth commenced a little earlier.

structure between 1750 and c.1815. However, this change is visible only at the aggregate national level. The growth in secondary sector employment at national level between 1750 and 1815 was driven principally by differential regional population growth rates and not by regional structural change. In this sense stability at the regional level masks significant change at the national level.⁵¹

Figure 15. Spatial Concentration of English population growth 1801-1851



Our findings so far suggest that highly distinctive regional male occupational structures were in place by the mid-eighteenth century, and perhaps earlier.

⁵¹ This is the mirror image of the composition effect noted by Woods with respect to mortality change in the nineteenth century: Woods, 'Effects of population redistribution.'

Lancashire and the West Riding had achieved remarkably high levels of secondary sector employment by that date, with approximately two-thirds of all adult males employed in the secondary sector. We do not have the data at present to determine when this level was first achieved nor whether or not this marked out Lancashire and West Riding as highly distinct from other European proto-industrial regions as early as the 1750s. An empirical answer to these questions would go a long way towards pinning down the nature and timing of England's divergence from the rest of North-Western Europe.

The primary sector's share of adult male employment fell only slowly before c.1815 (the decline more or less matching the rise in tertiary employment). At national but not regional level the shift from agriculture to the secondary sector must have been pronounced between the mid eighteenth and the late nineteenth centuries, though we are currently only in a position to quantify this rather provisionally. Our present estimates are that the primary sector accounted for 47 per cent of adult male employment in c.1755, 40 per cent in c.1820. This compares with a figure of 24 per cent in 1871. That the share of the workforce in the primary sector could be as low as 47 per cent in 1750 confirms Wrigley's earlier estimates and makes it undeniable that England's economic structure was radically different from any other European country by the middle of the eighteenth century.

Since the demographic evidence suggests that fertility and mortality were not very different in different parts of the country this broader structural change was driven by migration from areas which at an early date had highly agricultural occupational structures to areas which had high levels of non-agricultural employment by the mid eighteenth century.⁵²

Crafts has drawn attention to the limited impact of the industrial revolution before the second quarter of the nineteenth century. In his view it was only with the spread of steam-powered factory production outside the textile sector from the 1830s that revolutionary changes in production processes became general in manufacturing.⁵³ These views are consistent with the present findings. The relative size of the secondary sector was generally stable in the more agricultural counties of southern England over the period down to 1815. Thereafter there was growth in the relative importance of secondary sector employment. In some areas the change was spectacular. For instance in the area centring on Dunstable and Luton, which had remained strongly agricultural in 1815, the secondary sector share of employment doubled from around 25 per cent to about 55 per cent over the next 60 years. This second wave of regional industrialisation and its geography have attracted relatively little scholarly attention to date, but are clearly more important than previously realised. This striking development is illustrated in figure 16. In due course the whole of Britain will be mapped in this form as part of a historical atlas to be produced during the lifetime of the second round of ESRC funding.

Lee noted the importance of the growth of tertiary sector employment from the mid-nineteenth century.⁵⁴ It is now clear that the tertiary sector was in fact growing rapidly both relatively and absolutely in all regions from the late eighteenth century. The biggest element in tertiary growth in the late eighteenth and early nineteenth centuries was transport, reflecting and facilitating the growth of inter-regional trade. The

⁵² Wrigley and Schofield, *Population history of England*; Wrigley et al, *English population history*.

⁵³ Crafts, *British economic growth*.

⁵⁴ Lee 1979, 1984.

tertiary sector in this period produced non-tradable outputs (i.e. outputs which have to be produced where they are consumed) in contrast with the tradable outputs of most of the manufacturing sector. One section of the secondary sector which produced non-tradable outputs was the construction industry. Like the tertiary sector this was growing everywhere from the late eighteenth century. Because they produced non-tradable outputs, if the tertiary and construction sectors were to increase in importance at the national level they, unlike manufacturing industry, had to increase their local employment shares.

3.6 Differential population growth, women's employment and migration

Reported market economic activity rates for adult women varied massively around the country in 1851 as indicated in figure 17.⁵⁵ In most of the country reported adult female activity rates were between 20 per cent and 50 per cent. They were above 50 per cent in most of the textile districts of the West Riding and Lancashire and very high in some of the lightly populated districts further north which had probably experienced considerable out-migration to nearby industrial and mining areas. They were high in some of the smaller textile zones in the West country and East Anglia and in the straw and lace districts of the south-east Midlands, Nottinghamshire and Devon. On the Durham coal-field they fell below 20 per cent. Reported participation rates, therefore, varied astonishingly from under 20 per cent in some coal-field areas to over 70 per cent around Luton.

Whether female participation rose or fell overall during industrialisation is a much disputed point. The answer no doubt varied very considerably around the country. It is instructive to compare the geography of population growth with the gendered geography of employment opportunity. Consider figure 17. This is another spatial concentration map. As before the areas in any given colour contributed ten per cent to national population growth between 1801 and 1851.

There are four areas with a notable concentration of population growth: the industrial districts of Lancashire and the West Riding, the area around Birmingham, London and the Durham coal-field. This differential population growth, driven by migration, would have produced most of the national shift from agricultural to non-agricultural employment between 1750 and c.1815. But net migration took place only to areas with very high levels of adult male employment in the non-agricultural sector. Areas characterised by high levels of economic opportunities for adult women but not for adult men, most strikingly the south-east Midlands, did not experience rapid population growth. Areas with high levels of economic opportunities for men but with relatively low or very low opportunities for adult women, such as London or the Durham coal-field, nevertheless grew rapidly. In short relative population growth appears to have been critically dependent upon the opportunities for adult male employment. This reflects the importance of the male-breadwinner economy documented by Jane Humphries and Sara Horrell.⁵⁶ A much more careful statistical analysis of these data will obviously be required to test this hypothesis adequately.

⁵⁵ See page 5 and footnote 14 on the problems with the recording of female occupations in the nineteenth century censuses.

⁵⁶ Though this is not quite the interpretation they put on their findings.

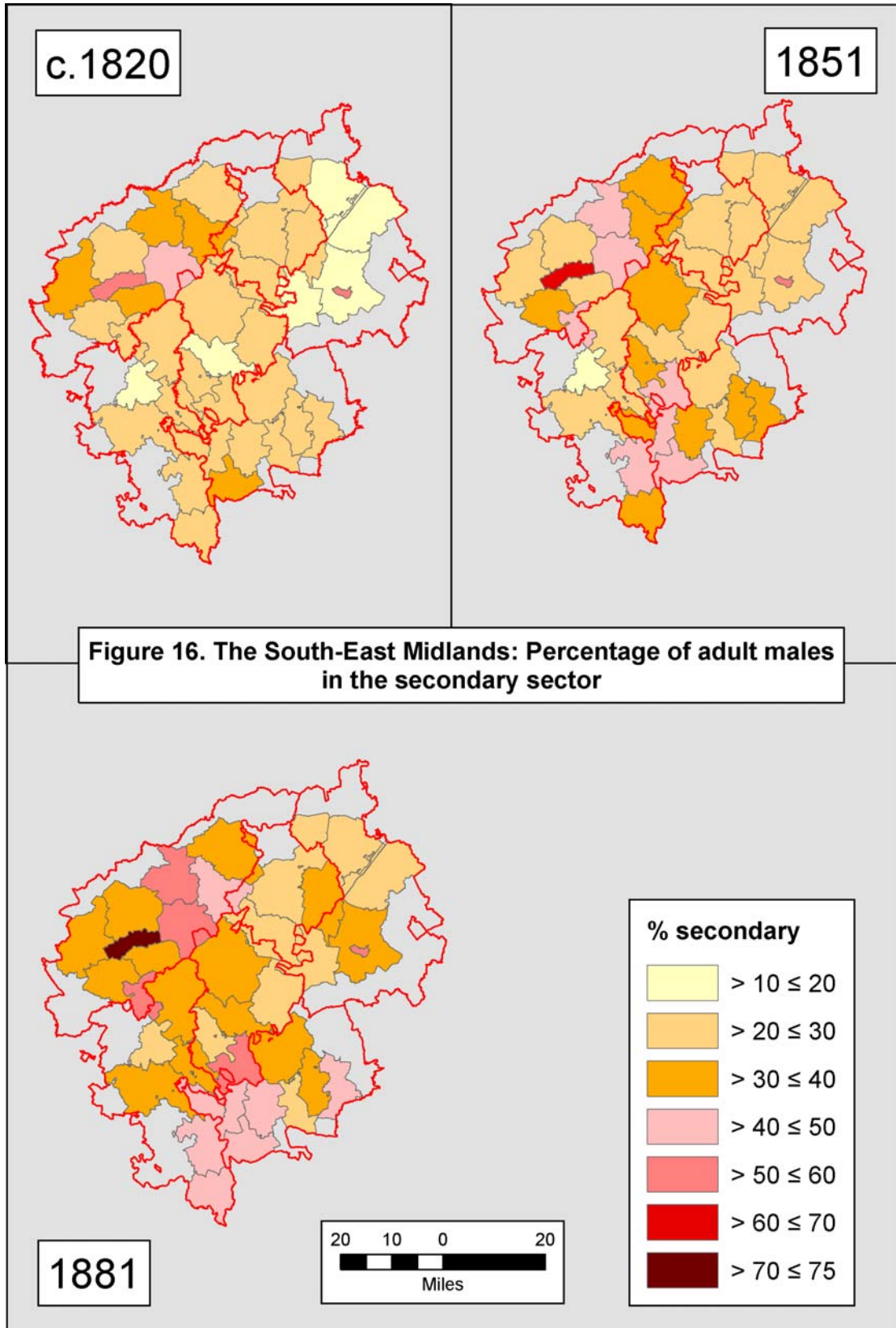
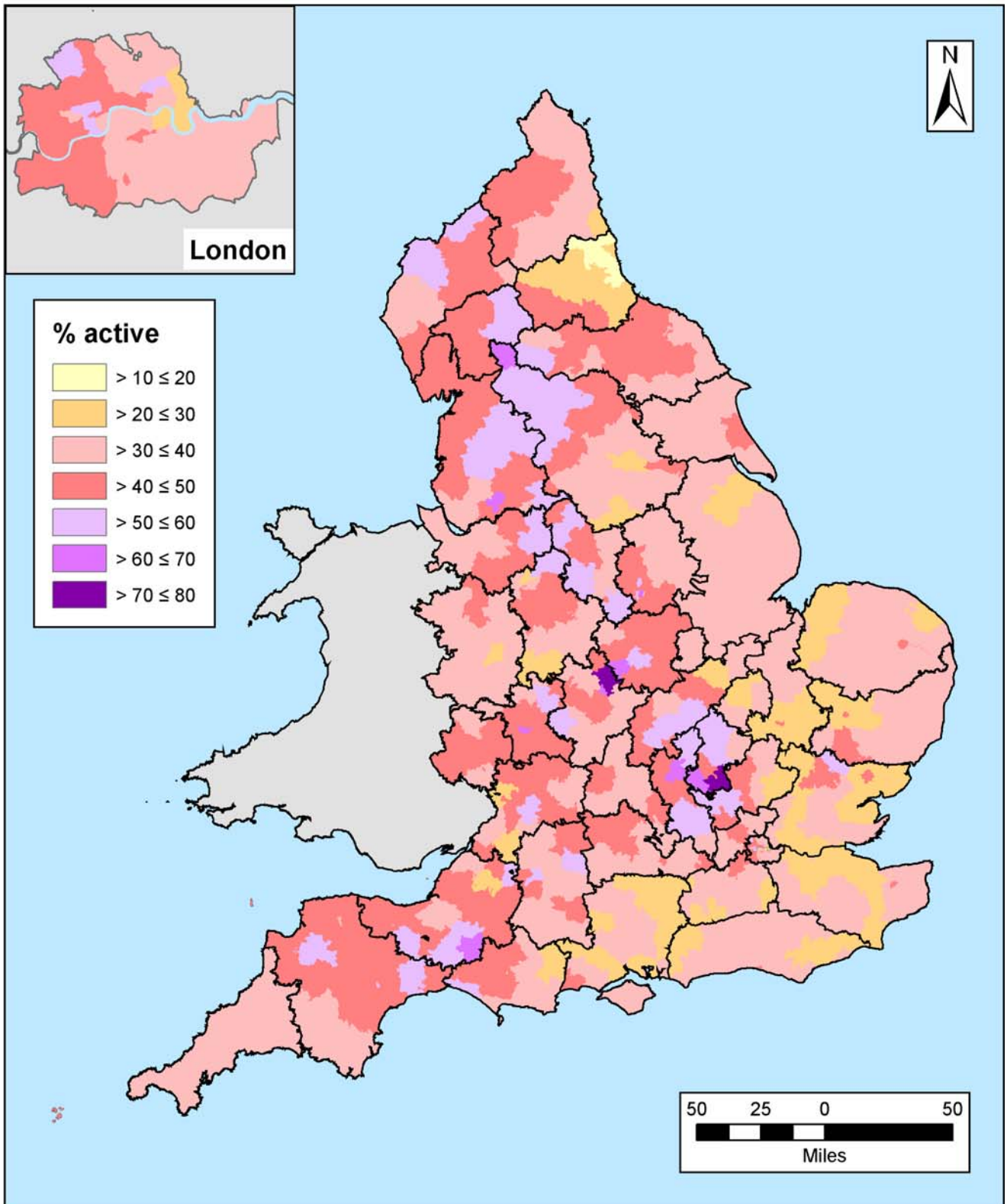


Figure 17. England 1851: Percentage of adult women reported economically active in 1851



3.7 The industrial revolution in a longer run context

Before discussing the longer-run context, it may be helpful to recapitulate the argument of the previous sections. Eight broad tentative conclusions have been put forward so far:

- (1) By 1750 Lancashire and the West Riding had the remarkably high figure of two-thirds of adult males employed in the secondary sector.
- (2) By 1750 less than half of England's adult males worked in agriculture. Thus by this date the country's occupational structure was already radically different from anywhere else in Europe.
- (3) The 'industrial revolution' of 1750-1850 took place within a geographical framework which had developed across the early modern period.
- (4) There was no radical expansion of secondary sector employment at the regional level between 1750 and c.1815. Thereafter there was substantial expansion in many areas away from the traditional heartlands of the industrial revolution.
- (5) Between 1750 and c.1815 the growth of the secondary sector at national level was caused almost exclusively by net inter-regional migration driven by male employment opportunities.
- (6) Between 1750 and c.1815 agricultural employment was generally stable at the regional level. Nationally it declined slowly in relative importance because of net inter-regional migration.
- (6) There was a dramatic growth of the tertiary sector from the late eighteenth century in all regions.
- (7) Transport was the biggest single element in this tertiary revolution suggesting a critical role for transport during the industrial revolution.
- (8) Agriculture declined rapidly in relative importance nearly everywhere after c.1815.

Figure 18 is based on the preliminary national estimates which are described in the appendix. This way of representing occupational change was introduced earlier in this report and an explanation can be found accompanying figure 4. As before, the secondary sector needs to be read along the diagonal lines to the numbers on the right hand axis. As indicated earlier, all economic development from the Neolithic to some point in the future may be represented by a shift from the bottom left hand corner of the graph to the top right. Put that way the developments of the period 1750 to c.1817 are modest.⁵⁷ On the other hand the longer period from 1750 to 1871 surely merits being labelled the industrial revolution.

⁵⁷ Though if we are considering a period of several thousand years in toto this period of seventy years clearly experienced a disproportionately rapid development. .

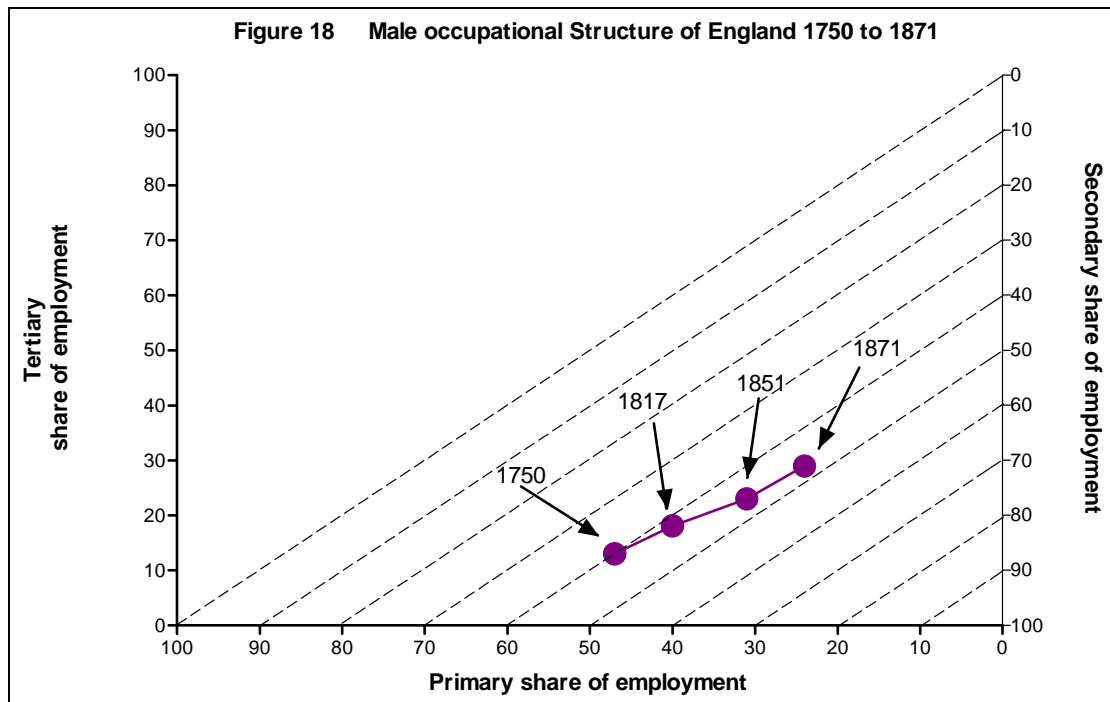


Figure 18 has major implications for development during the early modern period. We do not, at present, have sectoral employment estimates for the end of the medieval period or the beginning of the early modern period. But medievalists and early modernists are likely to concur that around 1500 agriculture accounted for approximately three-quarters of all employment and tertiary employment is unlikely to have accounted for more than five percent of the total.⁵⁸ If that is correct it follows that there was as much change in occupational structure, and more growth in the secondary sector between 1500 and 1750 than between 1750 and 1850. If this is not correct (and this is not being suggested) then we will need a radical upward revision of our view of economic development during the medieval period.

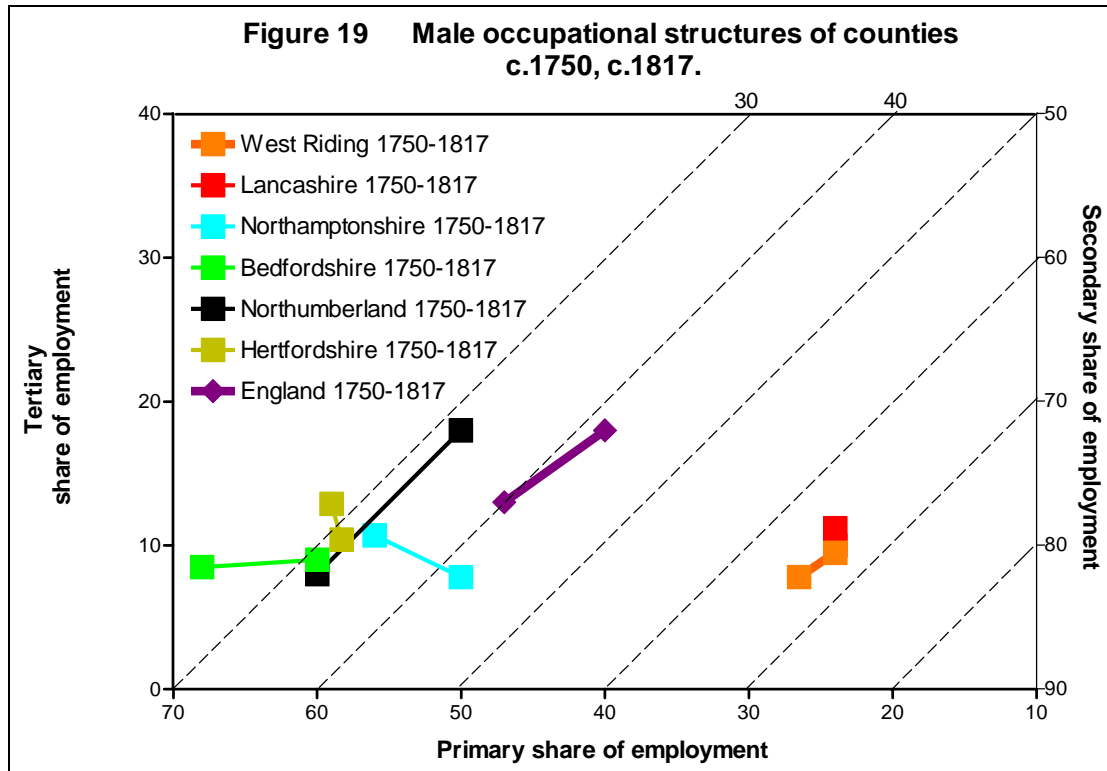
3.7.1 The classic period of industrial revolution

Figure 19 shows the male occupational structure of a number of counties, and the preliminary estimate for England as a whole in 1751 and c.1817. It shows how hesitant the change in occupational structure was over a period that covers the great bulk of the classic industrial revolution period (say 1760-1830) and how varied regional experience was over that period. Lancashire and the West Riding hardly change at all in this period. In contrast Northamptonshire, Bedfordshire and to a lesser degree Hertfordshire all experienced a rising primary share in employment as pre-existing proto-industries collapsed leading to de-industrialisation.⁵⁹ Northumberland experienced substantial tertiary growth. Nonetheless differential demographic growth pulled the national aggregate experience towards the north-western pattern, albeit rather modestly.

⁵⁸ In contrast Deane and Cole, writing in 1962, were of the opinion that in 1688 seventy to eighty per cent of the labour force were 'primarily occupied in agriculture': Deane and Cole, *British economic growth*, p.3.

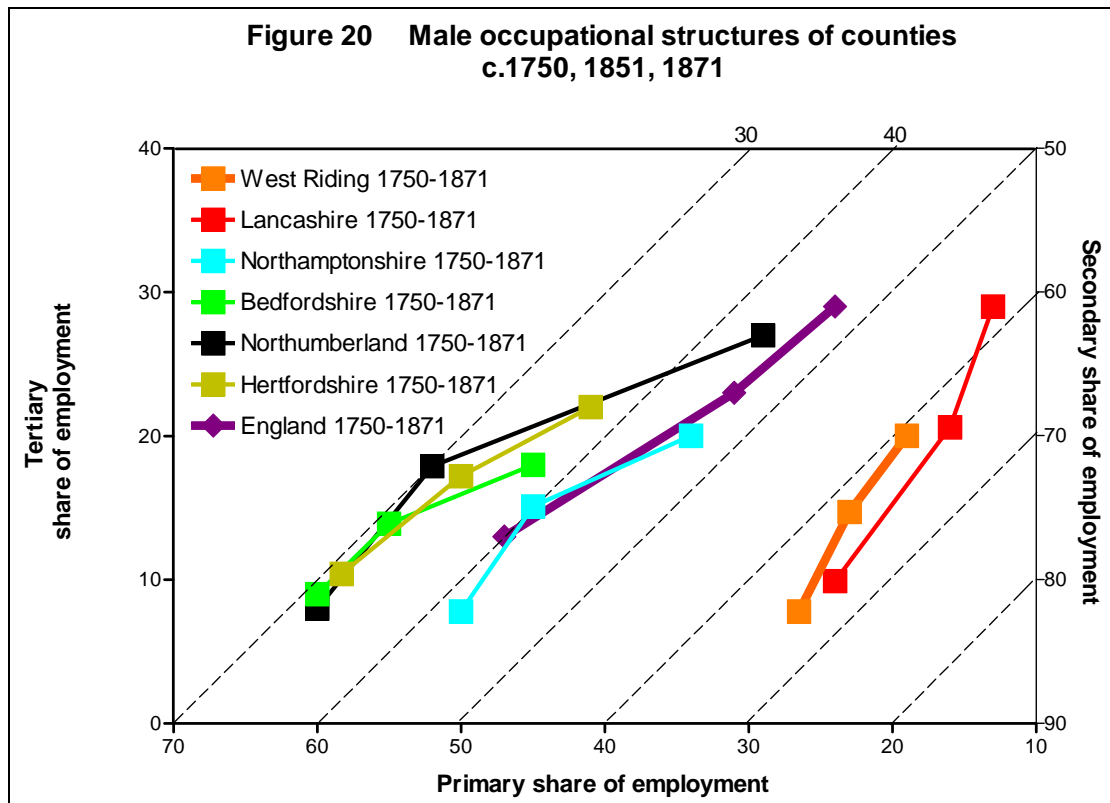
⁵⁹ The arrows on to this diagram are to make it clear that for these three counties the direction of movement over time is to the left.

Figure 19 reveals the hesitancy and inconsistency of changes in the structure of employment across most of the period traditionally considered as encompassing the industrial revolution. It goes a long way towards explaining the growth of rural poverty, the associated stresses on the old poor law and why there so much rural unrest, in southern and eastern England, in this period.



3.7.2 The period from 1750-1871

Figure 20 shows the male occupational structure of a number of counties, and the preliminary estimate for England as a whole (shown in purple) in 1751, 1851 and 1871. It shows very clearly that in Lancashire and West Riding throughout the period 1751 to 1871 the major change in occupational structure was the rapid growth in tertiary employment. Occupational change in the other counties was also dominated by tertiary growth between 1750 and 1851. After 1851 they experienced rapid secondary sector growth and began to converge somewhat on the north-western counties.



3.7.3 A new periodisation of economic development

Three major periods of development can now be detected in the historical record, though more may emerge as research proceeds. The first belongs to the early modern period and saw a remarkable development of the secondary sector in some regions. We do not know at what date before 1750 Lancashire and the West Riding acquired their remarkably high levels of secondary sector employment or the high population densities that characterised the textile districts by 1761.⁶⁰ But this must have been a product of some earlier period of development during which the relative importance of secondary sector employment rose to include two-thirds of adult males. When this period began and when it ended can only be determined by further empirical research. Initial inspection of the evidence by Wrigley suggests that there was only limited inter-regional migration before 1670 or 1700. Pilot work by Shaw-Taylor on testamentary data suggests that across the seventeenth century, at the same time as the textile industry was becoming more concentrated in a number of major centres, locally based village weavers dotted around the countryside began to disappear. In consequence some counties such as Cambridgeshire and Hampshire began a gradual and slow process of de-industrialisation.

A second phase of development had begun by the mid eighteenth century, during which the relative levels of secondary sector employment were more or less frozen at the regional or county level. This phase of development came to an end around 1815. Of course, the period between 1750 and c.1815 saw enormous technological and productivity changes in the textile industries in the Lancashire and the West Riding

⁶⁰ As part of the project Wrigley has produced estimates of the populations of every English hundred for 1761 and every ten years thereafter until 1841. In combination with GIS hundredal boundaries created by Max Satchell as part of the project, this makes it easy to calculate population densities at these dates for every English hundred.

which are not captured by the occupational data.⁶¹ In this period, in which the relative secondary employment was in a sense saturated, growth in the absolute size of the secondary sector was achieved by massive in-migration to the industrial districts. This period was marked by two other developments. Firstly, a number of proto-industrial areas de-industrialised very rapidly after 1790. Secondly, the tertiary sector began to grow rapidly.

A third phase of development began round 1815 and continued at least down to 1871. This witnessed a significant growth in the relative importance of secondary sector employment in areas outside the classic heartlands of the industrial revolution began to industrialise as railways and steam-powered factories spread across the whole of the country. It is important to note that the rapid increase in the rate of occupational change in this period was also accompanied by a rapid increase in technological change. Prior to 1830 steam-powered manufacturing and the extraordinary increases in labour productivity that came with it were restricted to the textile sector. After 1830 these changes came to affect a much larger share of British manufacturing. Tertiary development continued across this period.

3.8 Some further implications

New features of the industrial revolution have been revealed that will require further exploration. However, the views of Clapham, Crafts, Wrigley, Crafts and Harley that much economic development preceded 1750, that the industrial revolution was incomplete in 1851 and that change between 1760 and 1830 was slow and uncertain are dramatically confirmed. Whilst these views have been widely accepted by many economic historians for some time, they have neither won universal acceptance, nor have they penetrated popular or more general academic consciousness. This may be in part because their quantitative foundation has rested very heavily on the econometric estimates made by Crafts and others, which many historians have been reluctant to accept.⁶² It is certainly the case that textbooks and university courses on the industrial revolution continue to treat the period 1700 or 1750 to 1850 as encapsulating the industrial revolution.⁶³

The methods used here can be fully understood without any background in economics or econometrics. It is hoped that the data presented here, which are not dependent on the kind of theoretical assumptions which underpin Crafts' estimates, and are in any case more robust, will convince those who remained sceptical of the new orthodoxy and allow us to move on.⁶⁴ The failure to move on and to recognise fully that industrialisation was much more protracted than formerly believed has retarded our understanding of other related subjects. To take one example, the debate over the standard of living of the working classes during the industrial revolution continues to

⁶¹ For a good introductory account see Mokyr, *Lever of riches*, chapter five, pp. 81-112.

⁶² Berg and Hudson, 'Rehabilitating the industrial revolution'; Hoppitt, 'Counting', Daunton, *Progress and Poverty*, pp. 125-31

⁶³ The four most recent textbooks on the industrial revolution all treat their subject within the time-frame of 1700 to 1850 or 1750 to 1850 which misses out both the early stages of the process and its culmination: Floud and Johnson; *Industrialisation*; King and Timmins, *Industrial revolution*, Daunton, *Progress and poverty* and Hudson, *Industrial revolution*.

⁶⁴ Though it must be emphasised that estimates of GDP and GDP per capita contain vitally important information NOT captured by occupational data alone. It is therefore NOT my intention to argue that attempts to estimate GDP and GDP per capita should be abandoned in favour of estimates of occupational structure. All that is being suggested in this context is that the latter estimates incorporate fewer theoretical assumptions and can be understood by a larger audience and may therefore convince a wider audience.

be fixated on the classical period. The most important recent contribution, by Charles Feinstein, concludes ‘pessimistically’ that there was not much improvement in his index of real wages before the 1850s.⁶⁵ But why should we expect to find any given that the period of rapid economic development was only just beginning in the 1850s? One might ask what was the role of the rapid acceleration in economic development that was underway by the mid nineteenth century in the decline and collapse of Chartism? A deeper and more thoroughgoing recognition of the periodisation of economic change might require some rethinking of many topics in British economic, social, cultural and political history.

Eight key conclusions were identified on page 33. To these the following can now be added.

- (9) The early modern period (1500-1750) experienced a greater increase in the relative size of the secondary sector than the classic industrial revolution period (1760-1830) or the century between 1750 and 1851.
- (10) The two decades after 1851 saw an astonishingly rapid change in the country’s occupational structure. Occupational change in these two decades was as great as that between 1750 and c.1815.
- (11) The change in occupational structure between 1750 and c.1815 was modest and many areas actually experienced de-industrialisation in this period with attendant social problems.
- (12) In the longer run, three phases of economic development can be identified:

An early modern phase in which there was a considerable increase in the relative importance of the secondary sector and in which the economic geography of the later period was laid down. In Lancashire and the West Riding very high levels of secondary sector employment emerged.

A phase starting before 1750, but ending around 1815 in which the relative importance of secondary sector employment was constant at the regional level (except in some de-industrialising areas), but during which there was rapid tertiary growth everywhere.

A phase beginning c.1815 during which industrialisation began to affect the whole country. Outside London and the industrial districts many areas experienced a relatively sharp increase in the importance of the secondary sector and a decline in agricultural employment. Rapid tertiary growth continued across the period.

- (13) These findings dramatically confirm the revisionist case, but finally put it beyond reasonable doubt, whilst adding much that is entirely novel.
- (14) The findings will have major implications for the cultural, social and political history of Britain.

4 Future research

A number of lines of future research, arising from the first project are underway or planned. Some of these are discussed briefly below.

⁶⁵ Feinstein, ‘Pessimism.’ This is not to suggest that Feinstein was not fully cogniscent of and persuaded by the Crafts-Wrigley case.

Two key findings of the first project give rise to a nineteenth century research project outlined below (4.1). The first of these findings is that in all regions, outside London and the industrial districts, the occupational structure experienced the kind of change normally (but erroneously) assumed to have characterised the industrial districts between 1760 and 1830. This may be characterised as a second wave of industrialisation. The second key finding is that the national occupational structure changed as much between 1851 and 1871 as between 1751 and 1815. These developments and their relationship to the building of the railway network will be fully explored in the new nineteenth century project together with a range of other issues.

Two findings demand lead to questions on earlier period. Firstly, that: in 1750 England's secondary sector had already reached levels not reached by other European countries until the late nineteenth century. Secondly, that the relative importance of the secondary sector must have doubled across the early modern period and that the nineteenth century economic geography had already been established by 1750. This leads immediately to the question of when during the early modern period were these things achieved. An application has been made to the Leverhulme Trust (see 4.2 below) for a project aimed at answering this central question.

Further work is planned on women's work (4.3). Although the first project has shed much light on nature and the geography of female employment in the mid-nineteenth century, we still know very little about trends in female employment over time. Some historians have argued that the industrial revolution and the development of capitalism led to a major increase in market-participation by women, others historians have argued that women were increasingly squeezed out of the labour market. In fact in the absence of adequate data we simply do not know what was happening to female employment. Datasets that will be generated by the new project on the nineteenth century (4.1) and by the Leverhulme project (4.2), if the application is successful, will allow progress on this fundamental question.

A number of international comparative projects are being initiated (4.4). The first project has identified a number of questions which require the creation of comparable datasets from other countries before they can be answered. Were the West Riding and Lancashire fundamentally different from other European proto-industrial regions in 1750? At what date did England's occupational structure first diverge from that of the rest of north-western Europe and from the Dutch Republic in particular? Wider comparisons which we are planning to undertake, in collaboration with other research teams, would make fundamental empirical contributions to our understanding of the timing and nature of the 'great divergence' between Asian and European economies and the 'little divergence' between north-western and southern Europe.

4.1 The occupational structure of nineteenth century Britain

A second three year project has been funded by the ESRC. The core of this project can be illustrated by reference to figure 16. This project will produce machine-readable occupational data at registration district level for the whole of England and Wales (and at county level for Scotland) for c.1820, 1851, 1861 and 1881. This will enable mapping of the kind illustrated in figure 16 to be extended to the whole of Britain. In addition for 1820 and 1881 parish level data will be created. County level occupational data and parish level population data will be available for census years. This will be the largest research project yet undertaken using the British nineteenth century censuses.

All these datasets will be mapped and analysed to investigate a series of key questions in nineteenth century British economic history. One output from the project will be a full colour historical atlas which we envisage being a major resource for the teaching of economic history (in addition see 4.6). A second major feature of the project will be to explore and make full use of the data contained in the nineteenth century censuses on female employment (see 4.3).

4.2 The early modern period

As a result of work undertaken for the first ESRC funded project it is now clear that it will be possible to create a better picture of the male occupational structure of England and Wales c.1700 for parish registers than has been possible for the second half of the eighteenth century. Searching every English and Welsh parish register for this period forms the largest part of a current application to the Leverhulme Trust to reconstruct the occupational structure of England and Wales from the late medieval period to the early eighteenth century. Amy Erickson has been working with Shaw-Taylor on a number of pilot studies to identify suitable sources for reconstructing female occupations during the seventeenth and eighteenth centuries. Building on this work forms another key part of the Leverhulme application.

4.3 Women's work

Current datasets on female occupations for the pre-industrial and industrial revolution period are so poor that it has been possible for historians to argue that: female employment was increasing, female employment was decreasing, female employment increased and then decreased. If the Leverhulme application (4.2) above is successful, Shaw-Taylor and Erickson plan to compare pre-census and census occupational structures for women. We are both confident that we can greatly reduce the current uncertainty about trends in female participation, and optimistic that we can achieve a breakthrough on this fundamental question.

4.4 International work

The sub-discipline of global economic history is in its infancy but the debate provoked by Ken Pomeranz's *The Great Divergence* has ensured that it is growing rapidly. Currently there is a severe shortage of reliable and comparable datasets available to answer key questions. Most current quantitative work is based on comparing wage series or GDP figures. Comparisons are complicated, if not vitiated, by the problems of comparing monetary amounts across different currency zones. Data on occupational structure are more readily comparable. Comparative work has been initiated with scholars working on Belgium, Brazil, Germany, India, Japan, the Netherlands, Spain and Sweden. A preliminary comparison of the evolution of national occupations structures from some of these countries will take place at the

International Economic History Congress in Helsinki in August 2006 (organised by Shaw-Taylor and Wrigley).

A full-scale extension of the British project to the European level may be possible. Initial soundings suggest that the pre-1800 sources available for France, Germany, Italy, Spain and Sweden are radically better than those available for England. Source availability in the Netherlands and Belgium is also good. In central and south-eastern Europe the rich holdings of Austro-Hungarian and Ottoman bureaucracies have yet to be explored. By the late nineteenth century most European states were collecting detailed occupational data as part of the census. Thus the archival prospects for extending the project, in collaboration with other research teams, to the rest of Europe are good.

4.5 The twentieth century

Economic history *ought* to provide much of the empirical basis on which economics is based but economists often express frustration at the quality of the data available. The British datasets on employment and population numbers at county level could be extended right through to the present at modest cost (around £100,000). In conjunction with the work presently underway this would create the *only* detailed quantitative description of any economy in the world over a period of three centuries or more. Such a resource is likely to provoke very widespread interest amongst economists.

4.6 A interactive historical atlas for use in teaching at secondary schools

In addition to producing two ‘paper’ historical atlas as outputs from existing research projects we are, as part of the current ESRC funded project (4.1 above) hoping to find an educational partner (in the first instance we will approach BBC education), with whom to develop an interactive electronic historical atlas covering the period from to the present. This could be widely used in schools and it is intended that it would help to stimulate interest in economic history at school level.

4.7 Wider use of the datasets generated

Finally, it is worth noting that the occupational and population datasets produced by the project, and which will soon be publically available, are extraordinarily rich. Unlike the estimates of GDP per capita, the occupational data provide very considerable detail on the nature of local, regional and national economic activities. They cover every single sector of the economy and exist at a variety of spatial scales down to the individual parish. They could thus be used by economic historians working on the history of particular industries or working on local or regional case studies.⁶⁶ Equally they will prove of considerable value to social historians seeking a quantifiable local or regional economic context.

⁶⁶ In fact datasets have already been supplied to a number of economic historians for exactly these kinds of study.

Appendix: A preliminary attempt at modelling sectoral change in England c.1750-1851

This appendix documents a highly preliminary attempt to use the county level data from the project to create national estimates of the relative importance of primary, secondary and tertiary employment in 1851. The exercise needs to be up-dated in the light of further data which has come in since March 2005 when these estimates were made. The new datasets broadly confirm the pattern already established. However, it is now clear that trends in the period from c.1820 to 1851 differs from the period c.1750 to c.1820 in significant ways. However, it is not likely that the revised calculations will produce major differences in the estimates for c.1750. In due course we will be experimenting with a number of different ways of making national estimates for c.1750 and will compare the different results achieved by different methodologies.

The first batch of completed county case studies suggested that the following assumptions for adult males could be used with population data from registration districts for 1801 and 1851 to back project from occupational data from registration districts in 1851 to model the change in male occupational structure c.1750-1851:

- (1) At a local or regional level the secondary sector accounted for the same proportion of employment across the period 1751-1851.
- (2) At a local or regional level the tertiary sector rose 0.5 per cent p.a across the period 1751 to 1801 (the average rate in the West Riding, Northamptonshire and Hertfordshire from the mid C18th to 1817) but rose at 0.75 per cent from 1801 to 1851 (the average national rate from 1817 to 1851).

These assumptions produce the result shown below. I have assumed the relative population growth rates for registration districts was the same in 1751-1801 as in 1801-1851 but have constrained them to fit Wrigley and Schofield totals.⁶⁷

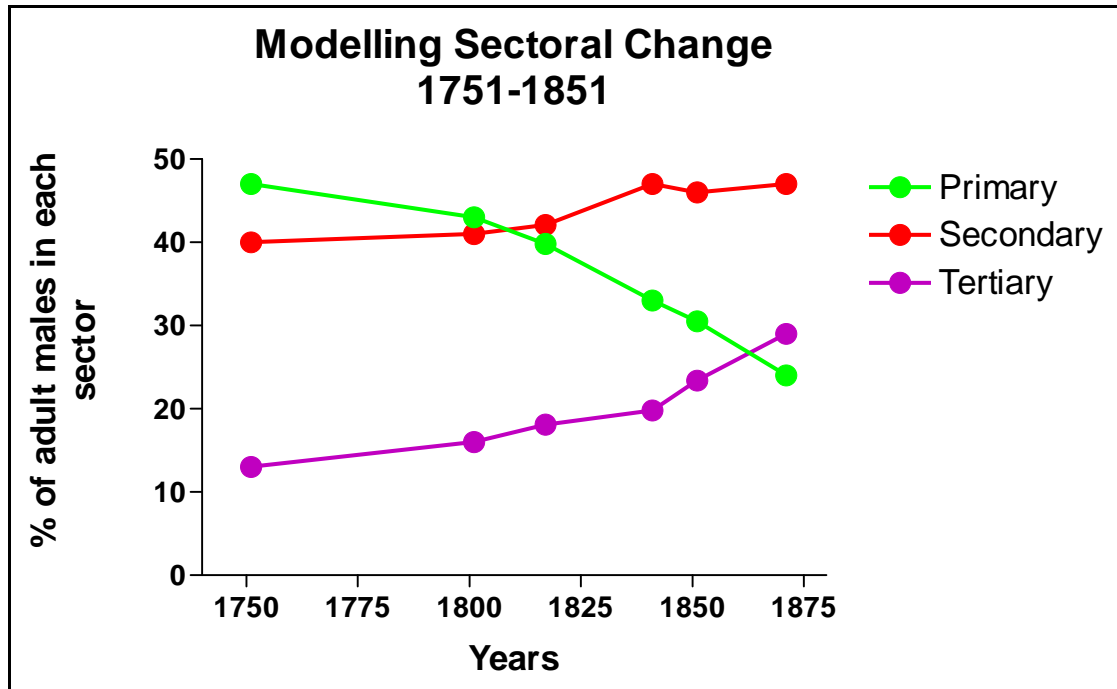
The results are promising. The data for 1841, 1851 and 1871 are derived from the published census. The occupational data for 1817 derive from a random national sample of 300 parish registers drawn by Tony Wrigley some years ago.⁶⁸ The data from 1801 and 1751 are the estimates derived by back-projecting the 1851 RD data on the basis laid out above. The new 1801 estimates are very plausible in terms of the 1817 estimates. The 1801 primary figure is 43 per cent compared with Wrigley's figure for agriculture in 1811 of 39.3 per cent. However mining accounted for 1.7 per cent in the 1817 sample. If we assume the same figures held in 1801, and deduct from the primary total to get an estimate of the agricultural total, we get a figure of 41.3 per cent.⁶⁹ This is pretty close to Wrigley's figure of 39.3 per cent for ten years later. Our figure of 1.7 per cent for mining may itself be an underestimate by as much as 50 per cent. This is because (a) the sample is too small (at 300 parishes out of 10,000) to be confident for such a spatially concentrated activity (b) the figures for

⁶⁷ By inflating the population totals for each RD in 1751 by 31 per cent above what they would be if pop growth had been as 1810-1851. Pop growth was 31 per cent higher 1801-1851 than 1751-1851 according to Wrigley and Schofield.

⁶⁸ Thanks are due to a number of volunteers, recruited through an appeal in *Local Population Studies* who collected these data.

⁶⁹ A better estimate of all these figures could be made by back projecting using AMST (Agriculture etc, Mining, Secondary and Tertiary) and modelling mining separately.

1841, 1851 and 1871 are respectively 3.2, 3.8 and 3.2 which do not suggest a rapidly increasing sectoral share.



Note: the primary sector calculation is calculated as a residual and hence prone to the highest errors.

Bibliography

- Anderson, M., 'Mis-specification of servant occupations in the 1851 census: a problem revisited', *Local Population Studies*, 60 (1998).
- Anderson, M., 'What can the mid-Victorian censuses tell us about variation in married women's employment', *Local Population Studies*, 62 (1999), pp. 9-30.
- Armstrong, W.A., 'The use of information about occupation' in E.A. Wrigley ed., *Nineteenth century society: essays in the use of quantitative methods for the study of social data* (1972).
- Berg and Hudson, 'Rehabilitating the Industrial Revolution', *Economic History Review*, 45 (1992) pp. 25-50.
- Clapham, J.H. *An economic history of modern Britain* (3 volumes: 1926-1939).
- Clarkson, L., 'The leather crafts in Tudor and Stuart England', *Agricultural History Review*, 14 (1966), pp. 25-39.
- Clarkson, L., 'The organisation of the English leather industry in the late sixteenth and seventeenth centuries', *Economic History Review*, 13 (1960), pp. 245-256.
- Crafts, N.F.R. and Harley, C.K. 'Precocious British industrialization: A general equilibrium perspective' in Prados de la Escocura, L., (ed.) *British exceptionalism: A unique path to the industrial revolution* (2004), pp. 86-107.
- Crafts, N.F.R., *British economic growth during the industrial revolution* (1985).
- Crafts, N.F.R., Harley, C.K., 'Output growth and the British industrial revolution: A restatement of the Crafts-Harley View', *Economic History Review*, 45 (1992), pp. 703-30.
- Daunton, M., *Progress and poverty: An economic and social history of Britain 1700-1850* (1995).
- Deane, P., Cole, W.A., *British economic growth 1688-1969* (1962).
- Everitt, A., 'Farm labourers' in Thjirsk, J, ed., *The agrarian history of England and Wales, volume IV, 1500-1640*, pp. 396-465.
- Feinstein, C.H., 'Pessimism perpetuated: Real wages and the standard of living in Britain during and after the industrial revolution', *Journal of Economic History*, 58 (1998), pp. 625-58
- Flinn, M.W., *Origins of the industrial revolution* (1966).
- Gibson, J., and Medlycott, M., *Militia lists and musters, 1757-1876: A directory of holdings in the British Isles*, 4th edn. (2000).
- Glennie, P., *Distinguishing men's trades: occupational sources and debates for pre-census England* (1990).
- Goose, N., (ed.) *Women's work in industrial England: regional and local perspectives*, forthcoming.
- Gregory, D., *Regional transformation and the industrial revolution: A geography of the Yorkshire woollen industry* (1982).
- Hartwell, R.M., *The industrial revolution and economic growth* (1971).

- Hoppit, J., 'Counting the industrial revolution', *Economic History Review*, 43 (1990), pp. 173-93.
- Horrell, S, and Humphries, J., 'Women's labour force participation and the transition to the male breadwinner family, 1790-1865', *Economic History Review*, XLVIII, 1 (1995), pp. 89-117.
- Hudson, P.H., *The industrial revolution* (1992).
- Hudson, P.H. (ed.) *Regions and Industries: A perspective on the industrial revolution in Britain* (1989).
- Floud, R., and Johnson, P., eds., *The Cambridge economic history of Britain. Volume I, Industrialisation* (2004).
- Jones, E.L., 'The constraints on economic growth in southern England, 1650-1850', in *Proceedings of the Third International Congress of Economic History* (1965).
- Jones, E.L., 'The agricultural origins of industry', *Past and Present*, 40 (1968).
- King, S., and Timmins, G., *Making sense of the industrial revolution: English economy and society: 1700-1850* (2001).
- Langton, 'Prometheus prostrated?' in Slack, P., and Ward, R., eds., *The peopling of Britain: The shaping of the human landscape* ((2002), pp. 243-54.
- Langton, J., 'The industrial revolution and the regional geography of England'. *Transactions of the Institute of British Geographers*, 9 (1984), pp. ??.
- Langton, J., "The Production of Regions in England's Industrial Revolution: Response." *Journal of Historical Geography* 1988 (14) 170-174.
- Lee, C.H., 'Regional growth and structural change in Victorian Britain', *EcHR*, XXXIII (1981), pp. 438-452.
- Lee, C.H., 'The service sector, regional specialization, and economic growth in the Victorian economy', *Journal of Historical Geography*, 10, 2 (1984), pp. 139-155.
- Lee, C.H., *The British economy since 1700: A macro-economic perspective* (1986), chapter 5. Lee, C.H., 'Regional structure and change', in J. Langton and R.J. Morris (eds.), *Atlas of industrialising Britain* (1986)
- McKay, J., 'Married women and work in nineteenth century Lancashire: The evidence of the 1851 and 1861 census reports', *Local Population Studies*, 61 (1998), pp. 25-37
- McKendrick, N., 'Home demand and economic growth: a new view of the role of women and children in the industrial revolution', in *idem*, ed. *Historical perspectives in English thought and society in honour of J.H. Plumb* (1974), pp. 152-210.
- Mid-Wharfedale Local History Research Group, 'A comparison between the Craven Muster Roll and parish registers', *Local Population Studies*, 45 (1998).
- Mokyr, J., *The lever of riches: Technological creativity and economic progress* (1990).

- Oeppen, J., Vaupel, J., 'Broken limits to life expectancy', *Science*, 296 (2002) p. 1092.
- Overton, M., Whittle, J., Dean, D, and Hann, A., *Production and consumption in English households 1600-1750* (2004).
- Pollard, S., *Region und industrialisierung* (1980).
- Pollards, S., *Peaceful Conquest: The industrialization of Europe 1760-1970* (1981).
- Pomeranz, K., *The great divergence: China, Europe, and the making of the modern world economy* (2000).
- Rostow, W.W., *The stages of economic growth: A non-communist manifesto* (1960).
- Rowlands, M. B., 'Continuity and change in an industrialising society: The case of the West Midlands industries', in Hudson, P., *Regions and Industries: A perspective on the industrial revolution in Britain* (Cambridge, 1989).
- Schwarz, L., *London in the age of industrialisation: Entrepreneurs, labour force and living conditions, 1700-1850* (1992).
- Swain, J.T., *Industry before the industrial revolution* (1986).
- van Leeuwen, M.H.D., Maas, I., and Miles, A., HISCO: Historical international standard classification of occupations (2002).
- Woods, R., 'The effects of population redistribution on the level of mortality in pre-nineteenth century England and Wales', *Journal of Economic History*, 45 (1985), pp. 645-51.
- Wrigley, 'Urban growth and agricultural change: England and the continent in the early modern period', *Journal of Interdisciplinary History*, 15 (1985), pp 683-728.
- Wrigley, E.A., *Continuity, chance and change: The character of the industrial revolution in England* (1988).
- Wrigley, *Poverty, progress and population* (2004).
- Wrigley, E.A. 'English county populations in the later eighteenth century', forthcoming *Economic History Review*.
- Wrigley, E.A., and Schofield, R.S., *The population history of England 1541-1871: A reconstruction* (1981, 1989).
- Wrigley, E.A., Davies, R.S., Oeppen, J., and Schofield, R.S., *English population history from family reconstitution 1580-1837* (1997).