Occupational structure and population change[1]

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Economic historians often make a distinction between 'Smithian economic growth' and 'modern economic growth.' The former term derives from Adam Smith's discussion, in *The wealth of nations*, of the role played by the division of labour in raising output per head and hence in driving economic growth. The term 'modern economic growth' was coined by Simon Kuznets who argued that it was driven by technological change (Kuznets 1966). In Kuznets' analysis, once modern economic growth took hold it tended to be sustained indefinitely and he identified the original development of modern economic growth with the industrial revolution in Britain. Drawing on data from a range of countries during the period of their industrialisation, Kuznets stated that the onset of modern economic growth was associated with major changes in the structure of an economy. During the transition period both the workforce and output of an economy shifted away from the dominance of agriculture - a general characteristic of poor or 'under-developed' economies - to the dominance of the non-agricultural sectors in both employment and output. This chapter summarises our current knowledge of shifts in the occupational structure of the British economy before and during the industrial revolution and its relationship to population change between 1700 and 1870; in doing so it shows that the British industrial revolution did not conform to Kuznets' model.

Ideally, the whole of Britain should be covered. Unfortunately in the eighteenth century the available sources do not allow the history of population change in Wales to be recovered in a manner comparable to what is possible for England. Nor in the case of Scotland is it possible to reconstruct the relative size of different occupational groups prior to the mid-nineteenth century. It therefore seemed best to focus almost exclusively on England and Wales in attempting to provide a coherent description and analysis of changes in occupational structure between 1700 and 1870 and on England alone for population change. This is unfortunate but it maximizes what can be described and analysed effectively given the available data. From 1851 onwards the evidential problems ease. Occupational data are available for women as well as for men and there is coverage of Scotland as well as England and Wales.

AVAILABLE SOURCES AND EARLIER RESEARCH

The key problem confronting economic historians who wish to reconstruct the evolving occupational structure of the economy between 1700 and 1870 is the apparent paucity of available data before the nineteenth century. The British state took a first census in 1801, but the first census to provide broadly reliable data on both male and female occupations was that of 1851. The first three censuses (1801-1821) provide only limited occupational information under three heads relating to the proportions of the workforce

[1] The research upon which this chapter was based was funded by the ESRC, the Leverhulme Trust, the British Academy, and the Isaac Newton Trust. Many people undertook research on the project over the last ten years. Critical contributions to the work reported here were made by Ros Davies, Jacob Field, Gill Newton, Peter Kitson and Max Satchell

employed in agriculture; trade, manufacture, and handicrafts; and all other occupations. The 1831 census contains more information but is still a long way from a full enumeration of occupations, though it is unusual and valuable in providing occupational information down to the level of the individual parish. The census of 1841 provides data on a much wider range of male occupations but coverage of female occupations is unsatisfactory.

Gregory King's famous social tables of 1688 have long been the point of departure for economic historians wanting to assess the structure of the labour force at the close of the seventeenth century. In 1962 when Deane and Cole, using national income accounting techniques, produced the first quantitative overview of the British economy since 1688, they drew upon King's material. They concluded that in the late seventeenth century between 70 and 80 per cent of the occupied population 'was primarily engaged in agriculture' though suggesting that many men must have had secondary occupations in industry or trade (Deane and Cole 1962: 3). Later they put the figure at between 60 per cent and 80 per cent depending on how one interpreted King's categories (Deane and Cole 1962: 137). More generally they 'doubted whether the economy was sufficiently specialised to permit a meaningful occupational or industrial analysis.' (Deane and Cole 1962: 3). In consequence they eschewed any detailed analysis of occupational structure before 1801. Even for the period 1801-1831 Deane and Cole described their estimates as 'exceedingly tentative' and 'little more than guesswork.' (Deane and Cole 1962: 137-8). Nevertheless, they concluded that it appeared that 'it was in the first thirty years of the nineteenth century that the main shift of labour took place toward the mining, manufacturing and building group of industries.' They speculated that this shift characterised the whole period from 1780 to 1831, often termed the 'classic' period of the industrial revolution (Deane and Cole 1962: 141, 145). They also identified a major upward shift in economic growth rates from the 1780s coincident with the major structural shifts in employment that were taking place. Their estimates were one of the sources used by Kuznets in his analysis of the relationship between structural change and modern economic growth.

In 1980, Peter Lindert, in the first attempt to reconstruct the occupational structure of the country in the pre-census period by using archival data, suggested that Deane and Cole's reliance on Gregory King's social tables had led them to overestimate substantially the importance of agricultural employment in 1688 (Lindert 1980). He used parish burial registers which recorded the occupations of adult males and parish population listings (documents with census type characteristics) to construct national estimates of occupational structure. He suggested that for large groups, such as agriculture, the true figures could be as much as 40 per cent below or 67 per cent above his estimates – a margin of error he fairly described as 'very sobering.'(Lindert 1980: 701). Whilst Lindert acknowledged that his numbers were '*very* tentative and subject to a wide range of error' he concluded that King substantially under-estimated the numbers in manufacturing, building and commerce and that 'England and Wales was almost surely more industrial and commercial in King's day than he has led us to believe.'(Lindert 1980: 706-7, 711-12). Later Lindert and Williamson, took a different approach (Lindert and Williamson 1982). Here, Lindert's earlier estimates were combined with the estimates made by Gregory King, Joseph Massie and Patrick Colquhoun

(for 1688, 1759 and 1801/1803 respectively). Lindert and Williamson replaced the contemporary estimates for particular categories only where they felt there were clear grounds for preferring Lindert's estimates to those of three men whom they held to have been well informed.

Lindert and Williamson stopped short of presenting a full account of the occupational structure of the country perhaps because of the difficulty of making an appropriate allocation of two large groups in King's estimates. Where did the 364,000 families of 'labouring people and outservants' belong? No doubt most of them worked in agriculture but some must have worked in other sectors. Even more problematic were King's 400,000 cottager families since the term 'cottager' carries no clear occupational connotation (Mathias 1983: tab. II, 24). Decisions made about how to divide such large groups between particular sectors will have a major effect on any estimation of occupational structure derived from King's figures.

In 1985, Nick Crafts published his path-breaking account of economic growth during the British industrial revolution (Crafts 1985). This influential book revised Deane and Cole's earlier work and argued that GDP per capita growth rates in the late eighteenth and early nineteenth centuries were substantially lower than Deane and Cole had argued. What Crafts, following Kuznets, termed modern economic growth (which Crafts took as rates of growth in GDP per capita of one per cent per year or more), was only achieved after 1830. Crafts took Lindert and Williamson's revisions of King, Massie and Colquhoun, and, by making a number of reasonable assumptions about the sectoral allocations of problematic groups, provided estimates of the occupational structure of Britain in 1688, 1759 and 1803, together with census derived estimates for 1841. These are reproduced in table 1. Crafts' interpretation of Lindert and Williamson's figures have remained the standard benchmarks used by economic historians ever since. However, as Julian Hoppit noted in a critique of Crafts, Lindert's original estimates came with the large margins of error attached and it followed that Crafts' figures inherited them (Hoppit 1992).

Table 1 ***Crafts' estimates for Britain's labour force shares 1688-1841***

	1688 %	1759 %	1801/3 %	1841 %
Primary	55.6	48.0	41.7	22.2
Secondary	18.5	23.8	24.7	40.5
Tertiary	25.9	28.2	33.6	37.3
Total	100.0	100.0	100.0	100.0

Note. Tab. 1 is not strictly comparable with subsequent tables in this chapter because Crafts' data (1) relate to Britain (2) nominally include women (3) place mining in the secondary sector rather than the primary sector. The primary sector estimates for 1688, 1759, and 1801-3 were upper bound estimates.
Source. Crafts 1985: 11-15.

Crafts' figures suggested that the economy was much more developed in 1688 than Deane and Cole had believed. Where Deane and Cole thought that agriculture occupied

between 60 and 80 per cent of the labour force, Crafts put the figure as low as 55.6 per cent at most. Nevertheless, Crafts' figures appeared to confirm Deane and Cole's view that the early nineteenth century was a period of very rapid structural change which saw a major shift in employment from agriculture to industry. It is noteworthy that throughout the whole period from 1688 to 1801/3, the tertiary sector, in Crafts' estimates, was larger than the secondary sector.

Crafts noted the remarkable precocity of British structural change at any given income level when compared with other European countries. As late as 1870 50.6 per cent of the male labour force in France remained in agriculture while in 1910 the equivalent figures in Italy and Spain were 55.4 and 56.3 per cent (Crafts 1985: 57-8, table 3.4). It followed that industrialisation in Britain was different from the subsequent continental experience. Crafts' estimates, unlike those of Deane and Cole, do not conform to Kuznets' description of the relationship between structural change in employment and modern economic growth. In Britain the onset of modern economic growth came only after substantial changes in occupational structure had already taken place.[2]

Further work on occupational structure was published by Paul Glennie in 1990. He provided a very tentative estimate of national occupational structure c.1759-1778. His figures were not radically different from Crafts' estimates for 1759. Glennie was explicit that although his dataset was 'scores of times larger than Lindert's' it was 'demonstrably inadequate', since it had too little coverage of industrialising areas (Glennie 1990: 126). However, like Lindert and Williamson he was confident that his data demonstrated that agriculture employed a much smaller fraction of the workforce in eighteenth-century England than earlier historians had supposed.

The next four sections constitute the first half of the chapter, reporting the results of a large research project undertaken at the Cambridge Group for the History of Population and Social Structure with the aim of producing robust estimates of the changing occupational structure of the country before and during the industrial revolution. The first section presents national estimates; the second examines regional patterns. In the third section we take advantage of the improved range of information available from 1851 onwards and consider what difference it might make if data on female occupations were available for earlier dates, while in the fourth section the availability of data for Scotland in 1851 makes it possible to consider the whole of Britain for the first time. In the second half of the chapter there are three sections describing national population trends, regional population growth and distribution, urbanisation, and inter-county migration. A concluding section discusses a range of broader issues.

THE NATIONAL PATTERN

[2] For a review of how well Kuznets' views have stood up more generally in the face of improved data see Saito and Shaw-Taylor, forthcoming.

From 1 January 1813 it was a legal requirement that fathers' occupations should be recorded in all Anglican parish registers when their children were baptised. Current demographic evidence suggests that at this date fertility differences between major occupational groups were limited whilst it is clear from the 1851 census that male occupational structure did not vary very much with age. This suggests that counts of occupations derived from baptism registers should provide a good picture of adult male occupational structure. Accordingly, we collected data from virtually every parish register in England and Wales for an eight-year period (1813-1820) to create a quasi-census of male occupations.[3] This exercise made use of 11,364 baptism registers and resulted in a dataset with c.2.65 million observations. For convenience the dataset is described as referring to c.1817, the approximate mid-point of the period.

Although the parish registers provide reliable information about the *percentage* of the workforce engaged in a given occupation, they do not provide *numbers* engaged in that occupation. When combining information about percentages in each occupational category from a number of different units, therefore, it is important to be able to weight the percentage for each unit by its population relative to the populations of the other units, as, for example, when combining information for all the parishes in a county in order to make an estimate for the county as a whole. The c.1817 parish-level datasets were re-weighted by estimates of the numbers of men in each parish, aged 20 and over, based on the censuses of 1811 and 1821. Since it was demonstrable that domestic servants were under-represented in the parish registers, a further adjustment was made, using the relevant information in the 1831 census. Comparison with a number of other sources of occupational data indicates that data quality is comparable with later census data (Kitson *et al.* 2012: 10-12). The tabulations for 1851 and 1871 were based on census data.

Before 1813 it was not a legal requirement to record fathers' occupations in Anglican baptism registers but nevertheless they were quite frequently recorded. All the registers used to generate the occupational estimates for c.1817 were searched to determine whether they contained comparable occupational data consistently recorded during the period 1695 to 1729, a period during which occupations were quite widely recorded, partly as an indirect result of the provisions of the 1694 Marriage Duty Act. About 9 per cent of the registers proved suitable, a total of 1,122 English and Welsh registers. They provided the data which form the basis of the estimates for c.1710 presented in table 2.

If these registers had been a random sample of English and Welsh registers as a whole, it would have been straightforward to have used the relative frequency with which different occupations were recorded to determine the occupational structure of the country, since so many registers were available. This, however, was not the case. Towns were heavily over-represented. Approximately 174,000 occupations were recorded in the registers of which 58 per cent were from urban registers, but at the beginning of the eighteenth century

[3] A full description of the creation of the dataset can be found in Kitson *et al*, 2012.

only about 30 per cent of the population lived in towns.[4] It was therefore necessary to re-weight the original data for urban and rural parishes to mirror the national percentages in the two categories. A further re-weighting was required to correct the imbalance caused by the fact that the three counties of Cheshire, Lancashire, and the West Riding of Yorkshire provided 25 per cent of the rural occupations even though these counties contained only 10 per cent of the national population c.1700. In these three counties the secondary sector provided employment for a substantially higher fraction of the male labour force in the rural parishes than in rural parishes elsewhere. Without re-weighting this would have resulted in a misleading overall picture.

Many men both in c.1710 and in c.1817 were described simply as labourers. A large proportion of labourers at both dates were employed in agriculture but some secondary and tertiary industries also employed labourers as, for example, in the building trades and in transport. The distribution of the labourers between the primary, secondary, and tertiary sectors proved a complex task described in detail elsewhere (Saito and Shaw-Taylor, forthcoming b).

Two further issues should be mentioned before considering the occupational estimates shown in table 2. The first is an issue which has often been raised in relation to all sources of occupational information before the middle decades of the nineteenth century. By-employment was so common and so important, it is said, that sources which normally provide only a single occupational descriptor are of limited value. It has proved tantalisingly difficult to quantify the scale of by-employment, especially as at one extreme it might represent, say, one third of an individual's working hours, while at the other no more than a twentieth. Since it is very rare to be able to specify hours spent by an individual on a range of different productive activities, a plausible case can be made for many different conclusions. However, a recent reconsideration of the issue has provided convincing reasons to think that the available evidence has not been correctly evaluated, and that by-employment does not represent a valid reason to distrust inferences made on the basis of conventional sources of occupational data, such as the parish registers. It can be shown that it is normally the case that a 'true' description of the occupational structure including by-employment would not differ significantly from one based solely on primary employment (Keibek 2012).[5]

The second issue concerns what is sometimes termed the maker/seller problem. Many bakers, for example, spent part of their time in baking the bread which they subsequently sold. Their working lives were spent partly in secondary and partly in tertiary activities. In which sector should they be placed? In this exercise bakers were placed in a secondary sector group which somewhat exaggerates the overall secondary total but the potential distortion is

[4] 17 per cent lived in towns with 5,000 or more inhabitants and an additional 14 per cent in smaller towns (Wrigley 1987: tab. 7.2, 162 and Clark 1995: 90). Both estimates refer to England only. The inclusion of Wales suggests that a figure of 30 per cent for the overall urban percentage should be preferred to the figure of 31 per cent implied by the combined total for larger and smaller towns.

[5] The essence of the argument is that the view that by-employments were prevalent is heavily dependent on the evidence of probate inventories. But those who were by-employed were disproportionately likely to leave a probate inventory. If taken at face value the probate record therefore exaggerates the importance of by-employment.

limited since there were also occupations in the tertiary sector which sometimes involved secondary activity. Beer sellers, for example, often sold a product which they had also brewed. It is unlikely that overall totals in each of the three sectors would be changed other than marginally even if the maker/seller problem were completely overcome.

Table 2 provides estimates of the occupational structure of England and Wales for males aged twenty and over. The occupational data used were coded to a new classification scheme: Primary, Secondary, Tertiary or PST for short (Wrigley, forthcoming). The primary sector refers to all extractive activities associated with the production of raw materials: agriculture, fishing, mining and so on. The secondary sector refers to the transformation of the raw materials produced by the primary sector into other commodities, whether in a craft or a manufacturing setting. The tertiary sector encompasses all services including transport, shop-keeping, domestic service, and professional activities. The PST system is intended to capture the effect of the differing income elasticity of demand for primary, secondary, and tertiary products. As real incomes rise the proportion of aggregate demand expended on these three types of product changes, and the occupational structure changes in sympathy. In a very poor country the PST proportions of the labour force may split 80:15:5 while in a wealthy country the split may be reversed 5:15:80. The PST system is therefore helpful in considering the implications of the changes in occupational structure which took place before, during, and after the industrial revolution.

When compared with Crafts' figures shown in table 1, the new estimates suggest a significantly less agricultural economy c.1710 (50 per cent rather than 56 per cent) but a radically larger secondary sector (37 per cent rather than 19 per cent) and a notably smaller tertiary sector (12 per cent rather than 26 per cent). Crafts considered that Britain was much more industrial at the turn of the eighteenth century than Deane and Cole had supposed. The new estimates suggest an even more industrial economy with employment in the secondary sector running at twice the level Crafts estimated. In contrast the tertiary sector is less than half as large as in his estimates.

Table 2 ***Occupational structure of England and Wales c.1700-1871***

Sector	c.1710 %	c.1817	1851 %	1871 %
Agriculture	49.8	35.7	26.9	19.3
Mining	0.6	3.2	4.9	5.7
Rest of Primary	0.4	0.5	0.6	0.6
Primary Total	**50.8**	**39.4**	**32.4**	**25.6**
Clothing	4.5	3.4	3.4	2.5
Footwear	3.2	3.8	3.9	3.0
Textiles	7.5	7.8	6.8	4.7
Iron and steel manufacture and products	3.4	3.0	3.8	4.7
Machines and tools, making and operation	0.9	1.1	1.6	2.9
Building and construction	6.1	7.4	7.5	8.5
Rest of secondary sector	11.6	15.6	17.6	19.9
Secondary Total	**37.2**	**42.1**	**44.7**	**46.3**
Dealers and Sellers	2.5	3.4	4.7	6.1
Services and Professions	5.1	8.7	10.4	12.2
Transport and Communications	4.4	6.4	7.7	9.7
Tertiary Total	**12.0**	**18.4**	**22.8**	**28.0**
Labour Force	**100.0**	**100.0**	**100.0**	**100.0**

Sources. 1851 Census, PP 1852-3, LXVIII, vols. I and II, England and Wales, Occupations of the people. *1871 Census*, PP 1873, LXXI, vol. III, England and Wales, Occupations of the people.

If we compare the new c.1817 estimates in table 2 with Crafts' figures for 1801/3 in table 1 then, since the new estimates refer to a date 15 years later than Crafts' estimates, the agricultural percentages are broadly consistent with each other (36 per cent compared to 42 per cent). But again the economy emerges as much more industrial in the early nineteenth century than the earlier estimates had suggested (42 per cent rather than 25 per cent). And again the tertiary sector appears significantly smaller (18 per cent rather than 34 per cent).

The new estimates for c.1710 and c.1817 reshape radically our understanding of the structural change in employment during the industrial revolution in three main ways. Firstly, they demonstrate that the economy was even more industrial at the beginning of the eighteenth century than the earlier revisionism had suggested, indicating a much greater shift towards secondary sector employment during the early modern period. Secondly, Deane and Cole had seen the key period for the increase in the relative importance of the secondary sector as the late eighteenth and early nineteenth centuries, a picture supported by Crafts' estimates of a growth from 24 per cent to 41 per cent between 1759 and 1841. That this period saw radical structural change was one of the few points of agreement in the debate

between proponents and critics of the revisionist account of the industrial revolution (Crafts and Harley 1992; Berg and Hudson 1992). However, the new estimates suggest a relatively modest secondary sector growth from 37 per cent to 46 per cent between c.1710 and c.1871. The critical period for the structural shift out of agricultural employment into secondary sector employment took place before the beginning of the eighteenth century. Major structural change now appears to have preceded the onset of modern economic growth after 1830 by well over a century. Since the rate of growth of labour inputs has been revised downwards, it follows that the rise in labour productivity in the secondary sector in the eighteenth and early nineteenth centuries must have been substantially higher than suggested in Crafts' analysis.

The third major revision to previous views of structural change relates to the tertiary sector. Between c.1710 and c.1817 the tertiary sector grew from 12 to 18 per cent of the male workforce rising further to 28 per cent in 1871. In the first period the absolute rise was 6 per cent; in the second 10 per cent. The comparable figures for the secondary sector were 5 and 4 per cent. Because the tertiary sector was much the smaller of the two sectors, the contrast is far more pronounced if expressed in rates of growth. In the first period the tertiary percentage share increased by 53 per cent; in the second period by 52 per cent; the comparable secondary sector figures are 13 per cent and 10 per cent. The population was rising quickly over the century-and-a-half and it is instructive to consider numbers as well as percentages. Because the secondary sector workforce was so much larger in absolute number, the growth in its workforce continued to outstrip that of the tertiary sector. Between c.1710 and c.1817 the number of men employed in the tertiary sector rose in round numbers by 300,000; in the secondary sector by 525,000, while in the period c.1817-1871 the comparable increases were 975,000 and 1,450,000, respectively (these totals are derived from estimates of the totals of males aged 20-64 at the relevant dates). Later in the century, even on this measure, the tertiary sector was growing the faster.

Whilst there have been many studies of particular parts of the tertiary sector, such as transport or retailing, the tertiary sector as a whole has, with a few exceptions (O'Brien 1983; Hartwell 1976; Mokyr, 2009) been somewhat neglected in studies of the industrial revolution, though its significance in the later nineteenth century has long been recognised (Lee 1984; Thomas 2004) but the new evidence suggests that the notable rise in the importance of tertiary sector employment should figure prominently in discussions of growth and change generally throughout both the eighteenth and nineteenth centuries. The reasons for the rapid and sustained growth in the tertiary sector are discussed below under sub-sectoral change.

The information in table 2 relates exclusively to male employment. It is natural to wonder how greatly the percentages in the table would change if both sexes were covered. Since the sources containing data on female employment for the period before 1851 are limited and their interpretation may present problems, any attempt to answer the question must involve some uncertainty. However, the conclusions reached in the section on female occupational patterns below and embodied in table 6 suggest that the sectoral percentages for the sexes combined may not have differed very greatly from those for men only.

Sub-sectoral change.

In the primary sector agriculture experienced a major decline between c.1710 and 1871 with its share of employment falling from one man in two to just under one man in five. Over the same period mining saw the most dramatic increases in employment shares of any sector, largely reflecting the changing energy base of the economy associated with the massive rise in coal production over the period.[6] The absence of significant technological change at the coal face meant that prodigious increases in output could only be achieved by deploying an ever larger share of the male work-force in the coal industry.[7]

In the secondary sector the decline in the share of the male labour force in the clothing trades over the eighteenth century may at first sight seem surprising since this was a period when the cost of cloth fell dramatically – thanks to the rising importance of cotton cloth whose price fell rapidly in the latter part of the period. There is, however, evidence to suggest that in the late seventeenth and early eighteenth centuries women came to play an increasing role in the tailoring trades.[8] The decline shown in table 2 probably reflects feminisation rather than a decline in overall employment. The rapid further decline after 1851, however, probably reflects technical progress; the invention of the sewing machine in 1859. The introduction of new technology led to a decline in relative labour requirements – a classic feature of modern economic growth. The decline of the percentage employed in footwear in the same period probably reflects the same technological innovation, but its earlier growth, given the absence of notable technical change in shoemaking, probably reflects slowly rising living standards leading to a better shod population. The absence of significant change in the eighteenth century and later decline in the relative importance of male employment in textiles, often regarded as the 'leading sector' of the industrial revolution, may occasion surprise. But this is *the sector* in which major technological change, and spectacular productivity increases began in the late eighteenth century. Despite the unprecedented increases in textile output across the period, the scale of productivity increases meant that the percentage of the male labour force in the sector fell continuously from the late eighteenth century. It is most unlikely, as we will see later, that this trend was offset by a countervailing trend in female employment.

The modest decline in the percentage share of iron and steel in male employment in the eighteenth century may also occasion surprise but there may have been substantial gains in output per head in this period and since the labour force as a whole was growing rapidly the number of men engaged in iron and steel manufacture rose substantially despite a fall in its percentage share. In the nineteenth century expansion was rapid, facilitated by a notable rise in demand in overseas markets (Davis 1979). An increase in the percentage share of machines and tools, already evident in the eighteenth century, became striking in the nineteenth century. The building industry grew in both centuries. The growth of the rest of

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[6] On the centrality of coal to the industrial revolution see Allen 2009 and Wrigley 2010.

[7] The output of coal in England rose from 2.43 million tons in 1700 to 16.67 million tons between 1700 and 1815, or roughly seven-fold: Flinn 1984:II, tab. 1.2, 26..

[8] For an overview of the evidence see Erickson 2011:156.

the secondary sector reflects the development of an increasingly complex economy with a more diverse manufacturing base.

The rate of growth of the percentage share of the tertiary sector dwarfed that of the secondary sector. Its rapid expansion probably reflects three factors. Firstly, as living standards rose it is likely that a rising proportion of national income was spent on tertiary products. Secondly, the increasing regional concentration of production together with the increases in output, especially in the secondary sector, meant that a rising proportion of primary and secondary sector products was being transported greater distances. This would have required increased activity in wholesaling, retailing, and transport and communications as well as in a number of professional services. Thirdly, it is likely that productivity in the tertiary sector grew less rapidly than in the secondary sector.[9]

Why are the new estimates so different from Crafts' reworking of the Lindert and Williamson data for the beginning of the eighteenth century? One obvious possibility is that Crafts' estimates relate to Britain and include women as well as men. However, those estimates derived from Lindert and Williamson's work which pertained only to England and made only a very incomplete attempt to include female employment. Two other factors probably explain most of the differences between the two sets of estimates. First, Lindert and Williamson depended heavily on Gregory King's problematic figures. Second, the size of Lindert's archival sample with between 27 and 51 parishes in observation in any given period is too small to capture reliably something as variegated as occupational structure. The new sample consists of more than one thousand parishes.

REGIONAL PATTERNS

National aggregates often mask marked regional differences which merit consideration. The early eighteenth century data are not sufficiently plentiful to provide estimates for all counties. Table 3 below shows estimates of adult male occupational shares between c.1725 and 1871 for three north-western counties for which we have sufficient data c.1725 to estimate occupational structure. It is striking that the secondary sector's share of employment was already large in the early eighteenth century but yet that it increased substantially during the next half century to a peak c.1785, after which there was a slight but consistent fall until 1871. The initial rise was primarily due to the rapid expansion of the textile industry. During the nineteenth century its percentage share declined sharply, largely, however, offset by expansion elsewhere in the secondary sector. The primary sector's share of male employment fell across the whole period but much more sharply over most of the eighteenth century than in later decades. The tertiary sector percentage rose modestly to c.1785 but rapidly thereafter.

Table 3 ***Male occupational structure: selected north-western counties***

[9] Kuznets suggested, as a general rule, that tertiary sector productivity growth tends to be below that of the secondary sector. Kuznets 1966: ch. 3, esp. 98-102

Sector	c.1725	c.1785	c.1817	1851	1871
	%	%	%	%	%
Primary	50.5	24.6	23.8	19.4	16.0
Secondary	42.3	65.4	64.1	60.3	58.0
Tertiary	7.2	10.0	12.1	20.2	25.9
Labour Force	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note. The counties: Cheshire, Lancashire, West Riding of Yorkshire.

Sources. See source note to tab.2 for 1851 and 1871 census data.

Table 4 shows comparable estimates for those southern agricultural counties for which we have sufficient data c.1710 to estimate occupational structure. Here a very different pattern is visible. Since these were mostly agricultural counties it is not surprising that the primary sector employed more than three-fifths of the workforce c.1710 and the percentage changed little during the following century. Thereafter the primary sector percentage declined but even in 1871 it still accounted for more than two-fifths of the total. The secondary sector was a substantial employer in c.1710 but the sector lost ground during the ensuing century only to expand again in the nineteenth century. The decline was substantially caused by a fall in the size of the textile sector. In counties such as Northamptonshire and Wiltshire, where the textile industry was of some significance c.1710, the decline in the secondary sector was more pronounced. The tertiary sector expanded steadily and substantially throughout the whole period; transport and communications grew especially rapidly.

Table 4 ***Male occupational structure: selected southern counties***

Sector	c.1710	c.1817	1851	1871
	%	%	%	%
Primary	61.4	59.5	49.6	42.7
Secondary	31.2	29.5	34.0	36.8
Tertiary	7.4	11.1	16.4	20.5
Labour Force	**100.0**	**100.0**	**100.0**	**100.0**

Noie. The counties: Bedfordshire, Buckinghamshire, Cambridgeshire, Huntingdonshire, Northamptonshire, Oxfordshire, Rutland and Wiltshire.

Sources. See source note to tab.2 for 1851 and 1871 census data.

FEMALE OCCUPATIONAL PATTERNS

Satisfactory data for women for the period before 1851 are not available as yet but on the evidence of the mid-nineteenth century censuses women made up almost a third of the

workforce. Therefore, any account which ignores female labour is necessarily partial. Table 5 presents data from the 1851 and 1871 censuses comparing the structure of the adult male and adult female labour force.

Before discussing table 5 a few brief remarks must be made on the enumeration of female employment in mid-nineteenth century censuses.[10] The censuses provide a substantially complete enumeration of adult male employment. But women whose work was irregular or part-time were not fully recorded. Some authors have suggested that ideological factors also served to reduce the recording of female employment and it has often been argued that the census substantially understated women's participation in the economy (Higgs 1995; Horrell and Humphries 1995; Sharpe 1995). Any undercounting was probably most pronounced in the agricultural sector, but its impact may be less serious than appears at first sight. Census data on female employment make no distinction between those who worked part-time and those who worked full-time. It is likely that a much higher proportion of women than men, whose occupations were recorded in the census, actually worked part-time. In other words the census contains a countervailing bias of unknown size. The nature and direction of any bias in the census remains unclear. Therefore, in the present discussion the census data will be taken at face value.

The first two columns in table 5 show that in 1851 male and female workers were distributed differently. Female members of the labour force were considerably less likely to be employed in the primary sector than men and slightly less likely to be employed in the secondary sector, but were much more likely to be found in the tertiary sector. Similar patterns are revealed in 1871. However, while male and female occupational structures were significantly different in the mid-nineteenth century, the difference between the male occupational structure and that for the sexes combined was relatively muted in the primary and secondary sectors, though more pronounced in the tertiary sector. The last two columns show the share of the labour force which was female. Women made up half the tertiary sector but only accounted for just over a quarter of the secondary sector and less than a fifth of the primary sector. The tertiary sector thus appears significantly larger once female employment is taken into account. In some sub-sectors, female employment was extremely important. Women accounted for between two-thirds and three-quarters of those making clothes, around half of the textile workers and roughly two-thirds of those in the services and professions. The last category includes the very large domestic service category which was the largest single source of employment for women in the nineteenth century. Clearly for these sub-sectors data relating to men alone provide a misleading picture of the overall situation. On the other hand in sub-sectors such as mining, metal-working, construction and transport, female employment was insignificant.

Table 5 ***Male and female occupational structure 1851 and 1871***

[10] A fuller discussion and guide to the literature can be found in Shaw-Taylor 2007.

		1851			1871		1851	1871
	Males	**Females**	**Both sexes**	**Males**	**Females**	**Both sexes**	**Female share**	**Female share**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Agriculture	26.9	16.6	23.7	19.3	11.8	16.9	0.22	0.22
Mining	5.1	0.2	3.6	5.7	0.2	3.9	0.01	0.01
Rest of Primary	0.6	0.0	0.4	0.6	0.0	0.4	0.00	0.01
Primary Total	**32.6**	**16.8**	**27.7**	**25.6**	**12.0**	**21.3**	**0.19**	**0.18**
Clothing	3.4	15.6	7.2	2.5	14.6	6.4	0.68	0.73
Footwear	3.9	4.9	4.2	3.0	4.1	3.4	0.36	0.39
Textiles	6.8	13.0	8.8	4.7	11.9	7.0	0.46	0.54
Iron and steel manufacture and products	3.8	0.6	2.8	4.7	0.5	3.4	0.07	0.05
Machines and tools, making and operation	1.6	0.0	1.1	2.9	0.5	2.2	0.01	0.08
Building and construction	7.5	0.0	5.2	8.5	0.0	5.8	0.00	0.00
Rest of secondary sector	17.4	4.2	13.3	19.9	6.0	15.5	0.10	0.13
Secondary Total	**44.5**	**38.5**	**42.6**	**46.3**	**37.7**	**43.5**	**0.28**	**0.28**
Dealers and Sellers	4.7	3.4	4.3	6.1	4.1	5.4	0.25	0.24
Services and Professions	10.4	41.0	20.0	12.2	46.1	23.0	0.64	0.64
Transport and Communications	7.7	0.3	5.4	9.8	0.1	6.7	0.02	0.01
Tertiary Total	**22.8**	**44.7**	**29.7**	**28.0**	**50.3**	**35.2**	**0.47**	**0.46**
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**0.31**	**0.32**

Sources. See source note to tab.2 for 1851 and 1871 census data.

Can anything be said about the structure of female employment before 1851? One striking feature of table 5 is that the female share of most sub-sectors was remarkably stable over a twenty-year period. In the absence of data one approach to making speculative estimates of female employment and hence of overall occupational structure is to assume that the female share of each sub-sector remained constant over time. The results of combining this assumption with the male data in c.1710 and c.1817 are shown in the second and third columns of table 6. For c.1817 this exercise is defensible. For c.1710 it is much more problematic since there is reason to think that for certain sub-sectors, notably agriculture, the making of clothes, and textiles, the underlying assumption may be seriously inaccurate. A second set of speculative estimates is shown for c.1710 in the first column of table 6 embodying stylised assumptions about each of these three sub-sectors while assuming that the female share of other sectors was the same as in 1851. The assumptions modelled here are likely to be controversial. They are simply a speculative illustration of what the overall occupational structure might look like c.1710 and c.1817 if both sexes were represented.

Table 6 Speculative estimates of overall occupational structure c.1710-1871

	1710a	1710b	1817	1851	1871
	%	%	%	%	%
Agriculture	48.1	44.5	31.6	23.7	16.9
Mining	0.4	0.4	2.2	3.6	3.9
Rest of Primary	0.2	0.3	0.4	0.4	0.4
Primary Total	**48.7**	**45.2**	**34.2**	**27.7**	**21.3**
Clothing	7.4	9.7	7.3	7.2	6.4
Footwear	3.1	3.5	4.1	4.2	3.4
Textiles	12.7	9.8	10.1	8.8	7.0
Iron and steel manufacture and products	2.2	2.5	2.2	2.8	3.4
Machines and tools, making and operation	0.6	0.6	0.8	1.1	2.2
Building and construction	3.8	4.3	5.1	5.2	5.8
Rest of secondary sector	7.9	9.0	12.0	13.3	15.5
Secondary Total	**37.7**	**39.4**	**41.5**	**42.6**	**43.5**
Dealers and Sellers	2.1	2.3	3.1	4.3	5.4
Services and Professions	8.7	9.9	16.7	20.0	23.0
Transport and Communications	2.8	3.2	4.5	5.4	6.7
Tertiary Total	**13.6**	**15.4**	**24.3**	**29.7**	**35.2**
Labour Force Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sources. See source note to tab.2 for 1851 and 1871 census data.

The four assumptions that have been made to produce the estimates for c.1710 in the first column are as follows. First, women formed twice as large a share of the agricultural workforce in c.1710 as they did in 1851. This was a period of considerable proletarianisation in agriculture. In consequence the female members of farmers' household would have formed a much smaller proportion of the agricultural workforce in 1851 than in c.1710 (Shaw-Taylor 2012). Female family labour would have loomed larger at the earlier date. Moreover, women's relative role in day labour probably also diminished over the eighteenth century (Burnette 2004 : Snell 1985: Allen 1992). Second, it is assumed that overall employment in the clothing sector was close to a constant share of employment in the eighteenth century. Given the evidence that women took over parts of the clothing trade in the eighteenth century, their relative importance has been reduced in c.1710 by 20 per cent to keep the overall share of employment in the sector broadly constant. The third assumption is that women constituted twice as large a fraction of the textile workforce in c.1710 as in 1851. In the pre-industrial period spinning was undertaken by women and weaving by men. Spinning was mechanised from the late eighteenth century and became increasingly a male occupation from the 1780s. The female share of the textile labour force therefore declined. Female spinners probably outnumbered male weavers by three to one or more in the pre-industrial period. A doubling of the relative importance of women in the industry in c.1710 compared with1851 may well be conservative (Muldrew 2012). The fourth assumption is that in all other sub-sectors women formed the same share of the labour force in c.1710 as they did in 1851. All these assumptions are fragile but they suggest ways in which the

occupational structure of the whole adult workforce might have differed from that of adult men alone.

Table 6, with estimates of occupational structure for both sexes combined, can now be compared with table 2, showing male occupational structure only. Our discussion will focus on the first column of table 6 since we regard the assumptions underlying these estimates as preferable to those used in the second column. The new estimates do not fundamentally alter the account presented above but they do suggest some modifications. Agriculture's share in c.1710 is somewhat reduced but diminishes more rapidly over the eighteenth century. The secondary sector's share is slightly larger in c.1710 but even more stable over time than suggested by table 2. The tertiary sector is significantly larger at every date but the trend growth remains very similar, more than doubling in relative importance between c.1710 and 1871. At a sub-sectoral level the declining relative share of textiles in total employment now appears to characterise the whole period, though if we had data c.1760 we would probably see no decline until the onset of mechanisation in textiles after 1760. Given that textiles have often been identified as the 'leading sector' in the industrial revolution, a continuous decline in employment may appear surprising. However, as already noted, it makes perfect sense that the sector which saw massive technological change earliest should exhibit declining labour shares from an early date. Indeed, *contra* Kuznets, this may be a common feature of 'modern' as opposed to 'Smithian' economic growth.

In considering female employment it is also important to bear in mind that female participation in the labour force is affected by demographic factors. In periods when marriage was late and many women never married female participation was higher than in periods when the opposite was the case, other things being equal. The same factor affects the proportion of women working part time and therefore the overall balance between male and female labour force participation. This point has little relevance over short periods but can be important over longer periods. For example, age at marriage for women and the proportion of women who never married were both significantly higher at the beginning of the eighteenth century than at its end (Wrigley *et al.* 1997: tab. 5.3, 97. Wrigley and Schofield 1981: 257-69). This should be borne in mind when considering table 6 It is probable that achieving a better understanding of the changing occupational structure of England and Wales is likely to come primarily from better estimates of changes in the female labour force and of the balance between full-time and part-time work among women.

A more general issue relating to the contribution of married women to productive activity should also be mentioned: the 'market economy' problem. It is in principle possible to take into account, say, a married woman's part in the textile output of a cloth-making household since the product enters the market and is there valued. But consider, for example, an activity like the domestic production of beer. If the beer is consumed at home it will not be included in conventional estimates of production since it was not valued in a market transaction. This problem affected female production more than male, and married women more than those who were single. The proportion of total production which was 'invisible'

for this reason was probably substantially higher at the beginning of the period than towards its end.

SCOTLAND

Whilst we are not currently in a position to present estimates of Scotland's occupational structure before 1851 it is possible to do so from that date. Table 7 compares the occupational structure of England and Wales with that of Scotland and Britain as a whole in 1851. It can be seen, by comparing the first two columns of data, that the occupational structures of Scotland did not differ greatly from that of England and Wales in 1851. Agriculture formed a marginally larger share of the occupational structure in Scotland and the primary sector was therefore larger. The secondary sector was also a little larger while the tertiary sector was significantly smaller. At a sub-sectoral level there are some more pronounced differences. Textiles formed nearly twice as large a share of employment in Scotland as in England while the services and professions were substantially smaller. The occupational structure of Britain as a whole, however, was necessarily not very different from that of England and Wales as a whole, since the population of Scotland was only one seventh of that of Britain as a whole.

Table 7 ***The occupational structure of England and Wales, Scotland and Britain in 1851***

	Occupational Structure: Both sexes combined				**Female share of labour force**		
	England and Wales	***Scotland***	***Britain***		***England and Wales***	***Scotland***	***Britain***
	%	**%**	**%**				
Agriculture	23.7	25.0	23.9		0.22	0.35	0.24
Mining	3.6	3.2	3.5		0.01	0.01	0.01
Rest of Primary	0.4	1.8	0.6		0.00	0.00	0.00
Primary Total	**27.7**	**30.0**	**28.0**		**0.19**	**0.29**	**0.21**
Clothing	7.2	6.0	7.0		0.68	0.71	0.68
Footwear	4.2	3.3	4.1		0.36	0.36	0.36
Textiles	8.8	15.0	9.7		0.46	0.51	0.47
Iron and steel	2.8	2.4	2.7		0.07	0.00	0.06
Machines and tools	1.1	0.7	1.1		0.01	0.02	0.01
Building and construction	5.2	6.9	5.4		0.00	0.00	0.00
Rest of secondary sector	13.3	12.8	13.2		0.10	0.05	0.09
Secondary Total	**42.6**	**47.1**	**43.3**		**0.28**	**0.29**	**0.28**
Dealers and Sellers	4.3	4.3	4.3		0.25	0.32	0.26

Services and Professions	20.0	14.2	19.1		0.64	0.66	0.64
Transport and Communications	5.4	4.4	5.2		0.02	0.01	0.02
Tertiary Total	**29.7**	**22.9**	**28.7**		**0.47**	**0.47**	**0.47**
Labour Force Total	**100.0**	**100.0**	**100.0**		**0.31**	**0.33**	**0.32**

Source. *1851 Census*, PP 1852-3, LXVIII, vol. II. Scotland, Occupations of the people.

We lack data on Scotland's occupational structure in the eighteenth century but it is likely that the differences between Scotland and England and Wales were much more marked in 1700 and rather different in nature. *A priori* it seems likely that as Scotland was pulled into the orbit of a more developed English economy during the eighteenth century it experienced greater and more rapid structural change. Scotland was only marginally more agricultural than England and Wales in 1851 but the differences were probably more marked in 1700. As with female occupational structure considerable further research would be required to confirm these speculations. However, whilst we lack firm population estimates for Scotland c.1710, there is no doubt the Scottish population then as later was a small fraction of the British population as a whole and it follows is that the aggregate occupational structure of Britain c.1710 cannot have been very different from that of England and Wales.

The second panel of table 7 compares the female shares of the workforce in Scotland with England and Wales and with Britain in 1851. In most sectors and sub-sectors the shares are remarkably similar. The one notable difference is in agriculture: in Scotland women made up a larger share of the agricultural workforce. Whether this is an artefact of different processes of census enumeration or reflects the greater importance of small farms, and hence family labour, is as yet unclear.

POPULATION GROWTH: ENGLAND AND THE CONTINENT

The radical changes in occupational structure taking place in the eighteenth and nineteenth centuries were paralleled by striking changes in the size and distribution of the population. The joint consideration of occupational structure and population change is helpful in clarifying the nature and pace of change taking place in England in this period, a period when the contrast between England and continental Europe became marked. At the beginning of the period agriculture was still by far the largest employer; at its end less than a fifth of the male labour force worked on the land.[11] Agriculture is intrinsically *areal* in nature; the extent and quality of cultivated land will influence relative population densities powerfully as long as it remains the dominant employer. Secondary and tertiary employment is far more *punctiform* in character. There are marked economies in the unit cost of industrial production when it is concentrated in a small number of places and the scale of output is large. The advantages of agglomeration are substantial. The same holds good for much of the tertiary sector. As secondary and tertiary employment increased in importance a rising

[11] In 1871 only 19% of the male labour force in England and Wales were engaged in agriculture; tab. 2 above. At similar dates in both Belgium and the Netherlands the comparable figures were 45%; in France 51%; in Italy 61%; Mitchell 1981: tab. C1, 161-71.

proportion of the population became concentrated at 'points' rather than being widely distributed. Radical change in occupational structure necessarily involved massive changes in the distribution of population.

Between 1700 and 1871 England experienced a faster rate of population growth than any other country of western Europe but the English growth rate varied markedly over time. In considering the changing rate of growth over this period, it is helpful also to include the seventeenth century in the review. Table 8 shows that the rate of growth of the national population was almost identical in the first half of the eighteenth century to that in the preceding century: about 2.5 per 1,000 per annum. At this rate of growth it would take almost three centuries for a population to double. Even such a comparatively modest rate had always proved difficult to sustain over a period of centuries because of the limited growth possibilities inherent in the nature of organic economies, but it had frequently been matched or exceeded over shorter periods.[12] In the second half of the eighteenth century, however, the rate of increase rose sharply and in the following half-century it rose still further. Between 1801 and 1851 the population virtually doubled, a rate of growth not matched in any previous or subsequent period of English history, and although the rate slackened slightly in the two final decades of the period, it remained brisk. In earlier centuries a rate of growth as high as that between 1750 and 1871 would have brought about a marked fall in real wage levels and living standards. It is a striking testimony to the transformation in productive capacity then in train that, despite the pace of population growth, real incomes held their own and may even have tended upwards (Wrigley 2011a).

Table 8 ***Population growth 1600-1871***

	1600	***1700***	***1750***	***1801***	***1851***	***1871***
England	4,161,782	5,210,623	5,921,905	8,671,356	17,030,153	21,292,297
		1600-1700	***1700-1750***	***1750-1801***	***1801-1851***	***1851-71***
Absolute increase		1,048,839	711,282	2,749,451	8,358,797	4,262,144
Percentage increase		25.2	13.7	46.4	96.4	25.0
Rate of growth (per 1,000 per annum)		2.5	2.6	7.5	13.6	12.5

Sources. 1600-1851; Wrigley 2011b: tab. 4.1, 104. 1871; *1871 Census*, PP. LIX, Preliminary Report, tab. V, 2-3.

That there was a striking acceleration in the rate of population growth in the eighteenth century has long been known but, in the absence of reliable information about changes in fertility and mortality rates, in the past it was usually attributed to a fall in the death rate. Recent research has enforced a major revision of this explanation. Mortality did decline moderately but two-thirds of the rise in the population growth rate between the late seventeenth and early nineteenth centuries was due to higher fertility (Wrigley 2004: fig. 3.3, 68). Age-specific marital fertility rates were largely stable. The increase in overall fertility

[12] The nature of an organic economy is described in Wrigley 2010: 13-17.

was chiefly caused by a sharp fall from 26 to 23 in the average age of marriage for women (Wrigley 2004: fig. 3.5, 74) and a decline in the proportion of women who never married.

The distinctive character of the population history of England in the period after 1750 is underlined by comparison with other European countries. Rates of growth in the period before 1750 were broadly similar across the board. After 1750 and especially after 1800 population growth in England outpaced growth elsewhere by a substantial margin. If the six continental countries included in table 9 are treated as a single unit their combined populations in 1700, 1750, 1800, and 1850 were 62.9, 69.7, 87.2, and 117.0 millions. In the three successive half centuries 1700-50 to 1800-50, therefore, their combined population rose by10.8, 25.1, and 34.2 per cent respectively. The increases in England in the same three half-centuries were 13.7, 46.4, and 96.4 per cent. In the first half of the eighteenth century the difference in growth rates between England and the continental group was minor, but thereafter the differences became marked. In the first half of the nineteenth century the difference might be termed dramatic. England had been a small country in 1700 by comparison with the three largest of her neighbours, France, Germany, and Italy. In 1850 England remained substantially less populous but, as may be seen in the middle section of table 9, the differences were much less than they had once been.

Table 9 ***England and her neighbours***

	Population (millions)				
	1600	***1700***	***1750***	***1800***	***1850***
France	19.6	22.6	24.6	29.3	36.3
Germany		16.0	17.0	24.5	35.4
Italy	13.5	13.6	15.8	18.3	24.7
The Netherlands	1.5	1.9	1.9	2.1	2.3
Spain	6.7	7.4	8.6	10.6	14.8
Sweden		1.4	1.8	2.4	3.5
England	4.2	5.2	5.9	8.7	17.0
	Comparative size (England =100)				
France	471	434	416	338	213
Germany		307	287	283	208
Italy	325	261	267	211	145
The Netherlands	36	36	32	24	18
Spain	161	142	145	122	87
Sweden		26	30	27	20
England	100	100	100	100	100
	Rates of growth (per thousand per annum)				
		1600-1700	***1700-1750***	***1750-1800***	***1800-1850***
France		1.4	1.7	3.5	4.3
Germany			1.2	7.3	7.4
Italy		0.1	3.0	2.9	6.0
The Netherlands		2.4	0.0	2.0	7.8
Spain		1.0	3.0	4.2	6.7
Sweden			5.3	5.6	7.9

England		2.5	2.6	7.5	13.6

Sources. For the continental countries, Livi-Bacci 2000: tab. 1.1, 8-9. For England, see tab. 8.

Two aspects of the remarkable surge in population growth taking place in England deserve emphasis because they are closely linked to the changes in occupational structure occurring at the same time. In both cases they underline the extent of the contrast between developments in England and those taking place on the continent.

POPULATION REDISTRIBUTION: URBAN GROWTH AND REGIONAL PATTERNS

Urban growth

The first concerns urban growth. In the sixteenth century England had been one of the least urbanised of European countries. In 1500 the percentage of the population living in towns with 10,000 or more inhabitants was only half the average for Europe generally (3.2 per cent compared to 6.1 per cent; Wrigley 1987: tab. 7.5, 176). By 1800 England had become the most urbanised European country other than the Netherlands, where urban growth had been dramatic in the sixteenth and seventeenth centuries but had halted in the eighteenth. The contrast in urban growth rates between England and continental Europe became especially marked during the eighteenth century. Although England's population constituted only about 7.8 per cent of the European total in 1800, in the course of the eighteenth century 66 per cent of the 'net' rise in urban population took place in England alone, an astonishingly high proportion (Wrigley 1987: tab. 7.7, 179).[13]

The character of urban growth in England no less than its scale was markedly different from that on the continent. In continental countries the urban hierarchy changed very little in the early modern period. In the Netherlands, where urban growth was marked for much of the period, of the twenty largest towns in 1550, nineteen were still among the top twenty in 1800. In Spain, where the urban percentage was falling over the seventeenth and eighteenth centuries, of the twenty largest towns in 1600, fifteen were still in the top twenty in 1800. In England over the same period only seven of the top twenty in 1600 remained in the list two hundred years later. London was, of course, the largest city throughout the whole period but of the next six places by rank order in 1800 only Bristol also appeared in the top seven towns in 1600 (de Vries 1984: app.1, 271 and 277-8, and tab. 3.7, 39).

The summary statistics of urban growth in England are striking but what lies behind them makes the story still more remarkable. The key summary statistics are set out in table10. In the seventeenth century urban growth was chiefly a metropolitan story. London's population rose from c.200,000 in 1600 to c.575,000 in 1700, accounting for more than a third of the overall increase in the whole national population total. The increase of population in other towns with 5,000 or more inhabitants was dwarfed by that of London in this century: in these towns the population rose from c.135,000 to c.275,000, or by 140,000.

[13] . The net rise is the number by which the urban population total exceeded that which would have obtained if the urban percentage had not changed over the time period in question.

Of the overall urban increase of c.515,000, therefore, London accounted for almost three-quarters (Wrigley 1987: tab. 7.2, 162). Given the scale of London's increase, it is no surprise that Middlesex was the fastest-growing county in the seventeenth century. But the 'London effect' was felt much further afield. The second and third fastest-growing counties were Northumberland and Durham (Wrigley 2011b: tab. 4.1, 104-5). London's consumption of coal more than quadrupled during the seventeenth century, rising from c. 100,000 to c. 475,000 tons (Hatcher 1993: tab. 14.6, 501-2). A matching rise in coal production on Tyneside afforded much local employment, and played a major role in causing population growth in the two counties to stand well above the average national figure.[14] Similarly, the growth of London was a major factor in engendering change in agriculture. The existence of a very large and rapidly growing urban market for the whole range of agricultural products created a strong incentive for investment, innovation, and specialisation which had been lacking hitherto.

Table 10 ***Urban growth in England* (*populations in '000s)***

	1600	**1700**	**1750**	**1801**	**1851**	**1871**
London	200	575	675	971	2,362	3,267
Other towns with 5,000 or more inhabitants	135	275	540	1,590	5,054	8,918
Total urban	335	850	1,215	2,561	7,416	12,185
Population of England	4,162	5,211	5,922	8,671	17,030	21,488
	The above totals expressed as percentages of total population					
London	4.8	11.0	11.4	11.2	13.9	15.2
Other towns with 5,000 or more inhabitants	3.2	5.3	9.1	18.3	29.7	41.5
Total urban	8.0	16.3	20.5	29.5	43.5	56.7
Population of England	100.0	100.0	100.0	100.0	100.0	100.0

Sources. Wrigley 1987: tab. 7.2, 162; *1801 Census*, PP 1801, VI, Enumeration; *1851 Census*, PP 1852-3, LXXXV, Summary tables, tab. VII, cciv-ccvii; *1871 Census*, PP 1872, LXVI, pt. I, vol. I, Summary tables, tab. VII, xviii-xxxiii.

In the eighteenth century the pace of urban growth increased further but its nature changed radically. London continued to grow but no faster than the overall rate of growth for the country as a whole. Whereas in the seventeenth century a third of the entire national increase took place in the metropolis, in the eighteenth century the comparable figure was little more than a tenth. The population of the capital rose from c.575,000 to c.970,000, an

[14] Assuming the average annual output of a coalminer was just under 200 tons, the increase in direct employment would have been about 2,000 men. With their families this figure would rise to c. 10,000, but in addition there was a large associated increase in employment in transport (keels and ships, horses and carts), plus the stimulus afforded by the increased demand for food, clothing, and accommodation resulting from the labour force working in the mines and in coal transport. The nature and extent of the changes brought about by the massive growth in coal mining is vividly illustrated in the classic monograph on Whickham, on the south bank of the Tyne, one of the parishes most transformed by London's rising demand for coal (Levine and Wrightson 1991).

increase of c.395,000, whereas other towns with 5,000 or more inhabitants grew at a furious pace, rising from c.275,000 to c.1,590,000, an increase of c.1,315,000. London's relatively modest rate of growth was not unique. It was broadly mirrored in historic regional centres also. A sample of ten such towns experienced a collective increase of 43 per cent, not greatly different from the London figure of 69 per cent.[15] Rates of growth were radically faster in manufacturing centres and leading ports. The combined population of Birmingham, Manchester, Leeds, Liverpool, and Sheffield was more than ten times as large in 1801 as it had been in 1700, rising from c.33,000 at the beginning of the century to c.360,000 at its end, and there was comparable growth in many smaller towns in which the expansion of industry and commerce was creating much new employment (Wrigley 1987: tabs. 7.1 and 7.3, 160-1, 166).

In the first half of the nineteenth century the pace of urban growth remained hectic. The proportion of the national population living in towns with 5,000 or more inhabitants rose from 29.5 to 43.5 per cent. London's share of the national total, which had stagnated for a century, rose moderately from 11.2 to 13.9 per cent but, as in the eighteenth century, urban growth was much faster in other towns, rising from 18.3 to 29.7 per cent of the national total. Whereas in 1700 London contained twice as many people as all other towns combined, by 1851 the situation had reversed: the rest of the urban sector now housed twice as many people as London. In the final 20 years the same relative pace of change obtained. The overall urban percentage rose to 56.7 per cent. London's share of the national total increased further to 15.2 per cent, but other towns collectively outpaced the metropolis by a wide margin.

Contrasting population growth rates in four county groups

The second aspect of population growth which deserves emphasis concerns the markedly different growth rates of English counties between 1700 and 1871. Like the first it reflected the changes taking place in employment opportunities. Restricted opportunities inhibited population growth; enhanced opportunities had the opposite effect.

Table 11 sets out population totals for four groups of counties at five dates; 1600, 1700, 1750, 1801, and 1851. The earliest date is included since establishing the patterns prevailing in the seventeenth century is instructive in considering the two halves of the eighteenth century. Like almost all other sets of county estimates for the period before the first census, the present estimates made use of the returns of baptism, burial, and marriage totals secured by John Rickman from the incumbents of Anglican parishes as part of the 1801 census exercise. A summary of the returns was published in the 1801 census. Rickman himself attempted to translate these returns into estimated population totals. Subsequently others have made comparable attempts to exploit the material Rickman collected. The totals presented in table 11, however, differ from earlier exercises in one important respect. Whereas earlier exercises arrived at county and national totals by converting baptism, burial, and marriage totals into population totals via assumed birth, death, and marriage rates, the

[15] The ten historic regional centres were Norwich, York, Salisbury, Chester, Worcester, Exeter, Cambridge, Coventry, Shrewsbury, and Gloucester.

new totals were obtained by exploiting the existence of independent estimates of national population totals recently produced by inverse projection.[16] Rather than deriving national totals by aggregating estimates for each county, the national totals were the starting point and county totals were inferred from the relative size of county totals of vital events (Wrigley 2009). It is probably fair to claim that the resulting totals represent an advance on previous exercises, though they too remain subject to significant margins of error.[17]

Table 11 ***Regional growth patterns***

		Population					
		1600	***1700***	***1750***	***1801***	***1851***	***1871***
London group		522,466	807,376	919,287	1,455,292	3,235,180	4,476,659
Industrial group		602,823	768,189	1,048,823	1,964,973	4,966,482	6,702,493
Agricultural group		2,217,130	2,592,533	2,726,227	3,509,603	5,615,590	6,072,535
Rest of England		819,363	1,042,525	1,227,568	1,741,488	3,212,895	4,040,610
England		**4,161,782**	**5,210,623**	**5,921,905**	**8,671,356**	**17,030,147**	**21,292,297**
		Percentage distribution of population					
		1600	***1700***	***1750***	***1801***	***1851***	***1871***
London group		12.6	15.5	15.5	16.8	19.0	21.0
Industrial group		14.5	14.7	17.7	22.7	29.2	31.5
Agricultural group		53.3	49.8	46.0	40.5	33.0	28.5
Rest of England		19.7	20.0	20.7	20.1	18.9	19.0
England		100.0	100.0	100.0	100.0	100.0	100.0
	Population increase (totals)						
	1600-1700	***1700-1750***	***1750-1801***	***1801-1851***	***1851-1871***	***1700-1851***	***1600-1851***
London group	284,910	111,911	536,005	1,779,888	1,241,479	2,427,804	2,712,714
Industrial group	165,366	280,634	916,150	3,001,509	1,736,011	4,198,293	4,363,659
Agricultural group	375,403	133,694	783,376	2,105,987	456,945	3,023,057	3,398,460
Rest of England	223,162	185,043	513,920	1,471,407	827,715	2,170,370	2,393,532
England	**1,048,841**	**711,282**	**2,749,451**	**8,358,791**	**4,262,150**	**11,819,524**	**12,868,365**
	Population increase (percentages)						
	1600-1700	***1700-1750***	***1750-1801***	***1801-1851***	***1851-1871***	***1700-1851***	***1600-1851***
London group	54.5	13.9	58.3	123.0	38.4	300.7	519.2
Industrial group	27.4	36.5	87.4	152.8	34.9	546.5	723.9
Agricultural group	16.9	5.2	28.7	60.0	8.1	116.6	153.3
Rest of England	27.2	17.7	41.9	84.5	25.8	208.2	292.1
England	**25.2**	**13.7**	**46.4**	**96.4**	**25.0**	**226.8**	**309.2**

Note. *London group*; Kent, Middlesex, Surrey. *Industrial group*: Cheshire, Lancashire, Staffordshire, Warwickshire, Yorkshire, W.R. *Agricultural group*: Bedfordshire, Berkshire, Buckinghamshire, Cambridgeshire, Devon, Dorset, Essex, Herefordshire, Hertfordshire, Huntingdonshire, Lincolnshire, Norfolk, Northamptonshire, Oxfordshire, Rutland, Shropshire, Somerset, Suffolk, Sussex, Westmorland, Wiltshire, Yorkshire, E.R., Yorkshire, N.R. *Rest of England*: Cornwall, Cumberland,

[16] The technique of inverse projection is described in Oeppen 1993a and 1993b.

[17] There is a review of earlier estimates and a discussion of the available sources in Wrigley and Schofield 1981: app. 5, 563-87.

Derbyshire, Durham, Gloucestershire, Hampshire, Leicestershire, Northumberland, Nottinghamshire, Worcestershire.

Source. Population totals 1600-1851; Wrigley 2011b: tab. A2.6, 224-5. Acreage; ibid., tab. A1.1, 170-1. Population 1871; *1871 Census*, PP. LIX, Preliminary Report , tab. V, 2-3.

The four groups in table 11 are: a London group, an industrial group, an agricultural group, and the rest of England. The division into these four groups is somewhat arbitrary but experiment suggests that modifying the composition of each group would make only marginal differences to the pattern which the table displays. The agricultural group contains all those counties in which at the time of the 1831 census 39 per cent or more of the male labour force was engaged in agriculture. The industrial group contains all the counties in which the boost to growth caused by the presence of industry caused the population to rise particularly quickly between 1700 and 1851. In all five the rise was five-fold or greater. These counties form a contiguous block stretching north from Warwickshire to Lancashire and then crossing the Pennines to the West Riding. There were other counties in which industry and/or coal mining flourished, such as Nottingham, Durham, or Derbyshire but, although growth was rapid in parts of these counties, in each county as whole it was smaller than in the five selected. The London group comprises the three counties in which London was located. The fourth group consists of the remaining counties. The counties in each group are listed beneath the table.

Despite the limitations of the county as a unit of reference, table 11 reveals the marked contrast in growth rates between county groups with differing occupational structures and how the pace of growth changed over time. In the seventeenth century agriculture was still the dominant industry, and the agricultural group contained almost exactly half the national population in 1700. Variation in regional growth rates was muted apart from the effect of metropolitan growth on the population of the London group. The industrial group grew no faster than the miscellaneous set of counties in the rest of England group, and did not greatly exceed the rate of growth in the agricultural group. In the half-century 1700-50 there were early signs of dynamism in the industrial group, while growth in the London group fell away sharply, and the agricultural group marked time. In the period between 1750 and 1801 there was an acceleration in the growth rate in all four groups and the ‘expected’ pattern became more pronounced with growth fastest in the industrial group and slowest in the agricultural group, and this pattern was maintained without significant change during the next half century to 1851. In the final period from 1851 to 1871, however, the London group occupied the top spot. The Great Exhibition of 1851 marks a symbolic high water mark for British industry. It was then still setting the pace internationally. But its period of dominance was brief. The rate of growth of population in the industrial group declined from 1.87 per cent per annum in 1801-51 to 1.51 per annum in 1851-71. In the London group the comparable rates were unchanged (1.62 and 1.63 respectively). The decline in the relative fortunes of the industrial group compared with the other groups, already visible by 1871, became more marked in the following decades.

The final column of the fourth section of table 11 shows the percentage increases experienced in the four groups between 1600 and 1851, the period during which the English economy was transformed. It demonstrates how widely their fortunes varied by showing the cumulative effect of the growth rates over the period as a whole. The population of the industrial group was eight times as large in 1851 as it had been in 1600, while that of the London group rose six-fold. In contrast the agricultural group grew only two-and-a-half-fold, while the rest of England group predictably occupied an intermediate position; its population quadrupled, as did that of the country as a whole. In the shorter period 1700-1851 the percentage increases were, of course, smaller but the relative fortunes of the four groups were very similar. It is worth noting that if London and the industrial counties are excluded, growth rates in the rest of the country in this period were broadly similar to comparable areas of continental Europe.

NATURAL INCREASE AND INTERNAL MIGRATION

The marked contrast in growth rates between the county groups naturally raises the question of the relative importance of local natural increase and inter-county net migration in bringing about this contrast. The population of early modern England was highly mobile. Reconstitution studies have frequently shown that only a minority of each new birth cohort who survived childhood died in the parish in which they had been born. This was true even before the marked increase in the growth rate differential between counties in the eighteenth century. In the seventeenth century, however, most migratory moves were short-distance, apart from the flood of migrants to London. In the eighteenth and nineteenth centuries not only London but the main industrial and mining counties attracted large numbers of in-migrants from other counties, as is evident from the difference between the decennial population growth rates of counties and their decennial rates of natural increase (RNI). The difference was marked both in 'sender' and 'receiver' counties, and it should be borne in mind that this statistic measures only net migration. Gross movements were substantially larger.

The calculation of county RNIs before the inception of civil registration is subject to large margins of error, and it is therefore instructive to consider the pattern which existed in the earliest years of civil registration of births and deaths when the relevant data are readily available. Column 2 of table 12 shows the annual rates of population growth during the first half of the nineteenth century in each of the county groups used in table 10. The next three columns show the crude birth and death rates and the resulting RNIs during the five-year period centring on 1841, while the final column shows the annual rate of net migration which would have occurred during the half-century on the assumption that rates of natural increase for the quinquennium 1839-43 had characterised the whole period from 1801 to 1851.

Table 12 ***Rates of natural increase and implied net migration per annum***

1	2	3	4	5	6
	Annual rate of	CBR per	CDR per	RNI per	Implied rate

	population growth per 1,000 1801-51	1,000 1839-43	1,000 1839-43	1,000 1839-43	of net migration (Col. 2 minus col. 5)
London group	16.2	33.8	23.5	10.3	5.9
Industrial group	18.7	39.4	24.8	14.6	4.1
Agricultural group	9.4	34.1	20.2	13.9	-4.5
Rest of England	12.3	37.4	21.9	15.5	-3.2
England	13.6	36.2	22.4	13.8	-0.2

Note. The composition of the country groups is as shown in the note to tab. 11

Sources. Population totals 1801 and 1851; tab. 11 above; population total 1841; Wrigley 2011b: tab. A1.1, 170-1. Birth and death totals 1839-43; *Annual Reports of the Registrar General for England and Wales*, corrected for under-registration (Wrigley and Schofield 1981: tab. A2.3, 496-502).

The registration of vital events was not complete in the early years of civil registration. Any plausible revision of the rates, however, would make only modest differences to the pattern of RNIs shown in the table (for example, the RNI for England over the whole period 1801-51 using corrected data from inverse projection was 14.3 per 1,000 which differs only modestly from the figure of 13.8 in column 5 of the table (Wrigley *et al.* 1997: tab. A9.1, 614-15). The key point revealed by the table is that rates of natural increase were very similar in three of the four groups. The RNI in the fourth, the London group, was lower than elsewhere but even in this group the difference was not marked. The marked fall in mortality rates in London which occurred during the later eighteenth century had greatly reduced the contrast between the capital and the rest of the country. The close similarity in the group RNIs other than London in turn implies that the marked differences in the overall growth rates between these groups must be attributed primarily to net migration. Not surprisingly the rate of net in-migration for the London group is higher than that for the industrial group, even though its overall rate of population growth was somewhat lower than that of the industrial group. The industrial group had both the highest CBR and the highest CDR of the four, a combination which had the effect of keeping its RNI close to the national average. Internal migration clearly played the major role in accounting for the differing growth rates in the English counties.

CONCLUSION

The new evidence about the changing occupational structure of England and Wales presented in this chapter suggests that much of the received wisdom about the industrial revolution will need to be modified. It remains sensible to suppose that in early Tudor times the economy of England was not greatly different from that of continental Europe, though clearly not a leading light. And it is clear that at the time of the Great Exhibition of 1851 the opposite was the case. The received wisdom concerning both the beginning and the end of this period remains unchanged. But the conventional view about the timing and nature of the change taking place between these two dates is in need of revision in the light of the new findings. In the early decades of the nineteenth century it was still normally the case on the

continent that well over half the labour force worked on the land.[18] This had ceased to be true in England before 1700. A substantial fraction of each rising generation in rural areas found work by turning to secondary and tertiary trades. This often involved migration to towns, many of which grew vigorously. Most of the jobs needed to accommodate those leaving the land were provided by the secondary sector but, although the much smaller tertiary sector figured less prominently on this measure, its percentage share of national employment was rising faster than the comparable secondary figure both in the eighteenth and nineteenth centuries. The opportunities afforded by the growth of secondary and tertiary employment meant that high rates of natural increase in the countryside did not produce rural misery on the pattern of earlier centuries. Events in early modern England show clearly that the assumptions embodied in Kuznets' model of 'modern' economic growth are not always justified.[19]

In this connection it is worth noting that Britain was not alone in failing to conform to Kuznets' model. Already in the seventeenth century the Netherlands had achieved an occupational structure which anticipated that of England at a later date. De Vries and van der Woude summarised their conclusions about this aspect of the early modern Dutch economy as follows:

> '---the Republic already by the 1670s had attained an occupational structure and infrastructure of local provisioning that was precociously modern, one where agriculture absorbed no more – and probably less – than 40 percent of the labor force. Industry and crafts, which together accounted for some 32 percent, was not far behind, while the trade and transport sector gave employment to one of every six participants in the labor force.' (De Vries and van der Woude 1997: 527).

The Dutch occupational structure they describe was broadly similar to that of England in c.1710. They noted that over the half-century 1570-1620 the Dutch non-agricultural labour force was growing at the 'phenomenal' rate of 3 per cent per annum and enjoyed a relatively high standard of living, though this was a time when, with far lower rates of population increase, real wages elsewhere in Europe were plummeting (De Vries and van der Woude 1997: 671). Dutch history makes it clear that in favourable circumstances 'Smithian' growth can produce radical change in occupational structure. De Vries and van der Woude, however, argued that despite the Netherlands being 'the first modern economy', it lost momentum, and ceased to grow in the eighteenth century, attributing the deceleration which occurred to 'economic circumstances which limited demand'. They noted that Kuznets had conceded that it was hard to imagine unlimited growth in any social process. He had dismissed the possibility that deceleration might result from supply side limitations but had acknowledged that it might arise from demand side failure (De Vries and van der Woude 1997: 720).

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[18] Indeed this remained true until the second half of the nineteenth century in most European countries for which data are available. Mitchell 1981: tab.C1, 161-73.

[19] It is only fair to stress that Kuznets' book was published half a century ago when the existing knowledge gave fewer reasons for concern about his model.

In many respects the changes taking place in England until the early eighteenth century mirrored what had earlier occurred in the Netherlands. 'Smithian' growth, however, is asymptotic rather than exponential in character. In the eighteenth century the Dutch economy reached a plateau. Rather than viewing the changes in the English economy which took place before the mid-eighteenth century as part of a lengthy but unitary process which culminated as the industrial revolution, therefore, they should perhaps be regarded differently. Such changes may have been a *necessary* but were not a *sufficient* condition for the later transformation which took place.

Until the early eighteenth century the most significant feature of the change taking place in England was the rise in output per head in agriculture. The proportion of the labour force working on the land declined steadily to levels unmatched anywhere on the continent with the exception of the Netherlands but whereas the food needs of the Dutch population were increasingly met by the import of food, English agriculture not only continued to meet the home demand for food but became a substantial exporter of grain in the early decades of the eighteenth century (Overton 1996: tab. 3.8, 89).

Agricultural productivity continued to increase in the following century but as time went on it was the secondary sector that witnessed the more striking gains in individual productivity. This is evident from what is perhaps the most significant single feature of the new evidence about occupational structure in the eighteenth century: the notably high percentage of the workforce engaged in the secondary sector at the beginning of the century and the relatively limited further growth in its percentage share of employment thereafter. This is significant for two reasons. First, since the proportion of the workforce in the secondary sector rose only modestly between the early eighteenth and early nineteenth centuries but secondary production increased dramatically, there must have been a marked gain in output per head. Whereas the primary sector had set the pace earlier, it was increasingly in the secondary sector that labour productivity gains were most pronounced. Secondly, since a large proportion of the output of the secondary sector was purchased on the home market, it implies a comparatively high level of real income per head in the 'Smithian' phase of economic development in England. On the continent the dominant pattern in the early modern period was for approximately three-quarters of the workforce to be employed in agriculture, reflecting the high proportion of aggregate demand devoted to meeting the basic necessities of life: above all food, followed by housing, clothing, and fuel. In England a substantially higher proportion of aggregate demand was spent on 'comforts', thereby creating employment in an expanding secondary sector. This point is strongly underlined by the fact that tertiary employment was rising so rapidly. By 1871 the tertiary sector workforce was three-fifths as large as that of the secondary sector; in c.1710 it had been less than one third as large.

Tapping new sources of energy in the form of fossil fuel combined with a flood of technical innovations meant that as the eighteenth century wore on the country no longer followed a path previously trodden by the Netherlands but pioneered 'modern' economic

growth. The transformation in the scale of industrial output which took place was achieved without the marked rise in the *percentage* of the labour force engaged in the secondary sector which was once believed to have occurred. There was, of course, a very substantial rise in the *absolute number* of men in industrial employment because the population was increasing rapidly[20] but productivity per head in industrial employment must also have risen signficantly. The possibility of economic growth becoming exponential rather than asymptotic depended upon developments which first took place in Britain, transforming first the secondary sector and eventually the whole economy.[21]

Overall rates of population growth were exceptionally high in the century after 1750, and markedly higher than in neighbouring continental countries. In largely agricultural communities high rates of population growth in earlier centuries had always created severe pressures on living standards. This had been the case in England in the late sixteenth century even though the population growth rate was then much lower than that in the decades before and after 1800.[22] In agricultural communities before the industrial revolution, a rising population had meant more people attempting to find a living from the same area of farm land with little opportunity to find employment away from the land. Secondary employment offered no alternative. Declining incomes meant a disproportionate fall in the demand for industrial products given the prevailing income elasticities of demand for basic necessities and other goods. The strikingly different rates of population growth in the different county groups in table 11 bear witness to the way in which the rapidly changing balance between the primary, secondary, and tertiary sectors brought new employment opportunities while also involving substantial migratory movement. These developments enabled living standards to be maintained while coping with rates of population growth which would once have resulted in widespread misery and suffering.

The history of urban growth serves to fill out several aspects of the changes taking place. In the seventeenth century urban growth was almost exclusively a London story, not surprising during what might be termed the 'agricultural' or 'Smithian' phase of the overall change. In the following century urban growth was much more an 'industrial' story as the rising importance of secondary and tertiary employment produced a hectic pace of urban growth in the midland and northern counties most affected. It had no parallel on the continent until the early decades of the nineteenth century.

In a sense the new information about the timing and scale of change in the relative size of the primary, secondary, and tertiary sectors of the English economy during the eighteenth and nineteenth centuries permits a partial return to a more traditional view of the industrial revolution. If the nature of the major changes taking place in the seventeenth and early eighteenth centuries had much in common with those which had occurred earlier in the

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[20] See pp. above.

[21] The range of issues which are very briefly summarised in this paragraph are explored in greater length in Wrigley, 2010, esp. chs. 1 and 2.

[22] . In the half-century from 1561 to 1611 the population was rising at the rate of 0.77 per cent annually. Between 1786 and 1836 the comparable rate was 1.29 per cent: Wrigley, *et al.*, 1997: tab. A9.1 pp. 614-15.

Netherlands, and if such changes were more likely to herald future stagnation than an increased momentum of growth, then an emphasis on the novel developments in the latter half of the eighteenth century and the early decades of the nineteenth century makes good sense. It was only then that the constraints which had always limited periods of growth in the past were finally overcome. It is one of the intriguing ironies of the emergence of economic growth as a distinctive subject for study that Adam Smith, widely regarded as its founding father, should have discounted the possibility of what is now termed exponential growth just when it was getting under way in the country in which he lived. He remarked:

> In a country which had acquired that full complement of riches which the nature or its soil and climate, and its situation with respect to other countries, allowed it to acquire; which could, therefore, advance no further, and which was not going backwards, both the wages of labour and the profits of stock would probably be very low. (Smith 1976 [1776]: I, 106).

The industrial revolution involved changes which were both dramatic and, at times, traumatic but anyone strolling round the Great Exhibition in 1851 might have had difficulty in recognising in mid-century Britain the features which Adam Smith had foreseen.

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