

The Wool and Cotton Textile Industries in England and Wales up to 1850

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1. Introduction

Textiles have made a major contribution to British economic development and they were at the heart of the industrial revolution. In addition, the growth of the British textile industry has had wide-ranging, long-term international consequences. This paper focuses on the wool and cotton textile industries until the middle of the nineteenth century because they have had the greatest economic and social impact. As we shall see, the different branches of Britain's textile industry have changed considerably in relative importance and location. Regionally, this has caused both industrialisation, when a branch was growing, and deindustrialisation, when a branch was declining or relocating. Technological innovation revolutionised British textile manufacturing and helped transform its international competitiveness. The key inventions that, in the main, were first applied within the cotton industry are described. The textile industry was highly centralised geographically; new research by the author is presented, which explores the spatial concentration of textile manufacturing in some depth.

This article proceeds as follows. The first two sections describe the long-term development of the wool and cotton textile industries. Then, the inventions that mechanised the British textile industry and played a central role in making Britain the first industrial nation are highlighted. The next section presents recent research into the location of the British textile industry at a key point in its history: the first quarter of the nineteenth century. Lastly, conclusions are drawn.

2. The Wool Textile Industry

The manufacture of woollen cloth was the staple of the English economy from 1200 to 1800. The traditional view was expressed by Ashton, "There was probably no county of England and Wales in which woollen cloth was not produced by the part-time work of peasants, farmers and agricultural labourers".¹ Many houses had a spinning wheel to convert raw wool into yarn whilst weavers producing woollen cloth inhabited a lot of villages and

¹ T. S. Ashton, *The industrial revolution 1760–1830* (Oxford, 1968), p. 23.

small towns. However, between 1600 and 1800, as we shall see below, the textile industry became more regionally concentrated.

Although craft workers did make woollen cloth for domestic consumption, little of this was exported before the fifteenth century. However, the consistently high quality of English and Welsh wools (particularly those from central Wales, the Welsh marshes, the Cotswolds and Lincolnshire) meant they were in great demand by foreign, woollen textile manufacturers. Hence, from the late thirteenth to the late fifteenth centuries, there was a boom in English raw wool exports to Flanders and Italy, which were Europe's major producers of high quality woollen textiles and its most advanced industrial regions. This dynamic trade greatly benefited large secular landowners, Cistercian monasteries, merchants and the monarch, who levied a tax on every sack of wool exported. During Edward III's reign (1327-77) England's raw wool exports were disrupted by embargoes, war-time controls, and customs duties. These circumstances gave the English textile industry greater access to raw wool and cloth producers not only gained a rapidly growing share of the home market but also began an export trade. This trade, which occurred primarily between London and Antwerp, doubled between 1475 and 1550. It included unfinished woollen broadcloths manufactured in Gloucester, Wiltshire and Somerset (these were dyed and finished in Antwerp to suit the central European market), finished broadcloths produced in Kent and kerseys (lighter and cheaper woollen textiles than broadcloths), which were manufactured, dyed and finished in Yorkshire and then exported to Antwerp from Hull and Newcastle. In summary, as Davis describes, the English wool textile industry now had two main components, "A nearly nation-wide production by small local craftsmen serving their village and town markets and never contemplating international or even inter-regional trade ... and ... several narrowly localised, highly organised groups of specialist producers selling their goods in widely scattered markets."²

As the production of wool textiles expanded in England, geographical specialisation enabled Marshallian external economies of scale to be gained, which boosted efficiency and learning.³ Thus, by the close of the Middle Ages, as Smith noted, "Three great regional centres had already emerged - the West Country, East Anglia, and, less important, West

² R. Davis, *English Overseas Trade 1500-1700* (Macmillan, 1973), p. 8.

³ A Marshall, *Principles of Economics* (1920; 8th edn., repr 1977).

Yorkshire”.⁴ Here, merchant-employers created larger scale wool textile manufacturing organisations that used the putting-out system. The merchants supplied wool, yarn and unprocessed cloth to a wide network of home-based outworkers, who performed many of the specialized operations that were needed to produce finished textiles. Having collected the products produced by the outworkers, the merchants had some of them finished and then took them to market.

By the mid 1550’s, Antwerp’s role as a key entrepot was under pressure due to several factors; particularly important was the protestant Dutch struggle for independence from catholic Spain. One outcome of this struggle was, from around the 1560’s, the migration of Flemish and Walloon religious refugees to England. Among these were skilled textile craftsmen who mainly settled in Kent and East Anglia, where they catalysed the growth of England’s nascent worsted industry. Made from wool, worsteds and semi-worsteds were lighter than broadcloths and collectively called the ‘New Draperies’. The English worsted industry grew to efficient scale based on vibrant home demand and, during the seventeenth century, it became the dynamic element of overseas trade by outstripping its Dutch rivals to capture new Mediterranean markets as the Italian and Spanish textile industries went into decline.

Broadberry et al estimate that by 1700, wool textiles accounted for 26 per cent of English manufacturing output - see Figure 1⁵. This made wool textiles the largest manufacturing sector of the English economy, marginally bigger than metals and mining. Estimates of the workforce employed in wool textiles in the mid-eighteenth century are unreliable - they vary between 800,000 and 1,500,000 people; nonetheless, even at the lower level, these figures are impressive since the population in England in 1761 was only 6,310,340.⁶ England was becoming the dominant European power in textiles

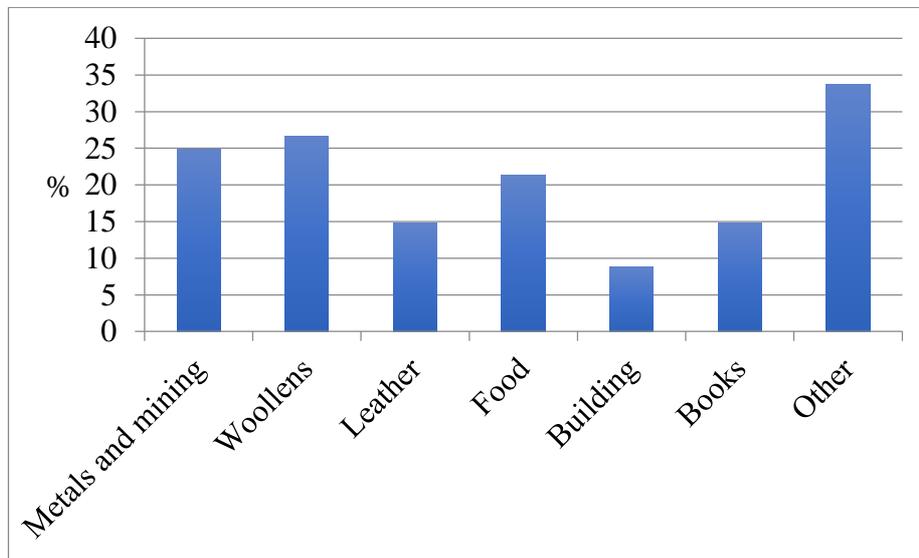
⁴ W. Smith, *An economic geography of Great Britain* (Second edition, Norwich, 1953), p. 78.

⁵ S. Broadberry, B. Campbell, A. Klein, M. Overton and B. Van Leeuwen, (2010), ‘British economic growth, 1270-1870’, some preliminary estimates, University of Warwick, <http://www2.lse.ac.uk/economicHistory/seminars/ModernAndComparative/papers2011-12/Papers/Broadberry.pdf> <http://www2.warwick.ac.uk/fac/soc/economics/staff/faculty/broadberry/wp>, last accessed August 2012. A number of sources were used to derive these data. Some data was taken directly from output statistics. Other data, for example in the textile and the leather sectors, was taken from the raw material inputs of wool and hides.

⁶ D. Gregory, *Regional transformation in industrial revolution; a geography of the Yorkshire woollen industry* (London, 1982), pp. 26-7. E. A. Wrigley, *The early English censuses* (Oxford, 2011), Table A2.6 provided in the compact disc that accompanies the book.

Figure 1: The industrial output of England, c. 1770

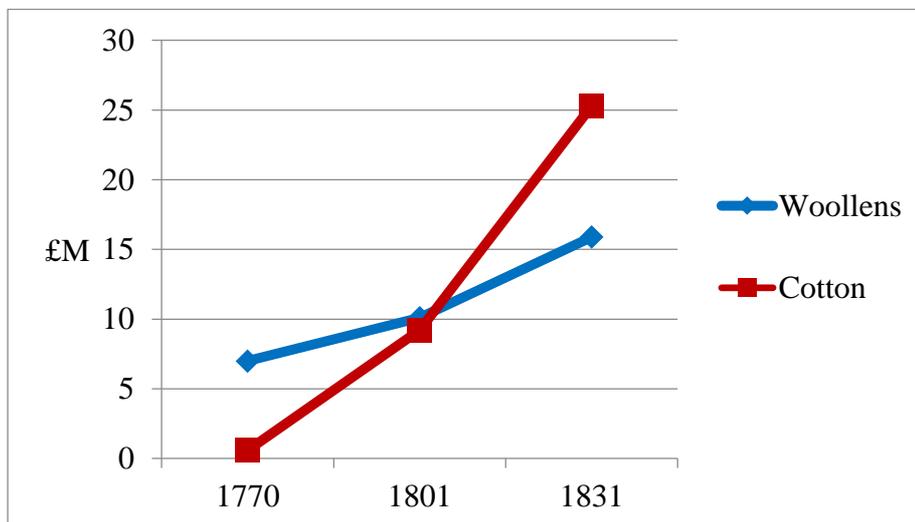
(each sector is presented as a percentage of the national output)



Source: Broadberry (2010).

Figure 2: The value added in the manufacture of woollen and cotton cloths

(£M, adjusted to current values)



Source: Crafts (1983). Source: 1813-20 PReEnglandWalesOccs.mbd, University of Cambridge.

The wool textile industry continued to play a dominant role throughout the eighteenth century. It maintained its important position and accounted for 25 per cent of exports in

1770.⁷ It was not until after this time that the cotton trade, sometimes referred to as the driver of the industrial revolution, grew rapidly and surpassed the value of wool textiles – as Figure 2 illustrates.⁸

3. The Cotton Industry

In 1500, India was the world leader in cotton textile production as Washbrook relates, “In the early modern period (sixteenth to eighteenth centuries) ... India was the workshop of the world in textile manufacture, exporting millions of yards of cloth annually to markets spread from south-east Asia to western Europe, and even to the Americas.”⁹ In comparison, England’s cotton industry, located in Lancashire, was minute, highly specialised and completely incapable of competing with Indian craft producers.

From the seventeenth century, the English East India began importing Indian cotton textiles, called ‘calicos’, into Britain. Calico cloths, designs and patterns proved very popular with British consumers and the speed and scale of their import constituted a threat to England’s established producers of fine woollens and linens. As O’Brien et al¹⁰ have described, the politically influential English woollen and linen producers sought protective legislation. This eventually resulted in the Calico Act of 1701, which limited Indian imports to white cottons that could be finished in Britain. Then, in 1721, Indian white cotton imports were also prohibited unless they were destined for re-export. The protective legislation proved effective and gave the domestic English industry breathing space to develop. What followed, as Broadberry and Gupta have described was, “A dramatic change in international competitive advantage, which must surely rank as one of the most important developments of the industrial revolution period.”¹¹ By 1890, the British cotton industry supplied sixty percent of the home market, over fifty percent of the Indian market and led the world trade in cotton fabrics. In consequence, the Indian cotton industry suffered deindustrialisation and

⁷ The total value of exports was around £4 million, of which woollens were £1M. J. H. Clapham, *The woollen and worsted industries* (London, 1907), p. 272.

⁸ N. F. R. Crafts, ‘British economic growth, 1700-1831: A review of the evidence’, *The Economic History Review*, 36 (1983), 177-99. Gregory (London, 1982), pp. 27-8.

⁹ D Washbrook, ‘India in the early modern world economy’, *Journal of Global History*, 2, (2007), p. 87.

¹⁰ P O’ Brien, T Griffiths, P Hunt, ‘Political Components of the Industrial Revolution: Parliament and the English Cotton Textile Industry, 1660-1774’, *The Economic History Review*, 44 (1991), pp. 395-423.

¹¹ S Broadberry, B Gupta, ‘Lancashire, India, and shifting competitive advantage in cotton textiles, 1700–1850: the neglected role of factor prices’, *The Economic History Review*, 62 (2009), pp. 279-305.

lost its dominant position in world manufacturing and trade.

The English cotton industry, located in Lancashire, gained ascendancy in three phases. Firstly, from 1750 to 1790 British industry began to mechanise; this is described in the next section. Secondly, from 1790 to 1830, the cotton industry's labour supply increased and, following Whitney's invention of the cotton gin, relatively cheap cotton from the American plantations began to be imported in bulk through Liverpool. Mechanisation together with better supplies of labour and cotton meant the price of English cotton textiles before shipping was now half that of Indian even though British labour was six times more expensive. Consequently, British cotton products gained market share at home and were competitive in foreign markets where transport costs were comparable to those incurred by Indian industry. Thirdly, from 1813 to 1913, the British industry achieved further productivity gains through technological innovations in weaving and continuous improvements in both spinning and weaving technology. As a result, British producers gained most the home market, over half of the Indian market and much of the remaining international market for cotton textiles.

In summary, a two-stage process of import substitution had occurred. First, the British cotton industry expanded behind protective barriers, which enabled the replacement of traditional craft production by capital-intensive machine production. Macro inventions (like Crompton's mule and Cartwright's power loom) and better input supplies had transformed British productivity compared to Indian. Second, a higher rate of micro inventions (incremental improvements to the new machines) in England had enabled a continuous stream of productivity gains that widened the Anglo-Indian price gap still further.

Numerous theories have been proposed to explain the meteoric rise of the British cotton industry and the central role it played in making Britain the first industrial nation. Most recently Allen, as mentioned above, has argued that Britain's unique combination of factor prices provided inventors with the greatest incentive for technological innovation, whilst Mokyr has suggested that the strength and depth of Britain's skill base gave it an unparalleled capacity to turn inventive designs into practical, profitable machinery.¹² Although the debate continues, there can be little doubt that the cotton industry was a major

¹² J Mokyr, *The Enlightened Economy: An Economic History of Britain 1700-1850* (New Haven, 2009)

factor in Britain's rise to world hegemony in the nineteenth century.

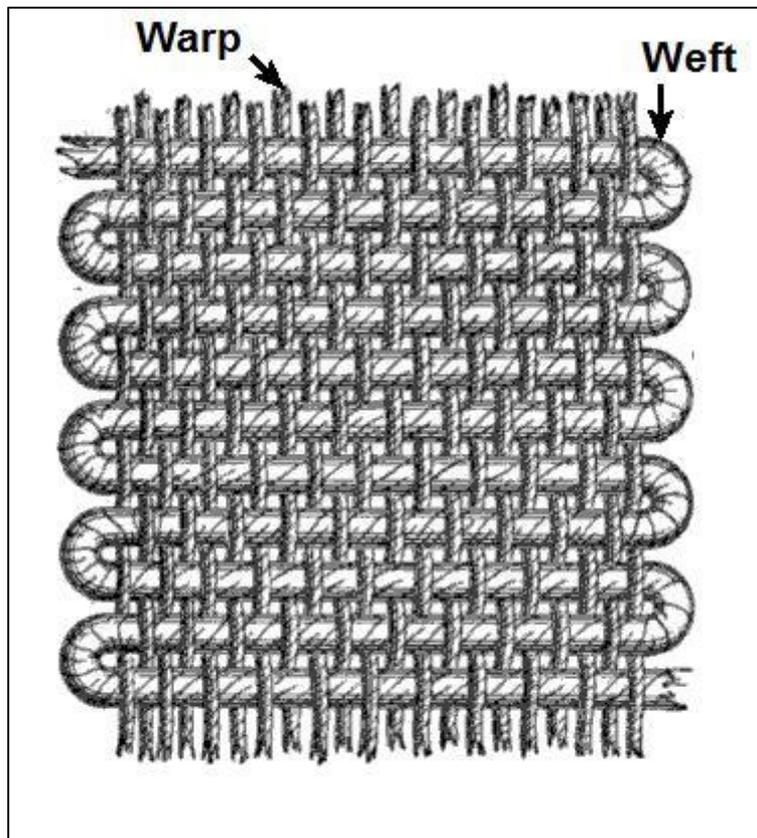
4. The Mechanisation of the British Textile Industry

This section describes the major technological innovations that transformed the British textile industry in the eighteenth century. The first part discusses the basic nature of textile fabrics. Next, a model of the core textile production process is presented. Then, the key inventions that mechanised the different stages of the textile production process are discussed. Lastly, conclusions are drawn.

4.1 The nature of textile cloths

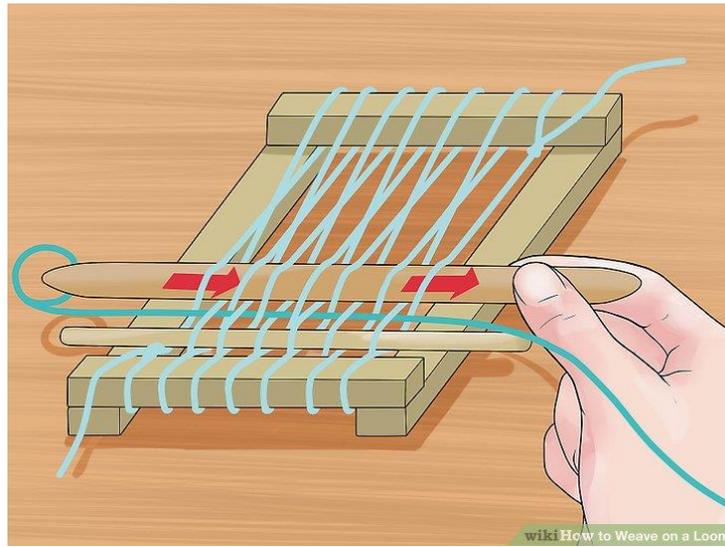
All cloths consist of two different types of yarn being woven together: the 'warp' yarn and the 'weft' yarn – see Figure 3 below (all pictures are from Wikipedia or Wikimedia Commons)

Figure 3: The warp and the weft yarns



The weaving occurs on a 'loom' or 'frame' (see Figure 4). Essentially, the warp yarns are attached vertically to the loom first and then a shuttle is then used to horizontally interweave the weft yarn into the warp. Different types and colours of yarn and different weaving methods enable an infinite variety of cloths to be made that all have different properties and uses.

Figure 4: How a loom works

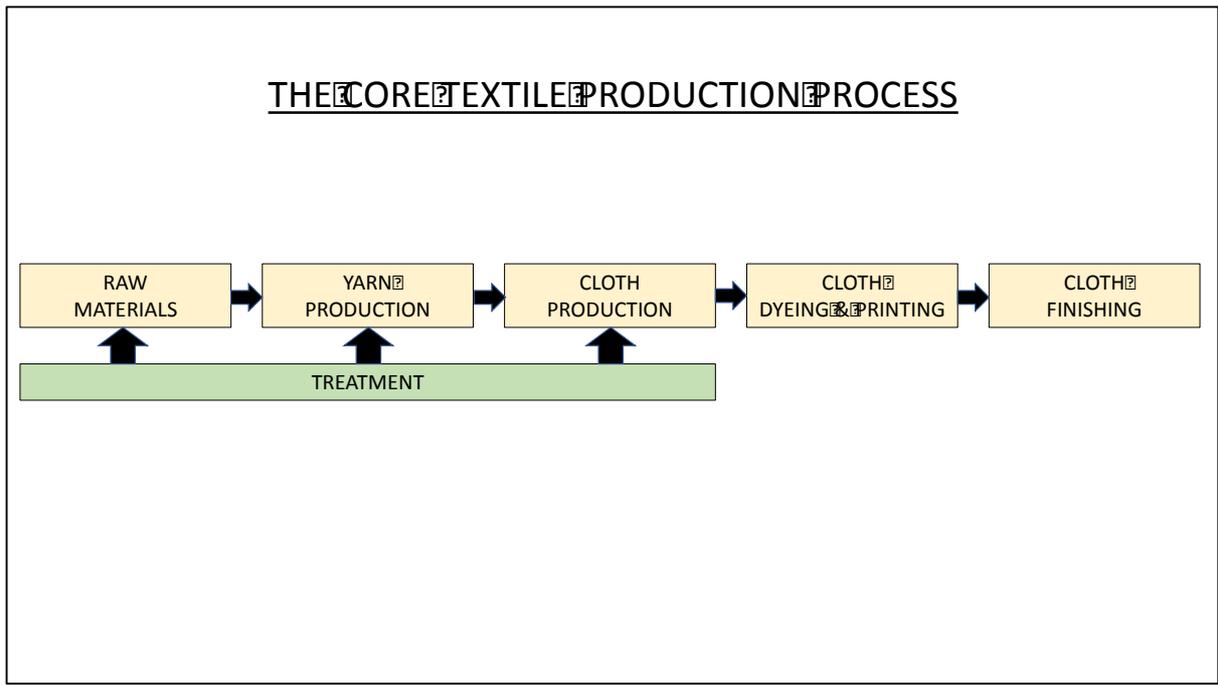


4.2 The core process of textile production

As we have seen, textiles are made from a variety of raw materials - such as wool, cotton, flax, silk and hemp - and a variety of cloth types are made from each raw material or combinations of them; for example, broadcloths, worsteds and semi-worsted are all made from wool. The textile production process is different for each raw material input; so, for example, the production process for broadcloths differs from that of worsteds. Nevertheless, it is possible to identify a core process that underpins all textile production. This is illustrated in Figure 5.

As Figure 5 shows, there are five core stages in textile production: raw materials, yarn production, cloth production, cloth dyeing & printing and cloth finishing. In addition, fibres, yarns and cloths are treated in various ways during the production process. Each of the five core stages is described below:

Figure 5: The core textile production process



4.3 Raw Materials

In our period, fibres were all organic in origin and derived either from plants (cotton, flax and hemp) or animals (wool and silk). Several operations and treatments were required

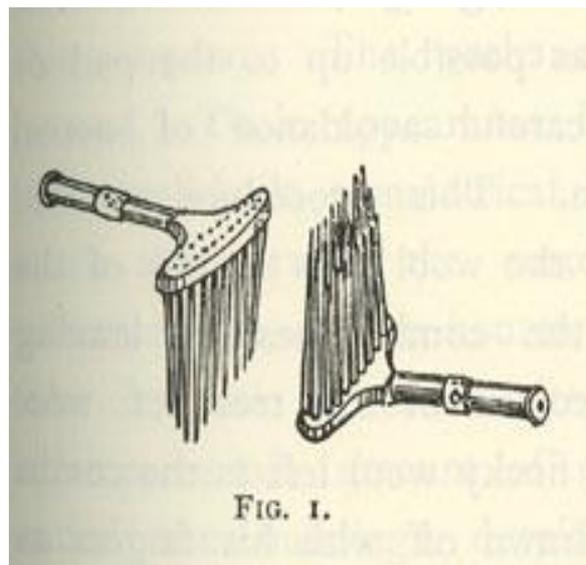
Figure 6: Carding of wool



to convert the basic raw material (such as a woollen fleece) into a fibre. For instance, wool processing requires sheep to be sheared and the resulting fleeces to be quality classed,

untangled, washed and prepared. Some breeds of sheep produce woollen fibres that are short, perhaps only two inches long; so historically these were subjected to a hand process known as carding, which produced the woollen fibres required for spinning - as shown in Figure 6. In contrast, the woollen fibres used for worsted yarn are long, seven inches or more, and this makes them unsuitable for carding; consequently, they had to be hand-combed - see Figure 7.

Figure 7: Hand-combing of wool

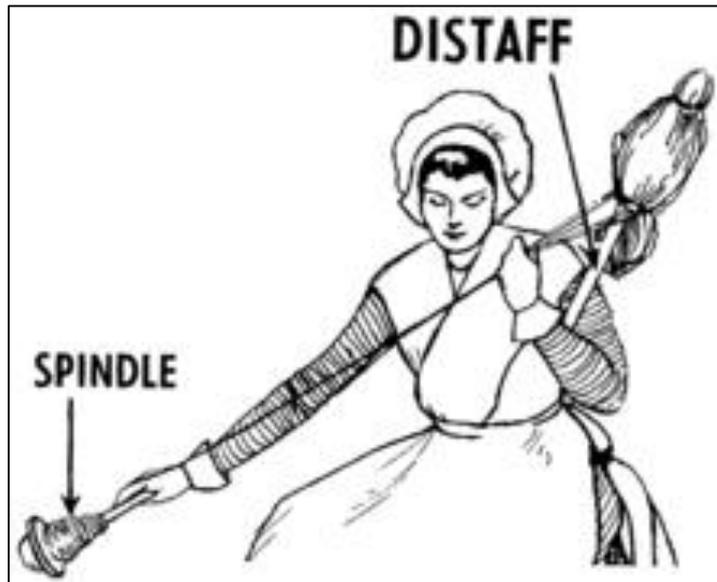


4.4 Yarn Production.

Once all necessary operations and treatments, like cleaning, carding and hand-combing, have been applied to the basic raw material it can be made into yarn via spinning.

For centuries, textile yarns were spun by hand using either a drop spindle, sometimes called a 'distaff', or a spinning wheel. With a distaff (see Figure 8), the raw material is attached to a stick and the yarn is slowly drawn out, stretched, twisted and wound round a spindle.

Figure 8: The drop spindle or distaff



Spinning by distaff is slow compared to spinning by wheel. In the latter case, the raw material is drawn out, stretched and twisted by the energy that the rotating wheel generates. Some spinning wheels are hand-powered whilst others are foot-powered; Figure 9 shows both types.

Figure 9: The spinning wheel

Hand spinning wheel



Foot spinning wheel



The technological developments that transformed British textiles during the eighteenth century were mainly applied to the cotton industry and yarn production was the

immediate beneficiary from three key inventions: Hargreaves' Spinning Jenny, Arkwright's Water Frame and Crompton's Spinning Mule.

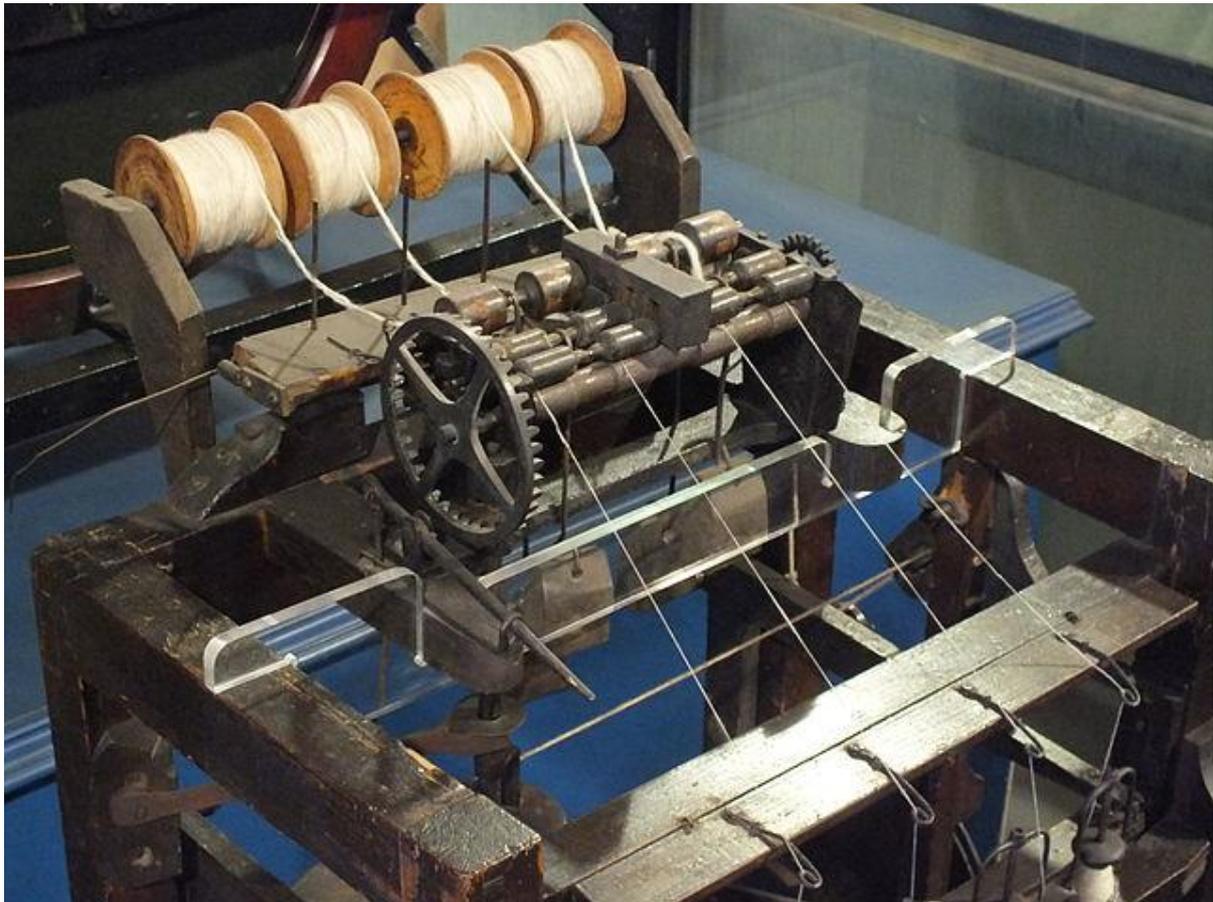
The Spinning Jenny (circa 1764) In the mid 1760's, James Hargreaves invented the Spinning Jenny, which could spin cotton weft. By the 1770's, the Jenny was being adopted by Lancashire's cotton spinners and it quickly replaced hand spinning in thousands of households. Hargreaves' creation increased productivity by using multiple spindles. His early Jenny had eight spindles and its compact size meant children could operate it more easily than adults. Larger Jennies were soon developed and productivity improved as the number of spindles increased. A 16-spindle Jenny is shown in Figure 10. Jennies could spin cotton weft but they were unsuited to spinning warp. As warp runs the length of the woven cloth it needs to be highly twisted and strong; the Jenny cannot do this. In contrast, weft yarn needs less twisting and strength because it passes under and over the warp threads widthways; this was within the capability of the Jenny.

Figure 10: A 16-spindle Hargreaves Spinning Jenny



The Water Frame (circa 1764) Richard Arkwright designed his Water Frame (see Figure 11) contemporaneously with the Jenny and it was complementary in function. Best suited to spinning warp, it was powered by energy from a water mill (hence its name), which meant it had to be placed in a factory building. Located close to fast running water, these factories resembled grain mills and so they became known as spinning mills.

Figure 11: Richard Arkwright's Water Frame

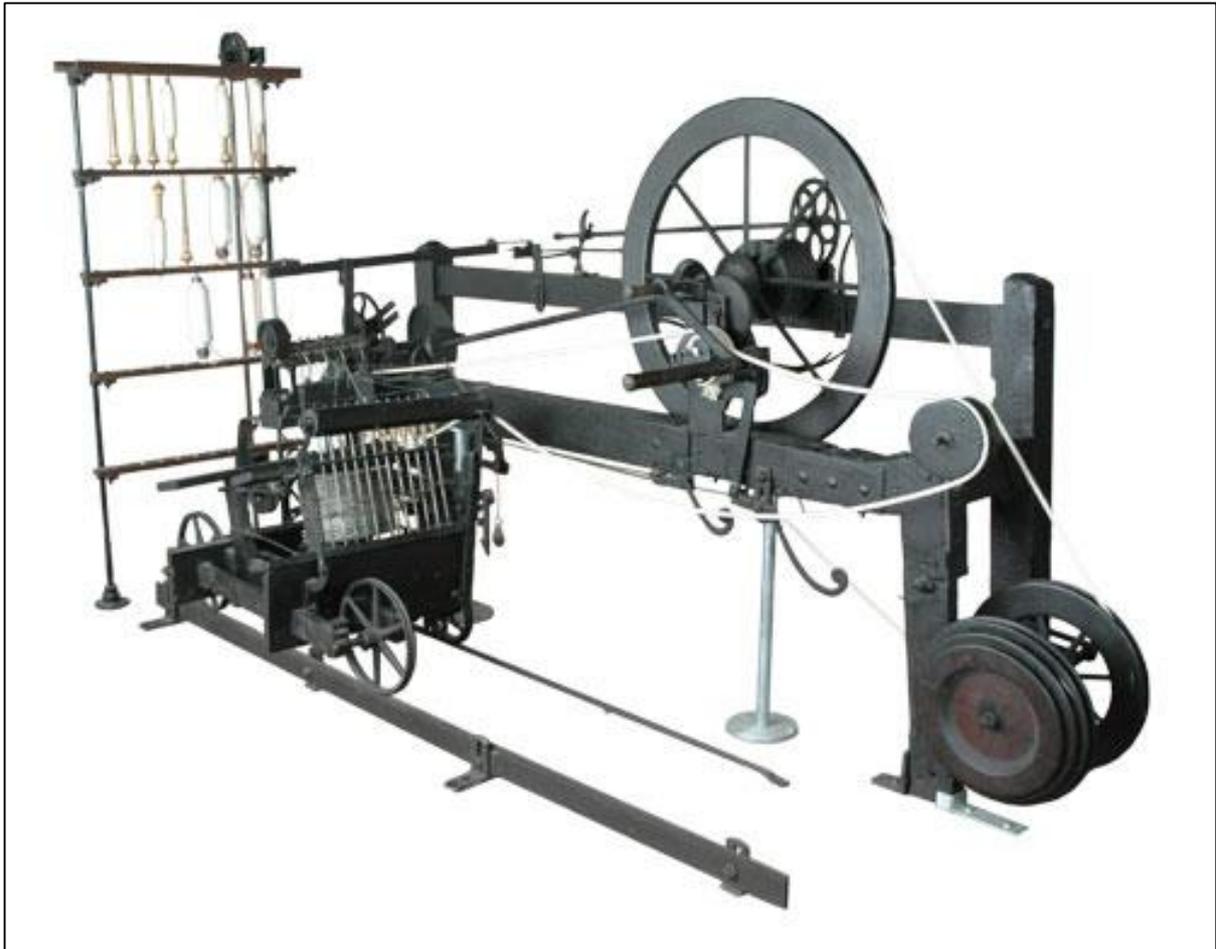


Crompton's Spinning Mule (circa 1779) The Jenny could only produce cotton weft and the Water Frame was best suited to cotton warp; spotting an opportunity, Samuel Crompton, in the late 1790's, invented the Spinning Mule (see Figure 12) to combine the best features of both machines.¹³ The Mule could spin weft, warp and fine yarn. Like the Water Frame, it utilized rollers to squeeze and stretch the yarn and spindles,

¹³ C. Aspin and S. D. Chapman, *James Hargreaves and the Spinning Jenny* (Preston, 1964), pp. 47-8.

like those on a Jenny, to draw out and twist the yarn.¹⁴ Cotton mule spinning advanced rapidly and became Britain's standard method of spinning both cotton and wool, although Crompton never patented the design and benefited little from it.

Figure 12: Samuel Crompton's Spinning Mule

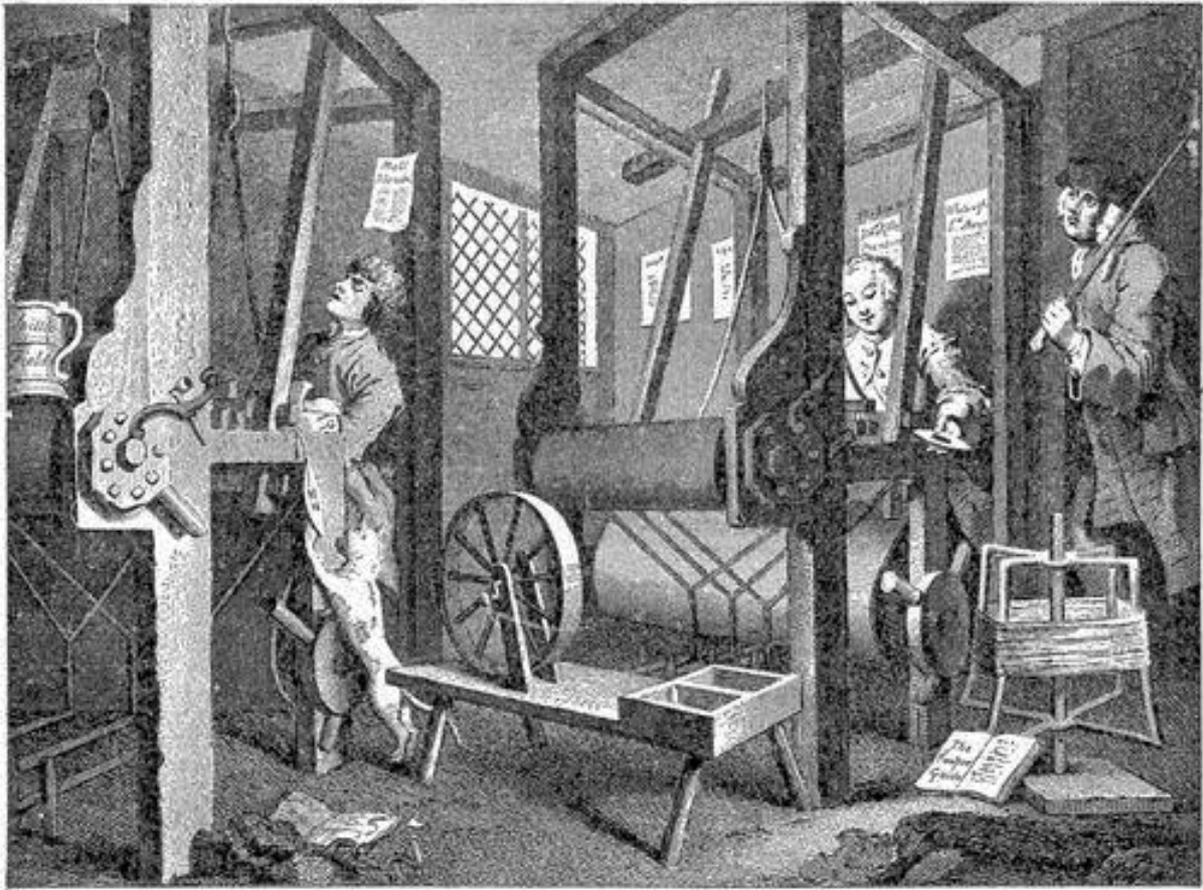


4.5 Cloth Production

The key operation in cloth production is weaving together the warp and waft yarns. For thousands of year hand looms of increasing complexity have been used for weaving - as shown in Figure 13.

Figure 13: Hand looms

¹⁴ Bolton Museum, www.boltonmuseums.org/museum/museum-collection-highlights/local-history/the-life-of-samuel-crompton, accessed March 2014.



Once again, the English textile industry in the eighteenth century broke the mould through two key inventions: Kay's Spinning Shuttle and Cartwright's Power Loom.

The Flying Shuttle (circa 1733) John Kay patented the Flying Shuttle for woollen weaving (Figure 14) well before spinning had been mechanised by Hargreaves, Arkwright and Crompton. Before Kay, the width of cloth that a single person could produce was limited by the extent to which a weaver's arms could be outstretched sideways. This was because the shuttle containing the waft yarn had to be passed across the loom from hand to hand. The textile trade called this product 'narrow cloth'. Wider 'broadcloth' could only be produced by two people and the process of passing the shuttle across the loom was slow. The Flying Shuttle allowed the waft yarn to be shot quickly across a wide loom by a single person so it speeded up weaving tremendously and allowed wider cloths to be produced much more cheaply. By 1770, the Flying Shuttle had been widely adopted in woollens although,

as Von Tunzelmann notes, the uptake in worsteds was slower.¹⁵ Once the flying shuttle became widely used, traditional one-thread spinning wheels couldn't keep pace with the demand for yarn; this stimulated the development of the yarn spinning technology described in the previous section.

Figure 14: John Kay's Flying Shuttle

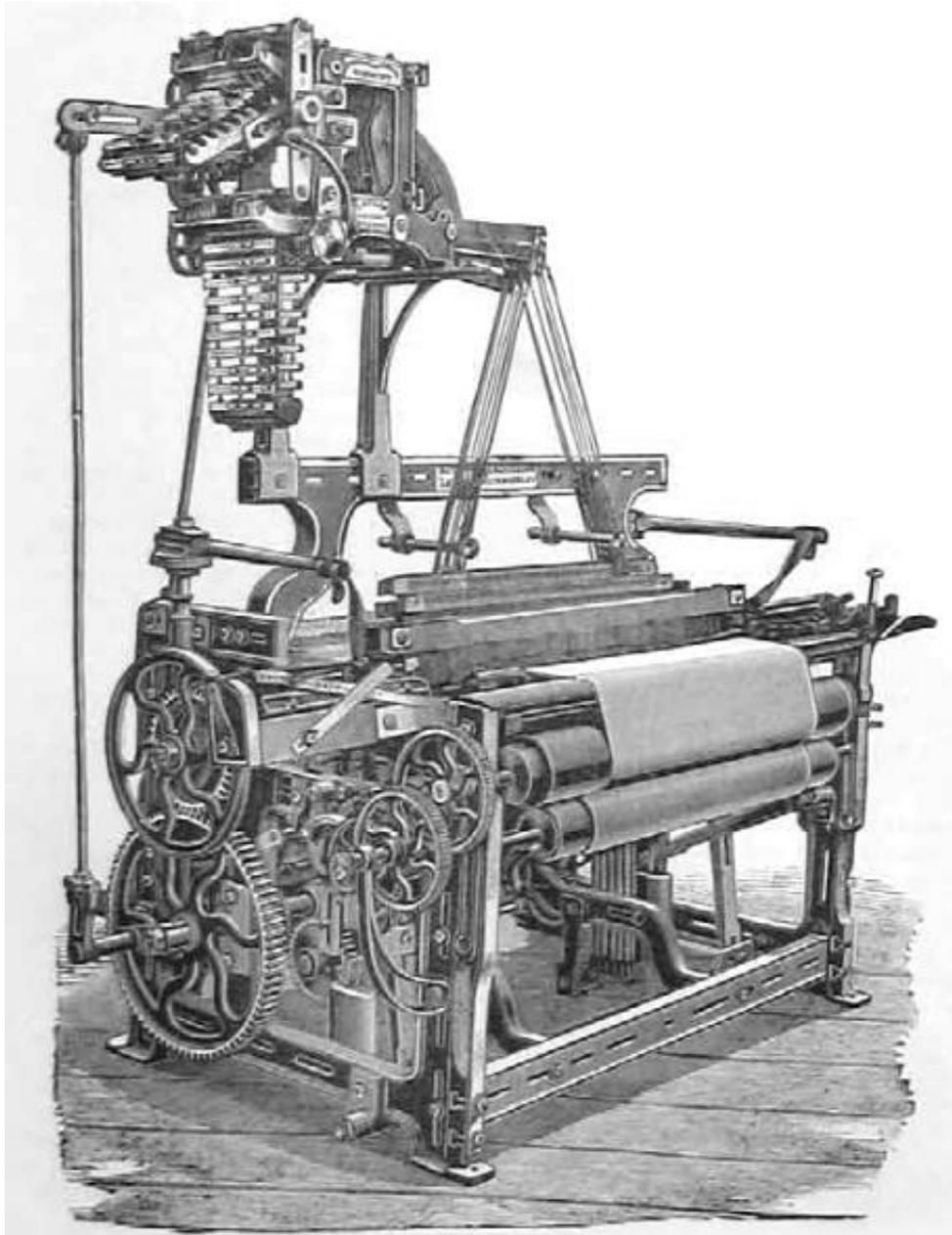


The Power Loom (circa 1785) Edmund Cartwright invented his Power Loom (Figure 15) in 1785.¹⁶ Power looms were used by a Doncaster cotton factory in the 1780's and another in Manchester during the 1790's; however, improvements were needed before

¹⁵ G. N. von Tunzelmann, *Steam power and British industrialization to 1860* (Oxford, 1978), p. 244.

¹⁶ A water driven power loom to weave linen was manufactured in 1685 by M. de Gennes but it had little use. M. Vauconson constructed a swivel loom in Manchester in 1765 but it offered few advantages to existing technologies. E. Baines, *History of the cotton manufacture in Great Britain* (London, 1835), p. 228.

Figure 15: Edmund Cartwright's Power Loom



the machine was accepted generally.¹⁷ In consequence, the adoption of power weaving was slow in every branch of the English textile industry.¹⁸ According to Baines, there were only 12,150 power looms in England by 1820. Thereafter, the take-up was more rapid; 45,500 power looms were operating by 1829 and 85,000 by

¹⁷ D. T. Jenkins, *The West Riding wool textile industry: a study of fixed capital formation* (Edington, 1975), p. 125.

¹⁸ J. L. Hammond and B. Hammond, *The skilled labourer* (Third edition, London, 1979), p. 70.

1833¹⁹ - mostly in the cotton industry.²⁰ The woollen and worsted industries lagged cotton in the adoption of the power loom. Worsteds first applied the innovation around 1830 and a report indicates that by 1835 Yorkshire had 2,804 power looms weaving only worsteds whilst another 533 were weaving worsted and wool or worsted and cotton cloths.²¹

4.6 Cloth Dyeing and Printing

The process of adding a single colour to raw material fibres, yarn or cloth is called dyeing. In our period, all dyes were natural and extracted from animals (like cochineal or kermes) or plants (such as woad, indigo and madder). Printing involves the application of one colour or several to cloth using a definite pattern or design. A variety of tools are traditionally used in printing, including wooden blocks and stencils.

In 1783, Thomas Bell patented roller printing as a cheaper alternative to copperplate printing. From the 1790's, after improvements to Bell's equipment had been made by Adam Parkinson in 1785, cotton cloth mills in Lancashire used roller printing (see Figure 17) to produce monochrome patterns on dresses. Subsequent improvement to the technology enabled complex patterns and designs to be printed in multiple colours. Roller printing transformed productivity; up to 12,000 yards of cloth could be printed in ten hours by a single-colour machine.

4.7 Cloth Finishing

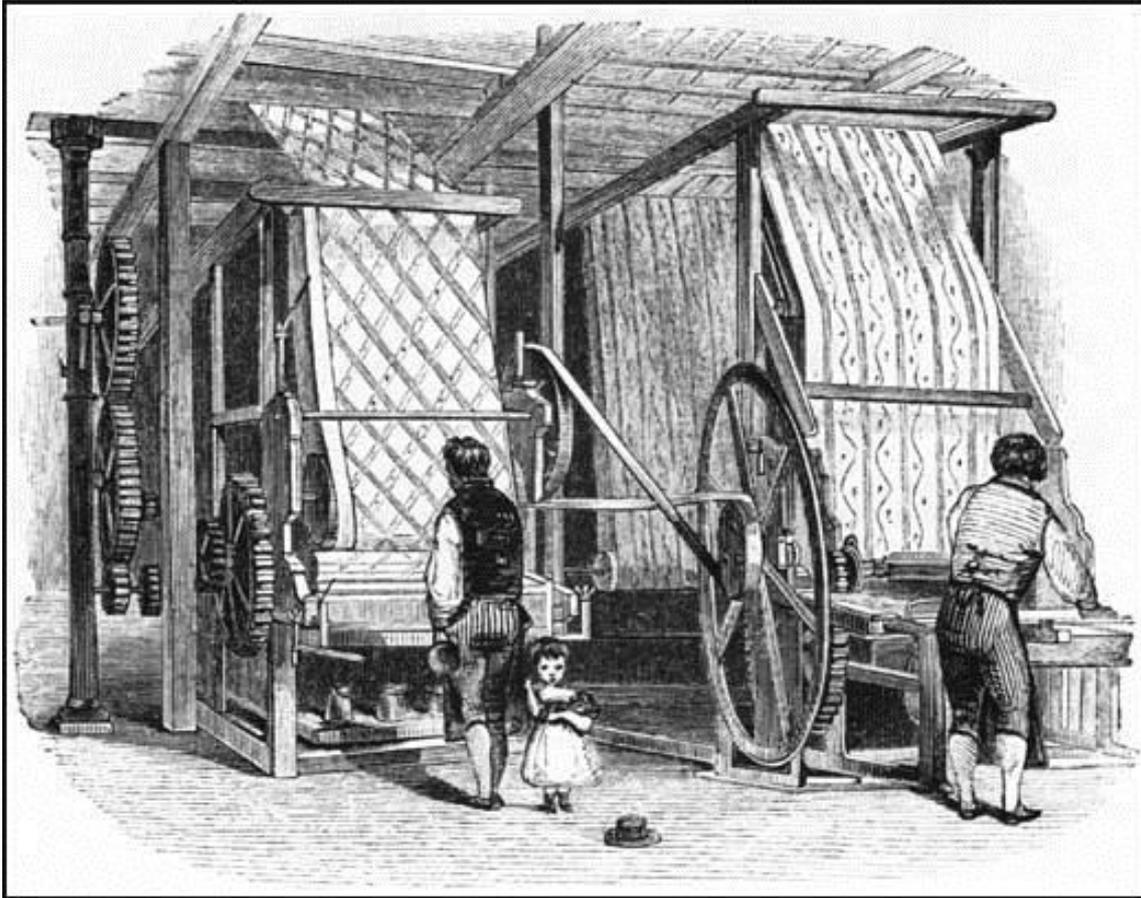
Finishing includes a variety of processes that make the cloth fit for purpose and ready for sale; these include, removing any unwanted oils or additives from the cloth, improving the appearance or hand-feel of the cloth and, pressing or relaxing the cloth.

¹⁹ Baines 1835. pp. 235-37.

²⁰ L. C. A., Knowles, *The industrial and commercial revolutions in Great Britain during the nineteenth century*, (2006 reprint, Abingdon, 1922), 55.

²¹ 'Return of the number of power looms used in factories, in the manufacture of woollen, cotton, silk and linen respectively, in each county of the United Kingdom', BPP 1836 (24) XLV. 145, 1-10. These numbers are considered to be an underestimate of the actual number of power looms at work. Jenkins, *West Riding*, pp. 125-127.

Figure 17: The Roller Printing machine of Thomas Bell & Adam Cartwright



This drawing of Bell's Machine Printer appeared in *An Illustrated Itinerary of the County of Lancaster* (1842)

4.8 Concluding remarks

During the late eighteenth and nineteenth centuries, British technological innovations transformed textiles manufacturing. This enabled Britain to be the first nation to make the transition to modern economic growth and to become the world's frontier economy. The ramifications were wide-ranging at home and abroad. As we shall see in the next section, the development of the textile industry in England caused industrialisation in some regions and de-industrialisation in others. Internationally, India was most directly impacted by the growth of British textiles; it suffered deindustrialisation as the competitiveness its cotton declined.

5. The Location of the British Textile Industry

This section presents new research by the author into the location of the British textile industry in the nineteenth century. It begins by describing the data that has been collected and analysed. Then, it explores the location of the textile industry in England from 1813 to 1820. Next, it investigates the location of specific branches of the textile industry (like woollens and cottons) from 1813 to 1820. Lastly, some concluding remarks are made.

5.1 Data sources

The findings presented here result from the pioneering, long-term research conducted by the Cambridge Group for the History of Population and Social Structure (Campop) - an enterprise led by Dr Leigh Shaw-Taylor and Professor Tony Wrigley at the University of Cambridge. One Campop project has collected, coded and digitised the baptism registers maintained by the Church of England from 1813-20. These data provide us with the first national 'census' of adult male employment.²²

The 'census' is possible because the Parochial Registers Act of 1812 changed the way in which baptisms were recorded. The Act necessitated the Church of England to record baptisms on a standardised pro forma.²³ A general template was provided (Figure x14),²⁴ which includes a column to register the trade or profession of the child's father. Hence, in theory, post-1812 baptism registers should capture the occupation of every father of every baptized child. However, the main systematic source of error concerns illegitimate children, who represented 5 per cent of all births in England and Wales. They were not recorded in the registers because, in the eyes of the law, they were fatherless.

²² The first official national census was taken in 1801. The censuses prior to that of 1851, and notably those of 1801-31, take no account of female labour and have been described as 'little more than headcounts of the population for each of the administrative units of the old poor law. While they do provide some insight into male occupational structure, the detail is crude, and was based upon counts of the numbers of families engaged in agriculture, trade, and other similarly broad-brush categories', P. M. Kitson, L. Shaw-Taylor, E. A. Wrigley, R. S. Davies, G. Newton and A. E. M. Satchell, 'The creation of a 'census' of adult male employment for England and Wales for 1817', http://www.econsoc.hist.cam.ac.uk/working_papers.html, working paper number 4, University of Cambridge, last accessed May 2014.

²³ The Parochial Registers Act of 1812, (52, Geo. III c.146).

²⁴ 'West Yorkshire, England, births and baptisms, 1813-1910', www.ancestry.com, last accessed March 2013.

Figure x14: A sample baptism register from the church of Halifax St. John the Baptist, 1817

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BAPTISMS solemnized in the Parish of *Halifax*
in the County of *York* in the Year 18*17*

When Baptized.	Child's Christian Name.	Parents Name.		Abode.	Quality, Trade, or Profession.	By whom the Ceremony was performed.
		Christian.	Surname.			
1817. Apr 6 No. 2049.	Jane	Noah Swan	Flabthwaite	Halifax	Taylor	W. Willmott
Apr 6 No. 2050.	Sarah	Er. Ellen	Brigg	Halifax	Butcher	W. Willmott
Apr 6 No. 2051.	James	Eliz. Ellen	Mitchell	Northm	Printer	W. Willmott
Apr 6 No. 2052.	Ellen	John Mercy	Griffiths	Northm	Shoemaker	W. Willmott
Apr 6 No. 2053.	George	John Mary	Mitchell	Halifax	Weaver	W. Willmott
Apr 6 No. 2054.	Christiana	George Mary	Richardson	Halifax	Butcher	W. Willmott
Apr 6 No. 2055.	Thomas	Thomas Mary	Stingworth	Halifax	Joiner	W. Willmott
Apr 6 No. 2056.	Lenny	Thomas Eliz.	Holden	Oxenden	Dropper	W. Willmott

Source: www.ancestry.com.

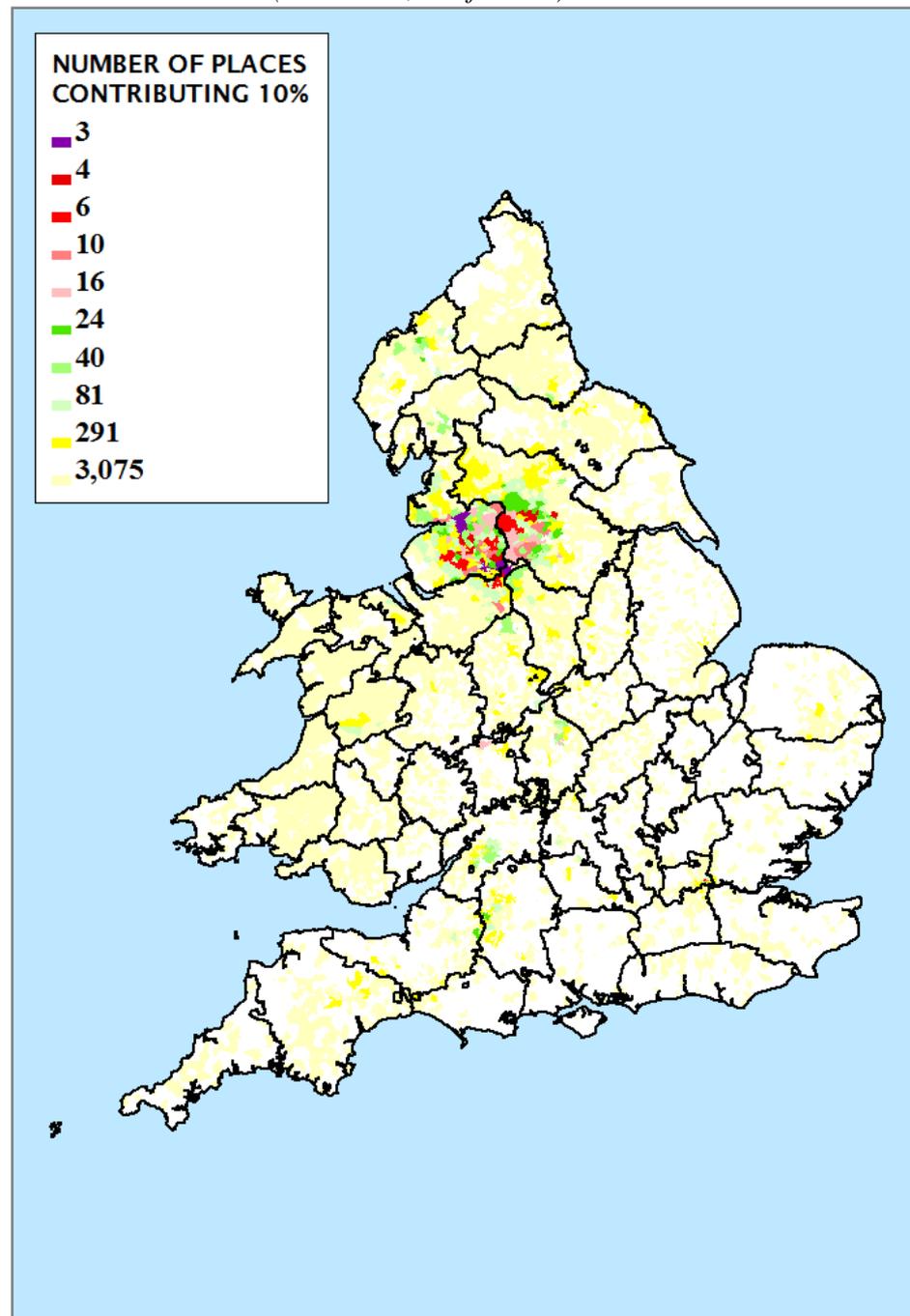
In total, the Campop database contains 10,376 baptism registers in England and 988 in Wales from 1813-20. The registers detail 2,419,857 fathers who have a stated occupation; 192,532 (8%) of the entries recorded fathers who were employed in the textile industry and these data are the input for the geographical analysis presented below.

6.3 The location of fathers employed in textile manufacture in England 1813-20

The data gathered enable us to map the geographical location of English and Welsh textile workers in this period - see Maps 1 to 5.

Map 1: Location of fathers employed in textile manufacture in England and Wales, 1813-20

(10% = 19,253 fathers)



Source: 1813-20 PREnglandWalesOccs.mbd, University of Cambrid

Each map shows the spatial concentration of fathers employed in textiles.²⁵ Places with no fathers employed in textiles are coloured white. Where fathers are employed in textiles, I explore how many parishes are needed for 19,253 fathers to be employed (i.e., 10% of the total sample). At one extreme, coloured yellow, 3075 parishes are needed to employ 19,253 fathers in textiles; this is the lowest spatial concentration. At the other extreme, coloured purple, only 3 parishes are required to employ 19,253 fathers in textiles; this the highest spatial concentration. In between, pink, indicates 16 parishes are required to employ 19,253 fathers in textiles; this is a moderate spatial concentration.

Map 1 plainly shows that the clear majority of textile workers lived in Northern England (defined as Lancashire, the West Riding of Yorkshire, Cheshire and North Derbyshire). As Map 2 reveals, two thirds were employed in Lancashire and Yorkshire alone. In the rest of the country, the West Country (defined as Cornwall, Devon, Dorset, Gloucestershire, Somerset and Wiltshire) accounted for 7 per cent of the total (Map 3). London (the Cities of London and Westminster plus the counties of Middlesex and Surrey) accounted for 5 per cent (Map 4). Norfolk had only 2%, whilst Suffolk and Essex had less than a half per cent each (Map 5). In summary, it appears the North, and especially Lancashire and Yorkshire, dominated male employment in English textiles by the second decade of the nineteenth century.

Even within Lancashire and Yorkshire, the textile industry was highly concentrated geographically by 1813-20 (Figure x15). Fifty per cent of all of fathers in English textile

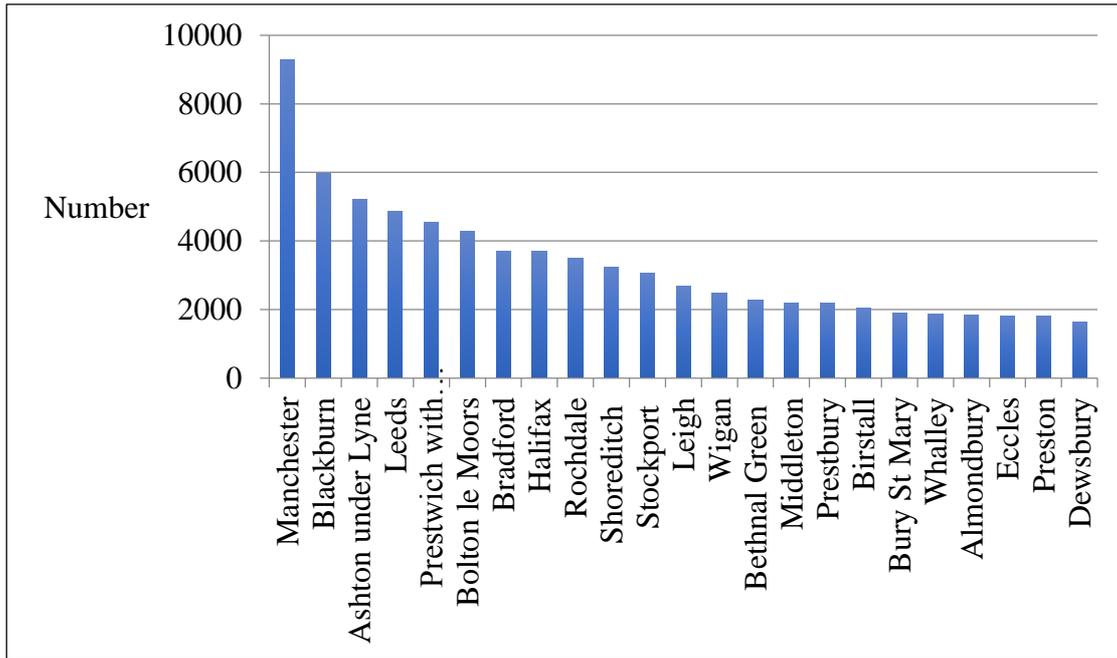
²⁵Map 1, p. 23 relates to *all* fathers working in textiles, regardless of the type of yarn. Therefore, there was no requirement to allocate fathers to different branches of the textile industry. In the other maps, however, fathers are allocated to the yarn pro rata, or as in the case of Norwich where worsteds dominated, it is assumed that all unassigned weavers wove worsteds. See Keith Sugden, 'The location of the textile industry in England and Wales, 1813-1820', *Textile History* 47 (2016), pp. 208-26. For the construction of the maps, see A. E. M. Satchel, P. M. K. Kitson, G. H. Newton, L. Shaw-Taylor and E. A. Wrigley, *1851 England and Wales Census Parishes, Townships and Places* (2006), Cambridge Group for the History of Population and Social Structure, University of Cambridge. The dataset was created with funding from the ESRC (RES-000-23-1579), the Leverhulme Trust and the British Academy. A description of the dataset can be found in A. E. M. Satchell, *England and Wales Census Parishes, Townships and Places: Documentation* (2006, 2015). The dataset is an enhanced and corrected version of N. Burton, J. Westwood J and P. Carter, *GIS of the Ancient Parishes of England and Wales, 1500-1850*, Colchester, Essex: UK Data Archive (May 2004), SN: 4828, which is a GIS version of R. J. P. Kain, and R. R. Oliver, *Historic Parishes of England and Wales: An Electronic Map of Boundaries before 1850 with a Gazetteer and Metadata*. Colchester, Essex: UK Data Archive (May 2001), SN: 4348.

³²Ashton under Lyne lies approximately 6 miles to the east of Manchester town.

manufacture lived in just 48 places and thirty per cent were in 23 places. The five Lancashire parishes of Manchester, Blackburn, Ashton under Lyne, Prestwich with Oldham and Bolton le Moors contained 20% of fathers working in textiles, and a further 10% were in the parishes of Leeds and Bradford in the West Riding of Yorkshire.

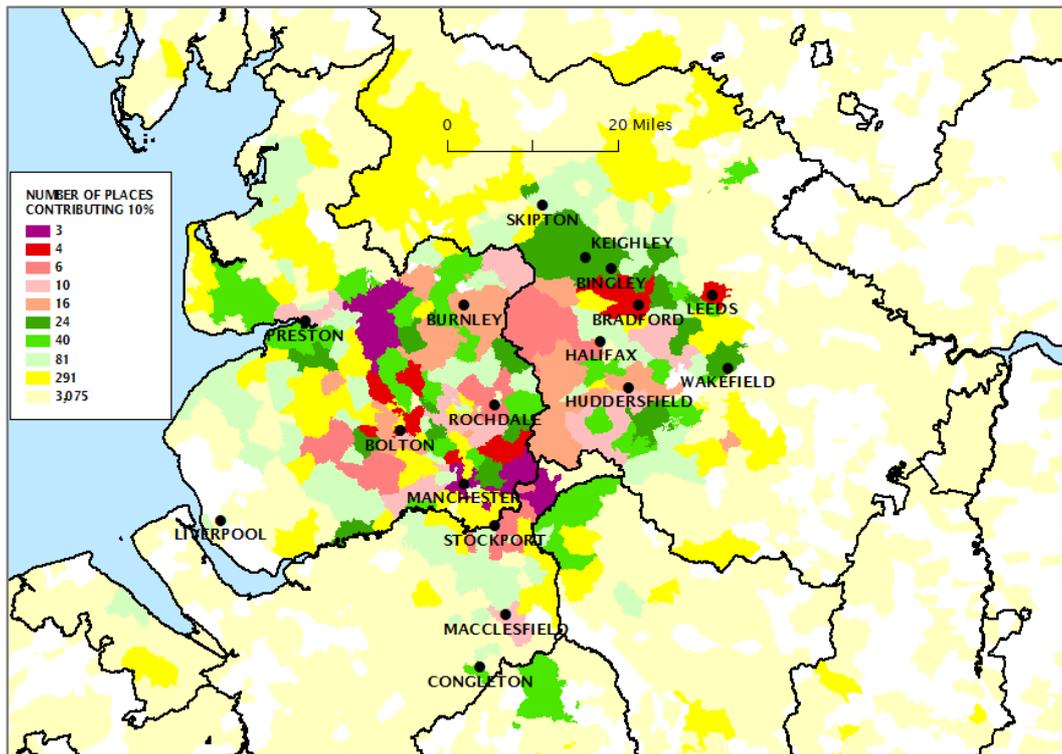
Figure x15: Top parishes of residence of fathers employed in textile manufacture, 1813-20

(The top 23 parishes, data expressed as the number of fathers recorded)



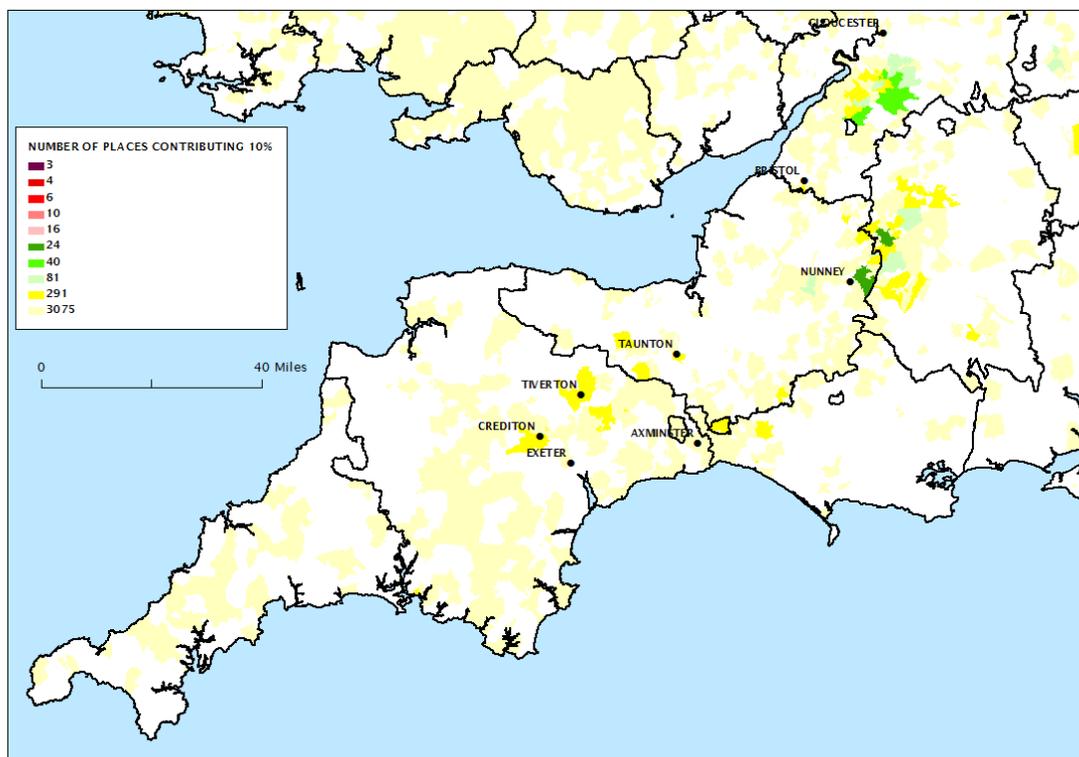
Source: 1813-20 PReEnglandWalesOccs.mbd, University of Cambridge.

Map 2: The location of fathers employed in textile manufacture in North England, 1813-20



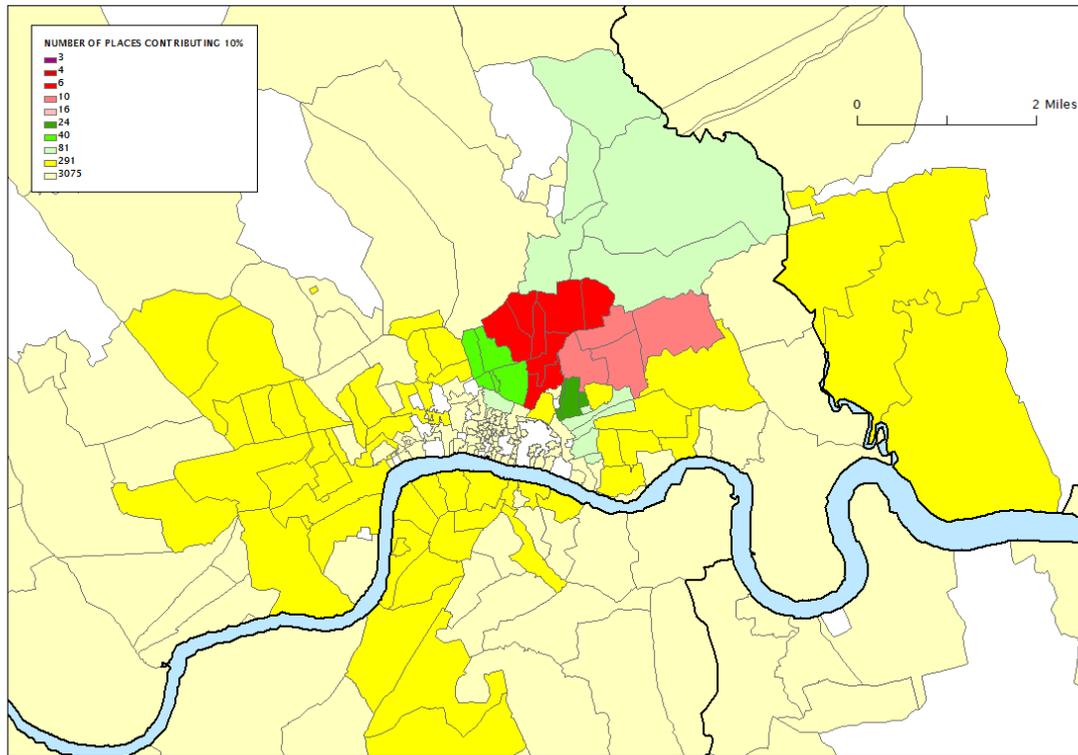
Source: 1813-20 PREnglandWalesOccs.mbd, University of Cambridge.

Map 3: The location of fathers employed in textile manufacture in the West Country, 1813-20



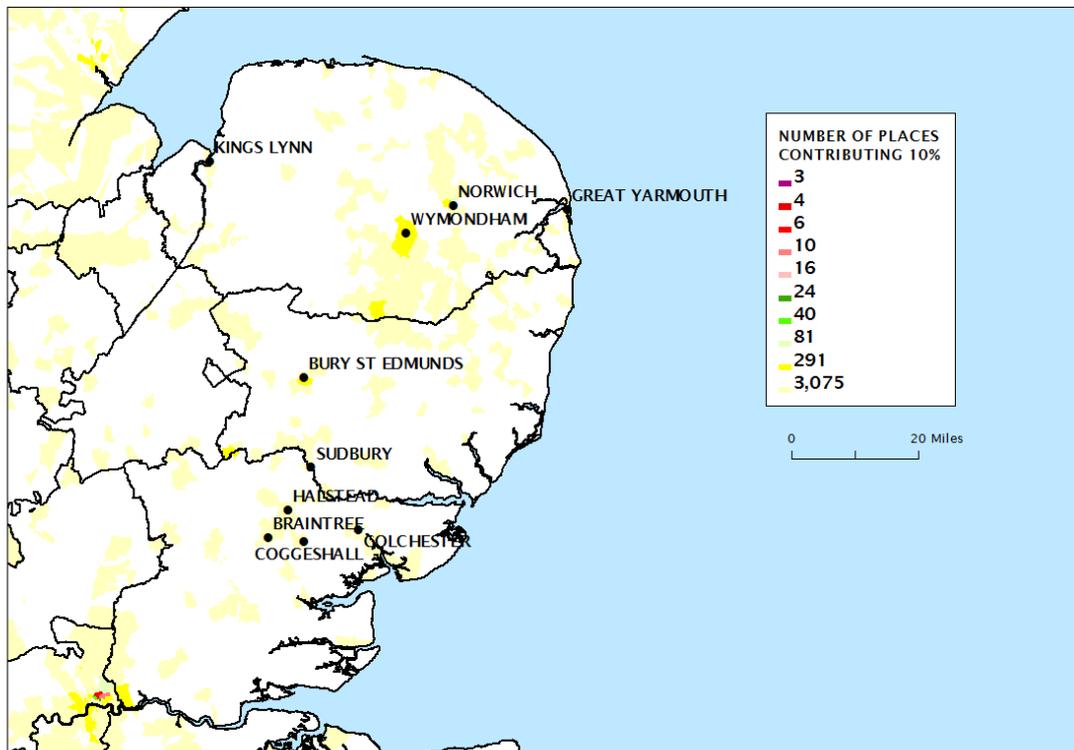
Source: 1813-20 PREnglandWalesOccs.mbd, University of Cambridge.

Map 4: The location of fathers employed in textile manufacture in London, 1813-20



Source: 1813-20 PREnglandWalesOccs.mbd, University of Cambridge.

Map 5: The location of fathers employed in textile manufacture in the East Anglia, 1813-20



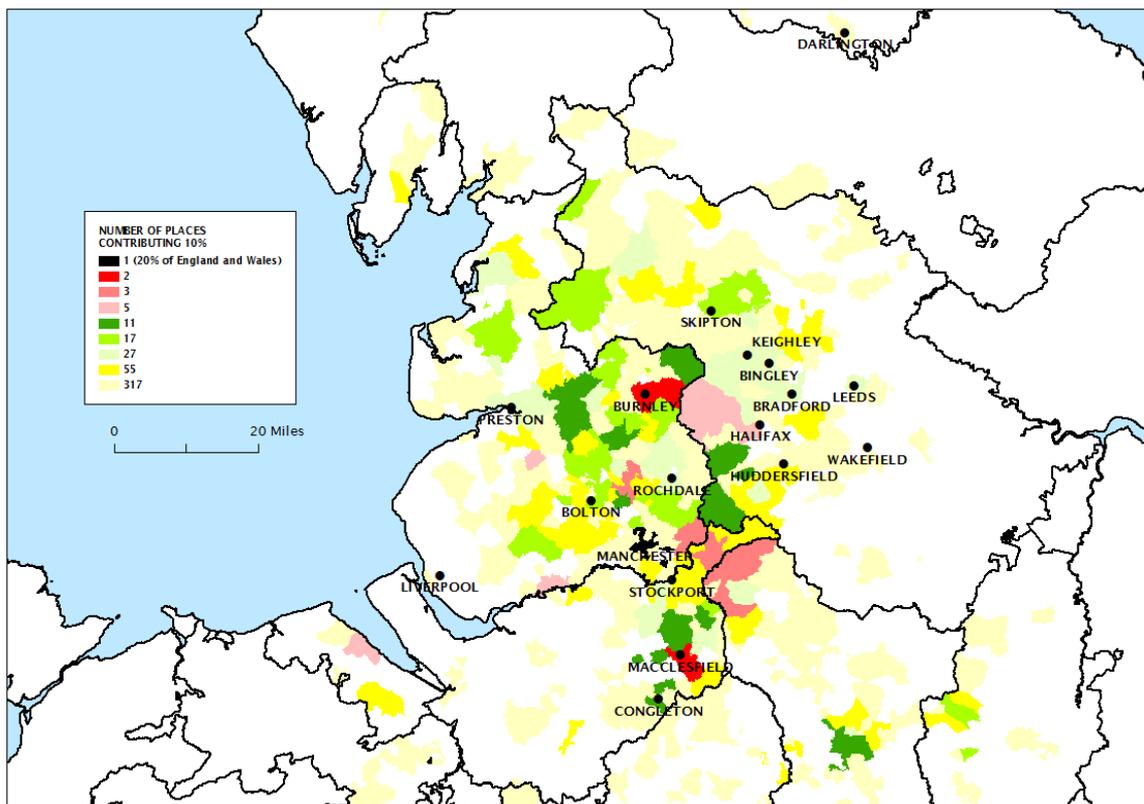
Source: 1813-20 PREnglandWalesOccs.mbd, University of Cambridge.

6.4 The location of fathers employed in English textile branches 1813-20

The location of textile manufacturing is affected by the type of yarn being processed. By 1813-20, the different textile industry segments had developed a high degree of regional specialization. Maps 6-10 show the geographical locations of the cotton, wool, worsted, silk, linen, flax and hemp segments.

Cotton manufacturing (Map 6) was centred in Lancashire, with a spill-over industry in those parishes of Yorkshire's West Riding that are adjacent to Lancashire in the eastern Pennines.

Map 6: Location of fathers employed in the cotton industry in Northern England, 1813-20²⁶



²⁶ Keith Sugden, 'An occupational study to track the rise of adult male mule spinning in Lancashire and Cheshire, 1777-1813', *Textile History* 48 (2017), pp. 160-75.

Woollen, worsted, linen, flax and hemp were also represented strongly in the West Riding of Yorkshire (Maps 7-9). The woollen area was located to the east of Bradford, an area that swept north east to southwest in a band, roughly from Leeds to Huddersfield. In contrast, Leeds and Barnsley were the heart of the linen industry.

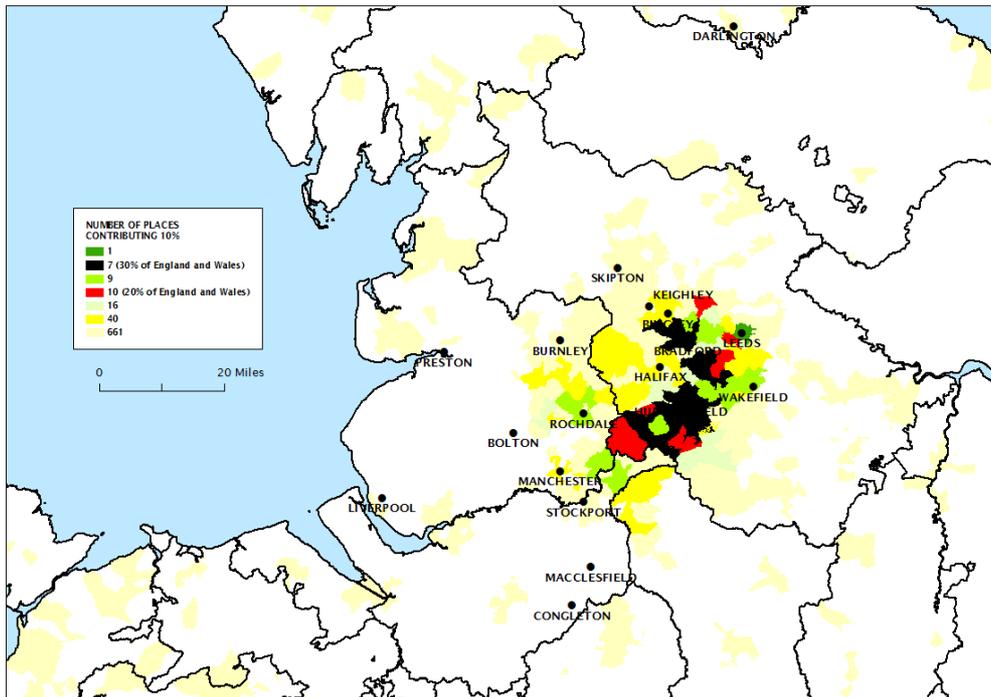
The worsted region of Yorkshire stretched from Bradford in east to the foothills of the Pennines in the west and from Ilkley in north to Elland in the south.²⁷ These findings indicate a major relocation of the sector. In 1700, East Anglia and the West Country had dominated worsted manufacturing but by 1813-20 these locations had lost their significance. As worsted manufacturing shifted to the north in the eighteenth century, southern England de-industrialized.²⁸ Furthermore, this shift occurred before either or spinning or weaving were mechanized - a time when hand spinning was technically redundant but power weaving had not progressed beyond its infancy. Multiple factors contribute to the change including the availability of cheap energy sources (water and coal), relative wages, the development of transport links and the transfer of technology from one branch of the industry to another.

Silk manufacturing (Map 10) was centred in both Cheshire (around Macclesfield and Congleton) and London. The latter was also a centre for cloth finishing, particularly dyeing and calendaring (i.e., hot-pressing to impart a glazed finish)

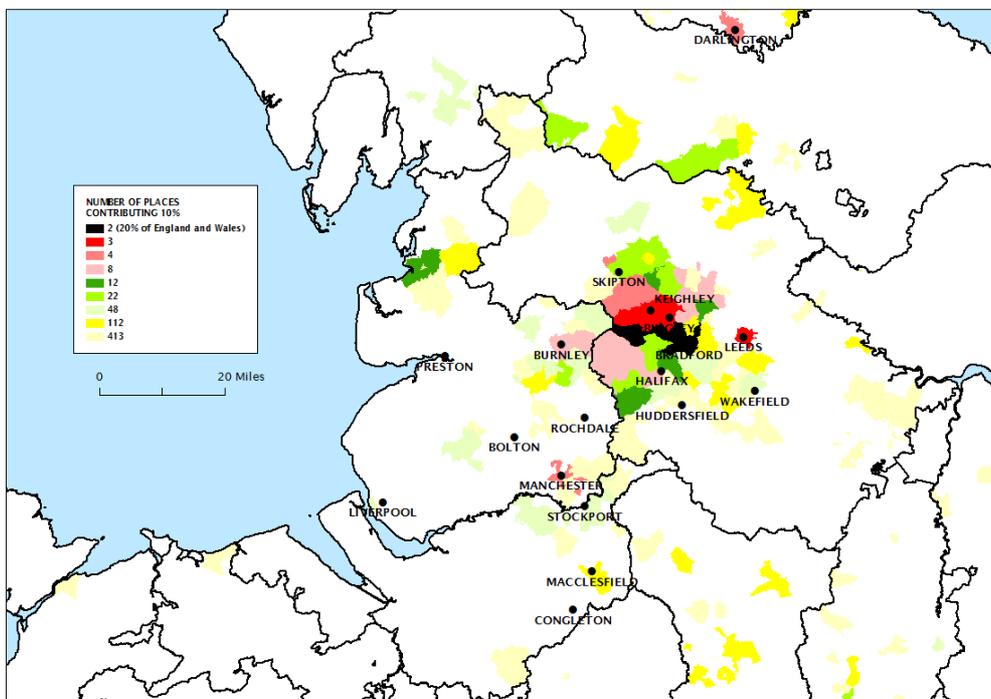
²⁷ The worsted industry also spilled over into adjacent parishes in Lancashire, notably around Colne, Burnley and Whalley.

²⁸ Keith Sugden, Sebastian Keibek and Leigh Shaw-Taylor, 'Adam Smith revisited: Coal and the location of the woollen manufacture in England before mechanization, c. 1500-1820', *submitted*.

Map 7: Location of fathers employed in the wool industry in Northern England, 1813-20

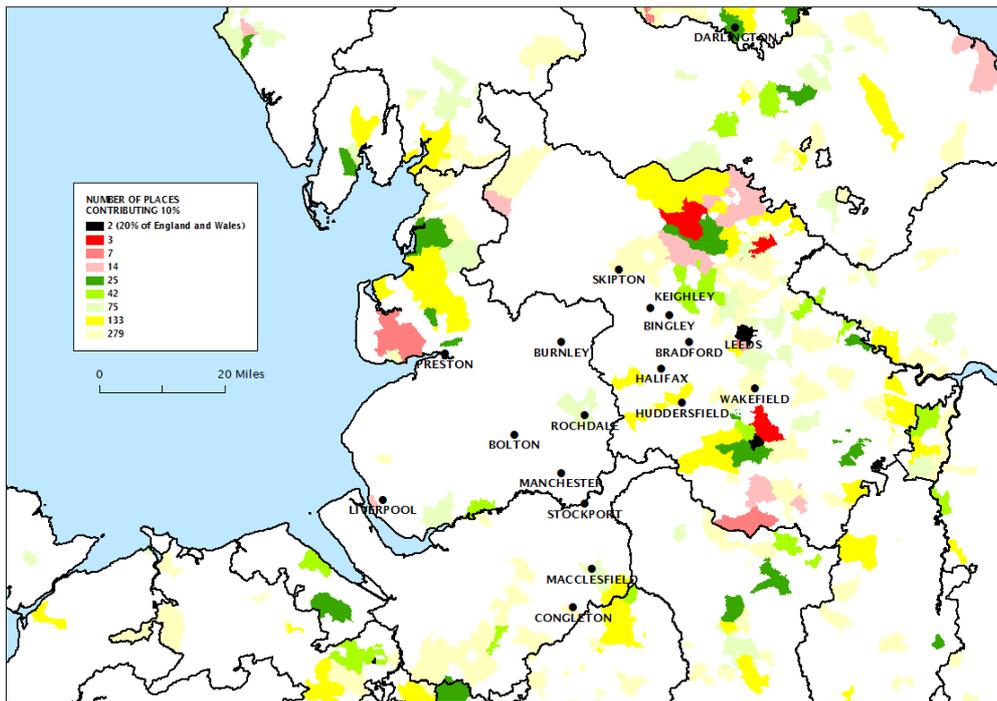


Map 8: Location of fathers employed in the worsted industry in Northern England, 1813-20



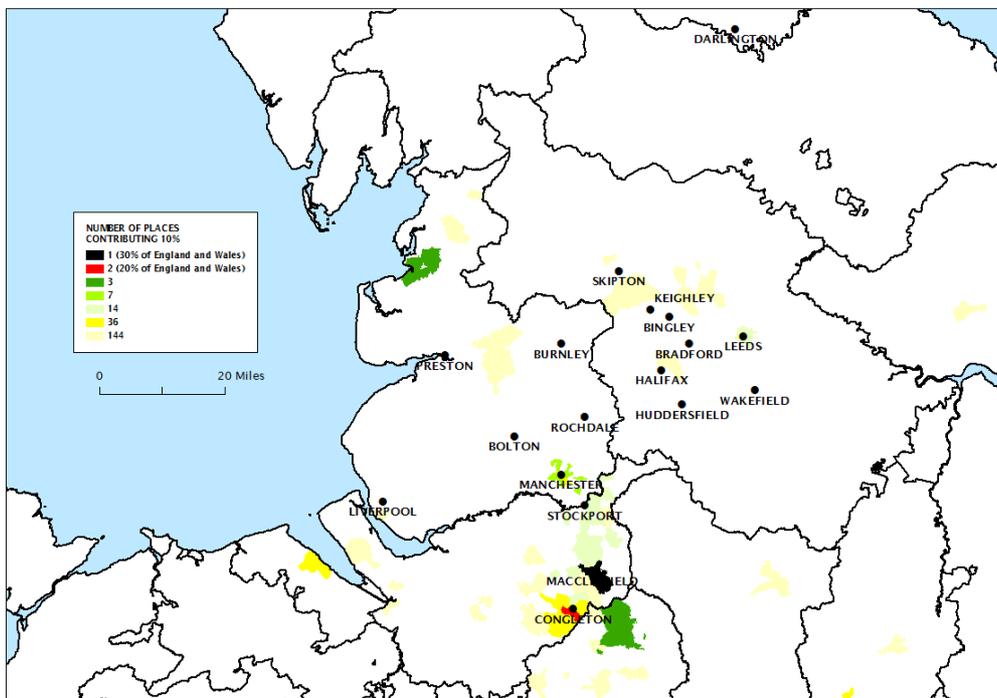
Source: 1813-20 PREnglandWalesOccs.mbd, University of Cambridge.

Map 9: Location of fathers employed in linen, flax, and hemp in Northern England, 1813-20



Source: 1813-20 PREnglandWalesOccs.mbd, University of Cambridge.

Map 10: Location of fathers employed in the silk industry in Northern England, 1813-20



Source: 1813-20 PREnglandWalesOccs.mbd, University of Cambridge.

7 Conclusions

This paper has focused on the wool and cotton branches of the textile industry in England and Wales because they have had the biggest economic and social impact at home and abroad. During the late middle ages, England and Wales were agricultural lands that exported primary products, most notably wool of high quality, to Europe's most advanced industrial centres. On a global scale, industry was concentrated in the East and India was the world's foremost cotton textile producer. By 1850, a remarkable reversal of fortunes had occurred. Britain had become the frontier economy, the workshop of the world and the greatest cotton textile manufacturer. Exceptionally, it had made the first transition in history to Modern Economic Growth in which living standards rise continuously. In consequence, India had suffered deindustrialisation, became a supplier of raw materials to the West and saw its living standards fall.

The paper has described how the woollen textile industry laid the foundations for Britain's remarkable path and how the cotton textile industry mechanised from the eighteenth century onwards. As the wool and cotton industries grew in England and Wales, they both became geographically concentrated; some regions experienced industrialisation and others deindustrialisation.

Why a small group of modernising industries, with cotton textiles in the vanguard, led the transition to Modern Economic Growth in Britain from around 1760 to 1830 is still a matter of intense debate. In recent years, Allen has attributed causation to Britain's unique configuration of factor prices (high wages, cheap energy and cheap capital). In contrast, Mokyr has argued that the breadth and depth of Britain's human capital, within the context of an Industrial Enlightenment, holds the key. The matter remains unresolved and will stimulate future scholars as much as their predecessors. What is certain, is the fundamental economic and social transition that occurred as the economies of Britain, Europe, the USA and then Japan became dominated by urban industry and services rather than rural agriculture.