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What Difference did Women's Work Make to the Industrial Revolution?

By

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What difference did Women's Work Make to the Industrial Revolution?

Recent research by economic historians on patterns of economic growth during the eighteenth and nineteenth centuries has raised important questions for the significance of women's work. This research has substantially changed our views on the speed and extent of industrial change during those years classically identified with the Industrial Revolution, circa 1760 to 1820.[1] It has also brought about a dramatic change in perspectives of social historians on work experiences and class formations.[2] While the quantitative estimates of this research and the conclusions drawn from these are already the subject of debate,[3] it is appropriate now to enquire into the effect of women's work on current understandings of this classical phase of industrialization. Let us look first at currently accepted views among many historians of the economy of the eighteenth and early nineteenth centuries.

It is now apparent that the eighteenth-century economy was much more industrial than once thought, but its growth in output and productivity was also much less dramatic.[4] New estimates of England's social structure show that even before the beginning of the eighteenth century most families were occupied not in subsistence agriculture, but in market based work. The average rate at which income per head had risen since the middle ages was approximately 0.3% per year, and the economy did not achieve any significantly higher growth until the second quarter of the

nineteenth century. Productivity grew over the whole economy very slowly: 0.2% in 1769-1801, 0.7% in 1801-31, and 1.0% in the period 1831-1860.[5] Families occupied in industry, building and commerce comprised 27.7% of the population in 1688, but 36.8% in 1759.[6] But the substantial proportions of the population in these activities yielded few bonuses to overall growth rates. Indeed, if we look to productivity growth in the manufacturing sector, this was only 0.2% between 1760 and 1801, and 0.4% between 1801 and 1831. Most of the economic growth actually achieved up to the second quarter of the nineteenth century found its source in agriculture and in two extremely small industries: cotton and iron. These industries did experience a spectacular acceleration in their growth of output, but they were very small industries, which together contributed less than 10% of output in 1770. By far the greatest proportion of industrial employment was to be found in industrial activity organised in very traditional ways and using nonmechanised and even primitive technologies. As late as 1831 only 10 % of the adult male workforce worked in high productivity industries serving distant markets.[7]

The following tables indicate the characteristics in terms of productivity growth and of employment of the manufacturing sector as seen by Crafts and Wrigley:

Table 1: Value Added in British Industry[8]

Industry	% 1770	% 1801	% 1831
Cotton	2.6	17.0	22.4
Wool	30.6	18.7	14.1
Linen	8.3	4.8	4.4
Silk	4.4	3.7	5.1
Building	10.5	17.2	23.5
Iron	6.6	7.4	6.7
Copper	0.9	1.7	0.7
Beer	5.7	4.6	4.6
Leather	22.3	15.5	8.7
Soap	1.3	1.5	1.1
Candles	2.2	1.8	1.1
Coal	4.4	5.0	7.0
Paper	0.4	1.1	0.8

2. Adult Male Employment in 1831 (20 years of age and over)[9]

Sector	Number	%
Agriculture	980,750	32.6
Manufacturing	314,106	10.4
Retail trade and handicraft	964,177	32.0
Capitalist, bankers, professionals	179,983	6.0
Labourers (other than agricultural	500,950	16.6
Servants	70,629	2.3
Total	3,010,595	100.0

Table 3. Major Employments in Retail Trade and Handicrafts in 1831.[10]

Activity	Number
Shoemakers	110,122
Carpenters	83,810
Tailors	60,166
Publicans	52,621
Shopkeepers	49,529
Blacksmiths	45,405
Masons	31,631
Butchers	31,026
Bricklayers	28,939
Bakers	23,730
Total	516,979

These tables indicate that by far the highest proportion of value added in industry was provided by industries which experienced little change in technical processes or organisation. And furthermore, most industrial employment was locked into activities where productivity had remained static for generations. Only a small proportion of male employment went to high productivity industry, and despite its contribution, it could not shift the weight imposed by the more traditional activities on the overall economy. Not until advances in the use

of coal based sources of power, that is until the spread of steam power through industry in the second third of the nineteenth century was industrial productivity to rise substantially and so to leave behind its pre-industrial patterns.

This is the current tale of the Industrial Revolution. It is a Malthusian tale based on an economy with a surplus of labour. In such an economy much of this labour was tied up in petty retailing, traditional trades, and some proto-industrial activity. A certain amount of this labour was 'disguised unemployment', in the sense that reducing numbers employed in the industry would not reduce its output. The effect of such a labour surplus according to theory is to keep wages to a subsistence level, and new industries offering employment at subsistence wages would have this workforce to draw on; they would also have the labour generated by increasing population, and the labour of women and children transferred from household to commercial activities.[11]

According to current underderstanding, the problem of development faced by the British economy in the eighteenth century was not a large subsistence agricultural sector. On the contrary agricultural productivity increased steadily over the century, and there was a fundamental shift of labour away from agriculture; male employment in the sector fell from 61.2% opf the labour force in 1700 to 28.6 % in 1800.[12]
But manufacturing and commerce, apart from a few key but still very small industries, was overendowed with labour relative to capital and was technologically stagnant. The evidence for this view, however, lies largely in the characteristics of the

distribution of the labour force, and in this case the adult male labour force. It was the small proportion of the adult male labour force to be found in progressive manufacturing industries serving distant markets which led historians to ascribe Britain's relatively poor economic performance to her industrial sector.

What difference does the inclusion of women's and children's labour make to this scenario?[13] First, we cannot answer this question at the aggregate level because occupational data on women and children was not collected in the eighteenth century. But enough information on women's employment is available at the regional and industrial level to provide some provisional answers. The question was raised, but dismissed by Wrigley... 'In some of the most dynamic industries, such as cotton textiles, a high proportion of the labour force was female...If information were available for the whole labour force, therefore, the numbers and percentages just given would be changed somewhat, probably in the direction of raising the overall percentage in forms of employment where productivity per head was rising, but not to a degree that would greatly affect the thrust of the argument presented.'[14] We need to examine how far we can get with the information on women's employment we do have at the local and industry level. The lack of aggregative data on their employment has meant that their contributions have thus far not been acknowledged. Yet as even E.A. Wrigley has conceded, a high proportion of the labour force in the dynamic industries, such as cotton textiles was not male, but female. Women workers were also concentrated in proto-industrial activity, in the potteries and to a lesser degree in metal goods. To what extent have our

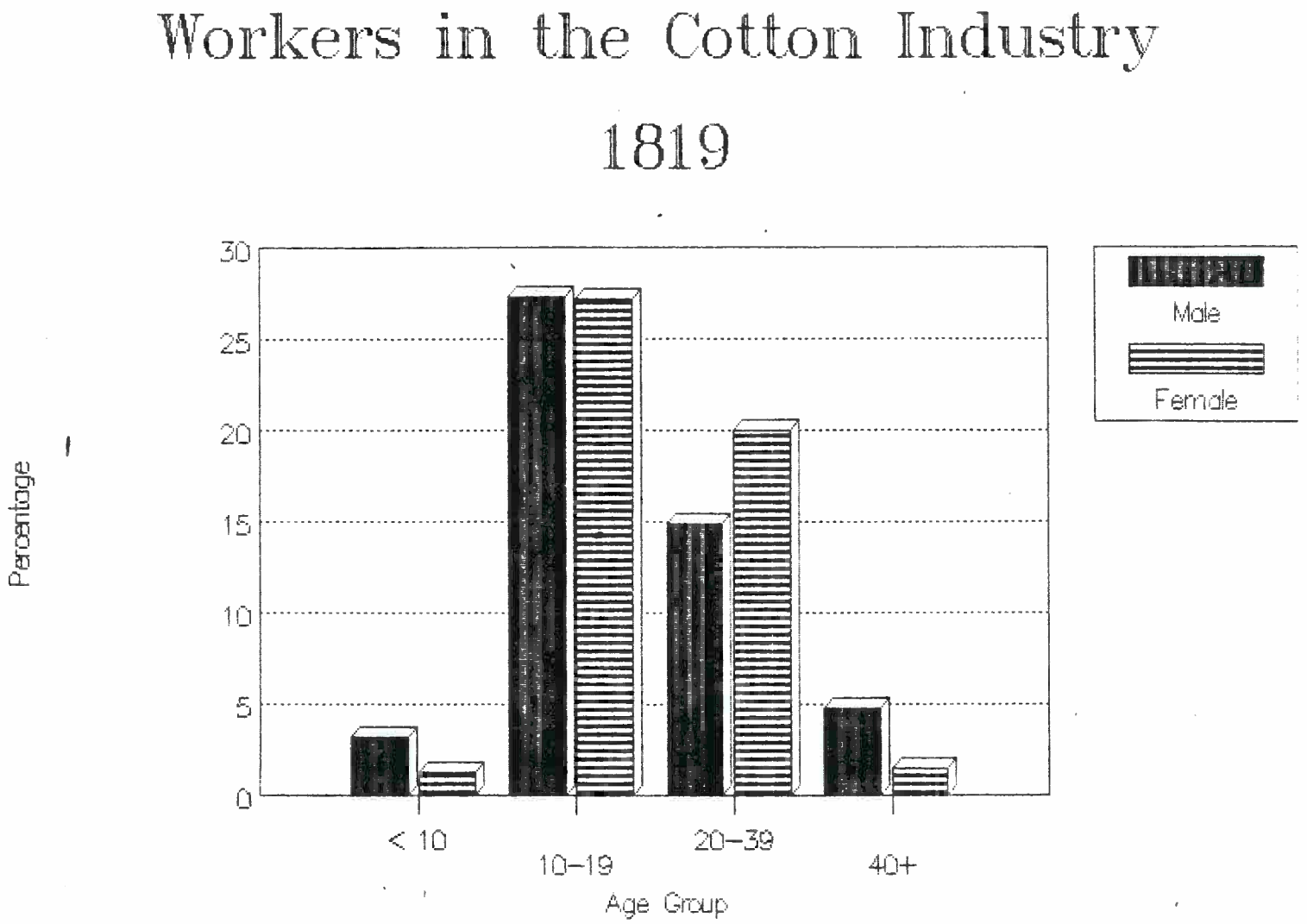
views of the the low productivity of British industry in the crucial years of the the Industrial Revolution been distorted because we have been looking at the industrial distribution of the wrong workforce? It was the female not the male workforce which counted in the new high productivity industries.

The relative place of the textile industries needs to be set in the context of wider industrial output. The textile industries as a whole contributed 45.9% of value added in British industry in 1770 and 46% in 1831. What had changed over the period was the contribution of the individual industries. Cotton's place grew from 2.6% to 22.14%, and wool's declined from 30.6% to 14.1%. But the gender division of the workforce remained predominantly female throughout the period. In 1770 14 men were needed to make 12 broadcloths, but an additional 17 women and 27 children were also required.[15] In the Yorkshire worsted manufacture female spinners outnumbered woolcombers and weavers by 3 to 1. The linen industry contributed more to value added in 1770 than the iron industry, and only approximately 2% less than did iron in 1831. Adam Smith calculated that in addition to flax growers and dressers, three or four spinners were necessary to keep one weaver in constant employment.[16] Silk contributed 4.4% of value added in 1770, the same proportion as coal; by 1831 the position of coal was more important at 7%, but equally silk's had grown to 5.1%. This too was a women's industry. In 1765, the proportion of women and children to men in the London trade was 14 to 1; and there were 4,000 in the Spitalfields trade.[17] In addition to this the industry was scattered by the late eighteenth century over twenty

counties and fifty towns, with one mill in Stockport employing 2,000. Women were employed in both the throwing and the weaving sections of the industry, including large numbers of colliers' wives in the suburbs of Coventry. These were women's industries, and even in face of the technological innovation and factory organisation that raised some of them by the early nineteenth century into 'dynamic' industrial sectors, they remained women's industries. For many 'dynamic' sectors, it was the distribution of the female labour force, not the male which counted.

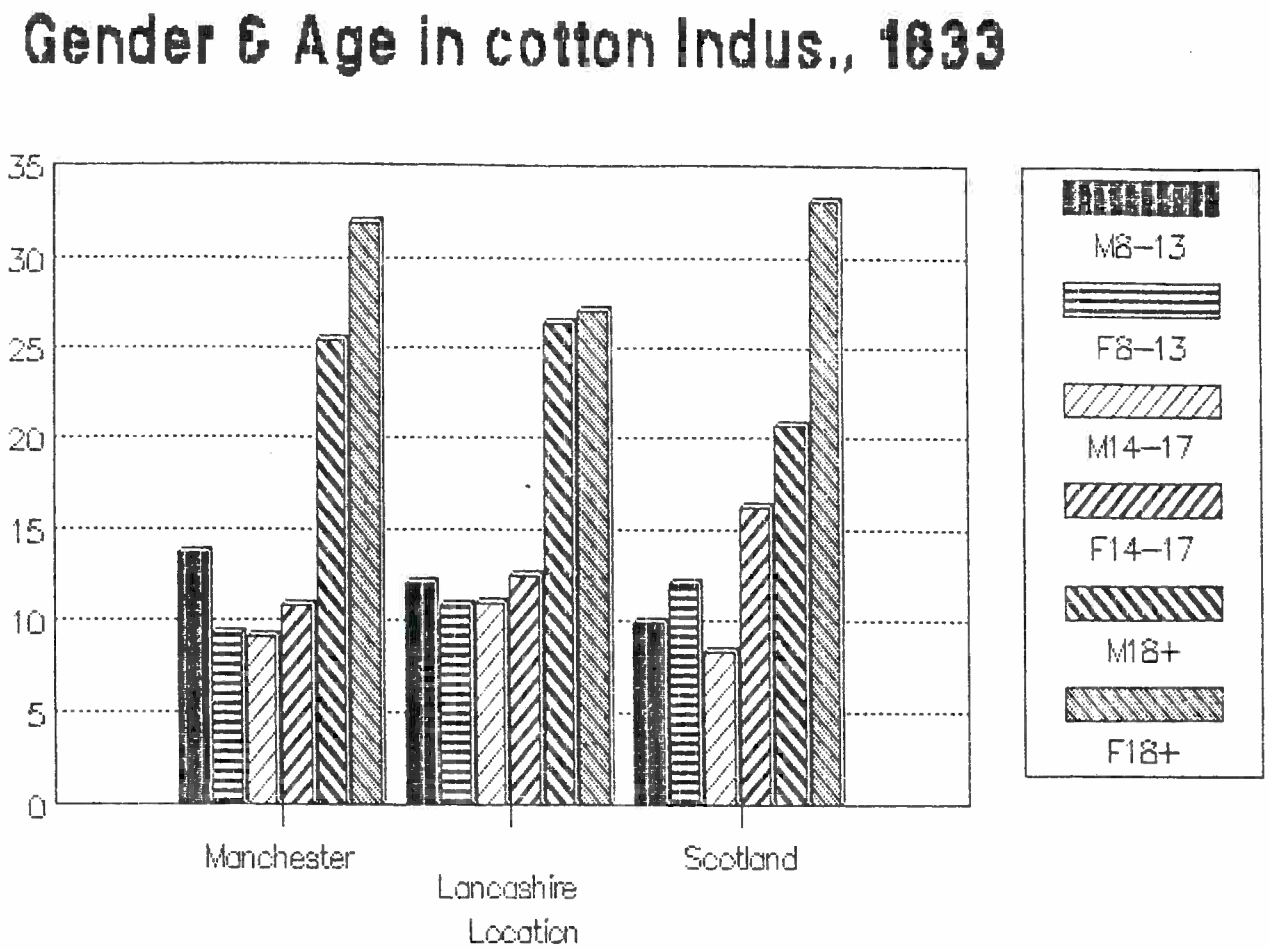
The cotton industry, the key 'dynamic' sector credited with much of the productivity increase of the industrial sector employed higher proportions of women and children than of men in factories in both the eighteenth and the early nineteenth century. The few large scale cotton mills of the eighteenth century employed roughly equal proportions of men and women; adults and children. The cotton factory labour force of 1818 showed that women accounted for a little over half of the workforce, and children accounted for a substantial proportion. In Scotland, these proportions were even more marked. Women and girls made up 61 per cent of the workforce in Scottish cotton mills; outside of Glasgow, the women were even more prominent, for they were also employed in spinning throstles and short mules.[18]

Diagram 1: Workers in the Cotton Industry by Age and Gender - 1819



Source: Report of the State and Conditions of the Children Employed in the Cotton Manufactories of the United Kingdom (L.P. 1819, CX) Data used in H. Freudenberger, F.J. Mather and C. Nardinelli, 'A New Look at the Early Factory Labour Force', Journal of Economic History, xliv (1984), pp. 1085-90.

Diagram 2: Workforce Composition According to Gender and Age in The Cotton Industry - 1833



Source: Parliamentary Papers 1833 XX, First Report of...Commissioners [on] the Employment of Children in Factories, p. D2 107; Parliamentary Papers 1834 XX, Faactories Inquiry Commission, Supplementary Report Part I, pp. 21-2. Data used in P. Bolin-Hort, Work, Family and the State Child Labour and the Organisation of Production in the British Cotton Industry, 1780-1920 (Lund, 1989), p.54.

Other textile industries employing high proportions of women were lacemaking and stocking knitting. Lacemaking was exclusively a female trade. From the late seventeenth century the industry was important in Devon when Honiton lace was popular, and employed approximately 4,000 in the Colyton district alone. It occupied 21% of the population of the town of Colyton, making it a major industry.[19] With the rise of the pillow lace industry late in the eighteenth century, numbers employed were estimated as high as 140,000 for Buckinghamshire, Northhampton and Bedfordshire. [20] Handknitting ranked with spinning as the main women's industry in rural areas all over the country, and in Scotland and the dales of the West Riding long after the introduction of framework knitting. Even after the introduction of the frame, used initially by men, women were occupied in seaming, finishing and winding. Increasingly as apprenticeship regulations were bypassed, women also worked the frames.

It is apparent that when we talk industry in the eighteenth and early nineteenth centuries, we are talking of a largely female workforce. Of course there were many other predominantly male industries which also contributed substantial proportions of value added: the leather trades, building and mining. But these are also classic examples of traditional industries which underwent very little innovation over the period. Indeed the building trades and shoemaking were classical sponges for casual surplus labour.[21] The iron industry is the counter-example, but if we compare its industrial significance to textiles, we find it contributed much smaller proportions of value added in industry: 7.4% of value added in 1801 in comparison with

cotton's 17%. Furthermore, while men worked in iron, other contemporary metal working industries which were also undergoing rapid innovation employed a mixed family labour forcie or high proportions of women and children in home and large scale workshops. Indeed there was a typical division of labour between women and children making small chains and nails at home while the men worked away in puddling and rolling mills. The Birmingham trades in the eighteenth century encompassed a whole range of new industries deploying new techniques with division of labour: button and bucklemaking, jappaning, and toymaking. These industries employed a mixed labour force, and systematic data available only from the nineteenth century indicates growing proportions of women and girls.[22]

Table 4: Age-sex ratio with the Birmingham metal trades

Workforce	% 1841	% 1851
Men (Males over 20)	71	58
Boys (Males under 20)	17	24
Women (Over 20)	8	11
Girls (Under 20)	4	7
Total	100	100

Table 5: Age-sex Ratio within the Button-making Trades

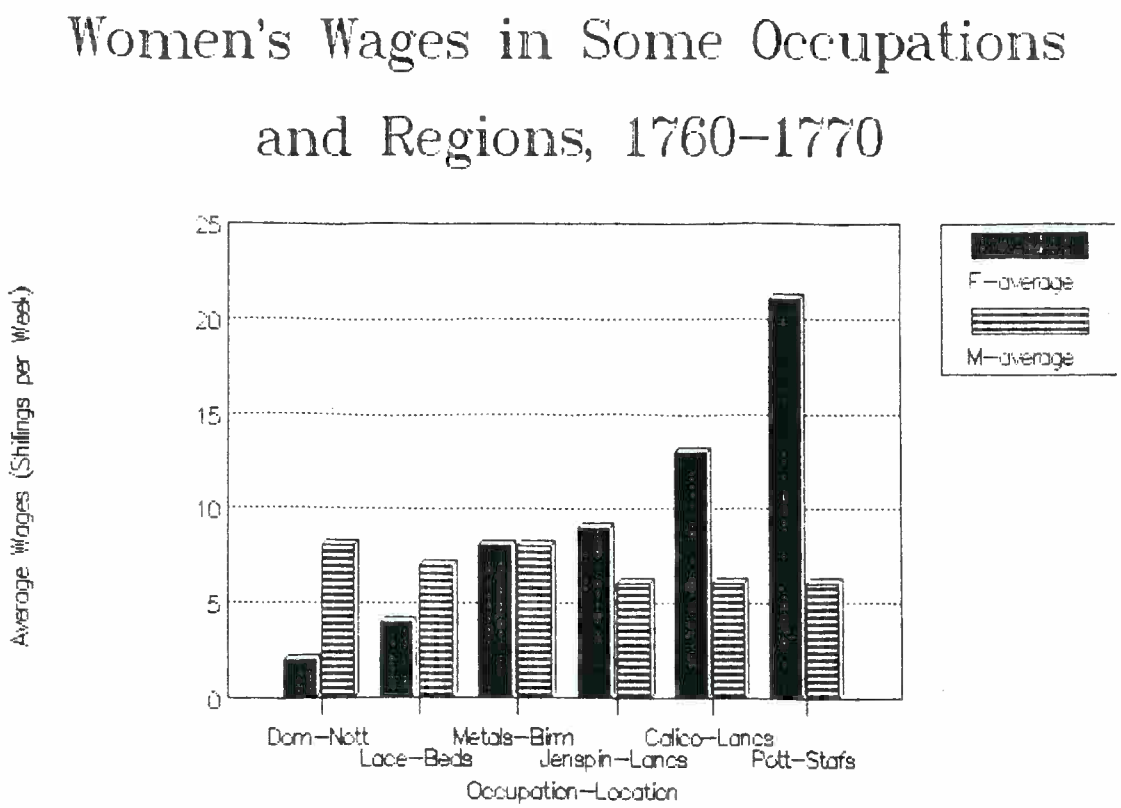
Workforce	% 1841	%1851
Men	45	27
Boys	15	16
Women	24	32
Girls	16	25
Total	100	100

Source for Tables 3 & 4: C. Behagg, Politics and Production in the Early Nineteenth Century (London, 1990), p.48.

Those industries at the forefront of technological and organisational innovation were also mainly industries employing women's labour. Why was this the case at a time when there was so much disguised and real unemployment among male workers in the industrial sector? The usual reason given for the employment of women rather than men in industry is cheap labour. Women had lower wages than men, and were therefore substituted where the opportunity arose. New industries would, therefore, seek out locations where there was female unemployment, and so acquire traditionally cheap labour at an even greater discount. But this analysis is not acceptable if we accept the tenets of a labour surplus economy. If there was male unemployment, and wages at the margin at only a subsistence level, why did not entrepreneurs seek out male labour? There is evidence of stable if not falling male wage rates for the period up to 1820. There are, of course, no long term wage trends for women, but it is generally assumed that women by custom received one third to one half the wage of

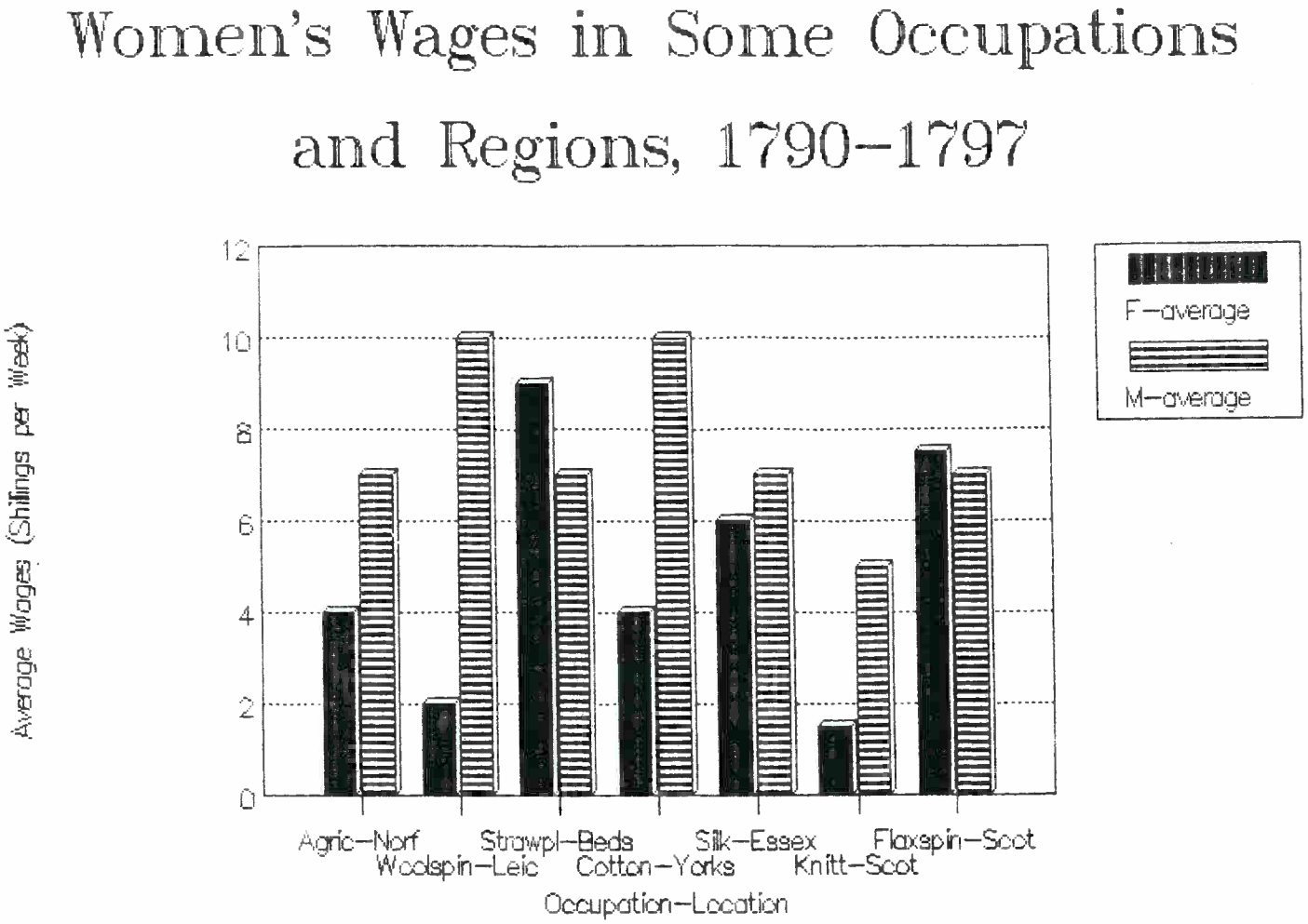
men. This in itself might be enough to induce a substitution of female for male labour. But there is more data available at the regional level to indicate other factors at play. We know that there were big regional differences in male wages.[23] But so there were too for female wages. High earnings for women in manufacturing were to be found in areas of the North and midlands where textiles, metalwares and potteries were expanding rapidly; and also in some southern agricultural areas where lacemaking, strawplaiting and silk spinning were growth industries. In these areas some women's wage rates were at least the equal of those received by local male agricultural labour, and in some cases much higher.

Diagram 3: Women's Wages in Some Occupations and Regions, 1760-1770 Compared to local Male Wage Rates in Agriculture



Sources: Male agricultural wages according to region are found in E.H. Hunt, 'Industrialization and Regional Inequality: Wages in Britain, 1760-1914', Journal of Economic History, 46, pp.935-66 and Idem., 'Wages', in J. Langton and R.J. Morris, Atlas of Industrializing Britain 1780-1914, (London, 1986), p. 63
Women's wages: Domestic service, Nottinghamshire - Bridget Hill, Women, Work and Sexual Politics, (Oxford, 1988), p. 133; Lace, Bedfordshire - I. Pinchbeck, Women Workers and the Industrial Revolution (1930) (London, 1969), p. 207; Metals, Birmingham - M. Berg, 'Women's Work, Mechanization and the Early Phases of Industrialization in England', in P. Joyce, The Historical Meanings of Work, (London, 1987), p. 83; Jennyspinning, Lancashire - M. Berg, ibid., p. 76; Calicoprinting, Lancashire - M. Berg, ibid., p. 79; Potteries, Staffordshire - M. Berg, The Age of Manufactures, (London, 1985), p. 152.

Diagram 4: Women's Wages in Some Occupations and Regions, in Comparison with Local Male Agricultural Wages 1790-1797



Sources: Agriculture, Norfolk - Hill, Women, Work, p. 54; Agriculture, Lincolnshire - Hill, ibid., p. 54; Woolspinning, Leicestershire - M. Berg, The Age of Manufactures, p. 140; Strawplaiting, Bedfordshire - I. Pinchbeck, Women Workers, p. 216; Cotton, Yorkshire - M. Berg, Age of Manufactures, p. 140; Silk, Essex - J. Lown, Women and Industrialization, p.29; Knitting, Scotland - Alex Gibson and T.C. Smout, Prices, Food and Wages in Scotland, 1550-1780 (Cambridge, forthcoming), chap. 9; Flax spinning, Scotland, Gibson and Smout, ibid.

Low wages were clearly not the key reasons for employing women in such new industries. Indeed most of these occupations were gender segregated at least for time and place, so that there was no question of substituting female for male labour as wage differentials changed.

The lace making industry is a good example. Far from being an industry developed on the feminisation of poverty, it promoted the independence of women as wage earners.[24] Wages in the seventeenth and early eighteenth century were high, higher than those for wool spinners and much higher than those for local male agricultural labour.[25] Yet despite the evident prosperity of this occupation for a time, men were not employed in it, neither did they seek to enter it. It was not wages which determined this gender divide, but the organisational and technological attributes of a women's workforce. Women workers were introduced in new industries or new settings along with a whole range of organisational and technological changes;[26] these associated together to yield substantially higher rates of profit than had been possible in other industries or under earlier manufacturing regimes. This phenomenon can be observed in a range of industries in the U.S.A. in the first years of the nineteenth century. Here larger scale workshops and small factories yielded economies of scale at even such low threshhold levels as 6 to 15 employees. The source of these economies was organisational and technological: a division of hand performed tasks, the use of simple tools, supervision and a more disciplined work regime. These workshops and factories also drew on higher proportions of

female and child labour than similar industries organised under artisanal regimes. In industries deploying large scale production, as in the factory textile industry and paper making, more capital intensive processes were introduced along with a more feminine and juvenile workforce. These industries were associated with gains in productivity and in wages for women over the period.[27]

This phase of development in manufacturing in the Northeast of the U.S. bore many similarities to the earlier phase of industrialisation in eighteenth-century Britain. If the kinds of organisational and technological changes observed in both factory and non-mechanised industry in the early-nineteenth century U.S. were associated with both changes in the division of labour and gains in productivity, it seems likely that there were similar associations in eighteenth-century industry in the U.K.

It is important to see the extent to which new technologies and organisation were associated with a female and child labour force. For early-nineteenth century America, Goldin and Sokoloff see the reason for this in women's lower wages relative to men's. Means were sought to substitute women's labour for men. But this was not the case in Britain, and there may be other reasons for this use of women's labour in the U.S. It is evident in Britain that women and children were simply assumed to be the key workforce to be targeted with any novelty in manufacturing methods. Machines and processes were invented with this workforce in mind. New techniques in calico printing and spinning provide classic examples of experimentation on a child and female

workforce. In calico printing, processes were broken down into a series of dexterous operations performed particularly well by teenage girls who contributed manual dexterity learned already at home with high labour intensity. The spinning jenny was first invented for use by a young girl, its horizontal wheel making it uncomfortable for an adult worker to use for any length of time.[28] Girls (and boys as well) were, as is well known widely employed with the newer textile technologies in the silk and cotton industries. They were used in the silk throwing mills, where they were taken on from the ages of 6 to 8, 'because their fingers are supple and they learn the skills more easily'.[29] A cotton mill at Emscote was reported to have dismissed girls after their apprenticeship because their fingers were too big to go between the threads.[30]

Patents and contemporary descriptions of new industries frequently pointed out the close connection between a particular innovation and its use of a child or female labour force.[31] Dean Tucker in 1760 described as the key attribute of the division of labour in the Birmingham trades the use of child assistants as an extra appendage of the the worker; this use also trained these children to habits of industry.[32] It was widely held at the time that machines for stamping and piercing in the small metal trades extended the range of female employment, especially that of young girls.[33] Girls were specifically requested in advertisements in Aris's Gazette for button piercers, annealers and stove and polishing work in the japanning trades.[34]

Josiah Wedgewood reported to the Children's Employment

Commission in 1816 that girls were employed in 'painting on the biscuit mainly, but they also paint upon the glaze and after the second dipping. They work with a camel hair pencil in painting patterns upon the ware, sitting at the table.'[35] The hand made nail trade relied largely on the labour of women and children. An early nineteenth century innovation, the 'oliver' or foot operated spring hammer allowed a smith to work signle hand, but was responsible for all kinds of deformities in the teenage girls who used it.[36]

These are just some examples of the way in which new technologies and divisions of labour were introduced, then described by contemporaries in terms of the gender and age of the workforce using them. There are two ways of looking at the gender-typing of this technological innovation. The first is that manufacturers and inventors saw the technical and profit-making advantages in using a new workforce which could be integrated with the new techniques, in such a way as to bypass traditional artisan customs and arrangements which would likely have entailed resistance to the technology. They furthermore believed that women and girls had a greater 'natural' aptitude for the manual dexterity and fine motor skills required by the new techniques, and that 'female' ways of working together were more amenable to division of labour than were 'male' work cultures.

The second way of looking at this gendered technology is that inventions and new working methods in manufacture were rather public affairs in the eighteenth century. The advantages of new projects in the seventeenth century, and new manufacturing

enterprises in the eighteenth century were frequently presented to the state or to local communities in terms of their capacities for providing employment.[37] Where the real point of such innovation was to save labour, if it was to be profitable, then it was politically expedient to present technologies in terms of the female and child labour they would employ, rather than the male labour they would save. The concerns of Poor Law authorities for providing manufacturing employment for women and girls, as well as providing industrial training for young girls in spinning and lace schools reflected concerns not just over poor rates, but over illegitimacy and in some areas the high proportion of single women among the poor.[38] These concerns were also related to the skewed effect of changing agricultural practices and declining opportunities in rural domestic industry on the labour market. New methods were making sharp inroads on women's work in pastoral agriculture, dairying and hand spinning.[39] R.C. Allen estimates the proportionate reduction of women's employment in agriculture in the South Midlands to be much higher than that of men or boys:

Table 5: Agricultural Employment in the South Midlands[40]

Approximate Date	Men	Women	Boys
early 1600s	79,135	52,148	50,210
early 1700s	72,801	46,144	43,128
early 1800s	54,976	32,902	27,507

It has, indeed, been argued that rather than widespread children's and women's employment before the industrial revolution, there was a long heritage of insufficient employment for this part of the labour force. Women in London were employed in a narrow range of badly paid domestic work as well as the textile and clothing manufacture. Children aged less than 13 or 14 faced idleness, with manufacture providing the only (and very limited) hope of employment.[41]

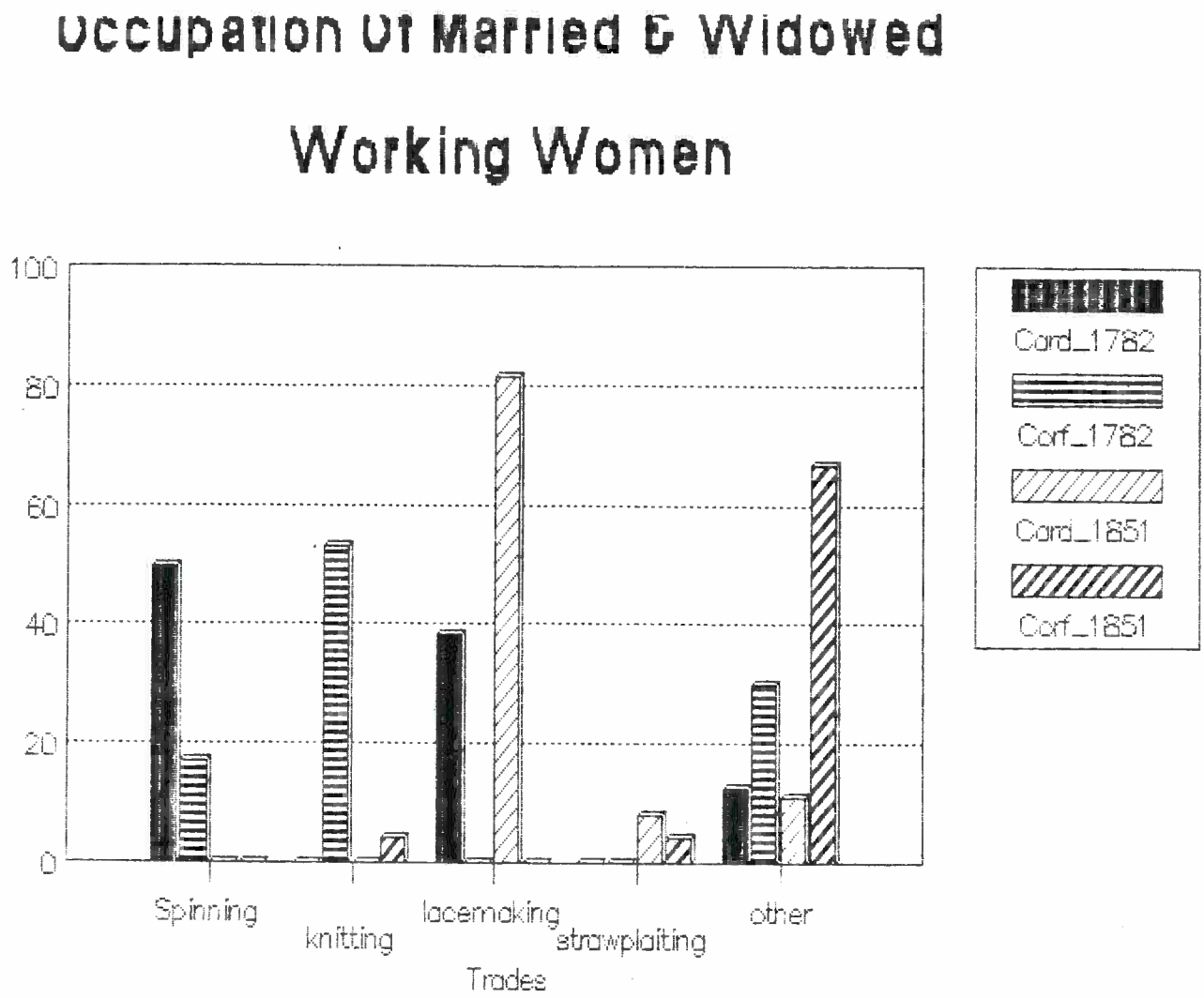
It seems that the new industries of the eighteenth century and their innovations can be presented either as purveyors of a new type of industrial workforce, or as a sponge for a traditionally cheap and even more available source of labour. What role did women and girls play in these new industries?

Labour supply factors no doubt played a part in the characteristics of the industrial labour force in the eighteenth century. Women went in large numbers to many 'traditional' female manufactures such as needlework, just as men flocked to the building trades and shoemaking. Demographic change over the

course of the eighteenth century was introducing new age and gender balances in the workforce. Children aged 5 to 14 comprised approximately one sixth of the population in the 1670s and one quarter in the 1820s. This compares with only 6% in 1951.[42] The young were thus both a potential source of labour, and the source of a high dependency ratio in the society. Gender balances were also skewed in favour of feminine sex ratios until late in the eighteenth century. Pamela Sharpe has shown recently the extent to which sex ratios in Colyton were skewed towards women throughout the seventeenth and the first half of the eighteenth century, and less so in the later eighteenth century.[43] Women married late, and there were higher numbers of spinsters and widows in the population than there were to be in the early nineteenth century.[44] Close associations between spinsterhood, poverty and illegitimacy prevailed over the century in Colyton.[45] Celibacy peaked at approximately one quarter of cohorts reaching marriageable age in the 1670s and 1680s, and fell thereafter, until it started to rise again in the 1780s.[46] In Colyton over twice the percentage of women from among the poor remained unmarried as among other social groups, and high celibacy and high feminine sex ratios prevailed over the whole eighteenth century. Colyton and other areas of rural industry like it experienced high feminine sex ratios, restraints on marriage, and lower rates of population growth than elsewhere.[47] High proportions of single women seeking some of gaining a subsistence were reinforced by large numbers of widows. Between 1574 and 1821 over a quarter of households were headed by a single person; widows accounted for 12.9% of households.

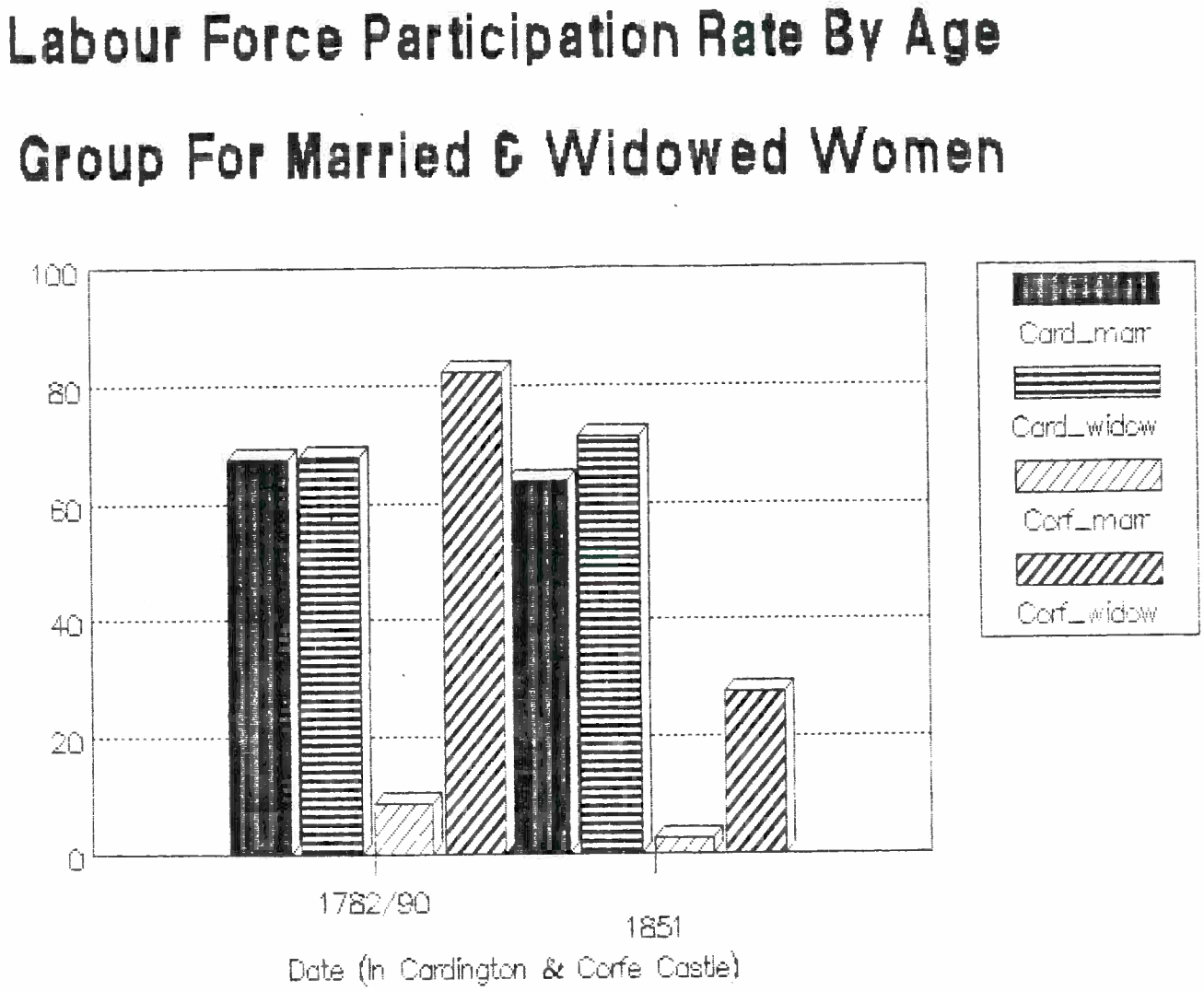
Historians have noted a decline in the numbers of these widows remarrying in the seventeenth and eighteenth centuries. The relationship of this to women's employment opportunities, on the one hand, or poverty on the other is open to debate.[48] Our standard image of women working within the context of the family economy is a great distortion for the eighteenth century. Substantial numbers of single women, either spinsters or widows, needed to gain an independent subsistence, but in many cases, wages were pitifully inadequate or highly precarious.[49]
Labour force participation rates varied by industry between married and widowed women, as indicated in Saito's study of lists of inhabitants in Cardington and Corfe Castle. This shows dramatic differences in the participation rates of married women and of widows between the two communities, differences which can be explained largely by the availability of work in cottage industry. The following graph indicates the percentages of married and widowed women engaged in the various cottage industries in both places. Most women in Cardington in 1782 were employed in spinning and lacemaking; in 1851, the predominant industry was lacemaking. Corfe Castle's main female industry in 1790 was knitting, but by 1851 few women were employed in any of the old cottage industries.[50]

Diagram 5: Occupations of Married & Widowed Working Women



Source: O. Saito, 'Who Worked When: Life-Time Profiles of Labour Force Participation in Cardington and Corfe Castle in the Late Eighteenth and Mid-Nineteenth Centuries', Local Population Studies, (1979), pp. 14-29, p. 25

Diagram 6: Labour Force Participation Rates by Age Group for Married and Widowed Women



Source: O. Saito, 'Who Worked When?', p. 23

The different industrial structures were reflected in major differences in the marital status of women workers. Similar high proportions of married and widowed women worked in the eighteenth and the nineteenth centuries in Cardington; while Corfe Castle's widows dominated the cottage industries in 1790, but dwindled with those industries by 1851.[51]

While wages for women in the newer industries could well be respectable, and as demonstrated, frequently higher than those for men in agricultural labour, they were also volatile, or the wages of relatively brief 'golden ages'.[52] As such single women and widows certainly were certainly able to take the opportunity of an independent subsistence for a time in many of these industries, but this subsistence was uncertain and frequently short-lived.

Where women worked within a family economy their low or fluctuating wages could become the deciding factor between crisis and stable or improving conditions for families. Even limited earnings, if pooled within a family economy, could help to put together a subsistence. This subsistence was most often based not on the traditional model of the family enterprise, but on individuals within a family or household working at a variety of activities and for a range of different employers.[53] The female silk weavers of Bedworth, Hillfields and Nuneaton were the wives of miners; the female chain and nailmakers of the Black Country were the wives and daughters of ironworkers.[54]

Estimates for industrial productivity have thus far been based only on data for male labour and wages. This wage data indicates stable or falling real wages at least until 1820, although there was considerable regional variation.[55] These trends in income levels have been associated with overall slow rates of growth in productivity, and especially of industrial productivity.[56] But the inclusion of women's wage rates and labour force participation could make a substantial difference to these trends. Low male wage rates where family incomes were at stake had the effect of encouraging high rates of female labour force participation.[57] Among very poor families, all women and children who could find any work, did it; amon those who were poor, but who could eke out a living the earnings of the household head, rather than female market wages provided the major determinant of female participation rates.[58] The implications of these findings based on Eden's budget studies for 1795-6 and the listing of inhabitant for Corfe Castle in 1790 show up even more dramatically in eighteenth-century Scotland. Here wage rates for male agricultural labour varied little from the mid seventeenth to the mid-nineteenth Century, yet there is evidence that conditions for many families improved. It is likely that such improvement came about not through higher wage rates or more employment for men, but through more labour by women and children. With relatively high wage rates and good opportunities in flax spinning and the 'flowering' or embroidery of muslin, the expanding textile industries of Scotland, women in some areas raised their families from destitution to getting

by.[59]

These features of the labour of women as individuals and as members of households affected the development of the newer industries and the technologies developed to use their labour. The gender characteristics of these industries and techniques were important to overall industrial performance which has thus far been assessed only in terms of information of industries employing men. What effect did this combination of female labour supply and gender-based industrial expansion have on women's employment and incomes?

While high proportions of the labour force employed in manufacturing, especially in the newer textile industries, it is also evident that the employment provided by industry was not sufficient to the task of soaking up the surplus labour left in the wake of demographic and agricultural change.

If we look at those industries and technological innovations affecting women, there is evidence of an eighteenth-century mahcinery question, one predating the intgroduction of the big power technologies and large scale factories of the nineteenth century. The spinning jenny displaced nine in ten warp spinners and thirteen in fourteen weft spinners in the West of England.[60]

Silk throwing machinery and Heathcoat's lace making machinery destroyed traditional sources of domestic women's employment. The double engine loom, the Jacquard loom, the flying shuttle and framework knitting machinery displaced more. Bujt othjer new processes in calico printing, the Birmingham trades and the potteries drew on more women's labour. The spinning jenny and

the power loom displaced women workers, but they were still themselves worked by women. When women's work in woollen spinning in Scotland went into decline it was replaced by flax spinning, then by flowering muslin or embroidery.[61]

While we are dogged by the paucity of quantitative indicators on women's employment for the early industrial period, there can be no resolution of the issue of mechanisation and women's work. But if we rely on current estimates of value added in industry, the place of the new sectors was not sufficiently great to absord the numbers of women displaced in agriculture and domestic spinning. The labour surplus economy which prevailed for men by the early nineteenth century also prevailed for women in the eighteenth century. Nevertheless, in terms of their proportionate contribution to the manufacturing labour force, women workers played a greater part over the whole course of the eighteenth century than they had done previously and were to do in the later stages of industrialisation. While for the most part, women's work in this period was low waged and exploitative, where this work contributed to a family economy, it lifted families above destitution. Where wages were higher for women, there were some limited possibilities of gaining an independent subsistence, and in such cases single women did work independently or in groups outside the family economy. Such work could support women as individuals, but do so generally for limited phases of the life cycle.[62]

By the mid Nineteenth Century labour conditions historically specific to the Industrial Revolution had changed. AS real wages rose, the proportions of occupied women fell at a rate of 0.7 per

cent per decade over the last half of the Nineteenth Century. Other factors combined to reinforce this effect, notably a combination of factory legislation, the activities of male trade unionists and an increasingly pervasive ideology of the male breadwinner, and of fit and proper female activities. From levels recorded as high as the 67.5% of marrried women working Cardington in the 1780s, participation rates of married women in the whole country fell to 10 per cent in 1911.[63]

What impact does the recognition of women's employment have for our interpretations of the Industrial Revolution? Interpretations have thus far been focussed mainly on data for adult male labour. The shift of labour away from agriculture would be reinforced with the inclusion of female labour. But the interpretation given to industry might be substantially altered by accounting for women's labour. The dominatn parts of the manufacturing sector were employers of higher proportions of women than of men, and women rather than men were employed in the new progressive industries to which most of the productivity gain in industry has been attributed. We need to know the extent to which the sources of productivity gain which made the first Industrial Revolution can be found, in industry at least, in the deployment of a largely female workforce with attributes firstly of high labour intensity with female patterns of labour discipline along with technical dexterity, and only secondly of low wages.

If we are even in a position to pin down these sources of productivity gain, we may well find ourselves contemplating an Industrial revolution which did achieve significant productity

gains, by employing women's and children's labour, and by introducing the organisational and technological innovation which went with this: in other words, the Industrial Revolution as it was once familiarly understood.

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1. See N.F.R. Crafts, British Economic Growth during the Industrial Revolution, (Oxford, 1985); and E.A. Wrigley, Continuity, Chance and Change. The Character of the Industrial REvolution in England, (Cambridge, 1988).

2. See, for example, Gareth Stedman Jones, 'The Changing Face of 19th-Century Britain', History Today, 41 (1991), pp. 36-40.

3. E.H. Hunt, 'Industrialization and regional inequality: wages in Britain 1760-1914' Journal of Economic History, xlvi (1986), pp. 935-66; J. Hoppit, 'Counting the Industrial Revolution', Economic History Review, 43, 1990, pp. 173-193; M. Berg and P. Hudson, 'Rehabilitating the Industrial Revolution', Warwick Economics Working Paper, No. 351, 1990, forthcoming, Economic History Review, February, 1992.

4. C.K. Harley, 'British Industrialization before 1841: Evidence of Slower Growth during the Industrial Revolution', Journal of Economic History, 42, 1982, pp. 267-289; N.F.R. Crafts, British Economic Growth during the Industrial Revolution, (Oxford, 1985), pp. 31, 81, 84.

5. Crafts, ibid.

6. Lindert, P.H. and Williamson, J.G., 'Revising England's Social Tables, 1688-1812', Explorations in Economic History, 19, 1982, pp. 385-408.

7.Wrigley, Continuity, p. 85

8. Crafts, British Economic Growth, p. 22

9. Wrigley, Continuity, p. 85.

10. Wrigley, Continuity, p. 85

11. This 'classical' model based on Malthus and Ricardo is developed in W.A. Lewis, 'Economic Development with Unlimited Supplies of Labour', The Manchester School, pp. 139-191; pp.141-3.

12. N.F.R. Crafts, 'The Eighteenth Century: a Survey,' in R. Floud and D. McCloskey, An Economic History of Modern Britain, vol. 1, forthcoming.

13. I have raised some of these issues more briefly in Berg, 'Women's Work and the Industrial Revolution', ReFresh, 12 (1991), pp. 1-4.

14. Wrigley, Continuity, p. 87.

15. A.J. Randall, Before the Luddites, (Cambridge, 1990)., p.

16. Adam Smith, An Inquiry into the Nature and Causes of the Wealth of Nations, (1776), 2 vols. (Oxford, 1976), Book IV, viii, vol. I, p. 644.

17. See N.K. Rothstein, 'The Silk Industry in London, 1702-1766' (unpublished MA thesis, University of London, 1961), chap. 2; J. Lown, Women and Industrialisation (Cambridge, 1991), chap. 1

18. H. Freudenberger, K.J. Mather and C. Nardinelli, 'A New Look at the Early Factory Labour Force', Journal of Economic History, 44 (1984), pp. 1085-90, p. 1087; P. Bolin-Hort, Work, Family and the State. Child Labour and the Organization of Production in the British Cotton Industry, 1780-1920, (Lund, Sweden, 1989), p. 54.

19. P. Sharpe, 'Literally Spinsters: a new interpretation of local economy and demography in Colyton in the seventeenth and eighteenth century', Econ.Hist. Rev., xliv, (1991), pp. 46-65, p. 52.

20. I. Pinchbeck, Women Workers and the Industrial Revolution, 1750-1850 (1930), (London, 1981), p. 204; G.R. Spenceley, 'The Origins of the English Pillow Lace Industry', Agricultural History Review, 21 (1973), pp. 81-93.

21. See J.M. Martin, 'Village traders and the emergence of a Proletariat in South Warwickshire, 1750-1851', Agricultural History Review, 32, (2), (1984), pp. Cf. R.C. Allen, Enclosure and the Yeoman (Oxford forthcoming, 1992) who found that shoemakers made up 15% of industrial employment in the S. Midlands in 1831. (See typescript, p. 42). These trades fitted well with W.A. Lewis's petty retail trades which are enormously expanded in overpopulated economies. See Lewis, 'Economic Development', p. 141.

22. See M. Berg, The Age of Manufactures, chap. 12; C. Behagg, Politics and Production in Nineteenth Century England, (London, 1990), pp. 48-9.

23. See E.H. Hunt, 'Industrialisation and Regional Inequality: Wages in Britain 1760-1914', Journal of Economic History, xlvi (1986) pp. 935-66.

24. Sharpe, 'Literally spinsters', p. 55.

25. Ibid., p. 52.

26. For discussion of the combination of gender division and new organisational regimes in some new manufacturing see R. Pearson, 'Women's Employment and Multinationals in the UK: Restructuring and Flexibility', in D. Elson and R. Pearson, eds., Women's Employment and Multinationals in Europe, (London, 1989), pp. 12-38.

27. C. Goldin and K. Sokoloff, 'Women, Children and Industrialisation', pp. 752, 753, 760.

28. See M. Berg, The Age of Manufactures, pp. 139-153.

29. James Pattison, Peter Noaille, Children's Employment Commission, 1816

30. Theodore Price, G.A. Lee, Children's Employment Commission, 1816

31. See Christine MacLeod, Inventing the Industrial Revolution The English Patent System, 1660-1800, (Cambridge, 1988), pp. 159-171.

32. Dean Tucker, cited in Roy Porter, English Society in the Eighteenth Century (Harmondsworth, 1982), pp. 213-14.

33. D.C. Eversley, 'Industry and trade 1700-1800', Victoria County History of Warwickshire, vii, (London, 1965), pp, 110-11.

34. See advertisements in Aris's Gazette, 1766-1796.

35. Josiah Wedgewood, Children's Employment Commission, vol. I, 1816.

36. E.I. Davies, 'The Handmade Nail Trade of Birmingham and District,' M.Com Thesis, University of Birmingham, 1933, p. 142.

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40. Taken from R.C. Allen, Enclosure and the Yeoman, Table 12-1

41. P. Earle, 'The Female Labour Market in London in the late Seventeenth and early Eighteenth Centuries' Economic History Review, xlii, (1989), pp. 328-353, pp. 338, 340, 346; D.A. Dent, 'Ubiquitous but Invisible: Female Domestic Servants in Mid-Eighteenth Century London', History Workshop, 28, 1989, pp. 111-129, especially, pp. 119, 125; H. Cunningham, 'The Employment and Unemployment of Children in England, c. 1680-1851' Past and Present, 126 (1990), pp. 115-150, especially pp. 131, 133, 137.

42. A.E. Wrigley and R.S. Schofield, The Population History of England, 1541-1871, (London, 1981), Tab. A3.1, pp. 528-9.

43. Pamela Sharpe, 'Literally Spinsters', p. 55

44. For further discussion of this for the country as a whole, and its interpretation for the course of women's lives see Bridget Hill, 'The Marriage Age of Women and the Demographers', History Workshop, 28 (1989), pp. 129-147; and idem., Women, Work and Sexual Politics in Eighteenth-Century England, (Oxford, 1989), chaps. 12, 13.

45. Sharpe, 'Literally Spinsters', pp. 56-7

46. See Hill, Women, Work, p. 223

47. Sharpe, 'Literally Spinsters', p. 63. Cf Richard Wall, 'Leaving Home and the Process of Household Formation in Pre-industrial England', Continuity and Change, 2, 1987, pp. 77-101, especially p. 86 for discussion of households in proto-industrial communities headed by women.

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51. Ibid., p. 23.

52. Sharpe, 'Literally Spinsters', p. 52; William Reddy, The Rise of Market Culture. The Textile Trade and French Society, 1750-1900, (Cambridge, 1984), chap. 2; M. Berg, The Age of Manufactures 1700-1820, (London, 1985), chap. 5

53. See John Styles, 'Embezzlement, Industry and the Law in England 1500-1800', in M. Berg, P. Hudson, M. Sonenscher, Manufacture in Town and Country before the Factory, (Cambridge, 1983), pp. 179-211 and A.J. Randall, Before the Luddites, p. show the extent to which woollen and worsted spinners operated over a widespread rural area, far from centres of male textile employment.

54. Berg, Age of Manufactures, pp. 215, 312.

55. P.H. Lindert and J.G. Williamson, 'English Workers' Living Standards during the Industrial Revolution: a New Look', Economic History Review, xxxvi (1983), pp. 1-25; E.H. Hunt, 'Industrialization and Regional Inequality: Wages in Britain, 1760-1914', Journal of Economic History, xlvi (1986), pp. 935-66.

56. N.F.R. Crafts, 'British Industrialization in an International Context', Journal of Interdisciplinary History, 19, pp. 415-428.

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60. See A.J. Randall, 'Work, Culture and Resistance to Machinery in the West of England Woollen Industry', in P. Hudson, Regions and Industries, pp. 175-201.

61. For examples, see M. Berg, 'Women's Work, Mechanisation and the Early Phases of Industrialisation in England', in P. Joyce, The Historical Meanings of Work, (Cambridge, 1987), pp. 64-98. A. Gibson and T.C. Smout, Prices Food and Wages in Scotland, 1550-1780 (forthcoming, Cambridge), chap. 9

62. See P. Sharpe, 'Literally Spinsters.'

63. O. Saito, 'Who Worked When', p.23; Idem., 'Labour Supply Behavior', p. 648