

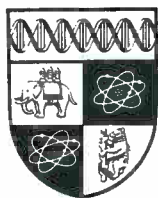
Artisans and Factory Systems in the Industrial Revolution

By

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Artisans and Factory Systems in the Industrial Revolution

The debate on the origins of the factory system has recently taken on new dimensions with a range of research on the potentials for productivity growth in different forms of manufacturing organisation. This research currently yields contradictory findings on similar industrial environments.

There is first the recent research on the growth of productivity in England's industrial revolution. The research of Crafts and others on English productivity change has distinguished the gains from high productivity factory and mechanised industry, confined mainly to the cotton industry, from the low or negligible productivity gains of most of the rest of the industrial and service sector. This research has found that most industry, unlike cotton, was technologically backward and organised in traditional small scale units. The high proportion of manufacturing taken up with this traditional manufacturing and services (and correspondingly small proportion of the high productivity modern manufacturing sector) meant an overall drag on productivity growth in the economy as a whole in the eighteenth and early nineteenth century. Crafts, Williamson and Mokyr have all defined manufacture in the eighteenth century as marked by a sharp divide between modern factory and mechanised industry on the one hand, and traditionally organised artisan industry on the other.<sup>1</sup>

In contrast to these findings, recent sociological literature and research on industrial organisation points to the productivity potentials of small scale manufacture as explored

in the concepts of 'flexible specialisation' and 'network capitalism'.<sup>2</sup> Other research on productivity growth in early industrial America looks to the gains made by larger and medium scale workshops and 'nonmechanised factories'.<sup>3</sup> Recent research on the enormous diversity of manufacturing organisation even within a single industry - with putting out, workshops and sweating existing alongside and complementary with a diverse factory sector - has muddied the waters of a once clear stream of unilinear development in the rise of the factory system. Yet the scale of production and a belief in a sharp divide in the production processes of the 'small scale' pre-industrial and the mass production modern world still underpin our understanding of the transition constituted by the industrial revolution.

This paper will first explore the interaction of myth and historical change on the role of the artisan in debates on industrialisation. It will then examine small and medium scale production in England's metal trades, specifically in Birmingham and Sheffield, in the eighteenth century. It will discuss characteristics of the manufacturing system of these towns, including the use of female and child labour in the light of discussion by Sokoloff and Goldin Sokoloff on the 'small scale factory' of early industrial America.

#### Artisans and factories: myth and history

Manufacturing organisation has been analysed in the main in terms of scale of production. And there have been strong arguments in favour of the view that bigger was better. Larger scale has been associated with greater efficiency, lower relative costs, and greater ability to develop and use new technology.<sup>4</sup>

But recent recognition of the advantages of creativity, 'flexible' skill-intensive technologies, product choices and external economies explain current trends to 'quasi-disintegration' and the successful Japanese model of 'network capitalism.'<sup>5</sup>

But the historical divisions along with all their attendant associations between artisan and factory production are still deeply rooted. The whole debate over scale of production - the different advantages of internal versus external economies, standardised versus specialised markets, capital-intensive powered technologies versus skill-intensive, specialised machines - depends upon largely unconscious assumptions about the nature of artisan production versus the factory system. The question we need to ask is 'what is an artisan?'. Do we owe more of our answer to historical myth than to empirical investigation?

The history of artisans is simultaneously a history of images of small workshops, pre-industrial customs and popular culture. This history carries with it a mythology conveyed in the political and legal documents left by the small producers themselves, and taken up by historians. The mythology constructs a binary opposition between the characteristics of pre-industrial and industrial society, associating artisanship with the archaic; large scale factory production with modern industry.<sup>6</sup>

Alongside this runs another mythology on the role of the small producer in industrialisation. Large manufacturers in the eighteenth and nineteenth centuries constantly retold myths of humble beginnings. Matthew Boulton, who had inherited a large scale business from his father, and married a woman with a dowry

of £28,000, told a Select Committee in 1799 'all the manufacturers I have ever known began the world with very little capitals.' Samuel Timmins, who had also inherited a large scale business from his father, wrote the classic survey of the Birmingham trades in 1866 to document the case for economic liberalism in the conviction that the factory was an organic development from small beginnings in the workman's cottage.<sup>7</sup> A mythology of artisan roots thus played a part in the perceptions of small producers whatever their conditions, and in the ethos of large manufacturers. The historical divide once made by historians between the non-mechanical craft worker and the skilled worker within the factory gates is a misleading one. For the craft worker might work within the framework of small scale production, and yet experience not harmony, cohesiveness and consensus, but the class conflict of a cutthroat competitive economic environment. In other cases, independent artisan producers moved by choice into the factory, where by sub-contracting they could maintain the viability of their small enterprises.<sup>8</sup>

But the modern mechanised technologies of the large scale factory also hinged on a close dependency on 'traditional' artisan producers. Cotton manufacturers typically combined steam powered spinning in factories with extensive employment of dispersed domestic handloom weavers long after the availability of powered technology. This spread risks and deployed a cheap labour supply of women and children. The metal working trades of Birmingham and Sheffield had both large and small firms primarily concerned with metalworking diversifying into large scale metal processing

ventures as a way of generating steady raw material supplies. They also combined occupations or changed these over their life cycle in a manner which brought the individual manufacturer either simultaneously or in succession into 'large scale mechanised production' and small scale 'traditional' activities.

In a parallel vein, the non-factory, supposedly stagnant small scale sector frequently pioneered extensive and radical technical and organisational change. The classic textile innovations were all developed initially within rural dispersed manufacture. The artisan metal trades, as we have seen, developed skill intensive hand processes, hand tools and new malleable alloys. The wool textile sector moved to new products which reduced finishing times and revolutionised marketing. Research on proto-industrialisation has identified the significance of innovation in organisation in the form of elaborate putting out networks, subcontracting and artisanal co-operative and share ventures, as well as in marketing techniques, credit arrangements, and product innovation. It has also emphasised the diversity of such innovation centred on the small scale unit of production, and the differences in the success rates of such innovation between industry and region.<sup>9</sup> The interdependencies of small scale and large scale technical innovation tend to undermine the notion of a sharp divide in the capacities for and types of innovation developed within the different organisational forms.<sup>10</sup> Thus far, however, research has continued to presuppose an essential divide between large scale and small scale production. This paper has suggested that there are no simple polarities. It will now proceed to look

at the specific case of the medium scale manufacture or what has also been termed the 'small scale factory' as a form of organisation which deployed specific divisions of labour, drew on a specific labour supply, and developed new largely non-mechanised techniques. Was this a specific organisational type, distinct in kind from both polarities of artisan and factory, or was it simply a half way house to the factory, combining aspects of both artisan and factory system?

Small scale factories - a unique form for a unique phase of industrialisation

Discussion of the scale of factory enterprise in the industrial revolution has, until recently, been confined to differences in the levels and structure of capital formation.<sup>11</sup> But in an altogether different vein, a series of essays by Sokoloff, and Goldin and Sokoloff has examined the characteristics of manufacturing in the Northeast of the U.S. in the early nineteenth century. These have identified a distinctive set of 'small scale factories', and have set out the structures of capital in these firms, the age and gender characteristics of their labour forces, their technologies and their organisational innovations. Sokoloff distinguishes the artisanal shop from large scale textile factories based on the use of sophisticated machinery, and both in turn from what he calls the nonmechanised factory. He argues that the rapid expansion of the manufacturing sector in the Northeast was accompanied with a movement toward larger scale production in a range of industries extending far beyond textiles to include



clocks, guns, hats, shoes and umbrellas. Manufacture in these industries became increasingly organised into nonmechanised factories, which in turn had an efficiency advantage over traditional artisanal workshops. Nonmechanised factories had scale economies up to a specific threshold size - such economies were virtually exhausted by establishments in the range of 6-15 employees. These economies derived from a division of hand performed tasks within a firm, the use of simple tools, supervision and a more disciplined work regime. Discipline was combined with a much higher proportion of female and child labour than in other production processes,<sup>12</sup> and the use of this workforce is explained by the substitution of an unskilled for an expensive skilled male labour force.<sup>13</sup>

These factories were also the focus for a high degree of inventive activity. Market expansion with and the development of inland waterways, fostered domestic competition. A pre-industrial population with a working knowledge of current technology and the facility to learn from advances in Britain stimulated invention.<sup>14</sup>

To what extent do we find this model of the small scale factory in eighteenth-century England? Are the characteristics of its organisation, labour force and inventive activity similar, or does the English case show up other characteristics which might in turn help to offer different explanations of the growth of manufacturing in the American northeast?

#### Workshops and Factories in England

British historians have revised downward their earlier notions of the very large scale of factories, notably of cotton

mills during the industrial revolution. The new cotton technologies were available at relatively low thresholds -small firms took advantage of small steam engines, and installed small numbers of spinning mules and power looms; they used traditional building methods and existing water power resources. But even those defined as small mills (employing less than 150) were very large in comparison with what Goldin and Sokoloff call the small scale factory ( 6 to 15 workers). If we look over industry in Britain as a whole, however, even in the nineteenth century the customary firm fitted the small or medium scale categories. Let us look at the case of the historical antithesis to the cotton industry - the small metal trades. To what extent was this industry much more representative of British industry as a whole in its scale of enterprise? Was this industry organised on the small scale artisan basis which is supposed to have so sharply distinguished its working experiences from those of the Manchester cotton industry, or was its experience closer to that of the American factories outlined above?

The metal trades have been seen as the prima facie case for a path to industrialisation different from that of cotton. G.C. Allen and Asa Briggs endowed the Birmingham metal trades with harmonious class relations. 'The analysis focused on the workshop closeness between masters and men forged by a combination of close physical proximity in the workplace, the indispensability of skilled labour to small-scale production, the absence of large scale capital investment, and the acknowledged possibility of upward social mobility from employee to employer status.'<sup>15</sup> Sabel and Zeitlin saw the Birmingham metal trades and the

Sheffield cutlery trades as the legitimate ancestors of current developments in 'flexible specialisation'.<sup>16</sup> Some recent research has continued to convey this simplistic notion of an artisan-workshop economy, with the traditional small master continuing into the nineteenth century. This economy of small producers formed the base, it is argued, for an open society, and a politics based on association, negotiation and compromise.<sup>17</sup>

This is the imagery of artisanship used to explain so much of Birmingham's class structure and politics, and it is the imagery which has recently been challenged for the nineteenth century. Instead of a democracy of small producers, the nineteenth century in Birmingham was marked by a production process polarised between large capitals and heavily subordinated small units.<sup>18</sup> From the 1820s there was a rise in the size of establishments, the introduction of machinery, and falling apprenticeship and wages. It was in this period that the balance of power shifted away from the skilled artisan to the larger scale unit.<sup>19</sup>

This dramatic break between the large and small producers appeared to prevail in most of the town's industries, between 1829 and 1840 whether they were 'traditional' such as tailoring or the leather trades, or new mechanised industries, such as steel-toymaking. The large-scale units dominated the town by 1840, and the small firm depended on the credit and market facilities controlled by the larger.<sup>20</sup>

Behagg has argued that though small 'artisan' producers and hand technology were still a feature of the system by the mid-nineteenth century, a dramatic reorganisation of work had taken

place since the Napoleonic Wars. New capital intensive plants multiplied smaller units rather than absorbing them. Small producers were frequently outworkers whose situation of dependence was little different from that of factory workers. The smaller firms were tied to the larger by a characteristic weekly business cycle, rather than the quarterly or annual credit markets used by the large firms. It was a relationship which ensured these small firms stayed small. 21

Sheffield, an altogether simpler society, had an even starker divide between its small scale sector and larger. Here a tradition of association between the landed aristocracy and the larger manufacturers was extended with the rise of the new heavy steel industry. The small masters occupied a world apart - that of the 'old Sheffield'. 22

### Manufacturing Workshops and Small Scale Factories

#### in Birmingham and Sheffield

A manufacturing organisation marked by a divide between small and large masters is the system which emerged in the metal trades in the course of the nineteenth century. But in the early stages of industrialisation, a different type of organisation prevailed, and this was not the system of the small scale producer or mythical artisan. It was that of the manufacturing workshop or small scale factory. It bore some similarities to the small scale factory of the North east U.S. But its significance for English industry has so far been ignored. This may be due to problems of evidence; evidence which provides the basis for quantitative data is meagre. But the framework of

industry can be assessed from probate records of the kind used by Behagg and from insurance records. I have collected the probate and insurance records of all those who identified their trades as part of the metal trades for Birmingham parish and for Sheffield parish in the period from 1700 to 1800. But none of this data provides the kind of information on employment and capital structure available in the U.S. case from the Maclean Report.<sup>23</sup> The population of Birmingham grew from approximately 7,000 in 1700 to 74,000 in 1800. Sheffield's population grew from 12,000 in 1750 to 46,000 in 1800. Both towns underwent a remarkable growth in the eighteenth century; their really outstanding periods of growth and transformation took place during this early industrial, rather than the classic industrial period. It is the eighteenth century, not the nineteenth which holds the key to the rapid expansion and productivity growth of their key industries.

2,625 individuals left wills for Birmingham parish only in the period between 1700 and 1800. Of these 526 were working in the metal trades. 594 in the metal trades of Sheffield left wills in the same period. A further 147 widows and spinsters are also considered for Sheffield over the period. Insurance records from the SSRC sample of policies for 1776-1786 were also examined. For this period, 178 Birmingham metal workers were insured under the Sun or Royal Exchange Companies; 138 from Sheffield were similarly insured.

The insurance records are a rich source for an assessment of the scale and capitalization of firms, for valuations are provided for properties and goods, and workshops, tools and

stock are frequently distinguished from household goods and homes. There are a number of biases built into these records<sup>24</sup>. But for the sample used for the one decade and for the regions examined, the insurance coverage and valuations have been deemed a fair reflection of firms and assets.

Insurance valuations for a sample of metalworkers in 1776-1787 for Birmingham and Sheffield are indicated in Tables 1 and 2.<sup>25</sup>

Table 1 - Total insurance valuation left by metalworkers  
Birmingham - Sample 1776 - 1787

N=178

<u>£100 - 500</u>	<u>£501-1000</u>	<u>£1001-2000</u>	<u>Over £2000</u>
<u>100</u>	<u>53</u>	<u>21</u>	<u>5</u>

Table 2 - Total insurance valuation left by metalworkers

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Sheffield sample 1776-1787				
N= 138				
Less than or = £100	£101-500	£501-1000	£1001-2000	Over £2000
13	61	47	12	5



If we consider small property-holders to count as those who held less than three properties, and medium sized proprietors, as those who held between 3 and 5 properties, then 30 per cent of those Birmingham metalworkers sampled who insured their assets with the Sun or Royal Exchange Insurance companies can be described as medium scale manufacturers. In the case of Sheffield, the proportion was 49 per cent, with a substantially higher number who had no properties, and more with a large number of properties.

If we turn now to total assets, 55 per cent of this sample of Birmingham metalworkers had insured assets of less than £500, and a further 29 per cent with assets insured at between £500 and £1,000. In Sheffield, 54 per cent were insured for less than £500, and 34 per cent for between £500 and £1000. If we judge scale by the distribution of insured assets, then on this evidence it appears that the medium scale sector made up a major part of industry in both cases. But again there was a greater predominance of medium scale businesses in Birmingham than in Sheffield.

These figures can be broken down further into valuation of properties and valuations of goods.

Table 3 - Values of all properties including home and trade

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No. of proprietors in each category

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Birmingham Metalworkers Sample 1776-1787

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N= 176 property-holders

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Less than £100	£101-500	£501-1000	£1001-2000
59	85	27	5

Table 4 - Values of goods - Birmingham Metalworkers Sample

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1776-1787

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No. of proprietors in each category

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N= 178

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Less than £100	£101-500	£501-1000	£1001-2000	Over £2000
27	65	15	4	3

Table 5 - Values of all properties including home and trade.

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No. of proprietors in each category

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Sheffield Metalworkers Sample 1776-1787

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N= 138

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Less than = £100	£101-500	£501-1000	£1001-2000	Over £2000
43	68	20	6	1

Table 6 - Values of goods - Sheffield Metalworkers Sample

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1776-1787

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No. of proprietors in each category

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N= 138

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Less than = £100	£101-500	£501-1000	£1001-2000	Over £2000
65	38	27	7	1

58 per cent of the Birmingham sample and 20 per cent of the Sheffield one held properties valued in the medium range of £101-£500. The pattern for the insurance of goods is less clear. Substantial numbers did not insure their goods at all. 24 per cent and 47 per cent of those in Birmingham and Sheffield respectively insured small quantities of goods. If the middle range of goods is considered to be that insured between £100 and £500, then 57 per cent in Birmingham and 27 per cent in Sheffield fell into this category. In the case of Sheffield it is notable that 25 per cent were insuring goods valued at over £500.

Records of property-holding need to be disaggregated further. Few of those firms identified as holding property valued at less than £100 were actually small scale firms. Most of these had insured goods which placed them at least within the range of the medium scale firm, and in 30 per cent of cases for Birmingham these held goods which placed them with the large masters. The case for Sheffield was similar, with most actually in the medium scale range, and 17 per cent falling in with the large masters. In nearly all of these cases, either dwelling houses or workshops, or both, are listed in the records, but not assigned a valuation. If insurance records were relied on alone, then, the case of the predominance of a medium scale manufacturing sector looks even stronger.

But as emphasised already, insurance records were biased

towards those of medium and large scale wealth. A broader picture is available from probate records, but even these were relatively infrequently left by the very small producers. It is, however, certainly true that a much broader range of the population left wills, and small producers did at least show up to some extent in these records. Probate records in the eighteenth century have other problems. A number left inventories, but such inventories did not often include valuations of properties. The inventories, in addition, become very infrequent after 1750. The wills themselves, however, identify numbers, types and locations of properties, cash settlements and goods. In most cases properties and goods are not valued; only numbers of properties are therefore considered. This must mean severe limitations on precise identification of capital and wealth distribution. But a guide to such values is provided by data in the insurance records used, and if needed more precise individual data can be brought to bear from records of title deeds and the inventories.<sup>26</sup> The advantage the use of these wills offers is their greater breadth over the social scale, and the long runs of information provided.

The records of 454 individuals in the metal trades in Birmingham and 594 in Sheffield have been examined during a one hundred year period.<sup>27</sup> In Sheffield, in addition, a further 105 widows and spinsters were examined. These women may or may not have had some involvement in the metal trades. Property-holding set out in the wills is indicated in Tables 7, 8, 9 and 10.

Table 7 - Proprietors and Number of Properties  
in Birmingham 1700-1800

Date	Masters with no prop.	Masters with prop.	Total Masters	Total prop.	Average prop.
1700-1725	38	36	74	54	0.73
1726-1750	42	62	104	189	1.82
1751-1775	50	54	104	172	1.65
1776-1800	92	151	243	497	2.05



Table 8 - Number of properties held by each masterBirmingham 1700-1800

Date	Total Masters	No. with 0 prop.	No. with 1 prop.	No. with 2 prop.	No. 3-5 prop.	No. 6-10 prop.	No. 11+ prop.
1700- 1725	74	38	23	10	3	-	-
1726- 1750	106	43	27	9	15	9	2
1751- 1775	104	50	18	13	16	3	4
1776- 1800	245	92	73	31	21	19	7

Table 9 - Proprietors and Number of properties -Sheffield 1700-1800

Date	No. with no prop.	No. with prop.	Total Masters	Total prop.	Average prop.
1700-1725	28	72	101	160	1.58
1726-1750	48	113	161	260	1.61
1751-1775	100	122	222	348	1.57
1776-1800	99	159	258	451	1.75

Table 10 - Number of properties held by each master  
Sheffield 1700-1800

Date	Total Master	No. with no prop	1 prop.	2 prop.	3-5 prop.	6-10 prop	11+ prop.
1700- 1725	100	28	41	11	14	5	1
1726- 1750	161	48	52	28	26	6	1
1751- 1775	222	100	49	26	32	12	3
1776- 1800	258	99	79	27	35	9	9

This data indicates average property holdings among this industrial group in both towns of over 1.5 properties, and rising by the last part of the century to 1.75 in Sheffield and 2.05 in Birmingham. While the numbers leaving either no property or one property in both cases was greater than those leaving between three and five properties, or even two and five properties, there was still a significant proportion of 21 per cent in the case of Birmingham and 24 per cent in the case of Sheffield who owned between two and five properties in 1776 to 1800. There was thus a substantial core of producers who stood apart from both standard images of the individual artisan producer and of large scale masters.

A breakdown by trade gives more indication of the distribution of wealth between the trades. (See Appendix 1).

The wealthiest trades in terms of property-holding appeared for Birmingham to be the bucklemakers, buttonmakers, brassfounders and whitesmiths. The women listed, mainly widows, were also substantial property-holders. In Sheffield, the cutlers, scissor-smiths and ironmongers were relatively well off. In Birmingham, 23 tradesmen in 1751-75 and 47 in 1776-1800 held three properties or more. The highest number of properties were held by toymakers and bucklemakers in 1751-1775, and buttonmakers in 1776-1800. In Sheffield 73 individuals held three or more properties in 1751-1775; 80 held three or more properties in 1776-1800. By far the highest proportion of properties over the whole period was held by cutlers, but until the mid-eighteenth century scissor-smiths also held a substantial proportion.

We can look in more depth at some of the Birmingham tradesmen that left both insurance policies and wills in the brief period of the 1780s and 1790s.<sup>28</sup> Isaac Anderton, a toymaker insured buildings for £200 in 1778, but reduced this in 1782 to £150. Goods which he had previously left uninsured were now insured for £50, and at this time he claimed 3 dwelling houses, a brewhouse and shops. He had three dependents, and left two houses in a will he made in 1784. John Botteley, a watchchainmaker, valued 5 houses and a brewhouse in 1783 at £250. He left these in 1785 to four dependents. Thomas Chamberlain, a hammermaker, had 11 properties, including houses, shops, coalhouses and brewhouses insured for the small sum of £280. He valued his goods at only £20, and in 1784 left two houses, brewhouse and shops to three dependents. These small producers all had several properties,

with most valued at very small sums.

The medium scale producers continued this pattern of multiple properties. Thomas Coton, a stamper insured his assets in 1779 for £700. He valued 5 properties, including houses, brewhouse, and stamping shop for £500, and his goods for £200. In 1796 he left his houses to 6 dependents. Edward Sawyer, a spoonmaker insured 9 houses, brewhouse and shops in 1780 for £400, and made a will in the same year leaving three houses and a brewhouse to three dependents. Edward Thomason, a bucklemaker, valued two houses and a brewhouse in 1779 for £300, and in 1794 left two farms, land and houses to six dependents. Finally William Ward, a buttonmaker, insured his three dwellinghouses, brewhouse, shops and stamping shop in 1781 for £600. He left a house and premisses in 1799 to 1 dependent. Multiple properties insured for relatively small sums seemed to be the pattern for both groups. It is also clear that properties frequently included a medley of workshops and outbuildings. Accumulation appeared to proceed through the addition of further small premisses rather than through amalgamation into larger scale premisses.

It is very difficult to establish in any systematic way just what these workshops looked like, their size and the numbers of employees. Among those who reported to the Select Committee of 1812 were a number of relatively large manufacturers who employed between 40 and 150. Larger firms were already well known by the 1760s for their advanced division of labour, and extensive use of child and female labour.<sup>29</sup> But we know little of the organisation of work within the medium scale firm. Metalworkers

in Birmingham frequently advertised for skilled labour and apprentices in Aris's Gazette, and these were generally for very small numbers of workers. Firms advertising for partners in the button, buckle and japanning trades in the 1780s were generally seeking partners with a capital to advance in the range of £400-£600. The Gazette was also used to advertise tools left by bankrupt or deceased firms. Substantial numbers of tools were frequently left by any one firm. William Orchard, a buttonmaker, in 1789 sold twenty-one lathes. John Simmonds, another buttonmaker, in 1769 disposed of three stamps, a press, fifteen lathes, two pairs of shop bellows and various vices and dies. And in 1789 another bucklemaker had twenty buckle vices, lathes and presses to sell.<sup>30</sup>

Greater detail within the insurance records shows a pattern of dwelling houses with adjacent workshops and warehouses, insured on the whole for modest sums, and where resources allowed, additional houses and workshops let out to other tradesmen.<sup>31</sup> John Kelsey, a buttonmaker in 1782 on a valuation of £600 had a house, brewhouse, counting house warehouse and shops. Jonathon Maddox, a japanner with £350 insured in 1786 carried out his trade in his house in Mount Pleasant with a stove shop behind the house and another beside it, and also used another shop three stories high in Anne St. Coral Whitehouse, a toymaker in 1786 valued goods at £600, but of this £80 was for a house in Snow Hill, and £100 for utensils in the shop and warehouse adjacent and above his house. The rest was for 7 houses and adjacent shops in streets nearby let out to a watchchainmaker, victualler and several gunmakers. Larger

premisses were clearly kept by those with greater wealth. But even here resources were spread over a series of smaller properties. James Pickard, a buttonmaker in 1777 had a valuation of £1,430. For this, he kept a house, brewhouse and shops in New Hall St., and had acquired a further three houses and a shop on Mount Pleasant to convert to workshops, all insured for £290. But he also had a further 6 houses and shops let out to a bookkeeper, leatherworker, steel grinder and others; all of these valued for £230.

It is also clear from inheritance strategies apparent in the probate records that those in the metal trades were very closely concerned with property holding. Other wider evidence indicates that the Birmingham manufacturers were more prominently involved in the property market than were their contemporaries in the Nottingham and Manchester textile industries.<sup>32</sup> There were major building booms in Birmingham in 1746-50 and in the 1780s. Most of these houses sold for just under £100, and a number of smaller buildings were also frequently built at the backs of houses, and sold for £35-60, and rented out for £3-£5. Expenditure on housing among the Birmingham artisans appears to have rivalled outlays on storage and materials, and on tools and, where this can be distinguished, work premisses.

This investment strategy was to some extent a family strategy, but also an indicator of the threshold size of manufacturing units. Urban property was a safe investment with a reasonable yield, and many attempted to accumulate enough separate properties to pass one rental asset on to each surviving child.<sup>33</sup> Such assets could in turn be used or mortgaged to

raise capital for new productive initiatives. Priority does not appear to have gone on increasing the size of the production unit. Further reasons for this go back to the organisation of production and the techniques of these trades.

Like the small-scale factories described by Goldin and Sokoloff, there was a definite threshold to the scale economies to be derived from extension of the division of labour and investment in hand tools and semi-mechanised technologies. In eighteenth-century Birmingham, and to a large extent in Sheffield too, there was a further threshold in the relationship between the family enterprise and levels of supervision required as the scale or number of units per family rose. Larger scale or even multiple workshops would require a shift in the levels of required supervision. A small family-run workshop would not, therefore, simply grow organically into something larger. It would require complete changes in organisation and management which may have taken production outside the horizons or desires of the small and even medium scale producer. A range of small-scale, highly adaptable and flexible technologies allowed the options of product and materials innovation without the requirements of large-scale production using extended divisions of labour, or of vertical integration. This creative adaptation and development of techniques and products was, furthermore, closely dependent on the individual energies of the entrepreneur and skilled tradesman. The process of invention was also the process of production for a large sector of the metal trades. Large numbers of entrepreneurial-industrial families worked actively as producers and managers. There were limits to the



process of accumulation under this system set by the threshold sizes of firms. But adaptable skills across a range of processes were acquired by a significant proportion of the population, in turn creating more opportunities for entry (bolstered for many individuals by the capital that could be raised by mortgaging small properties) to the industry and for entrepreneurial initiative.

The scale of enterprise and features of its organisation were very similar in the metal trades of eighteenth century England and the manufacturing enterprises of the early industrial U.S. republic. But this American industry was also highly skewed towards the use of female and child labour. To what extent was this also the case in early industrial England?

#### Labour Forces and Productivity

The characteristics of the division of labour and the labour force in the new manufacturing enterprises of the eighteenth century were distinctive, and the lessons drawn from them were repeated during the next few generations in the U.S. This division of labour entailed the use of high proportions of both female and child labour. The use of child labour with adult supervisors in the Birmingham metal trades was already well known in the 1760s<sup>34</sup>;

It is important to recall that the key to Birmingham's meteoric rise in the eighteenth century was this creativity in the development of products and materials substitution which gave the town an edge in market responsiveness at a key moment. The scale economies of the Birmingham and Sheffield products and techniques were fairly limited, but the medium scale manufacturer

who could introduce some division of labour and incorporate a range of tools and a portfolio of product diversification had a definite edge over the mythical artisan producer, and even over the exploited garret master.

This division of labour and other innovation in Birmingham and Sheffield fitted into the framework of broader developments during that period; and these were associated with a specific demand for female and child labour. New work disciplines, new forms of subcontracting and putting out networks, factory organisation and even new technologies were tried out initially on a child and female workforce.<sup>35</sup>

There thus appear to be clear parallels in the nature of the labour force and the types of organisational innovation in manufacturing in both eighteenth century Britain and the U.S. in the early nineteenth century. But in the U.S. case productivity gain has been attributed to the substitution of cheap unskilled labour for high wage skilled labour. In the English workshops and small factories of the eighteenth century, a specific labour force was targeted not simply because it was cheap, but because it formed part of a package with the new technologies and organisation. The new techniques and organisation brought whole new ways of doing things which were both new work cultures and new gender divisions in the workforce. The labour force was undoubtedly similar to the labour employed by multinationals in its third-world manufacturing plants today - young, unmarried women working on fine manufacturing processes requiring dexterity and concentration.<sup>36</sup> Such a labour force was to be found in both of England's contrasting industrial types -the cotton

industry and the metal trades. Highly labour intensive techniques such as picotage in calico printing or extensive division of labour as in button making were combined with disciplined workshop production. These processes were not highly mechanised but were supervised closely as in a factory system.<sup>37</sup> In the U.S., there was, if anything, an even higher proportionate use of young female migrants<sup>38</sup>, with their recruitment institutionalised in systems such as the Lowell system.

In England organisational innovation was also developed to tap married women with children through the adaptation of the family work group. Women and children were sought out because they were suitable for a division of labour based on the adult with child assistants. The adult-child work group grew out of eighteenth century domestic and workshop production, but was expanded to workshops organised under hierarchical division of labour and in small factories using family based work groups.<sup>39</sup> We cannot yet assess the extent to which the use of this labour expanded or contracted during the nineteenth century when what we know as the factory system became associated with altogether new levels of economics of scale, vertical integration and mechanisation. Certainly the increasing size of some firms in the Birmingham metal trades during the 1840s brought deskilling and a sharp increase in the proportion of female and child workers.<sup>40</sup> But the use of this labour, deployed either as young women in medium scale workshops and small factories, or as adult-child work groups was already well established in the eighteenth-century workshop, small factory economy.

### Conclusion

A definite hiatus in the industrial system of Birmingham and Sheffield appears to have set in during the nineteenth century, leaving a yawning gap between the very small and the very large scale producers. The earlier domination of the medium scale workshop was a forgotten episode of earlier days. The polarised production which marked the transition to the factory system in the nineteenth-century metal trades was, as Behagg, has so convincingly argued, achieved against a background of price reductions, cost-cutting and recession.

The traumas of this transition were compared in workers' consciousness to earlier 'pre-industrial artisan days,' while the industrial giants excused their actions and their existence by reference to their own mythical artisan origins. But the transition to the factory system had started much earlier in a very different economic climate. The characteristics of that factory system were also quite different from those of its descendants. The medium scale workshops and small factories of much earlier stages of industrialisation were forgotten by the nineteenth century, and have been passed over by historians. But it was these units rather than the very small or the very large which were able to seize on rising market opportunities, and thus to generate further expansion, innovation and productivity growth.

Appendix 1

Table 11 - Property left by major trades  
Birmingham 1700-1800

Trade	Date	No.	% of Metals	No. with prop.	No. of props.	% total prop.
Toy maker	1700-1725	2	2.7%	2	2	3.7%
	1726-1750	15	14%	10	22	11.6%
	1751-1775	24	23%	10	38	22.0%
	1776-1800	22	9.1%	12	40	8%
Cutler	1700-1725	5	6.8%	3	3	5.6%
	1726-1750	3	2.9%	2	2	1.0%
	1751-1775	1	1%	1	1	0.6%
	1776-1800	4	1.6%	3	3	0.6%
Sword-cutler	1700-1725	1	1.4%	1	1	1.9%
	1726-1750	4	3.8%	2	6	3.2%
	1751-1775	-	-	-	-	-
	1776-1800	2	0.8%	1	1	0.2%

Trade	Date	No.	% of Metals	No. with prop.	No. of props.	% total prop.
<u>Trade</u>	<u>Date</u>	<u>No.</u>	<u>% of Metals</u>	<u>No. with prop.</u>	<u>No. of props.</u>	<u>% total prop.</u>
Short-cutler	1700-1725	3	4.1%	2	3	5.6%
	1726-1750	2	1.9%	2	9	4.8%
	1751-1775	5	4.8%	4	15	8.7%
	1776-1800	2	0.8%	1	1	0.2%
Button-maker	1700-1725	-	-	-	-	-
	1726-1750	1	1%	1	3	1.6%
	1751-1775	-	-	-	-	-
	1776-1800	34	14%	21	124	24.9%
Buckle-maker	1700-1725	1	1.4%	-	-	-
	1726-1750	2	1.9%	1	11	5.8%
	1751-1775	9	8.7%	5	20	11.6%
	1776-1800	11	4.5%	7	35	7%
Iron-monger	1700-1725	3	4.1%	1	1	1.9%
	1726-1750	2	1.9%	1	1	0.5%
	1751-1775	3	2.9%	2	11	6.4%
	1776-1800	6	2.5%	3	5	1.0%

Trade	Date	No.	% of Metals	No. with prop.	No. of props.	% total prop.
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<u>Trade</u>	<u>Date</u>	<u>No.</u>	<u>% of Metals</u>	<u>No. with prop.</u>	<u>No. of props.</u>	<u>% total prop.</u>
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Brass-founder	1700-1725	1	1.4%	-	-	-
	1725-1750	3	2.9%	2	8	4.2%
	1751-1775	6	2.5%	4	7	4.1%
	1776-1800	12	4.9%	4	8	1.6%

White-smith	1700-1725	3	4.1%	2	3	5.6%
	1726-1750	5	4.8%	4	7	3.7%
	1751-1775	5	4.8%	3	14	8.1%
	1776-1800	2	0.8%	2	9	1.8%

Women	1700-1725	5	6.8%	-	-	-
	1726-1750	14	13.5%	6	20	10.6%
	1751-1775	4	3.8%	3	9	5.2%
	1776-1800	31	12.7%	20	53	10.7%

Table 12 - Property left by major tradesSheffield 1725 - 1800

Trade	Date	No.	% of Metals	No. with prop.	No. of props.	% total prop.
Cutler	1700-1725	69	68.3	48	102	63.8
	1726-1750	81	50.3	54	119	45.8
	1751-1775	78	35.1	51	130	37.4
	1776-1800	87	33.7	60	212	47
Scissor-smith	1700-1725	9	8.9	7	18	11.3
	1726-1750	20	12.4	16	55	21.2
	1751-1775	8	3.6	5	13	3.7
	1776-1800	7	2.7	5	12	2.7
File-smith	1700-1725	1	1	1	1	0.6
	1726-1750	17	10.6	9	17	6.5
	1751-1775	6	2.7	4	10	2.9
	1776-1800	18	7	14	28	6.2
Watch-maker	1700-1725	1	1	1	2	1.3
	1726-1750	1	0.6	1	3	1.2
	1751-1775	3	1.4	2	10	2.9
	1776-1800	5	1.9	1	1	0.2



Trade	Date	No.	% of Metals	No. with prop.	No. of props.	% total prop.
<u>Trade</u>	<u>Date</u>	<u>No.</u>	<u>% of Metals</u>	<u>No. with prop.</u>	<u>No. of props.</u>	<u>% total prop.</u>
Iron-monger	1700-1725	1	1	1	5	3.1
	1726-1750	6	3.7	5	13	5
	1751-1775	5	2.3	1	1	0.3
	1776-1800	1	-	-	-	-
Button-maker	1700-1725	1	1	1	8	5
	1726-1750	5	3.1	3	4	1.5
	1751-1775	9	4.1	6	10	2.9
	1776-1800	3	1.2	3	4	9
Women	1700-1725	2	2	2	2	1.3
	1726-1750	1	0.6	1	1	0.4
	1751-1775	63	28.4	25	56	16.1
	1776-1800	83	32.2	40	85	18.8

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