1. Why a ‘spatial history’ of an industrial city?

The spatial qualities of British cities associated with the industrial revolution (classically
dated from 1780-1840) are rarely considered separately from their legacy of environmental
degradation: stinking rivers, squalid housing and filthy air. This is particularly true for
the period of urbanisation before the arrival of the tram and the railway towards the
middle of the nineteenth-century. The theoretical and methodological difficulties involved
in researching ‘urban spaces past’ has resulted in a failure to distinguish conceptually
between the articulation of particular ‘representations’ or ‘theorisations’ of the industrial
city’s socio-spatial significance and the need for spatially sensitive historical contexts for
understanding the lives the people who inhabited them. The industrial city continues to
lie on the dark side of the urban imagination, a problem rather than a place.

Such is the absence of an historical spatial perspective that the revisionist historian
J.C.D. Clark is able to question whether the industrial revolution was anything other
than a “term of historical art”.1 Of course, industrialisation and urbanisation were not
synonymous, but related, historical processes which were locally rather than universally
experienced, but it can hardly be in doubt that the mushrooming towns of the north
of England bore witness to their existence. One aspect of Clark’s argument is that he
does not believe a distinctively urban culture arose in England as a consequence of ur-
ban migration during the early industrial period, characterising the transformation as a
rather reluctant intermingling of urban and rural cultures.2 This is interesting because
it precisely reveals the nature of the historical problem addressed in this paper. Clarke
is unable to satisfactorily express socio-spatially his culturally based argument which in
itself has considerable merit. Between the ‘rus’ of the countryside market town and the
‘urbe’ of the City of London (perhaps extended to include cathedral and university towns)
unprecedented urbanisation undoubtedly occurred during the industrial revolution but it
was, and largely remains, an urban transformation without a spatial - or a social - identity
of its own.

This paper addresses the question of spatial identity in early industrial Sheffield. It
starts from the premise that the generation of urban space through persistent industrial
activity is the critical relation.

2. Industrial functions in early industrial Sheffield

Between 1770 - 1850, Sheffield’s metal trades expanded prodigiously, predominantly in
the areas of cutlery manufacture, silver plated goods and steel production. Industrial

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1 Clark, 2000, p.449.
2 Clark, 2000, p.463-4
organisation in the metals industry during this period was generally small scale, the typical unit of production being the individual cutler in his (and occasionally her) workshop. Plating and steel production were larger operations but they still relied on small teams of skilled metal workers and bore little resemblance to the factories of the textile industry or the steel works of the later nineteenth-century.

The data regarding industrial functions presented in this paper, therefore, overwhelmingly represents the economic activity of independent cutlers and metal workers or small, usually family based, partnerships. This quality makes Sheffield particularly suitable for research into the spatiality of the industrial city since the growth of the cutlery industry and the expansion of the city appear to be related in a demonstrably ‘bottom-up’ process. In principle, the genuinely ‘organic’ nature of this urban transformation should make it easier to discern the relation of space and society over time by eliminating the distorting effect of large-scale interventions in the urban fabric.

The small amount of capital needed to set oneself up as an independent cutler and the limited amount of physical space cutlery manufacture required meant that relatively little economic power was necessary to enter the industry. The cutlers, known as ‘little mesters’, generally practiced what shall be referred to as the ‘core trades’ of the city: manufacturing pen and pocket knives, table knives, razors, scissors, files and handles, (known as ‘hafts’ and involving final assembly of the knife), which between them account for 42% of the total sum of industrial functions in sample.

3. The dataset

An extensive database containing approximately 20,000 records was compiled from six commercial directories for Sheffield, published between 1774 -1841. The directories contain various information, including location by street, of all the principal trades people in Sheffield during these times. They form the basis of the time-series (t1...t6) for the years: 1774 (t1), 1787 (t2), 1797 (t3), 1817 (t4), 1825 (t5) and 1841 (t6). The irregular intervals of the time-series reflects the publication dates of extant directories and the selection of those which provided the most data on industrial functions.

From the database all streets containing individuals or firms connected with Sheffield’s metal industries were extracted to provide a sample of what are generically referred to here as ‘industrial functions’ and ‘industrial streets’. This wide range of related trades is distinguished from other local industries, such as brewing, by its national and international market. Further data analysis extracted the full range of different functions performed in combination and counted each one separately. A large company therefore may have performed many functions whereas an individual cutler may have performed only one.

For the time-series (t1...t4) the sample of industrial functions is identical to the universe of industrial functions in the database. For time-series (t5-t6) it was necessary to restrict the sample to those streets which contained more than one, (t5), or more than ten, (t6), directory entries. This was because the greater number of streets and trades covered in the later directories meant that an exhaustive sample was impractical. However, once a street appeared in a time-series, it was included in all subsequent ones to ensure a comparison of streets over as many time-series as possible. In total, the sample (t1...t6) consists of 249 ‘industrial streets’ containing 7028 industrial functions of 107 types.
4. Methodology

The aim of the study was to enquire into how Sheffield’s burgeoning metal trades were collectively implicated in the emergent temporal-spatial structuring of the city, rather than to investigate the distribution of any given function or set of functions. For this reason, it was decided that a traditional ‘dots on maps’ approach would not provide the appropriate analytical framework for this study. Initial examination of the sample data established that the dominant characteristic of Sheffield’s industrial functions during this period was not their clustering in particular ‘quarters’, though local concentrations did exist, but rather their ubiquity throughout the newly built areas of the town. Existing locational studies of industry in early industrial Sheffield confirmed this impression. 3

For this reason it seemed desirable to employ a scaling technique, scalogram analysis, (described below) which would facilitate an assessment of the extent to which industrial functions provided an index, or structuring principle, to the expansion of Sheffield during this period. This involved the addition of temporal and spatial data to the sample of streets so that the value of any such index could be evaluated.

4.1. Adding temporal and spatial data

In order to identify temporal processes across the time-series, an additional datafield, ‘first-function’, was added to each street and assigned a value from one to six dependent on which time (ti) the street first appeared in the sample. Although the dating of first-function streets is not equivalent to their date of construction, it does reflect their rate of economic development, which for most streets is a reliable index of the period over which they were physically constructed. Irregularities occur with a small number of streets, mainly in the old centre of town, which were not generally industrial, but where industrial functions appear sporadically. The data was normalised so that each ‘street’ in the sample corresponds to approximately equivalent urban space across the time-series. Where the ‘spatial lineage’ of a street is too unclear, it has been excluded from the sample.

Spatial variables have been assigned to each street using space syntax methodology originally developed by Hillier and Hanson4. These values have been generated through the creation of two axial maps of Sheffield, for 1774 (t1) and 1850 (t6), making it possible to compare spatial values at either end of the time-series. Where a street consisted of more than one line, syntactic measures have been averaged. Two further axial maps for 1736 and 1808 have also been created and analysed to inform the conclusions of this study.

Axial maps are the representation of an urban area in terms of the longest and fewest lines it takes to pass through all the space. The axial map is analysed as a graph in which a line is a node and an intersection of lines is an edge between nodes. The analysis produced measures for depth, local and global integration. Depth measures the number of steps it takes to move from one line to another. Global (radius-n) integration is a measure derived from calculating the mean depth of a line from all other lines in the system, local (radius-3) integration calculates the mean depth of a line from all other lines to a step-depth of three. Extensive research has shown that the relation of local and global integration generates predictable patterns of movement around the urban grid which exert a profound influence on patterns of land-use.5.

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3 Hunt, 1956, p. 235; Beauchamp, 1997, p. 42-43
4 Hillier & Hanson, 1984
Space syntax is compatible with historical method because it acknowledges the bottom-up generation of the ‘spatial configuration’ - that is, social structures embodied in space and recovered, piecemeal, by the human subject over time.\textsuperscript{6} Traditionally, the research focus has been on the structural, or ‘top-down’ level of analysis which tends to privilege the synchronic over the diachronic, though this has begun to change.\textsuperscript{7} The approach taken here is to recognise the mutuality of bottom-up and top-down perspectives and move from the individual engaged in industrial activity in a particular time and place to the configurational properties of space over time, and back again. This involves approaching the spatial configuration as a temporally plastic context rather than a synchronous structure - of course it is both. By analysing the relation of form and function in this manner it is hoped to reveal the spatiality of diachronic processes as well as the synchronic states that comprise historical space.

4.2. Scaling the data

The sample data was examined using scalogram analysis, a non-parametric ranking technique which uses the presence or absence of a single variable to determine the rank-order of the ‘items’ being scaled.\textsuperscript{8} A robust scale should be representative of the whole universe of variables. Scalogram analysis has been used by historical geographers to reveal the functional basis of regional urban hierarchies.\textsuperscript{9} An important feature of scalograms is their visual legibility which facilitates hypothesis formation by providing an “easily assimilated picture of the configuration of the data”.\textsuperscript{10} The potential of this method to tease out the structural relation between streets on the basis of extant source data concerning industrial functions recommended it for this study.

The raw time-series data was arranged into six matrices. A further matrix ($\Sigma t_1...t_6$) was also constructed which contained all the data in the sample. In each matrix ($t_1...t_6$), the x-axis (streets) and the y-axis (types of industrial function) were arranged in descending rank-order from left to right and top to bottom respectively. The x-axis was ranked according to the range of different industrial functions present on that street, the y-axis was ranked according to the total number of streets containing at least one instance of that function. Each point (x,y) on the matrix, provides the exact number of instances of the function. Figure 275 shows a close-up example of the matrix for the 1774 time-series ($t_1$).

In all six matrices, some approximate scaling is visually evident in the relative concentration of functions in the top-left corner and their relative sparsity in the bottom-right corner. However, the data was too irregular to meet the minimum criterion for ‘true’ scalogram analysis which stipulates a maximum of 10% error\textsuperscript{11}. Even in the matrix ($\Sigma t_1...t_6$) only 12% of grid co-ordinates (x,y) were present in total. This meant the sample could not possibly scale since the minimum number of errors was 38%, even if there were no

\textsuperscript{5} Penn, 2003
\textsuperscript{6} Hillier, 2001
\textsuperscript{7} Penn, 2003
\textsuperscript{8} Stouffer, 1950; Hagood, 1952
\textsuperscript{9} Patten, 1978
\textsuperscript{10} Patten, 1978, p. 255
\textsuperscript{11} Stouffer, 1950, p. 77-80
scale errors in the 12% positive responses. We can conclude from this that an instance of a particular set of functions occurring on one street would only provide a very approximate guide to the functions appearing on the streets immediately above and below it in the rank-order. There could not be said to be a ‘typical’ scale of industrial street in early industrial Sheffield.

The scalogram analysis highlighted the fact that, despite the existence of a very approximate visual ‘scale’, the large number of discrepancies within this pattern appear to be randomly distributed. There do not appear to be any latent ‘sub-patterns’ in the data that would suggest the universe of industrial functions consists of a number of sub-scales, which further analysis could reveal.

Reducing very substantially the number of functions included in the sample could improve scalability by restricting analysis to the core cutlery functions. Our purpose however, was not to find the most scaleable set of industrial streets through a reductionist approach to our data but to identify the historical relation of industrial activity to urban form.

4.3. The absence of a strong hierarchical relation between industrial streets

In order to test the result of the scalogram analysis, which pointed to an absence of a significant linear scale in the rank-ordering of industrial streets, the regression of the rank-order against spatial variables and temporal variables was evaluated.

From 1770-1850 Sheffield expanded in all directions (especially to the west) around its medieval centre. A street’s first-function (ti), therefore, clearly implies something about its metric distance from this centre. In the matrix (t6), the regression of a street’s first-function (ti) value against its rank-order gave an r-squared of 0.08, showing no significant relationship. This suggests it would be incorrect to characterise the rank-ordering of industrial streets as a function of metric distance from centre to edge. While it is generally true that first-function streets which contain most functions in total (t1-t3) are more geographically central than first-function streets (t4-t6), this is more likely to be a result of

| RANK-ORDER OF INDUSTRIAL STREETS BY INDUSTRIAL FUNCTION: SHEFFIELD 1774 (t1) | NOROOLY STREET | WARDER GREEN | HONITET | CHIRCH LANE | ROKELEY CROFT | COOLDIT LANE | PEJ-CROFT | DURLEY STREET | WHITESTR STREET | BROAD STREET | POOL STREET |
|---------------------------------|----------------|--------------|---------|------------|---------------|-------------|-----------|--------------|---------------|-------------|
| PEN & POCKET KNIVES            | 1              | 2            | 1        | 5          | 2             | 6           | 3         | 1            | 3             | 5           | 3           | 2           | 1           | 6           | 3           | 4           | 5           | 4           |
| TABLE KNIVES                   | 2              | 3            | 2        | 1          | 4             | 2           | 1         | 1            | 1             | 1           | 1           | 1           |
| FILES                          | 4              | 1            | 3        | 2           | 3             | 1           | 1         | 1            | 1             | 1           | 1           |
| RAZORS                         | 2              | 1            | 1        | 2           | 1             | 1           | 1         | 1            | 1             | 3           | 1           | 2           |
| SCISSORS                       | 1              | 1            | 1        | 2           | 1             | 1           | 1         | 1            | 1             | 1           | 1           |
| NON-SPECIFIC CUTLERS           | 2              | 1            | 2        | 1           | 2             | 1           | 1         | 1            | 1             | 2           | 1           |
| SILVER & PLATED GOODS          | 3              | 1            | 1        | 2           | 1             | 1           | 1         | 1            | 1             | 1           | 1           |
| SPOTTED KNIVES                 | 1              | 1            | 2        | 1           | 1             | 1           | 1         | 1            | 1             | 1           | 1           |

Figure 275: Detail of matrix showing rank-order of sampled streets by industrial function 1774 (t1)
the persistence and intensification of industrial activity over a greater period of time (an issue that will be returned to). The majority of Sheffield’s expansion to 1850 occurred unevenly within a square mile around the market place. While peripheral locations may have been less industrialised in 1841 (t6) than in 1817 (t4), they were hardly non-industrial. For example Fitzwilliam Street, first-function (t6), was still at the edge of the built up area in 1850 but already a hub of industrial activity in 1841.

It is possible that topological, rather than geographical, measures of centrality could help explain the rank-ordering of streets by industrial function.\textsuperscript{12} This proved not to be the case. A comparison of the industrial (i.e. containing industrial functions) and non-industrial (i.e. not containing industrial functions) axial lines in (t1) and (t6), on the basis of their depth from the most globally integrated line at each time, showed that there was little to distinguish them. A comparison on the basis of depth from the market place yielded a similar result. Further regression analyses correlated the rank-ordering of streets for (t1) and (t6) against the syntactical measures of local and global integration. No significant correlations were found (the highest r-squared was 0.05), indicating the need for a more ‘heuristic’ or perhaps ‘historical’ approach to the relation of industrial functions and the emerging spatial configuration.

It was not considered surprising that the rank-ordering of industrial streets did not conform to a ‘true’ scale. A manufacturing process comprised of small autonomous units might logically gain from a non-centralised mode of organisation which allowed information to be widely distributed. This would be consistent with Geoffrey Tweedale’s characterisation of early industrial Sheffield as an innovative milieu in which the multiplicity of skills was an essential factor in generating entrepreneurship “from the ground upwards”.\textsuperscript{13}

This suggests a hypothesis in which the ‘top-down’ structuring of the urban grid through movement might have its ‘bottom-up’ analogue in the expansion and organisation of the grid through industrial activity: where the grid functions more or less generically, the organisation of space itself is constantly evolving as the city grows. Industrial functions, without the locational imperative of businesses directly dependent on passing trade, may have been freer to develop new urban areas and take advantage of whatever suitable locations became available. In this sense the industrial city innovated spatially by investing in the diachronous, historical, identity of space: the potential for distinct industrial activities to arrange themselves over time in an apparently random manner but with the potential to confer mutual benefits. If time, as Jane Jacobs has argued, is the “constructive factor” in cities, this would provide a reason for the absence of a meaningful rank-order scale of industrial streets, since data arranged in time-series are not, ironically, sensitive to the uneven temporal texture of the states they describe.\textsuperscript{14} The remainder of this paper will be concerned to investigate this hypothesis.

5. The chronology of functional-space

Figure 276 represents as a ‘chronological bar-code’ the rank-order of first-function streets (t6). The varied shading refers to the different first-function values of the streets. A definite, though highly irregular, pattern can be observed: moving from left (high functional range)

\begin{itemize}
  \item \textsuperscript{12} Hillier, 1999, p. 110
  \item \textsuperscript{13} Tweedale, 1995, p. 35
  \item \textsuperscript{14} Jacobs, 1994, p.143
\end{itemize}
to right (low functional range) the clumps of first-function street groupings become larger. This suggests that each new set of first-function streets contained an approximately similar distribution of functions: one or two with many, and many with few.

When comparing the chronological bar-codes of different time-series, it is generally true that, following the first time a new street appears, its position tends to remain more or less stable in the rank-order hierarchy - relatively, as new streets are added in the subsequent time-series. Over time, the average number of functions per street in a first-function group \((t_i)\) tend to stabilise just below the average number of the previous time-series. This suggests that the arrangement of industrial functions in expanding urban space may have an identifiable diachronic arrangement. In Sheffield’s case the correct description of such expansion would not be hierarchical, from the centre out, but wave-like and similar at each stage of expansion.

This becomes clearer if the series of streets in each time-series matrix are rearranged into their first-function groups, moving from \((t_1)\) on the left through to \((t_6)\) on the right. Within each first-function group the arrangement of the streets is arbitrary according to the initial sampling procedure. Figure 277 shows the sum of industrial functions for each street in the sample at each stage in the times-series. The sequence of peaks and troughs in the graphs clearly show a high degree of regularity and repetition, though the overall pattern is still considerably ‘messy’. The implication is that the ‘self-similar’ regularities in Figure 277 contains information about the nature of urban expansion in early industrial Sheffield. The organisation of urban space by industrial functions is perhaps better understood diachronically, in terms of regularities across scales, rather than synchronically in terms of a single scale.

Figure 278 shows, on a log-log graph, the total number of pen and pocket knife functions for all streets present in each time-series. The pattern of distribution \((t_1...t_6)\) suggests that each new wave of functional expansion was substantially similar to the previous one in terms of the number of new pen and pocket knife cutlers added per street. It is worth noting that, as Sheffield expanded, new industrial functions were added to the city in a pattern superficially analogous with the power-law distributions of axial line lengths identified by Carvalho and Penn as being universally characteristic of cities. Although no significant relationship has been identified between axial line length and number of functions, it implies some kind of relationship existed between patterns of industrial activity and patterns of morphological expansion.

This self-similar tendency in the temporal texture of functional space is detected in the...
Figure 277: Sum of industrial functions per street (t1...t6)

Figure 278: Rank-order of pen and pocket knife functions per street (t1...t6)
arrangement of pen and pocket knife cutlers, table knife cutlers and hafters in 1841 (t6). All three crafts are highly skilled finishing processes in the manufacture of knives. Figure 279 clearly shows that, while there is a marginal preference for hafters to be located in the more central streets (first-function t1), the distribution in each first-function ‘wave’ is fairly consistent, while gradually diminishing overall. Agglomeration suggests the organisation of a range of functions in a manner which confers mutual benefit but without implying any intentional co-operation on behalf of individuals. A large number of individual cutlers are implicated in what could be called ‘temporal agglomeration’ in early industrial Sheffield.

The temporal agglomeration of industrial functions could have helped ensure an efficient distribution of functions throughout the city by operating at a number of spatial scales. Local functional imbalances could, it implies, be compensated for at the urban scale, or in another local area. This would have been an advantageous outcome in a small workshop based industry which relied upon the city itself to communicate innovation and information. As one recent local history has pointed out:

Many independent craftspeople worked on only a single stage of production... Articles often circulated around the town between different artisans, who each completed their part in the manufacturing process before passing it on for the next stage.17.

This temporal regularity in the generation of functional space was a distinctive characteristic of early industrial Sheffield.

17 Wray et al, 2001, p. 11
6. The organisation of functional space

This section examines how the temporal distribution of functions in early industrial Sheffield was embedded at the local scale in the spatial configuration of the city. One advantage of deploying time-series data is that the local grid conditions that create centrality can be recognised as a process of spatio-functional organisation over time on the urban periphery: Hillier’s ‘edge city’.\(^{18}\) In early industrial Sheffield this was clearly a ‘bottom-up’ process, in the sense that, even in larger areas which were deliberately planned, their development took place over a number of years and they were just one of the morphological forms that expansion took.

Two types of local centrality for early industrial Sheffield are selected here as examples. They are presented in Figure 280 in the context of an axial map showing local integration (radius-3) for Sheffield in 1850 (t6). Both lines are picked out by this map as highly locally integrated. The Moorfields-Shalesmoor centrality developed along a radial route leading out of Sheffield to the north-east. The Eyre Street centrality is part of a grid development to the south-west of the old centre. The axial lines for these two areas are shaded according to connectivity (number of links to other lines), with the darkest grey being the most connected.

The two local integrators best define their local grid conditions at a depth of two steps from the principal line.\(^ {19}\) The Moorfields-Shalesmoor integrator (Figure 280) picks out the grid intensification which developed out along the northern edge of the late eighteenth-century town. Eyre street neatly picks out the planned grid development and connects it to the wider system. (Note that in Figure 280 only lines at one step depth from Eyre Street are shown. These represent the extent of the street sample for the functional analysis.

\(^{18}\) Hillier, 1999, p. 108

\(^{19}\) Hillier, 1999.
presented in the next sub-section). The axial lines comprising these two-step local grids show a higher correlation of local and global integration than the average for Sheffield in 1850 ($r^2$ 0.38 for Moorfields-Shalesmoor and 0.57 for Eyre Street contrasted with 0.35 for all lines). This highlights, more particularly in the case of Eyre Street, the organisational role of these lines within the global structures of Sheffield at this time. The Moorfields-Shalesmoor centrality is relatively more locally than globally integrated as might be expected from its ‘griddiness’ but relatively peripheral location. It provides a ‘snapshot’ example of the temporal texture of spatio-functional agglomeration as it appeared at (t6). The Eyre Street area is given as an example of functional persistence in historical space.

6.1. Moorfields-Shalesmoor local integrator

The sub-sample of streets comprising the Moorfields-Shalesmoor centrality (t6) taken at up to two steps depth from the integrating radial, comprises 17 streets from all first-function groups in the following distribution: t1:1, t2:3, t3:1, t4:4, t5:3, t6:5. The sub-sample is not exhaustive of all lines in the local grid since it only includes streets from the original sample. St.Phillips Road has not been included as the section adjoining the radial had not been developed by 1850.

The number of functions present on each street in the sub-sample at each time (ti) was compiled and arranged by function. A small selection of the results are shown in Figure 281 which compares the functional composition of Moorfields-Shalesmoor centrality by street, with the average total on the equivalent number of streets in the whole sample at each time. The base average per street was calculated by dividing the total sum of functions by the total number of streets containing at least one instance of that function at each time (ti).

Figure 281 shows that, with respect to the two examples of pen and pocket knife and file manufacture, the functional development of the Moorfields-Shalesmoor area over time broadly mirrored that of Sheffield as a whole. Furthermore, the sub-division of each function-type total into separate totals for each street shows that no one street was responsible for generating this pattern, though Gibraltar and Meadow Street are dominant. This distribution of functions across streets was the accumulative effect of spatio-functional development from the bottom-up. The wide range of functions in the area comprised an agglomeration of related trades in the cutlery and metal industry. This suggests that the Moorfields-Shalesmoor centrality would have been capable, to a certain extent at least, of generating its own ‘external economy’ of information and skills at a local scale without recourse to global structures.

6.2. Eyre Street local integrator

Another concept pertinent to the historical analysis of industrial functions is persistence. This is defined as the tendency of a given functional identity to remain consistently present in a location over time. Where persistence is not in evidence then it might be thought that socio-economic or cultural changes are assigning new meaning to urban form, which in time may affect a subsequent spatial transformation. The period of 1770-1850 in Sheffield was marked by high levels of functional persistence in most locations due to the continuing growth of the cutlery and metals industries.

Figure 282 (left-hand graph) shows the persistence over time of selected functions in
Figure 281: Functional composition of the Moorfields-Shalesmoor area by street compared with average for Sheffield in 1841 (t6).

Figure 282: Functional persistence in the Eyre Street area as sum and percentage of total functions in Sheffield (t1...t6).
the Eyre Street centrality during the early industrial period. For comparison, Figure 282 (right-hand graph) represents this as a percentage of the total instances of that function in Sheffield at each time (ti). Only streets at depth of one step from the main integrator formed the sub-sample. It was thought that, given the relatively small size of the urban area overall, an analysis of industrial functions at two steps depth from one of the principal local-global integrators might obscure some of the local functional arrangements that are our concern here.

In the Eyre Street area, cutlery manufacture, silver plating, specialist hafting and mercantile activity (not shown in Figure 282) all showed high levels of persistence. The long term importance of the area to producing high quality silver cutlery and plated goods contrasted with the relatively small (but equally persistent) role of pen and pocket knife production. The persistence of table knife manufacture in this area suggests the presence of larger firms who increasingly moved into this, relatively less skilled, area of production. The high proportion of dessert knives produced here is indicative that a high degree of specialisation in cutlery manufacture emerged in this area.

During the early industrial period, the relation of industrial functions and urban form was characterised at the local level by a series of morphologically varied local centres organised spatio-functionally over time. These appear to have recreated at a smaller scale the social conditions propitious for the rapid development of the cutlery industry which characterised Sheffield as a whole, but with local variations reflecting particular spatial histories.

7. Conclusion

It is hoped that the approach adopted here to the history of early industrial Sheffield has indicated how an analysis of the historical texture of space might provide a context for understanding the simultaneity of change and continuity in an urbanising society. Industrialisation in Sheffield gave rise to a complex and distinctive form of social-spatial organisation comprehensible across different scales and emergent over time. The city’s multiplying smoke filled streets, in their energetic generation of social worlds on the urban periphery, were, in a sense, ‘technologies’ no less implicated in transforming the horizons of social experience than the later developments of the tram and the car. The smoke is gone, but Sheffield remains. If the significance of the industrial city is sometimes misunderstood it is because, despite the furious human endeavour it embodies, we often see only what it is not: a compact citadel, an urbane market town.

Literature


