

**The London School of Economics and Political Science**

*Networks, Innovation and Knowledge: The North  
Staffordshire Potteries, 1750-1851*

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A thesis submitted in the Department of Economic History of the London School of  
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## **Declaration**

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## **Abstract**

During the eighteenth and nineteenth centuries, the industrial district of the North Staffordshire Potteries dominated the British earthenware industry, producing local goods that sold in global markets. Over this time the region experienced consistent growth in output, an extreme spatial concentration of physical and human capital, and became home to some of the most famous Master Potters in the world. The Potteries was also characterised by a growing body of useful and practical knowledge about the materials, processes and skills required to produce world-leading earthenware. This thesis exploits this striking example of a highly concentrated and highly skilled craft-based industry during a period of sustained growth and development which offers a rich opportunity to contribute to several strands of economic and business history. This thesis presents and analyses new empirical evidence based on trade directories to examine the organisational evolution of the district. It reconstructs the district at the firm level, showing that the region's growth was incredibly dynamic. The spatial concentration of producers and the importance of social and business networks are also explored through a new map of the region in 1802 and social network analysis.

As a study of a craft-based, highly skilled industry without a legacy of formal institutions such as guilds to govern and protect access to knowledge, this thesis also offers substantial empirical and historiographical contributions to the study of knowledge and innovation during the period of the Industrial Revolution. It presents a new database of pottery patents alongside a variety of qualitative evidence such as trade literature, exhibition catalogues, advertisements and sales catalogues. Quantitative and qualitative analysis reveals the low propensity to patent in the North Staffordshire pottery industry, and provides a new typology of knowledge used in the industry. It argues that the types of knowledge being created and disseminated influenced the behaviour of producers substantially, and this typology of knowledge is far more complex than those established tacit/explicit divisions favoured in historical study and the social sciences more broadly.

The findings of this thesis allow us to answer numerous outstanding questions concerning the development of the North Staffordshire Potteries during the eighteenth and nineteenth centuries. When brought together in such a way, the complementary strands of research and findings presented offer a coherent narrative of an extremely complex and dynamic cluster of production that both challenges and confirms traditional historiographical tradition concerning industrial districts.

## Acknowledgements

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As I contemplate life with a young family after a PhD, the words of Monty Python seem rather apt...

*"And now for something completely different"*

Joe Lane, Oxhey, April 2018.

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# Part One: The Industrial District

## 1 Introduction

The North Staffordshire Potteries, a small region in the West Midlands seven miles long and three miles wide, accounted for almost eighty per cent of the total labour force employed in English earthenware manufacture in 1820. By this time there were over 140 firms operating in the region with some of the largest producing in excess of 500,000 pieces annually.<sup>1</sup> A staggeringly diverse array of goods were produced ranging from the highest quality ornamental wares, such as Josiah Wedgwood's Portland Vases of 1789-90, to more simple everyday tableware such as plates, cups and saucers.<sup>2</sup> Over the course of the seventeenth and early eighteenth centuries the centre of production of earthenware in England gradually shifted from London to the Potteries; after which, a period of sustained growth and development ensured the region's national and international presence. The name 'The Potteries', originally bestowed on the region by outsiders, became so embedded in the inhabitants' sense of identity that 'Staffordshire-ware' quickly became a familiar and established feature of English pottery production.<sup>3</sup> Indeed by Josiah Wedgwood's death in 1795, 'Staffordshire-ware' could be considered to be a truly global commodity with exports reaching Continental Europe, the West Indies, the Americas, the Far East, Russia, and Africa.<sup>4</sup>

To make pots is difficult; to consistently produce a diverse range of high-quality earthenware, even more so. A global feature of pottery production which transcends the local or national level is the astounding amount of knowledge, skill and 'ingenious manual labour' required, much of which is

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<sup>1</sup> Lorna Weatherill, *The growth of the pottery industry in England 1660-1815* (Garland Publishing Inc.: London, 1986), pp. 393, 453. Refer to Figure 3.1 for location of North Staffordshire.

<sup>2</sup> The ceramics gallery at the V&A museum in London houses thousands of different pieces of Staffordshire produced earthenware which are regularly on display.

<sup>3</sup> Harold Owen, *The Staffordshire Potter* (Grant Richards: London, 1901), p. 1.

<sup>4</sup> Weatherill, *The growth of the pottery industry*, pp. 132, 306-11, 353-6.



extremely difficult to articulate or express explicitly.<sup>5</sup> The pottery industry of North Staffordshire was no exception; during the period 1750-1851 the region was characterised by a growing body of useful and practical knowledge about the materials, processes and skills required to produce ‘local’ goods that sold in global markets.<sup>6</sup> The skills and knowledge essential to succeed in the industry were recognised by contemporary commentators as somewhat elusive and typically attached to the individual. These were features known to contemporary commentators such as R. Campbell, the author of the *London Tradesman*, who understood that the ‘secret of the composition’ of earthenware could come and go with individuals, and that a potter ‘must carry always in his head’ key principles such as colour and design.<sup>7</sup> The difficulty of articulating and deciphering such knowledge and skill is abundant in contemporary attempts to describe various production processes with generic or context-specific phrases such as ‘like cream in consistency’ frequently used.<sup>8</sup>

Nevertheless, despite the difficulties and ‘cognitive limitations’ associated with the transfer of technical and tacit knowledge in the pre- and early modern period, the Potteries remained the centre of a highly competitive and successful English industry until the closing decades of the twentieth century.<sup>9</sup> Such a striking example of the continued geographical concentration of a highly skilled craft industry during a period of sustained growth and development illuminates several key issues of relevance to economic historians. There is an opportunity, therefore, to expand our understanding of the dynamic evolutionary processes through which craft-based industries have developed within the context of intense spatial and social proximity.

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<sup>5</sup> Simon Schaffer, ‘Introduction’, in Lissa Roberts *et al* (eds.), *The mindful hand: Inquiry and invention from the late Renaissance to early industrialisation* (Edita KNAW: Amsterdam, 2007), p. 315.

<sup>6</sup> Weatherill, *The growth of the pottery industry*, p. 43.

<sup>7</sup> R. Campbell, *The London Tradesman, being a compendious view of all the trades, professions, arts, both liberal and mechanic, now practised in the Cities of London and Westminster* (T. Gardner: London, 1747), pp. 185-6.

<sup>8</sup> See part two of the thesis for an in-depth discussion of the types of knowledge used in pottery production: Society for the Diffusion of Useful Knowledge, *The Working-Man’s Companion: The Results of Machinery* (Charles Knight: London, 1831), p. 125.

<sup>9</sup> Stephan R. Epstein, ‘Property Rights to Technical Knowledge in Premodern Europe, 1300-1800’, *American Economic Review*, Vol. 94, No. 2 (2004), p. 382; Andrew Popp and John F. Wilson, ‘The emergence and development of industrial districts in industrialising England, 1750-1914’, in Giacomo Becattini *et al* (eds.) *A Handbook of Industrial Districts* (Edward Elgar: Cheltenham, 2009), p. 52.

We know that aside from the application of steam power to turn wheels and lathes and grind raw materials, the introduction of mechanised production was rather late in North Staffordshire, at least in comparison to other industries. Between 1840 and 1843 John Ridgway and George Wall invented and patented a mechanical device for making flat-ware known as a *jolly* or *jigger*.<sup>10</sup> Although several factories did adopt this machinery during the 1840s, it was not until the 1870s that these were in general use throughout the district.<sup>11</sup> Contemporaries were also aware of the lack of mechanisation in the industry with a writer in *Mechanics' Magazine* stating in 1839 'machinery has not introduced its iron hand very extensively into the making of pottery. It is still an art as much as it is a manufacture.'<sup>12</sup> Production was still largely craft-based well into the nineteenth century and, unlike other industries with significant mechanical elements, the production process was still fundamentally embodied in the hands and minds of the master potters and their assistants.

The Potteries is an example of a 'classic' industrial district and should be approached with the same vigour and prominence as other historical districts and industries such as cotton production in Lancashire, the woollen sector in Yorkshire, and the metal working districts of South Yorkshire and the West Midlands<sup>13</sup> The North Staffordshire pottery industry is exceptional and warrants particularly close study because, unlike these other industrial districts, the Potteries did not fully experience the 'terminal phase' of its life-cycle until the first decade of the twenty-first century.<sup>14</sup> For more than a quarter of a millennium the region demonstrated remarkable resilience, flexibility

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<sup>10</sup> See patents 8339, 8340, 9901, Bennet Woodcroft, *Patents for Inventions: Abridgments of the Specifications relating to Pottery*, (Patent Office: London, 1863).

<sup>11</sup> *The Potter's Examiner and Workman's Advocate*, Vol. 2, No. 24, 9 November 1844; W. H. Warburton, *The History of Trade Union Organisation in the North Staffordshire Potteries*, (George Allen & Unwin Ltd: London, 1931), p. 191-2; Burchill, F, and Ross, R., *A History of the Potters' Union* (Ceramic & Allied Trades Union: Stoke-on-Trent, 1977), p. 154; J. L. and B. Hammond, *The Rise of Modern Industry, edition 4* (Methuen & Co.: London, 1930) p. 172; A. Lamb, 'The Press and Labour Response to Pottery-making Machinery in the North Staffordshire Pottery Industry', *Journal of Ceramic History*, Vol. 9 (1977), p. 6.

<sup>12</sup> *Mechanics' Magazine*, Sat 6 April, 1839, pp. 14-15.

<sup>13</sup> Andrew Popp and John F. Wilson, 'Districts, networks and clusters in England: An introduction', in Andrew Popp and John Wilson (eds.) *Industrial Clusters and Regional Business Networks in England, 1750-1970* (Ashgate: Aldershot, 2003), pp. 14-15.

<sup>14</sup> Popp and Wilson, 'The emergence', p. 52.

and persistence. Indeed, Emma Bridgewater still produces large quantities of hand-made wares in Stoke-on-Trent for an international market.<sup>15</sup>

The 'life-cycle' model, proposed by business historians John Wilson and Andrew Popp, though far from rigid and certainly not inevitable, can generally be seen to explain the decline of industrial districts in England in the long-term. The cycle involves six stages: critical mass, take-off, cooperative competition, maturity, saturation and finally, either decline or renaissance.<sup>16</sup> The period of study chosen, 1750-1851, has been chosen as it was during this time that the district experienced the second two stages, take-off and *cooperative competition*, having achieved critical mass by around 1760 after a century of initial development.<sup>17</sup> The path to critical mass can be traced back to the seventeenth century. Weatherill identifies a first period of development for the industry at the national level, from roughly 1660-1720. During this time, the different branches of earthenware production expanded as the labour force in stoneware in particular grew rapidly.<sup>18</sup> It was also during this time that the location of the industry was changing, with London dominating, only to be challenged from the turn of the century by North Staffordshire.<sup>19</sup> The second stage of development identified by Weatherill culminated in the achievement of critical mass and occurred from roughly 1720-1760. As other industries such as textiles and metalworking began to concentrate in the eighteenth century, so too did pottery production in North Staffordshire. The growth of the industry overall during this time was characterised by new firms entering the industry alongside the growth in their size.

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<sup>15</sup> The turnover for the firm was £7.5m in 2009, see: 'Fired up to succeed in ceramics', *Financial Times*, February 25, 2009.

<sup>16</sup> Popp and Wilson, 'The emergence', p. 54; Andrew Popp and John Wilson, 'Life cycles, contingency, and agency: growth, development, and change in English industrial districts and clusters', *Environment and Planning A*, Vol. 39 (2007), pp. 2975-2992

<sup>17</sup> For details of this earlier period see: Lorna Weatherill, *The Pottery Trade and North Staffordshire 1660-1760* (Manchester University Press: Manchester, 1971).

<sup>18</sup> *Ibid.*, pp. 45-7, 131-3,

<sup>19</sup> For a more in-depth discussion of this stage of development, see chapter three

By 1750, a century-long period of dynamism and growth for the pottery industry began and coincides with the emergence of the district's most famous names such as Josiah Wedgwood (1730-1795), Josiah Spode, (1755-1827), Herbert Minton (1793-1858), William Copeland (1797-1868) and the Doulton family company established in 1815. This period also witnessed early signs of collaborative and collective organisation between potters who endeavoured to keep the district successful and dominant.

The end-date for this study coincides with the opening of the Great Exhibition at the Crystal Palace in London on May 1<sup>st</sup> 1851. This was the first of many World Fairs held during the nineteenth century 'which allowed inventors and firms to exchange technological information internationally.'<sup>20</sup> Staffordshire potters accounted for a thirty per cent of all exhibitors of china, porcelain and earthenware and also provided examples of products at different stages of manufacture.<sup>21</sup> Herbert Minton & Co. provided over seventy separate articles for the exhibition including a full dessert service and various samples of clay.<sup>22</sup> The exhibition was thus an arena in which to showcase the scale and scope of production in North Staffordshire and the high levels of skill its potters possessed.<sup>23</sup> 1851 provides a practical end-point with the wares on display a product of the development and evolution of the district in the preceding century. In terms of patterns of knowledge creation and sharing, the year 1851 marks the last complete year for which patents were issued before the 1852 Patent Amendment Act which drastically altered the patent system and the appropriation of intellectual property in the United Kingdom.<sup>24</sup> The trend-break in patenting in

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<sup>20</sup> Petra Moser, 'How do patent laws influence innovation? Evidence from nineteenth century world fairs', *The American Economic Review*, Vol. 95, No. 4 (Sept, 2005), p. 1216

<sup>21</sup> *Official Catalogue of the Great Exhibition of the Works of Industry of all Nations, 1851*, (London, 1851), pp. 125-127.

<sup>22</sup> *Great Exhibition of the Works of Industry of all Nations, 1851. Official Descriptive and Illustrated Catalogue*, Vol. 2, (London, 1851).

<sup>23</sup> See Appendix Two for an example of the ornamental wares on display.

<sup>24</sup> For further discussion regarding patenting in England and the impact of the 1852 Patent Amendment Act see chapter six.

England between 1851 and 1852 is cited as a key turning point in several recent studies and is thus a practical and appropriate end-date for this research.<sup>25</sup>

This case-study exploits the recent resurgence of a global interest in the study of both historical and contemporary industrial districts and their role in industrialisation and development processes.<sup>26</sup> It is hoped that it will contribute to this established body of literature and provide the possibility for future comparative research with other historically and geographically located cases. The key driving force behind this research is the need to interpret and explain the patterns and trends in knowledge creation and sharing, a dynamic series of processes at the core of craft-based production. What follows attempts to further understand some of these dynamic processes that were governing, and influencing, the behaviour of firms and producers in North Staffordshire between 1750 and 1851.

However, this body of work is not merely a micro-study of a particular industry in a particular region over a particular period of time; localised and focused study can help answer larger ‘theoretically informed’ questions.<sup>27</sup> As such, through this research there is a much wider contribution to be made to the economic and business history of Britain. Earthenware and ceramics are of crucial importance not only to the history of British invention and the first Industrial Revolution, but also to the history of product innovation and the consumer revolution, industrial

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<sup>25</sup> See: Sean Bottomley, *The British Patent System During the Industrial Revolution, 1700-1852: from Privilege to Property*, (Cambridge University Press: Cambridge, 2014), pp. 21-22; H. I. Dutton, *The patent system and inventive activity during the Industrial Revolution, 1750-1852*, (Manchester University Press: Manchester, 1984); Christine MacLeod, *Inventing the Industrial Revolution: The English Patent System, 1660-1800*, (Cambridge University Press: Cambridge, 1988); Alessandro Nuvolari, ‘Collective Invention during the British Industrial Revolution: the case of the Cornish pumping engine’, *Cambridge Journal of Economics*, Vol. 28, No. 3 (2004), pp. 347-363.

<sup>26</sup> For several more recent examples see: Jon Stobart, *The First Industrial Region, North-west England, c.1700-60* (Manchester University Press: Manchester, 2004); Andrew Popp, *Business Structure, Business Culture and the Industrial District, The Potteries, c. 1850-1914* (Ashgate: Aldershot, 2001); Charlie Karlsson *et al* (eds.) *Industrial Clusters and Inter-Firm Networks* (Edward Elgar: Cheltenham, 2005); Tomoko Hashino and Keijiro Otsuka, ‘Hand looms, power loom, and changing production organizations: the case of the Kiryū weaving district in early twentieth-century Japan’, *Economic History Review*, Vol. 66, No. 3 (2013), pp. 785-804; Giacomo Becattini, *Industrial Districts, A new approach to industrial change* (Edward Elgar: Cheltenham, 2004), F. Molina-Morales, ‘Industrial districts and innovation: the case of the Spanish ceramic tiles industry’, *Entrepreneurship & Regional Development: An International Journal*, Vol. 14, No. 4, (2002), pp. 317-35.

<sup>27</sup> Popp and Wilson, ‘Districts, networks and clusters’, p. 17.

organisation and theories surrounding entrepreneurial and firm behaviour.<sup>28</sup> Pottery products became some of the most sought-after items of the consumer revolution of the seventeenth and eighteenth centuries, and English production was dominated by North Staffordshire.<sup>29</sup> As Popp and Wilson have argued, industrial districts are of crucial importance to the industrialisation process and North Staffordshire was one of these districts.<sup>30</sup> Therefore, if we want to fully understand the diversity of British economic and business history since the eighteenth century, we must understand industrial districts, and as an example of an extremely successful, long lasting and, perhaps, unique industrial district, North Staffordshire deserves our attention.

This thesis provides new empirical evidence and analysis which helps us to understand the organisation and evolution of an important example of an early industrial district. It presents analysis based on a new dataset of all known potters in the district between 1781 and 1851 constructed by the author. It also provides new empirical evidence of knowledge and innovation in the district by constructing and analysing a new patent dataset detailing all known pottery patents for the period 1617-1851.

## **1.1 Thesis Outline**

This thesis is formed of two parts. The first examines the region as an industrial district, and the second part shifts the focus to the perspective of a knowledge district and examines innovation in the industry. The chapters are systematic and focused in their analysis of specific features of North Staffordshire and the English pottery industry. Together, they provide a rich portrait of a district and industry over more than a century of development and highlight the complexity of factors determining the fate and behaviour of producers of some of the world's most recognisable and sought-after earthenware goods.

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<sup>28</sup> For a discussion of the consumer revolution and earthenware see: Maxine Berg, 'From imitation to invention: creating commodities in eighteenth-century Britain', *Economic History Review*, Vol. 55, No. 1, (2002), pp. 1-30.

<sup>29</sup> Regina Lee Blaszczyk, *Imagining Consumers: Design and Innovation from Wedgwood to Corning* (Johns Hopkins University Press: Baltimore, 2000), p. 4.

<sup>30</sup> Popp and Wilson, 'Districts, networks and clusters', pp. 14-15.

In part one, chapter two provides an overview of some of the extant literature and theory surrounding the study of industrial districts and social networks. Chapter three examines some of the key characteristics of the district and reconstructs its organisation and evolution over time. It assesses the district's rise to prominence during the early eighteenth century and serves as the first stage of analysis, laying the empirical foundations for the context of the study. It points to several key features concerning the development of the district during its initial take-off phase and its more dynamic period of growth from the later eighteenth century into the first half of the nineteenth century. Bringing together data for employment, the number and size of firms, output and exports, it charts the rise of North Staffordshire to become the dominant pottery producing region in England by the late eighteenth century.

New evidence and data is presented which allows an analysis of the industrial organisation of the district at the firm level. This provides a detailed perspective of the district and uses trade directories and business records to construct a database of all known pottery producers in the region for the period 1781-1846. The analysis highlights and exploits the dynamism of historical change over time. By considering the composition of firms in the district and how this changed over time, several important observations and questions are posed concerning the optimal organisational form of production in an early industrial district. The new data presented is combined with historical maps to reconstruct the geographical distribution of firms in the district at the turn of the nineteenth century. The use of geographic information systems (GIS) software makes it possible to produce maps of the region which highlight the spatial concentration of firms and producers and their factories. This chapter also begins to point to interesting characteristics that speak to a topic we know relatively little about: the relationship between the acquisition and dissemination of knowledge, and the organisation and evolution of firms and producers. This chapter lays the foundations in terms of building an empirical picture of the region and emphasises its extremely dynamic nature in the context of intense spatial proximity.

Using the same database in addition to the correspondence and records of Josiah Wedgwood, chapter four adopts a network perspective and is influenced by literature and theory from the field of economic sociology. It conducts social network analysis of some of Josiah Wedgwood's social and business relationships in order to highlight the role of networks in knowledge transfer. It places emphasis on the notion that the economic actions of individuals are embedded in their social context.<sup>31</sup> This approach is novel and identifies informal, or less obvious, relationships between important individuals in the district that hitherto may have gone unnoticed. In particular, the network analysis reveals the role of brokers that emerged between economic actors in an organisational structure such as an industrial district.<sup>32</sup> The importance of these networks is shown through their relationship to knowledge production and transfer. Chapter five draws some conclusions for the first part of the thesis.

Part two of the thesis follows on from the questions raised around knowledge production and appropriation in part one. By shifting the perspective to viewing the North Staffordshire Potteries as a knowledge district, we are able to explain complex knowledge regimes and contribute to a large body of literature with new empirical evidence and analysis. There is a large separate body of literature which addresses innovation during the British Industrial Revolution. As such, part two of the thesis has an additional literature review in chapter five, which goes into detail concerning the specific sources used and the literature to which this analysis contributes.

Chapter six presents substantial new empirical evidence of knowledge, invention and innovation in the English pottery industry during the eighteenth and nineteenth centuries. Constructing a database of all pottery patents granted for the period 1617-1851 allows the formal protection of intellectual property in the industry, through the act of patenting, to be reconstructed for the first time. The

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<sup>31</sup> Mark Granovetter, 'Problems of Explanation in Economic Sociology', in Nitin Nohria and Robert Eccles (eds.) *Networks and Organizations: Structure, Form, and Action* (Harvard Business School Press: Boston, MA, 1992), p. 25-56.

<sup>32</sup> Nitin Nohria, 'Is a network perspective a useful way of studying organizations?', in Nitin Nohria and Robert Eccles (eds.) *Networks and Organizations: Structure, Form, And Action* (Harvard Business School Press: Boston, MA, 1992), p. 5.



chapter provides quantitative analysis of the patent data including occupational and geographical distribution. Qualitative analysis is conducted through close readings of specifications for patents granted. The standard tacit/explicit division of knowledge is challenged and a new, more complex typology is proposed.

Chapter seven then moves to the informal sphere of knowledge protection outside the patent system. It builds on the empirical findings of chapter six and explains them in further detail. Exhibition prizes, sale catalogues, trade literature and advertisements are analysed to provide a picture of a highly competitive industry in which secrecy was a real strategy for success. It puts forward arguments concerning the relationship between the types of knowledge being produced and employed, and the behaviour and of potters.

Chapter eight draws together the findings and conclusions of the thesis to present an economic and business history of the North Staffordshire Potteries during a dynamic period of sustained growth. It draws attention to the significant empirical, theoretical and historiographical contributions of the thesis. Some brief conclusions to the second part of the thesis are provided in chapter nine before the main conclusions are presented in chapter ten. These conclusions reiterate the importance of this study for our understanding of historical industrial districts, processes of industrialisation and rapid change under conditions of intense spatial proximity. In addition to providing an argument that the Potteries should be studied more rigorously, it provides direction for further work in this vein.

## 2 Literature Review

Collector's literature on pottery production, design, marks and companies can be found in almost any book shop, and specimens of wares are almost certainly to be a feature of many antique stores. There is a fascination with the porcelain, ceramics and earthenware to which entire galleries are dedicated in institutions such as the V&A museum in London. Academic study of one of the most important pottery producing regions in the world has been relatively limited, however, when compared to the cotton industry or the advent of steam technology. One of the earliest academic studies of the region came in 1829 when Simeon Shaw published his account of the success and vitality of the Potteries since the 1760s.<sup>1</sup> He had been employed at Hanley Grammar School in the early nineteenth century, and was a close friend of the potter Josiah Spode II, to whom the book was dedicated.<sup>2</sup> His admiration for the 'interesting and opulent district' and its resident 'eminent potters' is clear.<sup>3</sup> Whilst Shaw is keen to heap praise on the progress of the industry, he demonstrates remarkable insight and is undoubtedly one of the earliest commentators to acknowledge the collective sentiments of the North Staffordshire potters. He argues that the region succeeded by combining the 'researches of the mineralogist with the ingenuity of the artizan'. The collective community that inhabited the district thrived 'by uniting talents and perseverance, the recesses of the earth [had] been explored to enrich its owners'.<sup>4</sup> This pioneering assessment of the Potteries remained largely ignored for much of the nineteenth century until it was re-published at the turn of the twentieth century. Despite publishing several notable works on science, history and philosophy during the first half of the nineteenth century, Shaw seems to have faded into obscurity until his

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<sup>1</sup> Simeon Shaw, *History of the Staffordshire potteries, and the rise and progress of the manufacture of pottery and porcelain, with notices of eminent potters* (Scott: London, 1900), reissue of original 1829 edition.

<sup>2</sup> *The Monthly Magazine*, Vol. 41, No. 284 (June 1816) pp. 389-90.

<sup>3</sup> Shaw, *History of the Staffordshire potteries.*, p. 1.

<sup>4</sup> *Ibid.*, pp. 8-10.

death in an asylum in 1859.<sup>5</sup> It was over a century and half later before the importance of the collective identity of the potters was acknowledged in academic literature and associated with the economic fortune of the region.<sup>6</sup>

It was not until the middle of the twentieth century that the region began to be studied in any great detail although much of the focus was placed either on the introduction of machinery in the late nineteenth century, the history of the Trade Union Organisation, or the entrepreneurial talents of Josiah Wedgwood.<sup>7</sup> In contrast to the then prevailing ‘over-emphasis’ on Wedgwood, Weatherill argues that the potter, whilst certainly of importance, was far from representative of the industry as a whole. Rather, she focuses on creating a wider understanding at the regional level.<sup>8</sup>

In recent years the fields of regional and business history have ignited a renewed academic interest in the Potteries as a ‘classic example of an industrial district’.<sup>9</sup> This interest stems from a wider historiographical shift in social and economic history which has seen an increased recognition of the value of localised or regional study when thinking about the features and patterns of industrialisation processes.<sup>10</sup> Recognition of the importance of a disaggregated perspective is not limited to the study of the British Industrial Revolution; this cause has been taken up by historians of science and technology and also those working on macro-economic history. The global history pursued by scholars such as Patrick O’Brien and Ian Inkster seeks to remove ‘centrism’ of any kind

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<sup>5</sup> For reference to Shaw’s death, see the introduction to the reissue of his book: Shaw, *History of the Staffordshire Potteries*, pp. xxi; for another notable publication of his see: Simeon Shaw, *Nature displayed in the Heavens and on the Earth, according to the latest observations and discoveries*, six volumes (London: 1823).

<sup>6</sup> Andrew Popp, ‘The True Potter’: identity and entrepreneurship in the North Staffordshire Potteries in the later nineteenth century’, *Journal of Historical Geography*, Vol. 29, No. 3 (2003), pp. 317-35.

<sup>7</sup> See: Burchill and Ross, *A History of the Potters’ Union*; Warburton, *The History*; N. McKendrick, ‘Josiah Wedgwood: An Eighteenth Century Entrepreneur in Salesmanship and Marketing Techniques’, *The Economic History Review*, Vol. 19, No. 3 (1960), pp. 408-33, ‘Josiah Wedgwood and Cost Accounting in the Industrial Revolution’, *The Economic History Review*, Vol. 23, No. 1 (1970), pp. 45-67; F. Celoria, ‘Ceramic Machinery of the Nineteenth Century in the Potteries and in Other Parts of Britain’, *Staffordshire Archaeology*, Vol. 2 (1973), pp. 10-48; A. Lamb, ‘The Press’.

<sup>8</sup> Weatherill, *The growth of the pottery industry*.

<sup>9</sup> Popp and Wilson, ‘Districts, networks and clusters’, pp. 14-15

<sup>10</sup> Pat Hudson (ed.), *Regions and Industries: Perspectives on the Industrial Revolution* (Cambridge University Press: Cambridge, 1989); Maxine Berg and Pat Hudson, ‘Rehabilitating the Industrial Revolution’, *Economic History Review*, Vol. 45, No. 1 (1992), pp. 24-50.

from our understanding and explanation of historical processes. These authors and others from the now burgeoning ‘global school’ argue that the study of regimes of knowledge production and its application can serve as a useful comparator for global economic history.<sup>11</sup> In particular, Inkster argues that more study should be undertaken into ‘specific sites of material and technological advancement’ which were the locus of complex interactions between individuals and of practical collaboration between the mind and the hand. Emphasising the variety of such sites within single national contexts, he points to the intellectual and academic gains to be had in extending the empirical cases on which our understandings of the development of science and technology are based.<sup>12</sup> Current trends in ‘big’ or long-run economic history and the Great Divergence debates also recognise the diversity of experience and regional variation.<sup>13</sup> This broader trend toward regional study has been one of the driving forces behind the motivation for this study.

There are numerous theories and approaches in the literature of the historical and social sciences which may help, to a greater or lesser degree, explain the rise of North Staffordshire as a pottery producing industrial district. The theoretical and empirical problems and methods of disentangling this process of growth and development are common when examining Industrial Districts, both contemporary and historical. To drive this literature review, there are two key research questions that we must bear in mind.

1. How can we explain the process of the growth, intense concentration, and sustained dominance of a craft-based industry in such a small area?

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<sup>11</sup> Patrick O’Brien, ‘Historiographical traditions and modern imperatives for the restoration of global history’, *Journal of Global History*, Vol. 1, No. 1 (2006), pp. 3-39; Ian Inkster, ‘Potentially Global: ‘Useful and Reliable Knowledge’ and Material Progress in Europe, 1474-1914’, *The International History Review*, Vol. 28, No. 2 (2006), pp. 237-86.

<sup>12</sup> Ian Inkster, ‘The West Had Science and the Rest Had Not? The Queries of the Mindful Hand’, *History of Technology* Vol. 29, (2009), pp. 205-6. This framework is related to global comparative studies as part of the URKEW project based at the LSE although it is particularly relevant as it adds further support for the close study of localised sites of production.

<sup>13</sup> Prasannan Parthasarathi, *Why Europe Grew Rich and Asia Did Not* (Cambridge University Press: Cambridge, 2011), ‘Rethinking Wages and Competitiveness in the Eighteenth Century: Britain and South India’, *Past and Present*, Vol. 157, (1998), pp. 79-109; Stephen Broadberry, ‘Accounting for the Great Divergence’, LSE Economic History Working Papers, No. 184/2013, (2013); Kenneth Pomeranz, *The Great Divergence: China, Europe and the Making of the Modern World Economic*, (Princeton University Press: Princeton, 2000).

2. What did the organisational structure of the district look like and how did this change over time?

Any solutions, in part or in full, to these questions will vary depending on how we approach them and ultimately this depends on the roots of the questions and how we ask them. Academic research is driven by a fascination with understanding processes; as the motto of the London School of Economics states, *rerum cognoscere causas*, or, *to Know the Causes of Things*. One of the fundamental motivations for historical research is laid out by H.G. Wells in *The Outline of History* as the state of observing a set of conditions or events at a given time and asking ‘How had these things come about?’<sup>14</sup> In the context of this study, we could ask the fundamental question of why we see geographical concentration of industries in England at all when we know, for example, that there was significant coal production spread across the country providing one of the key inputs for energy intensive industries.<sup>15</sup> By extension, we should then ask why it was North Staffordshire in particular that emerged as the principal seat of pottery production. Similar questions could and have been asked for other crucial tangible inputs and requirements such as skilled labour and fixed capital, or less tangible factors such as useful, reliable and specific knowledge.

From a broader theoretical perspective, we may want to ask the following question: Was there a single underlying factor which can explain the origins and emergence of North Staffordshire as an ‘Industrial District’ that differentiates it from other districts? Or in other words: Was North Staffordshire unique? Depending on the answer to this question, can we generalise or propose a theory of industrial districts in England, and how applicable is this to other historic and geographic locations? Such an approach will allow future research to be conducted comparing the experience of North Staffordshire between 1750 and 1851 with other industrial districts of the time such as the Sheffield cutlery district or the Birmingham metalworking district. North Staffordshire was notably

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<sup>14</sup> H. G. Wells, *The Outline of History, Being a Plain History of the Life of Mankind*, Revised Edition (Cassell and Company Ltd: London, 1932), pp. 1-6.

<sup>15</sup> Robert Allen, *The British Industrial Revolution in Global Perspective*, (Cambridge University Press: Cambridge, 2009), pp. 82.

absent from John Wilson and Andrew Popp's edited collection of essays on English industrial clusters since 1750.<sup>16</sup> Indeed Popp's own study of the region as an industrial district covered only the period 1850-1914.<sup>17</sup> There is a real need for a substantial study into North Staffordshire as an Industrial District during this formative period.

## 2.1 Industrial Districts

Any discussion of industrial districts must include the work of Alfred Marshall who coined the term in the late nineteenth century.<sup>18</sup> Among his key concepts developed was the notion that external economies of scope and scale could be realised by clusters of small firms 'welded almost automatically into an organic whole'.<sup>19</sup> The spatial proximity found in distinct geographical areas such as the Lancashire cotton and Sheffield cutlery districts provided the 'nexus of interdependencies' that enabled these externalities.<sup>20</sup> For Marshall, the 'industrial atmosphere' of a district was of crucial importance in providing agglomeration benefits to firms such as increased pooling of skilled labour, technological spill-overs, and the diffusion of information and innovation due to the concentrated presence of small and medium sized enterprises.<sup>21</sup>

The term 'industrial atmosphere' is something that has been revisited and debated in recent years and has been repeatedly cited in subsequent work on industrial districts.<sup>22</sup> In his earlier work, *Principles of Economics*, Marshall did not use this term, but instead introduced this now infamous characterisation of the benefits of the concentration of industry in industrial districts in the following manner: 'The mysteries of the trade become no mysteries; but are as it were in the air,

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<sup>16</sup> Popp and Wilson (eds.) *Industrial Clusters*.

<sup>17</sup> Popp, *Business Structure*.

<sup>18</sup> Alfred Marshall, *Principles of Economics*, Eighth Edition (Palgrave Macmillan: Basingstoke, 1920).

<sup>19</sup> Alfred Marshall, *Industry and trade: a study of industrial technique and business organization*, Third Edition, (Macmillan and Co.: London, 1920), p. 599.

<sup>20</sup> Popp and Wilson, 'Districts, networks and clusters', p. 4.

<sup>21</sup> Jonathan Zeitlin, 'Industrial Districts and Regional Clusters', in Geoffrey Jones and Jonathan Zeitlin (eds.) *The Oxford Handbook of Business History* (Oxford University Press: Oxford, 2008), p. 222

<sup>22</sup> A brief search through academic work on industrial districts, including those listed here, points to this assertion.

and children learn many of them unconsciously.<sup>23</sup> Use of the term ‘industrial atmosphere’ came in his later work, *Industry and Trade*, in reference to the cutlery industries of Solingen and Sheffield.<sup>24</sup> Marshall used this to describe the character of the districts, a character that cannot be moved and that yielded significant benefits to the manufacturers and producers in operation. In their examination of the progression of industrial district theory from Marshall and his followers in the Cambridge school, Belussi and Caldari characterise Marshall’s framework, including the atmosphere, as a feature of ‘compound localisation’, a complex form of localisation that transcends ‘primitive’ localisation based on spatial concentration of industry in certain areas due to natural resources or other physical conditions.<sup>25</sup> For Marshall, this more intense localisation explains far more of the benefits of the concentration of industry than the ‘elementary localisation’, or purely natural or geographical endowments that preceded it, and was something that developed only over a long period of time.<sup>26</sup>

Marshall’s studies on industrial organisation place a great deal of emphasis on the division of labour as a requisite feature of a true and successful industrial district. He highlighted the benefits of the division of labour in allowing specialisation to develop among both large and small firms, thus increasing efficiency and productivity through the development of specialised skills, knowledge and machinery.<sup>27</sup>

The importance of these features is shown in Figure 2.1 which is a stylised representation of the ‘Marshallian Industrial District’ model and its progression and augmentation over time. The box at the top with the dashed border summarises the key features of Marshall’s classic industrial districts based on his observations of regions such as Sheffield and Lancashire in the late nineteenth century.

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<sup>23</sup> The rather nefarious term ‘in the air’ is also an extremely common citation in works on industrial districts and agglomeration; Marshall, *Principles of Economics*, p. 225.

<sup>24</sup> Marshall, *Industry and Trade*, pp. 284-7.

<sup>25</sup> Fiorenza Belussi and Katia Caldari, ‘At the origin of the industrial district: Alfred Marshall and the Cambridge school’, *Cambridge Journal of Economics*, Vol. 33, No. 2 (November 2008), p. 337;

<sup>26</sup> Marshall identifies the character of the climate, soil, the existence of mines and quarries, and easy access via land or water as ‘physical conditions’: Marshall, *Principles of Economics*, pp. 222-5.

<sup>27</sup> *Ibid.*, p. 201.

The top row shows the externalities that Marshall argued were the core economic features of an industrial district. Clusters of firms create economies of scale and concentration of physical plant and capital. These firms provide a thick market for specialised inputs in the region, namely, highly skilled labour. The clustering also generates and promotes knowledge spillovers. Underneath these are the characteristics that Marshall described as the 'industrial atmosphere'. Over time, the geographical proximity of firms and producers promoted frequent and repeated economic interaction and exchange between them. This in turn encouraged socialisation between actors which stimulated the diffusion of innovation and the acquisition of specialised skills.

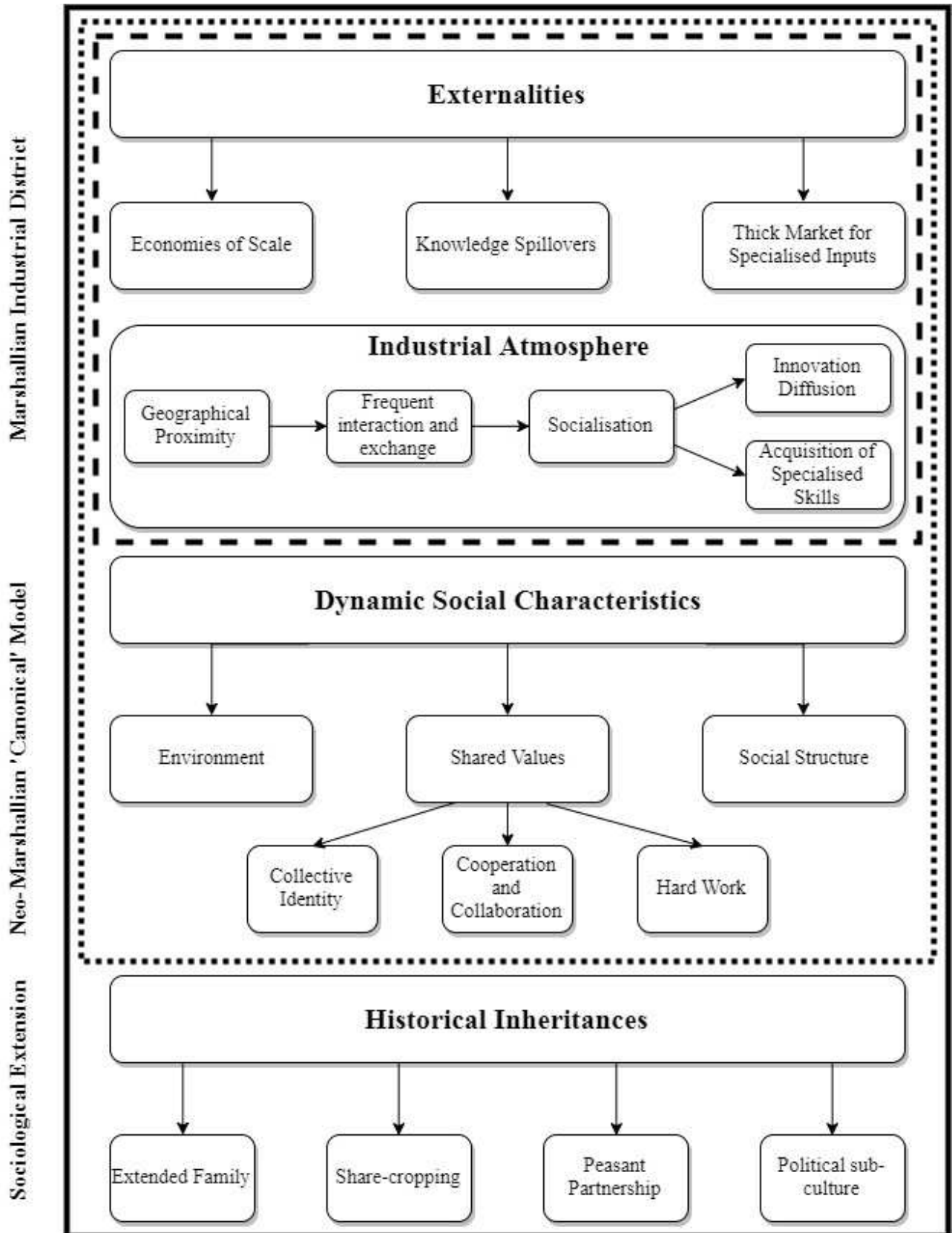
Since Marshall's writing in the late nineteenth and early twentieth century, there has been much progress in the breadth and depth of the study of industrial districts and substantial criticism of this model. However, it is clear that his ideas have served as a 'powerful source of inspiration' for economic theory and history.<sup>28</sup> This is reflected in the cumulative nature of model building where Marshall's characteristics remain as a starting point.

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<sup>28</sup> Marco Dardi, 'The Marshallian industrial districts and current trends in economic theory', in Giacomo Becattini *et al* (eds.) *A Handbook of Industrial Districts* (Edward Elgar: Cheltenham, 2009), p. 129.



Figure 2.1: The Marshallian Industrial District Paradigm



A key criticism of Marshall's conception of the industrial district is that it fails to provide sufficient focus on social characteristics such as trust that are important for economic activities in such close proximity.<sup>29</sup> In the later twentieth century in an effort to move the study of industrial districts beyond purely Marshallian economic externalities, a number of Italian scholars sought to develop a more dynamic theory of industrial districts. In his study of the organisation of production in the Emilia-Romagna region of Northeast Italy during the 1970s, Sebastiano Brusco introduced the 'Emilian Model' as a way of parsing the complex organisation of industrial production and activity in a defined region. The components of the model cover: the agricultural development of the region; the primary industrial sector which features advanced technology, innovation and larger firms with a heavy union presence (the latter two creating rigidity in the system); the secondary industrial sector which also features innovation capabilities, advanced technology and international competitiveness, but is composed of smaller firms; local government which plays an active role in wage rates and quality of life. The result, in the case of Emilia-Romagna and other such industrial districts as the clothing and garment industry in Modena, pig breeding in Reggio Emilia, and buttons in Piacenza, is a complex system that maintains a high degree of flexibility and provides choices and opportunities for businesses and workers.<sup>30</sup> Brusco's work brought international attention to Italian industrial districts of the later twentieth century and can be seen as the founding publication of the Italian school of industrial district theory.

More recently, Giacomo Becattini, began to develop a more dynamic theory of industrial districts in which they are defined as 'a socioterritorial entity which is characterised by the *active* presence of both a community of people and a population of firms in one naturally and historically bounded area.'<sup>31</sup> This neo-Marshallian, or 'Canonical' model is based on empirical observations of the 'Third Italy' developing during the 1970s and 1980s; industrial districts such as those noted by

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<sup>29</sup> Popp and Wilson, 'Districts, networks and clusters', p. 5; Popp, *Business Structure*, p. 8.

<sup>30</sup> Sebastiano Brusco, 'The Emilian model: productive decentralisation and social integration', *Cambridge Journal of Economics*, Vol. 6 No. 2 (June 1982), pp. 167-184.

<sup>31</sup> Becattini, *Industrial Districts, A new approach*, pp. 18-19.

Brusco and also ceramic tiles, textiles and knitted goods in Modena, machine tools in Carpi, and heavy machinery and motorcycles in Bologna, to name but a few.<sup>32</sup> The neo-Marshallian model was extremely influential in developing our understanding of the relationship between economic externalities on the one hand, and the less tangible industrial atmosphere on the other. Marshall's core concepts were kept whilst the dynamic social characteristics shown in the second box of Figure 2.1 were emphasised. Quantifiable features such as the level of urbanisation and the social structure of the district were married with, and reinforced, a set of common shared values of identity, cooperation and hard work.<sup>33</sup> A sociologically focused extension of this neo-Marshallian model was developed in the late 1980s and put forward by Trigilia.<sup>34</sup>

The Marshallian model and its 'Italianate' extensions provide a theoretical space which allows for a combination of economic and social characteristics to play a role in the development of industrial districts. However, just as the Italian school sought to redress inadequacies of the Marshallian model, there are significant weaknesses in the framework which become apparent when we try to assess its usefulness outside of the Third Italy and even the original Marshallian district. In a recent study of the Sheffield cutlery industry during the nineteenth century Geoffrey Tweedale abandoned the big history of Chandler and the Marshallian framework in favour of a micro-level analysis of family firms.<sup>35</sup>

The problems with the Marshallian framework as presented in Figure 2.1, and the reasons why it might be of limited value for our study of North Staffordshire lie mainly in its fixed empirical origins. A broad historiographical shift in social and economic history began in the 1980s, which

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<sup>32</sup> Brusco provides many examples of diverse Italian industrial districts in: S. Brusco, 'The Emilian model: productive decentralisation and social integration', *Cambridge Journal of Economics*, Vol. 6, No. 2 (June 1982), pp. 167-184; a summary of the Italianate model is provided in: S. Brusco, 'The idea of the Industrial District: Its genesis', in F. Pyke *et al* (eds.) *Industrial districts and inter-firm co-operation in Italy* (ILO: Geneva, 1990), pp. 10-19.

<sup>33</sup> Zeitlin, 'Industrial Districts', pp. 280-281.

<sup>34</sup> Carlo Trigilia, 'Work and politics in the Third Italy's industrial districts', in F. Pyke *et al* (eds.) *Industrial districts and inter-firm co-operation in Italy* (ILO: Geneva, 1990), pp. 160-184.

<sup>35</sup> Geoffrey Tweedale, 'Backstreet capitalism: An analysis of the family firm in the nineteenth-century Sheffield cutlery industry', *Business History*, Vol. 55, No. 6 (2013), pp. 875-891.

saw an increased recognition of the value of localised and regional study when thinking about the features and patterns of industrialisation processes. As with the proto-industrialisation debate, one of the key proponents of this shift was Pat Hudson, who in 1989 edited a collection of essays under the title *Regions and Industries*.<sup>36</sup> This was followed by Berg and Hudson's critique and reassessment of the aggregate and national growth accounting methods in which they argued for more emphasis on 'new research at [the] regional and local level' in order to build a broader and more inclusive representation of social and economic development in England from the seventeenth century.<sup>37</sup>

Berg and Hudson's call-to-arms largely succeeded in its aims to highlight the diversity of experience across regions and industries. The problems of assuming a single development path or end point are particularly significant when considering the historical organisation of industrial production and how this has changed over time. In a series of publications since the 1980s critiquing 'closed' models of industrial districts and regional clustering, several scholars have stressed the need for a new approach to challenge the dominant models of industrial progress based on mass production and vertical integration.<sup>38</sup> Among them, Piore and Sabel were first to address alternatives to mass production by introducing the concept of flexible specialisation, a modern form of craft-based production that can respond quickly to changes in the market environment. Emphasis was placed on 'industrial divides', or 'technological branching points', moments at which decisions were made that would determine the future of technological and industrial development; the first

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<sup>36</sup> Hudson (ed.), *Regions and Industries*.

<sup>37</sup> Berg and Hudson, 'Rehabilitating the Industrial Revolution', p. 44.

<sup>38</sup> See: Charles Sabel, 'Flexible Specialisation and the Re-emergence of Regional Economies', in Paul Hirst and Jonathan Zeitlin (eds.) *Reversing Industrial Decline?: Industrial Structure and Policy in Britain and Her Competitors* (Berg: Oxford, 1989), pp. 17-70; Charles Sabel and Jonathan Zeitlin, 'Stories, strategies, structures: rethinking historical alternatives to mass production', in Charles Sabel and Jonathan Zeitlin (eds.) *World of Possibilities: Flexibility and Mass Production in Western Industrialization* (Cambridge University Press: Cambridge, 1997), pp. 1-34; 'Historical Alternatives to Mass Production: Politics, Markets and Technology in Nineteenth-Century Industrialization', *Past & Present*, No. 108 (Aug. 1985), pp. 133-176; Jonathan Zeitlin, 'The Historical Alternatives Approach', in Jones and Zeitlin (eds.) *The Oxford Handbook of Business History*, pp. 120-140; 'Industrial districts and local economic regeneration: Overview and comment', in F. Pyke and W. Sengenberger (eds.) *Industrial districts and local economic regeneration*, (International Institute for Labour Studies: Geneva, 1992), pp. 279-294; 'Industrial Districts and Regional Clusters'.

such divide was met in Britain and the United States in the nineteenth century with the advent of mass-production, and the second, argue Piore and Sabel, arrived in advanced countries, predominantly the United States, by the early 1980s.<sup>39</sup> Both of these divides involved tensions between two divergent and potentially conflicting strategic development paths for growth: one based on mass-production technology, the other established on more craft-based production.<sup>40</sup>

Piore and Sabel's initial offering was written as a response to the economic challenges faced by the United States and flexible specialisation was offered as one of the 'Possibilities for Prosperity'.<sup>41</sup> This was followed by a wave of publications, based on the *Historical Alternatives* approach, and this concept of flexible specialisation, that assumed that the development of technologies and organisations can develop along potentially myriad lines, that each strategy or form can be pursued to a greater or lesser extent, thereby placing the emphasis on the importance of these junctures and decision making by individuals.<sup>42</sup> The resulting logic of this assumption is a model and approach which allows for the sheer number of possible paths of development, and as previously noted challenges the notion of a canonical model of industrial districts and regional clusters.<sup>43</sup> The theoretical space needed in which hybrid forms of organisation can exist appears to be far less constraining than the Marshallian model. Marshall's theoretical contribution to the study of industrial districts and our understanding of the firm are rooted in, and constrained by, the empirical foundations of his work; namely, late Victorian England. As Lloyd-Jones and Le Roux state, the 'historical specificity' of Marshall's work provides a context useful for business histories of the size and growth of firms in the second half of the nineteenth century.<sup>44</sup> Where it falls short, however, is

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<sup>39</sup> Michael J. Piore and Charles F. Sabel, *The Second Industrial Divide: Possibilities for Prosperity* (Basic Books: New York, 1984), pp. 5-6, 44.

<sup>40</sup> The former superseded the latter during the course and aftermath of the First Industrial Revolution: *Ibid.*, p. 6.

<sup>41</sup> Piore and Sabel, *The Second Industrial Divide*.

<sup>42</sup> Zeitlin, 'The Historical Alternatives Approach', p. 127.

<sup>43</sup> Hector Rocha, *Entrepreneurship and regional development: the role of clusters* (Palgrave Macmillan: Basingstoke, 2013), p. 99.

<sup>44</sup> R. Lloyd-Jones and A. A. Le Roux, 'Marshall and the birth and death of firms: the growth and size distribution of firms in the early nineteenth-century cotton industry', *Business History*, Vol. 24, No. 2 (1982), pp. 141-2.

in attempts to impose this framework on earlier periods with different characteristics and growth patterns.

The sheer variety of case studies within England alone emphasises the rigidity of the Marshallian model and the extensions of the Italian school. The framework rests on the cumulative addition of more and more characteristics based on ‘highly specific socio-historical context’.<sup>45</sup> It is thus hard to reconcile these models with such diversity or generalise from them in any meaningful way. Indeed, the two key criticisms laid at the feet of the Italian school are that it generalises from too specific an empirical base, and that the diversity of industrial districts elsewhere leave it open to challenge.<sup>46</sup> As Sabel neatly reminded us, ‘a proverb has it that ‘for example is not a proof’’.<sup>47</sup> If we try to examine the North Staffordshire potteries in the Marshallian or neo-Marshallian framework we are likely to be left with a shopping list of criteria which, while each specific to a particular case-study, are far from a best fit for our context.

Aside from the empirically driven models of the Italian school, theory driven approaches to the study of industrial districts in the 1990s followed a similar agenda to incorporate the social *and* the economic elements. In a theoretical and influential article of 1992 Bennett Harrison sought to reconsider the key features of industrial districts and argued for a more complex comprehension of what he called the ‘socioeconomic brew’ present in industrial clusters.<sup>48</sup> His basic definition of industrial districts offers the closest fit to the North Staffordshire Potteries: ‘networks of mostly small, linked by generally loosely coupled, spatially-clustered manufacturing companies, typically built around a craft form of work organisation.’<sup>49</sup> Harrison’s approach does not provide a check-list of criteria or a rigid model to judge different districts. Rather, he stresses the need to focus on the individuals, the relationships between economic actors, and the trust, experience and cooperation

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<sup>45</sup> Zeitlin, ‘Industrial Districts’, p. 281.

<sup>46</sup> Rocha, *Entrepreneurship and regional development*, p. 99.

<sup>47</sup> Sabel, ‘Flexible Specialisation’, p. 23.

<sup>48</sup> Bennett Harrison, ‘Industrial Districts: Old Wine in New Bottles?’, *Regional Studies*, Vol. 26, No. 5 (1992), pp. 479.

<sup>49</sup> *Ibid*, p. 471.

between firms and individuals. Just as in the Historical Alternatives approach, the decisions and behaviour of individuals then become paramount concerns. In brief, Harrison's logic of industrial districts begins with proximity, as many do, which fosters experience through repeat encounters, thus nurturing trust. This trust then manifests itself in the paradoxical phenomena of collaboration alongside competition, or *cooperative competition*, a point noted by many of industrial district scholars as discussed above. The benefit of these processes is enhanced regional economic growth.<sup>50</sup>

Whilst this may seem to be no different from the other frameworks and models of industrial districts discussed here, Harrison's is a useful context in which to start thinking about how we can explain the complex dynamic processes taking place in such a concentrated area as North Staffordshire during the eighteenth and nineteenth centuries. Harrison's critique certainly benefits from a broader perspective than the Marshallian view and is not as limited by a narrow set of features specific to a certain time and place in history. Nevertheless, the origins of Harrison's revisionist approach can be found in attempts to explain the 'new wave of economic growth' in regions across Europe, North America and East Asia observed during the later decades of the twentieth century.<sup>51</sup> Whilst Harrison stresses the instability and dated nature of canonical theory, his approach is still influenced by a desire to explain new forms, features and growth patterns of industrial districts of the second half of the twentieth century. He argues that the districts of the late twentieth century were not merely 'old wine in new bottles' but fundamentally different from those which had preceded them and formed the empirical analysis of the canonical model.<sup>52</sup> There is no reason why the case should be any different for the study of historical industrial districts such as those in England during the eighteenth century. To continue Harrison's analogy and to add a well-

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<sup>50</sup> *Ibid*, p. 477-8.

<sup>51</sup> *Ibid*, pp. 469-70

<sup>52</sup> *Ibid.*, p. 469.

used metaphor, 'The past is a foreign country', we should try not to view North Staffordshire or other historical industrial districts as the same 'old wine' in even older bottles.<sup>53</sup>

This is precisely the approach taken by the contributors to an edited collection of case studies of industrial clusters in England during the eighteenth, nineteenth and twentieth centuries.<sup>54</sup> This thesis brings us closer to a framework that proves useful to understand North Staffordshire. Popp and Wilson's drive for research into English industrial districts was, like other critiques, a response to the insufficient appreciation of social features in Marshall's districts. Moreover, the English cases such as the glove industries in Worcester and Yeovil, the Birmingham jewellery district and bicycle production in Coventry 'do not fit a simple template in reference either to themselves or the 'Italianate' ideal.'<sup>55</sup> The edited collection highlights not only the immense variety exhibited historically in England at the regional and local level, but also develops a distinctly English concept of the industrial district.

Many of their English industrial districts were 'hotspots' of economic and industrial activity in diverse trades in which mechanisation was typically difficult, skill levels were high, and specialisation among firms allowed production of an extremely diverse range of goods. The revisionist theory places the historical English industrial district at the centre of the first industrial revolution and subjects them to powerful life-cycle effects.<sup>56</sup> The model has two dimensions, both of which are useful for this study; a sequential six-stage growth process, and a cyclical logic based on social interactions. Whilst far from rigid and certainly not inevitable, the framework is used by Popp and Wilson as a structure and process capable of explaining the decline of industrial districts in England over the long-term. The life cycle is shown in Figure 2.2.

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<sup>53</sup> L. P. Hartley, *The Go-Between* (Penguin: London, 1998), p. 1.

<sup>54</sup> Popp and Wilson (eds.) *Industrial Clusters*.

<sup>55</sup> Popp and Wilson, 'The emergence', p. 44.

<sup>56</sup> *Ibid.*, p. 45-54



Figure 2.2: Nondeterministic life cycle model of English industrial districts

1. **Critical Mass:** the initial clustering of expertise and factors of production
2. **Take-off:** often associated with key inventions or innovations, which alongside the clustering of expertise and factors of production give the district a significant competitive advantage
3. **Cooperative competitiveness:** balancing the lateral and vertical advantages of clustering and networking and achieving competitive advantage over rival clusters
4. **Saturation:** the costs of clustering start to outweigh the benefits, with rate of growth falling away, innovation rare, and competition increasing from lower cost producers
5. **Maturity:** rival clusters offer superior advantages for new firms, and decline sets in across the older district
6. **Renaissance:** new industries locate in the cluster, attracted by either cheap factors of production, demand for their products, or the activities of regional planners

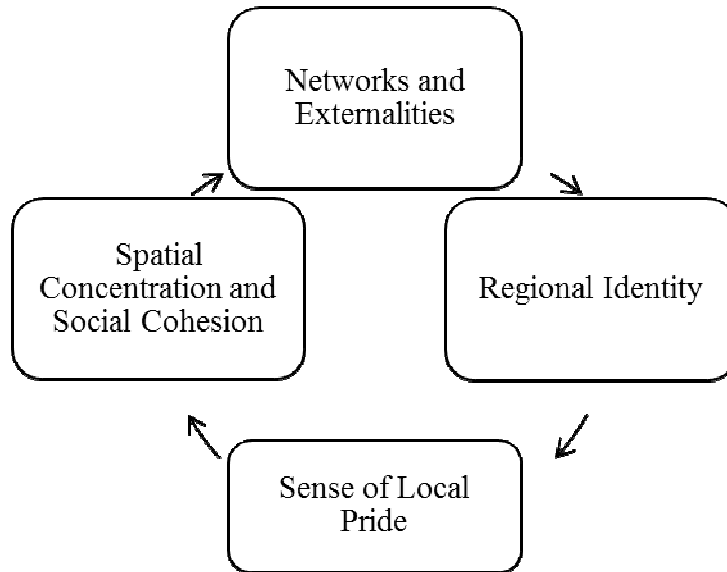
Source: this is a facsimile reproduction of Popp and Wilson, 'Life cycles, contingency, and agency', p. 2978

The second dimension extends both their own model and the way of conceptualising industrial districts beyond the limits of Marshall. It concerns the role of social interactions in the development of industrial regions which are often characterised by varying degrees of networks, both business and social. These networks and connections between individuals and firms help build a sense of identity in the region, which in turn instils a sense of local pride. Subsequently this promotes further spatial concentration and social cohesion, which reinforces the benefits of networks and externalities.<sup>57</sup> This self-reinforcing framework is simplified in Figure 2.3.

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<sup>57</sup> *Ibid.*, p. 46.

Figure 2.3: Popp and Wilson's stylised logic of English Industrial Districts



Notes: Author's visualisation of Popp and Wilson's social connections within industrial districts.

There are two key reasons why their framework is more suitable for this study than either pure Marshallian models or Italian extensions. The first is a simple matter of fact; the empirical foundations for Popp and Wilson's framework are far closer to the North Staffordshire Potteries both temporally and spatially, thus having arisen out of a similar social and economic context. The second reason is that this model stresses the 'nondeterministic' nature of the development of English industrial districts; it celebrates the diversity of experience and avoids rigid, linear, path dependent accounts.<sup>58</sup> At any given point a district may diverge from the cycle and fail to make the transition to the next stage. By accommodating a far broader range of districts that are ruled out by strict adherence to the Marshallian paradigm, thinking more along the lines of Popp and Wilson's framework highlights the limitations of Marshall's perspective. Heterogeneous regions and districts that enjoyed varied fortunes, fluctuating periods of success and failure, and very different trajectories broaden the scope of our understanding of the nature of districts and clusters. The underlying logic detailed in

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<sup>58</sup> Popp and Wilson, 'Life cycles, contingency, and agency', p. 1975.

Figure 2.3 is also extremely useful as it provides a context in which the interaction between social and economic elements can be examined. This framework is useful because it allows room for the unexpected, for complex features that require substantial further research to explain, but it does so whilst retaining a structure and a set of potential signposts to help us present a coherent story of the past.

The two models contribute dynamism to the study of industrial districts in two important ways. The first, shown in Figure 2.2 captures change over time, and the second in Figure 2.3 emphasises the relationship and tensions between social factors, spatial proximity and economic development. Whilst at this stage their explanatory power may be limited in terms of the North Staffordshire Potteries, together, they draw attention to certain features and questions concerning the district and have the potential to help us explain key moments in the history of the Staffordshire Potteries such as the achievement of critical mass and the district's take-off. The limits of the explanatory power, or perhaps the non-deterministic nature of the model, are evident when we think about take-off in particular, which, according to Popp and Wilson is often accompanied by key inventions and innovation. The evidence discussed later in this thesis suggests that for the century before 1750, other pottery producing regions in the north and Midlands had achieved, or were very close to achieving critical mass. In the seventeenth century at least, perhaps less so for the early eighteenth century, there were three or four potential industrial districts for the production of pottery in England. As history has shown us, North Staffordshire was the region which realised its potential and by 1750 had clearly overtaken competing districts in terms of clustering of expertise and factors of production.

However, when we examine the number of patents issued in the pottery industry it is difficult to identify a period of increased innovative activity until well into the nineteenth century. This is potentially challenging to the model as we could ask why take-off did not take place in, say, the

early decades of the eighteenth century when there was a small surge in patents for a decade.<sup>59</sup> Using this evidence, the model would suggest that even by the end of the Napoleonic Wars, North Staffordshire had not achieved the required clustering of factors of production and human capital in the form of skill and expertise to capitalise on the resulting innovative potential. Discussion in the main chapters of this thesis will show that this is not the case, although this does not invalidate the usefulness of the life-cycle model as a conceptual and analytical tool. By providing signposts or potential thresholds and sequences of events, it raises interesting questions and points us in particular directions for further research that the Marshallian model does not do. For example, in attempting to identify a potential moment of take-off, questions are raised over issues surrounding invention and innovative activity; the propensity to patent, the types of knowledge being created, used and patented (or not) in the pottery industry, and alternative forms of knowledge appropriation and transfer. Thus, the approach from Popp and Wilson is a useful one as it prompts us to probe various features for further explanation.

Whilst the life-cycle approach seems more useful as an analytical structure, there are important aspects of Marshall's work which do need to be discussed and which can prove useful in helping understand exactly what it is we may be observing in the analysis below. Much of the industrial district literature refers to benefits of agglomeration and externalities. There is continuing debate over the issue of specialisation and diversification, i.e. 'whether agglomeration economies arise between firms belonging to either the same or to different industries.'<sup>60</sup> The root of this debate lies essentially in the conception of knowledge spill overs and whether such knowledge is deemed to be industry specific or complementary. Marshallian externalities assume that knowledge is on the whole specific to the industry in which it is created and situated. Thus, Marshallian agglomeration economies, or *specialisation externalities* are more likely to arise in regions dominated by a single

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<sup>59</sup> See chapter six for a detailed analysis of patenting.

<sup>60</sup> Gerben van der Panne, 'Agglomeration externalities: Marshall versus Jacobs', *Journal of Evolutionary Economics*, Vol. 14 (2004), pp. 593-604.

industry. Jacobian externalities, on the other hand, are based on the notion that knowledge spillovers occur between complementary industries, therefore *diversification externalities* are achieved in regions with variegated industrial development.<sup>61</sup> These diversification externalities were highlighted by Jacobs in her work on cities.<sup>62</sup> She introduced Manchester and Birmingham during the nineteenth century as examples of efficient and inefficient cities respectively, and the seemingly paradoxical assertion that it is inefficient cities that are economically valuable, rather than traditionally efficient cities. The key to this value, the ability to stave off stagnation and obsolescence, was found, in the nineteenth century at least, in the inefficient organisation and fragmentation of industry and production. This organisational framework and the externalities it engendered enabled Birmingham to develop and evolve over time, constantly creating new work without the need to compensate for the loss of any one dominant industry, as was the case in Manchester.<sup>63</sup>

A simple exercise based on the characteristics of North Staffordshire can be conducted at this stage which will suggest whether we are likely in future chapters to observe benefits of agglomeration which lie closer to Marshallian or Jacobian distinctions. At a basic level, if we see the development of several different yet complementary industries in North Staffordshire over time, we could logically infer that Jacobean externalities may have had a significant positive impact on the region. Equally, the impact of Marshallian externalities would likely be characterised by increased specialisation of the region in one industry, such as the production of pottery. Based on these assumptions then, we could hypothesise that Marshallian, not Jacobian, externalities were a key driving force in historical industrial districts and clusters where the region was dominated by a single industry.

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<sup>61</sup> *Ibid.*, pp. 594-595.

<sup>62</sup> Janet Jacobs, *The Economy of Cities* (Cape: London, 1970).

<sup>63</sup> Jacobs' analysis of the economies of Manchester and Birmingham during the mid-nineteenth century also introduced the notion of trial and error, 'development work', that, whilst relatively inefficient, 'sometimes led to successful new activities and sometimes not'; *Ibid.*, pp. 86-94

There is much general literature which stresses the inconclusive nature of the empirical evidence concerning whether Marshallian or Jacobian externalities stimulate innovation. Arguments in favour of either form are based largely on studies of developed economies in the twentieth and twenty-first centuries and are highly context specific.<sup>64</sup> However, current ongoing research by Klein and Crafts focusing on the second industrial revolution in the United States provides some evidence to support the hypothesis that Marshallian, rather Jacobian, externalities were present in North Staffordshire.<sup>65</sup> They found that in general, whilst Marshallian externalities were a key feature of the second industrial revolution in cities which were specialised, Jacobian externalities ‘were only realized in large cities such as Chicago, Philadelphia, and New York’. Smaller cities which did not meet the ‘city-size’ threshold were precluded from the benefits of diversification externalities, and actually experienced a reduction in productivity.<sup>66</sup> Given that in 1900 the cities of New York (population 3.43 million), Chicago (1.69 million) and Philadelphia (1.29 million) were the three largest ‘urban places’ in the United States, it is highly unlikely that the Jacobian threshold was met by the North Staffordshire Potteries, a region with no cities during our period of study, limited levels of urbanisation spread across six villages and towns, and a combined population of no more than 130,000 by 1851.<sup>67</sup> Additionally, although not fully supported by strong data, Weatherill and Hollowood have stressed the lack of development of any other significant industries in the Potteries during the eighteenth and early nineteenth centuries.<sup>68</sup> Thus, although in this thesis it is not possible to conduct an econometric analysis along the lines of Klein and Crafts, it is possible at this stage in the investigation to put forward the hypothesis that it is unlikely that Jacobian externalities were

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<sup>64</sup> For a discussion of this literature see: Riccardo Crescenzi, Andrés Rodríguez-Pose and Michael Storper, ‘The territorial dynamics of innovation: a Europe-United States comparative analysis’, *Journal of Economic Geography*, Vol. 7, Issue 6 (2007), pp. 679.

<sup>65</sup> Alexander Klein and Nicholas Crafts, ‘Agglomeration Economies and Productivity Growth: U.S. Cities, 1880-1930’, *CEPR Discussion Paper Series*, No 10673 (June 2015).

<sup>66</sup> *Ibid.*, p. 17-18.

<sup>67</sup> Population estimates for U.S. cities taken from: Campbell Gibson, ‘Population of the 100 largest cities and other urban places in the United States: 1790 to 1900’, *U.S. Bureau of the Census*, Population Division Working Paper, No. 27, Table 13; population estimates for Potteries region taken from John Thomas, *The Rise of the Staffordshire Potteries*, (Adams & Dart: Bath, 1971), p. 13.

<sup>68</sup> Weatherill, *The growth of the pottery industry*, pp. 133-34; A. B. Hollowood, ‘The Localization of the Pottery Industry’, *Transactions of the North Staffordshire Field Club*, Vol. xxiv (1939-40), pp. 22-28.

driving development and growth of the industry in North Staffordshire during the eighteenth century.

We have already discussed the Historical Alternatives approach and noted that one of its key contributions was the development of the theory of flexible specialisation and a renewed interest in the diverse forms of industrial organisation in the past. Indeed, Scranton used this concept to challenge the dominant paradigm of Chandlerian business history based on vertical integration, capital-intensive production and technological innovation.<sup>69</sup> A crucial point to note is that flexible specialisation is not a one-size-fits-all model with strict characteristics but an approach which allows for, and celebrates, variation and hybridity. One of the key proponents of flexible specialisation has noted how difficult it is to ‘arrive at even a rough characterisation of the logic of industrial districts’ primarily due to the complexity of relationships between firms, individuals and institutions within them.<sup>70</sup> With this in mind, Zeitlin has recently provided a succinct definition of flexible specialisation which sits in contrast to our understanding of mass production systems: ‘a model of productive efficiency, based on the manufacture of a wide and changing array of customised products in short runs by skilled, adaptable workers using versatile general-purpose machinery’.<sup>71</sup> The underlying logic of this type of system was to check opportunism and free riding through the use of institutions for collective service provision and conflict resolution ‘without stifling fluid cooperation among decentralised economic actors’.<sup>72</sup> A particularly important feature of flexible specialisation is that the size of a firm is not a determining factor of its economic success. The approach sits as an alternative to Chandlerian big business history focused on the success of ‘the large, vertically integrated, horizontally diversified, managerially directed

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<sup>69</sup> Philip Scranton, *Endless Novelty: specialty production and American industrialisation, 1865-1925* (Princeton University Press: Princeton, 1997).

<sup>70</sup> Sabel, ‘Flexible Specialisation’, p. 28.

<sup>71</sup> Zeitlin, ‘The Historical Alternatives Approach’, p. 121

<sup>72</sup> *Ibid.*, p. 125.

corporation', typified in the American economy during the twentieth century.<sup>73</sup> It is not a diametrically opposed 'small is beautiful' model, but one in which 'there are no intrinsic barriers to preventing (networks of) small firms from being economically efficient, technologically innovative and commercially successful.'<sup>74</sup> This may help us explain the prevalence of a dynamic group of small to medium sized enterprises in the Potteries which will be discussed below in a short case study.

Flexible specialisation is also a model that has been discussed in relation to numerous historical industrial districts specialised in one particular industry, such as the Lyons silk industry of the eighteenth and nineteenth century, the cutlery industries of Sheffield and Solingen during the nineteenth century, and the US motion picture industry of the twentieth century.<sup>75</sup> Broadly speaking, some of the key characteristics of regions that were flexible and specialised are as follows:

1. Products varied continually to meet changing demand and extend markets
2. The development of general-purpose technologies combined with highly skilled labour to reduce production costs
3. Development of institutions to enforce working conditions, set minimum wages and control inferior materials
4. Cooperative banks encourage competition through provision of credit for reorganisation of firms and 'vocational schools' to encourage development of human capital
5. Cooperative competition key for all firms regardless of their strength and position in system

The underlying principle was that success relied on an ability for the region or district *as a whole* to respond to rapidly changing and unpredictable markets.<sup>76</sup> However, the degree of localisation and concentration, the size of the district, and the size firms within them are not key determining factors

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<sup>73</sup> Naomi Lamoreaux, Daniel Raff and Peter Temin, 'Against Whig History', *Enterprise and Society*, Vol. 5, No. 3 (September 2004), p. 377.

<sup>74</sup> Zeitlin, 'The Historical Alternatives Approach', pp. 129-30

<sup>75</sup> Tweedale, 'Backstreet capitalism'; Rudolph Boch, 'The rise and decline of flexible production: the cutlery industry of Solingen since the eighteenth century', in Sabel and Zeitlin (eds.) *World of Possibilities*, pp. 153-187; Michael Storper and Susan Christopherson, 'Flexible Specialization and Regional Industrial Agglomerations: The Case of the US Motion Picture Industry', *Annals of the Association of American Geographers*, Vol. 77, No. 1 (March 1987), pp. 104-117.

<sup>76</sup> Sabel, 'Flexible Specialisation', p. 17.



(as we previously noted) and in fitting with the flexible nature of the approach, are scalable to a certain degree. Zeitlin, like Popp and Wilson, is keen to stress that the approach contains no assumptions of the success of districts if they exhibit these features, nor that successful districts will then develop along the lines of the canonical Marshallian model, or that flexible specialisation will feature at all in industrial districts. Rather, industrial districts are ‘one possible organisational framework’ in which flexible specialisation may flourish.<sup>77</sup> Flexible specialisation, then, seems one of the more useful theories that may help us understand the rise and success of the North Staffordshire Potteries; it provides generalisations that arise out of diversity and hybrid cases.

Aside from that of Popp and Wilson, all the theories discussed so far have one common feature: they all assume that industry is already concentrated and are thus all limited in their ability or usefulness in trying to explain the earlier period of origins and development in North Staffordshire. The empirical evidence from which all these theories have been constructed largely focuses on industrial districts in their prime, once they have risen to prominence; again, with the exception of the life-cycle model which is also concerned with explaining the decline of districts. None adequately address the initial concentration thoroughly or systematically. The most useful appears to be the logic proposed by Popp and Wilson and shown in Figure 2.3. This at least argues that the process of spatial concentration is part of a virtuous circle although we are still left with a chicken-egg scenario in trying to determine what sparked the initial concentration.

In a more recent formulation of the English industrial district theory Popp and Wilson refer to ‘centripetal forces’ which account for the ‘deepening regional specialisation’ and concentration of workshop industries in industrial districts.<sup>78</sup> Although not fully explained, they argue that the location of natural resources and geographically fixed factors of production were of initial importance in the clustering and formation of industrial districts but these ‘rapidly became much

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<sup>77</sup> Zeitlin, ‘Industrial Districts’, p. 223-4.

<sup>78</sup> Popp and Wilson, ‘The emergence’, p. 46.

less important to their future development'.<sup>79</sup> The timing of this shift in importance is not discussed in any great detail by Popp and Wilson as much of their theory then returns to explaining the dynamics of fully fledged districts. However, Weatherill has shown that whilst precise dating is not possible, it is clear that pottery producing regions were using clay from other parts of the country by the early eighteenth century. In particular, ball and china clay from Cornwall and Devon was being transported around the country and flint from Newcastle-upon-Tyne and the south-east coast was being shipped along the coast and rivers. We know that ball-clay was crucial in the development of Staffordshire pottery types such as creamware and tortoise-shell ware but acquiring reliable estimates of the quantities used in different regions of the country and whether Staffordshire's use of non-local raw materials occurred before other regions has proved difficult.<sup>80</sup> Tortoise-shell ware was not developed until c.1750 and creamware, pioneered by Josiah Wedgwood, was not fully developed until c.1760.<sup>81</sup> It is therefore unlikely that localised natural resource endowments can explain the surge in growth in North Staffordshire around the middle of the eighteenth century and we may be able to say, then, that already by 1750 the Staffordshire potteries had shaken its reliance on advantageous local deposits of clay.

This does not cast much light on the earlier period of development during the late seventeenth and early eighteenth century, the period in which critical mass was being accumulated and when, theory suggests, geographical advantages based on natural resources should be important. The earlier emergence of North Staffordshire thus remains somewhat hazy. Popp and Wilson's theory is useful but it does have limitations. We must thus look for other potentially useful theories relating to the location of industry and it is here that we return to the work of Crafts.

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<sup>79</sup> *Ibid.*, p. 48.

<sup>80</sup> Weatherill, *The pottery trade and North Staffordshire*, p. 13.

<sup>81</sup> *Ibid.*, pp. 8-14; D. H. Cohen and C. Hess, *Looking at European ceramics: a guide to technical terms* (British Museum Publications: London, 1993), pp. 29-32.

In their study of the location of the British industry between 1871 and 1931 Crafts and Mulatu sought to test two models used to explain industrial location: the Hecksher-Ohlin model based on factor endowments, and the New Economic Geography models based on market access and scale economies.<sup>82</sup> They argued that factor endowments were the key to the location of industries in England before 1931 although they do concede that scale economies may have accentuated ‘the attraction of factor endowments’. Before the Second World War, transport costs were too high to allow for the linkage effects emphasised in the New Economic Geography models to take centre stage.<sup>83</sup> In a later case study of the British cotton textile industry in the earlier nineteenth century, Crafts and Wolf tested competing claims over why the industry concentrated in Lancashire.<sup>84</sup> Whilst they rejected Farnie’s earlier ‘laundry list’ of factors explaining the location of cotton textile production in Lancashire, they do present an augmented version of his argument based on original and acquired locational advantages; also known as first and second nature geography.<sup>85</sup> For example, Crafts and Wolf argue that original geographical advantages which influenced the location of the industry in Lancashire were the sources of water power, rugged terrain, a history of ‘textile tradition’ and proximity to ports. Acquired advantages included access to foreign markets, agglomeration benefits and access to cheap coal. Coal was not initially important for the location of the cotton textile industry but it did impact on the size of factories and employment.<sup>86</sup> The key transition came when agglomeration benefits and second nature advantages ‘eventually acted to “lock-in” the industry to its heartlands’, in other words, ‘original advantages could have legacy effects’.<sup>87</sup>

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<sup>82</sup> Nicholas Crafts and Abay Mulatu, ‘What explains the location of industry in Britain, 1871-1931’, *Journal of Economic Geography*, Vol. 5 (2005), pp. 499-518

<sup>83</sup> *Ibid.*, pp. 512-4

<sup>84</sup> Nicholas Crafts and Nikolaus Wolf ‘The Location of the UK Cotton Textiles Industry in 1838: A Quantitative Analysis’, *The Journal of Economic History*, Vol. 74, No. 4 (Dec. 2014), pp. 1103-1139

<sup>85</sup> *Ibid.*, p. 1106.

<sup>86</sup> *Ibid.*, p. 1134.

<sup>87</sup> *Ibid.*

In contrast to Popp and Wilson's approach discussed directly above, this gives us a much more refined theory in which to situate the dynamics of industrial development: the changing importance of geographical factors and endowments over time. For example, we could argue that the presence of coal and clay in North Staffordshire was a first nature geographical advantage as these were both essential factors of production and we know from Weatherill's work on the seventeenth century that transporting coal was costly. Proximity to cheap coal was extremely important given that estimates suggest that in the early eighteenth century a ton of clay required between five and twelve tons of coal to produce wares.<sup>88</sup> Following this line of argument, the development of improved transportation links such as turnpikes and the Trent and Mersey canal could then be seen as acquired advantages providing both increased access to markets and also reducing the costs of transporting clay and coal from further afield.

Having discussed some of the relevant theories about the origins and growth of the industrial district, the chapter will now introduce some broad literature to highlight the development and importance of network analysis in the study of the past and more generally.

## 2.2 Networks

Mark Granovetter has been hugely influential in pushing forward and developing our understanding of economic actions by viewing them through a social lens. The key points of his arguments are summarised below and reflect his belief in the intense interconnectedness of economic and social spheres.

1. Economic pursuits are usually found hand in hand with non-economic ones such as sociability, approval, status and power.
2. Economic action is socially situated, it is not carried out by atomised actors based on individual motives alone but is embedded in 'ongoing networks of personal relationships'.

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<sup>88</sup> Weatherill, *The pottery trade and North Staffordshire*, pp. 30-31.

### 3. Economic institutions are socially constructed.<sup>89</sup>

His pragmatic approach and sociological grounding is even clearer as he explicitly states that because economic activity is such a large part of life, we cannot be expected to conduct it in isolation from the other aspects of our life.<sup>90</sup> Granovetter also produced two seminal and much cited works which focused on social network structures and the importance of ‘weak ties’ between individuals in providing access to novel and diverse information and opportunities.<sup>91</sup> The strength of a tie is determined by the ‘emotional intensity’, ‘intimacy’, ‘reciprocal services’ and the amount of time invested in it.<sup>92</sup> In the context of a social network, one’s close personal relationships are considered *strong* ties, whereas one’s acquaintances with whom one may be less close or familiar are considered *weak* ties. It is these weak ties that become crucial in extending an individual’s network and providing access to different networks. Granovetter formalised this in his ‘strength of weak ties’ theory.<sup>93</sup> Figure 2.4 has been created by the author and shows how the mechanism behind this theory works and is crucial for interpreting the network diagrams that will be presented in chapter four. In Figure 2.4, an individual, A1, has a set of close friends A2-A10, many of whom are close friends with each other. Thus, the relationships between A1-A10 constitute a dense network of strong ties, represented by solid lines. A1 also has an acquaintance, B1, and this relationship constitutes a weak tie represented by a dotted line. However, B1 also has their own dense network of strong ties with close friends B2-B6. The network around B1 is distinct and separate from the network around A1. The weak tie between these two individuals therefore becomes an important link between these two networks that would otherwise be unconnected. This connection provides information and access to ‘distant parts of the social system’.<sup>94</sup>

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<sup>89</sup> Mark Granovetter, ‘Problems of Explanation’, p. 25-56.

<sup>90</sup> *Ibid.*, p. 26.

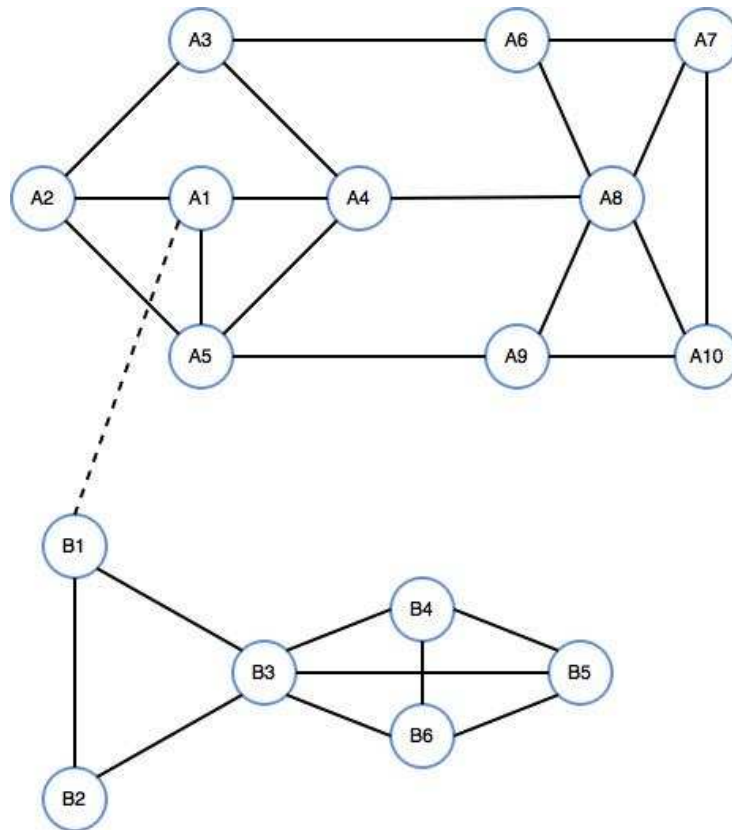
<sup>91</sup> Mark Granovetter, ‘The Strength of Weak Ties’, *American Journal of Sociology*, Vol. 78, No. 6 (1973), pp. 1360-1380; ‘The Strength of Weak Ties: A Network Theory Revisited’, *Sociological Theory*, Vol. 1 (1983), pp. 201-33.

<sup>92</sup> Granovetter, ‘The Strength of Weak Ties’, p. 1261.

<sup>93</sup> Granovetter, ‘The Strength of Weak Ties: A Network Theory’.

<sup>94</sup> *Ibid.*, pp 201-3.

Figure 2.4: Visual representation of Granovetter's 'Weak Ties'



The strength of weak ties is linked to the number of them an individual has: the more acquaintances or weak ties a person has, the better connected they are to other dense networks, and therefore, the better their access to knowledge and information in those networks. Granovetter applied his theoretical framework in a study of the impact of weak ties on networks and opportunities in the job market. His hypotheses were borne out empirically: he found that individuals undertaking job searching practices that generated weak ties were at an advantage in the job market over those who remained insulated.<sup>95</sup>

Granovetter's work in this regard has had extraordinary influence on a broad range of research both within and outside pure sociology, such as, the study of large-scale organizations and social systems, social mobility and cohesion, network theory, and the transmission of information and innovation. Although this theory is based on the relationships of individuals, it has been applied

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<sup>95</sup> Mark S. Granovetter, *Getting a Job: A Study of Contacts and Careers* (Harvard University Press: Cambridge, Mass, 1974).

empirically to inter-organisational networks and, more recently, industrial districts: Chetty and Agndal applied network theory based on Granovetter's interpersonal relationships to the current Auckland boat building cluster. They found that interpersonal networks could be transformed into inter-organisational networks which strengthened the district. These networks also helped firms and organisations find a balance between competition and cooperation.<sup>96</sup>

Individual networks can also cross the boundaries of the firm or workplace and provide the structure and context in which economic actions and outcomes take place.<sup>97</sup> Moreover, Granovetter highlighted the importance of these networks in his account of 'relational' and 'structural' embeddedness. The former refers to the importance of relationships within firms such as those between employees and managers; how these individuals interact is determined in part by the organisational hierarchy of the firm, but also by the history of their personal relations. These interactions may affect economic choices such as labour mobility and opportunities elsewhere in the labour force. The impact of the latter, 'structural' embeddedness, is more indirect although relates closely to the diffusion of information and ideas and refers to the connections between an individual's contacts.<sup>98</sup> Granovetter argued that as the mutual contacts of two people become connected, forming the now familiar weak ties, information is more efficiently diffused and an awareness of what other network members are doing increases. Thus, dense networks are formed with subnetworks of strong ties being connected by weak ties. These impact on individuals because they can determine what information is available to them when economic decisions are made: 'Such cohesive groups are better not only at spreading information, but also at generating normative, symbolic, and cultural structures that affect our behaviour.'<sup>99</sup>

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<sup>96</sup> Sylvie Chetty and Henrik Agndal, 'Role of Inter-organizational Networks and Interpersonal Networks in an Industrial District', *Regional Studies*, Vol. 42, No. 2 (2008), pp. 178-9, 185.

<sup>97</sup> Granovetter, 'Problems of Explanation', pp. 27-36.

<sup>98</sup> *Ibid.*, pp. 34-5.

<sup>99</sup> *Ibid.*, p. 35.

The notion that the strength and density of ties in networks impacts upon economic actions has been developed along slightly nuanced lines by Ronald Burt in his ‘structural hole’ theory.<sup>100</sup> Burt’s argument focuses on social networks between individuals and is constructed along similar lines as Granovetter, in that he also recognises the importance of weak ties in providing access to more diverse information. However, Burt argues that the central role in information transfer in such networks is carried out by ‘brokers’, whose connections and relationships span between different groups and bridge the ‘structural holes’ of information between these groups.<sup>101</sup> This is based on several assumptions which are important when thinking about the study of organisations, networks and social groups.

Firstly, Burt argues ‘opinion and behaviour are more homogenous within than between groups’.<sup>102</sup> This has the effect that those individuals, ‘brokers’, whose connections span *across* and *between* different groups or networks are more accustomed and receptive to new or different modes of thought and behaviour. Burt assumes that within a social group or network, people focus on the activities or pursuits of their own group, a relatively inward perspective which allows ‘structural holes’ to appear in the information travelling between groups. Secondly, the position of ‘brokers’ allows them to take advantage of this condition rendering them paramount to innovation and learning within the groups they are connected to.<sup>103</sup> This role is vital given Burt’s assertion that generation of ideas and knowledge requires ‘someone moving knowledge from this group to that, or combining bits of knowledge across groups.’<sup>104</sup> Finally, Burt argues that networks themselves do not act; rather, they are the structure and context for the actions of individuals.<sup>105</sup>

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<sup>100</sup> Ronald Burt, ‘Structural Holes and Good Ideas’, *American Journal of Sociology*, Vol. 110, No. 2 (2004), pp. 349-99.

<sup>101</sup> *Ibid.*, p. 353.

<sup>102</sup> *Ibid.*, p. 349.

<sup>103</sup> *Ibid.*, pp. 353-4.

<sup>104</sup> *Ibid.*, p. 356.

<sup>105</sup> *Ibid.*, p. 357.



The work of Burt and Granovetter has highlighted the importance of focusing on the connections of individuals to understand the wider impact of their actions. Whilst both situate the individual as their unit of analysis and as the base unit for their networks and groups, each recognise that individuals often act within the boundaries of firms and organisations. Consequently, their actions and connections at an individual level impact upon the wider success of these firms and organisations. There has been much literature drawing on the theoretical work of Burt and Granovetter and the impact of embeddedness and network connections on performance at multiple levels of analysis from the individual to the national.<sup>106</sup>

However, we must not overlook the importance of combining such an approach with an economic or organisational one, especially when considering industrial districts as these are complex sites of intense social *and* economic interactions. Mark Casson has provided a conceptual synthesis of the economic and social characteristics of networks and clusters which demonstrates the benefits and limitations of economic theory in explaining their historical development. He defines a general network as a 'set of high-trust linkages connecting a set of people'. The levels of trust make these connections strong ties, to use Granovetter's terminology. The act of networking is, Casson argues, both 'entirely rational' and 'inherently social' and builds on trust between members which is not enforced by regulation or law.<sup>107</sup>

Trust can serve as a means of gaining access to increasingly diverse information by allowing contacts and connections outside of the network or region within which an actor is located. Casson also highlights the importance of access to external information although he shifts his focus slightly

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<sup>106</sup> For a recent survey and critique of these theories see: Peter Moran, 'Structural vs. Relational Embeddedness: Social Capital and Managerial Performance', *Strategic Management Journal*, Vol. 26 (2005), pp. 1129-51.

<sup>107</sup> Mark Casson, 'An economic approach to regional business networks', in Andrew Popp and John Wilson (eds.) *Industrial Clusters and Regional Business Networks in England, 1750-1970* (Ashgate: Aldershot, 2003), pp. 29-30.

to the need for regions to remain ‘outward looking’ to identify and access the economic benefits of the metropolis.<sup>108</sup>

However, trust is a difficult concept to define and can be approached from different perspectives. For Casson, trust is *the* defining characteristic of a network as it can release the members of networks from the constraints of purely face to face transactions within a defined region or district; it can reduce the need for actors to know each other on a personal basis.<sup>109</sup> He argues that trust in successful networks must be ‘*warranted mutual trust*’: trust that is reciprocated by all parties and which is expressed in the behaviour of those parties, i.e. when those who are trusted behave in a trustworthy manner.<sup>110</sup> However, not all trust is warranted or mutual.

Oliver Williamson’s vital work on economic behaviour approaches the issue of trust from a different perspective: transaction cost economics. He has clearly articulated how economic organisations are susceptible to opportunistic behaviour, often in the form of ‘false or empty...self-disbelieved, threats and promises’ made with the intention of securing individual advantage or gain over others.<sup>111</sup> A core tenet of Williamson’s work is the assumption that ‘*some* individuals are opportunistic *some* of the time and that differential trustworthiness is rarely transparent *ex ante*’. It is difficult for parties to distinguish between sincere commitments and promises and those which are self-disbelieved or made with guile.<sup>112</sup> There are two important implications of such opportunism for organisational structures which are relevant for this study. Firstly, the *ex-ante* monitoring of other parties and the *ex post* creation of safeguards, and secondly, economic organisations in which genuine trust and good intentions are ‘generously imputed to the

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<sup>108</sup> Casson, ‘An economic approach’, p. 24.

<sup>109</sup> *Ibid.*, p. 30.

<sup>110</sup> *Ibid.*, p. 29

<sup>111</sup> Oliver E. Williamson, *Markets and Hierarchies: Analysis and Antitrust Implications* (The Free Press: New York, 1975), p. 26.

<sup>112</sup> *Ibid.*, p. 27; Oliver E. Williamson, *The Economic Institutions of Capitalism* (The Free Press: New York, 1985), p. 64 (own emphasis).

membership' are inherently fragile.<sup>113</sup> The threat or possibility of opportunistic behaviour greatly impacts on economic transactions and contractual arrangements within an organisation; if opportunism is present, contracting between parties must be comprehensive in order to mitigate inherent uncertainty. If bounded rationality is also present, 'serious contractual difficulties arise'.<sup>114</sup> Opportunism, bounded rationality and asset specificity are the key 'elementary attributes of human decision makers' and are the basis of Williamson's explanation of human behaviour.<sup>115</sup> As such, any examination of economic behaviour, particularly in relatively small organisational structures (compared with markets for example), must look for signs of opportunism and the solutions and institutions formed to combat this.

Nohria provides further justification for devoting a chapter of this thesis to the study of networks and highlights an increasing trend beginning in the 1970s and 1980s in the adoption of a network perspective when studying organisational structures. <sup>116</sup> He defines a social network as 'a set of nodes...linked by a set of social relationships...of a specific type'.<sup>117</sup> Although his definition is somewhat vague, it does perhaps highlight the difficulty in identifying a rigid concept of a 'network' as this can change depending on the unit of analysis and the field of study. A looser definition will prove more useful when beginning research. Table 2.1 has therefore been created by the author for use as an analytical tool in this chapter and throughout the rest of the thesis. It provides a stylised summary of several of the most important and relevant theories and definitions of various networks and organisational forms. The different concepts will be useful for examining different features of the Potteries.

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<sup>113</sup> *Ibid.*, pp. 64-5.

<sup>114</sup> *Ibid.*, pp. 66-7.

<sup>115</sup> *Ibid.*, p. 4; J. I. Moore, *Writers on Strategy and Strategic Management: The Theory of Strategy and the Practice of Strategic Management at Enterprise, Corporate, Business and Functional Levels*, 2nd edition (Penguin: London, 2001), pp. 179-88.

<sup>116</sup> Nohria, 'Is a network perspective'.

<sup>117</sup> *Ibid.*, p. 5.

Table 2.1: Approaches to networks

Authors	Organisational Form	Definition	Operating Logic	Primary Application	Examples Include
Miles, Snow & Coleman (1992)	Network Organisation	<i>'Full disclosure information systems' in the form of 'clusters of firms or specialist units coordinated by market mechanisms instead of chains of command.'</i>	Helps mitigate the problems firms have in struggling to respond effectively to changes in their competitive environment	Larger complex firms located in an increasingly competitive business environment	
	Stable Network	<i>Serves to link 'independently owned specialised assets along a given product or service value chain.'</i>	A large core firm creates market-based linkages to a limited set of up-stream and/or down-stream partners	Mature industries requiring large capital investments. Varied ownership limits risk and encourages full loading of all assets	Nike
	Internal Network	<i>One firm with internal units operating by market defined prices</i>	Commonly owned business elements allocate resources along the value chain using market mechanisms	Mature industries requiring large capital investments. Market-priced exchanges allow performance appraisal of internal units	Asea Brown Bovari (large multinational electrical systems and equipment)
Appleyard (1996)	Dynamic Network	<i>Independent firms are linked together for the one-time (or short term) production of a particular good or service</i>	Independent business elements along the value chain form temporary alliances from among a large pool of potential partners	Low tech industries with short product design cycles and evolving high tech industries	IBM, Apple
	Knowledge Transfer Network	<i>A structure of connexions between individuals and firms which function across company lines as a medium through which useful know-how or information can be transferred</i>	Individuals share know-how across company and industry lines predominantly through private channels	Professional networks as a source of private knowledge linking cross-company and cross-industry experts	Japanese and American Semiconductor industries
Allen (1983)	Information Disclosure Channels	<i>A structural framework of communication between firms centred around a culture of testing and sharing of technical information through two channels - informal disclosure and publication in engineering literature</i>	A firm makes its new technical information available to competitors allowing cumulative advance and increasing the rate of invention in that industry	Industries characterised by small incremental technical improvements in which new knowledge was shared and used by new technical endeavours	Cornish copper and tin mines c. 1730-1860; British pig iron industry of the 19th century

Authors	Organisational Form	Definition	Operating Logic	Primary Application	Examples Include
Weatherill (1986)	Distribution Network	<i>A structure of 'trading relationships' through which products could be traded from producers concentrated in a few parts of the country to the final consumers</i>	A producer develops a number of links with different commercial units in order to distribute their products to other parts of the country. Merchants had to draw on supplies of products from as great a variety of producers as possible in order to offer a diverse product range to their customers.	An industry where the products are produced in concentrated regions serving a spatially diverse group of consumers with a diverse range of products	English pottery industry during the 18 <sup>th</sup> century
	Communication Network	<i>A framework of people who knew one another and who could discuss and influence the development of the industry</i>	It was along these lines within the distribution networks that information about new products and consumer preferences could be channelled.	Alongside established distribution networks as above	English pottery industry during the 18 <sup>th</sup> century
Blaszczyk (2000)	Intermediary Network	<i>A matrix within which the connections and relationships of key individuals forged links between the spheres of producers and consumers (or supply and demand)</i>	A producer develops a relationship and/or partnership with an 'intermediary' in order to gain insight and more intimate access to their market	Manufacturing industries where consumer preference changed frequently and in which demand determined supply	Wedgwood-Bentley Business Partnership
	Social Network	<i>The social context in which an individual's economic actions are embedded. An individual's network is formed of a mixture of stronger, close relationships and weaker acquaintances</i>	An individual with a network of strong ties, utilises their weak ties to gain access to new information and increase opportunities. The more weak an individual has, the stronger their impact becomes	Diverse range of possible applications. Primarily the theory is based on individuals and their networks, although it can also be applied to inter-organisational networks	Late 20 <sup>th</sup> century US job market; Auckland boat building industry late 20 <sup>th</sup> century

Miles, Snow and Coleman Jr, in two articles in 1992, approach networks at the firm level in order to identify the features and characteristics of various types of organisational form.<sup>118</sup> The authors are studying networks as a form of organisational structure ranging from a single firm to complex networks of multiple diverse firms. Within this diversity there are several key features on which the success of a network depends: the collectivising of assets of numerous firms, cooperating and willingly sharing information with others (firms do this to maintain their position in the network), and voluntary behaviour that improves the final product rather than simple contractual obligation. This blend of cooperation and self-preservation fosters collectivism within the network.<sup>119</sup> Although the successful network organisations described by the authors are primarily based on observations of the second half of the twentieth century, there are some interesting parallels to be drawn with the more sociological arguments discussed above. These parallels stress the relevance and usefulness of focusing on both the individual, whose economic actions are socially embedded, and the firm, composed of individuals who act both in their own right and in the capacity of a firm. For example, Miles and Snow argue that relationships in networks of firms *must* be both voluntary and external. Voluntary connections, comparable to Casson's 'high-trust' linkages, do not require complex contracts between firms which can compromise their openness and limit their ability to adapt and respond to changes and challenges in their competitive environment. The external relationships of firms in networks allows them to remain competitive and 'test and protect the value of their contribution' to the network and avoid overspecialisation and dependence on a small group of firms.<sup>120</sup> As we have seen, these external relationships also provide access to other networks, firms and areas of specialisation and the novel useful information to be found there.

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<sup>118</sup> R. Miles, H. Coleman Jr and C. Snow, 'Managing 21<sup>st</sup> Century Network Organizations', *Organizational Dynamics*, Vol. 20, No. 3 (1992), pp. 4-20; R. Miles and C. Snow, 'Causes of Failure in Network Organizations', *California Management Review*, Vol. 34, No. 4 (1992), pp. 53-72.

<sup>119</sup> Miles and Snow, 'Causes of Failure', p. 55.

<sup>120</sup> *Ibid.*, p. 66.

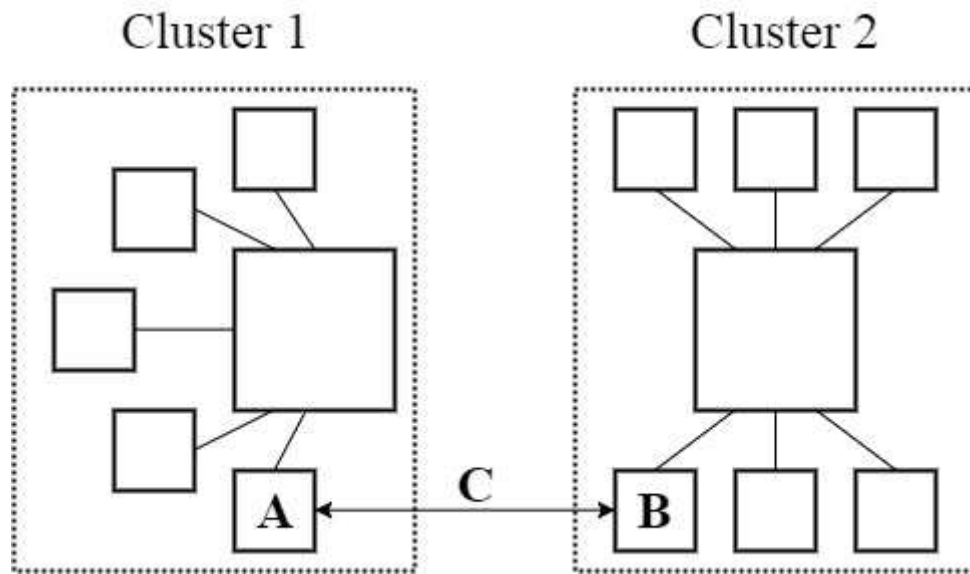
Based on the discussion above, then, the argument could be made that the success, and to a certain extent the failure, of regions and districts could be determined, in large part, by the degree to which the local networks, and the individuals within them, engage and integrate with external networks.

Figure 2.5 was created by the author and illustrates the possible channels of information exchange between actors in different clusters. These clusters can be networks of individuals, groups of firms, or entire districts and industries. The framework is malleable enough to be useful alongside a variety of network conceptions and the schema is intended to be applicable to a range of contexts, environments and units of analysis. For example, clusters 1 and 2 can represent ‘stable networks’ of core firms as Miles and Snow suggest. Connection C, in this instance, can represent a commercial relationship through which firms A and B are able to operate outside of their own business network, thus maintaining competitiveness. Alternatively, clusters 1 and 2 can represent entirely different sectors or industries such as earthenware and glass or stoneware and porcelain. A and B, in this case, can represent individuals from different firms whose informal connection or relationship outside of the workplace provides access to new information or knowledge and helps promote trust. In this case, Figure 2.5 more closely represents Appleyard’s knowledge transfer network.<sup>121</sup>

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<sup>121</sup> Melissa Appleyard, ‘How does knowledge flow? Interfirm patterns in the semiconductor industry’, *Strategic Management Journal*, Vol. 17 (1996), pp. 137-54.

Figure 2.5: Information channels between networks, industries, and groups of firms



Although Figure 2.5 is a stylised representation, it is a useful tool for thinking about the importance of connections between groups. Its core assumption is that line C provides units A and B with the chance to engage with a whole host of other actors, which was otherwise not possible, and thus gain access much more diverse knowledge, information and skills. The logic behind this network is applied in chapter four, and specifically in Figure 4.1.

There exists, then, a great deal of literature concerning social network theory, and its application in both a contemporary and historical context. Granovetter's theory in particular illustrates the importance of thinking about network forms and how people use their networks. As Table 2.1 shows, networks can be framed and analysed in different ways. What is important for this study is that different types of networks exist, and agents, whether they are individuals, groups of individuals, or institutions, use them more or less intensely and gain different benefits from them. The analysis presented in chapter four draws on network theory and the literature discussed here in order to provide a deeper and more critical understanding of the impact of certain types of behaviour, and reveals far more than previous studies of 'well-connected' individuals such as Josiah Wedgwood.



### 3 The organisation of a district and the evolution of firms

*Near the head of the Vale, seams of coal break out, and columns of smoke proclaim the neighbourhood of Etruria, the celebrated pottery of the ingenious Mr. Wedgwood. Here we have a colony raised in a desert, where clay-built Man subsists on clay, and where he seems to want nothing but the power of Prometheus to copy himself in that material – How prolific is art! How far beyond numeration the forms into which this material is turned both for use and ornament! The vases of antient Etruria are outdone in this pottery. Taste makes even the petuntze of China unnecessary here; and in vain does the gilding of Dresden and St. Cloud endeavour to make the eye deceive the judgement.<sup>1</sup>*

#### 3.1 The early stages of an industrial district

In the summer of 1791 a gentleman traveller made the above remarks about what he saw when his journey from London to the Lake District brought him to the district of the Potteries. Whilst this is only a short account, it is an important one as not only does it demonstrate the literary flair of the writer, but it neatly captures a lot of what we now know about pottery production in North Staffordshire around 1800. Firstly, one of the key geographical features of the region, the coal seams, are noted and the extensive use of coal as an energy source is alluded to in the reference to *columns of smoke*. The renown of Josiah Wedgwood is clear and the description of his factory at Etruria as a neighbourhood is particularly accurate as we know that, like philanthropic entrepreneurs of the nineteenth century such as Titus Salt, Wedgwood provided good quality accommodation for around 300 of his workers in the immediate vicinity of his factories.<sup>2</sup> The visual language given over to the description of the Potteries as a *colony* is rather interesting as it reminds us that the concentration of pottery production in the region needs explaining; how was this colony (or agglomeration) raised, and why was it raised in a desert (or North Staffordshire)? The writer

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<sup>1</sup> Anonymous, *A Tour from London to the Lakes: Containing Natural, Œconomical, and Literary Observations, Made in the Summer of 1791. By a Gentleman* (John Abraham: London, 1792), p. 19.

<sup>2</sup> See: 'Rent Account Book 1796-1811', E43-28683, Wedgwood Museum Archives, Stoke-on-Trent. For an account of Wedgwood's motivations in this decision see: Neil McKendrick, 'Josiah Wedgwood and Factory Discipline', *The Historical Journal*, Vol. 4, No. 1 (1961), pp. 30-55.

invokes imagery of classical antiquity in the *power of Prometheus*, used to refer to the use of fired kilns in the *art* that is pottery production.

The passage then turns to a discussion of the sheer variety of wares being created in the Potteries, and differentiates between the *useful* and the *ornamental* branches of production. Not only did potteries produce tableware and dinner services intended for everyday use, but master potters, designers and modellers were able to create increasingly sophisticated and intricate objects which ranged from porcelain fountains to ornamental clocks.<sup>3</sup> The reference to ‘antient’ *Etruria* may possibly be included as an allusion to Josiah Wedgwood’s successful jasperware imitation of the Portland Vase, a cameo-glass vase thought to have been produced near Rome around AD 5-25.<sup>4</sup> The first copy made by the master potter was well advertised and displayed at ticketed events in London and across Europe so it is possible that the writer was aware of Wedgwood’s most recent achievements.<sup>5</sup> Yet more awareness of the manufacturing process and international competition is revealed in the writer’s inclusion of *petuntze*, a type of stone known in England as Kaolin and required for the production of porcelain, which was discovered in Cornwall and patented by William Cookworthy in 1768 and was the subject of heated Parliamentary debate during the 1770s.<sup>6</sup> Finally, the passage refers to two major European sites of pottery production, Dresden in Germany and Saint-Cloud in France, both known for the high quality of their wares.<sup>7</sup>

The remarks made by the gentleman traveller describe a vibrant and successful district and serve as a starting point for a close study of the region at the lowest possible unit of analysis given the

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<sup>3</sup> See Appendix Two; *Great Exhibition of the Works of Industry*, pp. 709-728.

<sup>4</sup> Anonymous, *A Tour from London to the Lakes*, p. 19; ‘The Portland Vase’, The British Museum Online, at [http://www.britishmuseum.org/explore/highlights/highlight\\_objects/gr/t/the\\_portland\\_vase.aspx](http://www.britishmuseum.org/explore/highlights/highlight_objects/gr/t/the_portland_vase.aspx) [accessed 7th February 2014]

<sup>5</sup> ‘Invitation to View Portland Vase’ (1790), manuscript held at Wedgwood Museum Archive; Neil McKendrick, ‘Josiah Wedgwood and the Commercialization of the Potteries’, in N. McKendrick, John Brewer and J. H. Plumb (eds) *The Birth of a Consumer Society: The Commercialization of Eighteenth-Century England* (Europa: London, 1982), pp. 129-31.

<sup>6</sup> ‘Patent 898, March 17, 1768,’ in Woodcroft, *Patents for Inventions: Abridgments*, p. 8. For further information on patenting and this debate see chapter three.

<sup>7</sup> Abraham Rees, *The Cyclopaedia or Universal Dictionary of Arts, Sciences, and Literature, Volume 28*, (London, 1819), subsection relating to ‘Porcelain’.

evidence and sources available, the pottery or workshop. The main research question for this case study is: what did the organisational structure of the district look like and how did this evolve over time? By the second half of the nineteenth century the district had progressed through stage one of Popp and Wilson's life-cycle model, achieving the critical mass of expertise and factors of production. During the era of master potters such as Josiah Wedgwood I and Josiah Spode I, the region was enacting the second stage, take-off, consolidating its competitive advantage and serving as a site of progress and innovation in the pottery industry. These developments took place within a context of dynamic growth, and it is this which must first be explained.

The maps in Figure 3.1 illustrate the geographical location of the North Staffordshire Potteries and serve to highlight the localised nature of this study. The North Staffordshire Potteries, or *The Potteries*, was a name originally bestowed on the region by outsiders and became so embedded in the inhabitants' sense of identity, and by extension the objects they produced, that 'Staffordshire-ware' quickly became a familiar and established feature of English, and later global, pottery production.<sup>8</sup> Any future references to activities taking place in the Potteries should be understood as taking place within the boundaries of the parishes shown in Figure 3.1 (c). This region of approximately eighty square kilometres accounts for 0.06 per cent of the total land mass of England and to provide some perspective, if England covered an area the size of a professional football pitch, the region being studied would be a circle with a radius of 1.2m and would fit inside the centre circle more than sixty times. It thus becomes even more remarkable that the overwhelming majority of England's earthenware produced during the eighteenth and nineteenth centuries came from such a small region. During this time there were some significant producers outside of the region with porcelain produced by such names as Crown Derby and Royal Worcester.<sup>9</sup> The catalogue of the Great Exhibition of 1851 also lists contributions registered in Leeds, Newcastle-

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<sup>8</sup> We may think of the 'Black Country' as a similar colloquialism; Harold Owen, *The Staffordshire Potter* (Grant Richards: London, 1901), pp. 1-4.

<sup>9</sup> Geoffrey Godden, *New Handbook of British Pottery and Porcelain Marks*, second edition (Barrie and Jenkins: London, 1999).

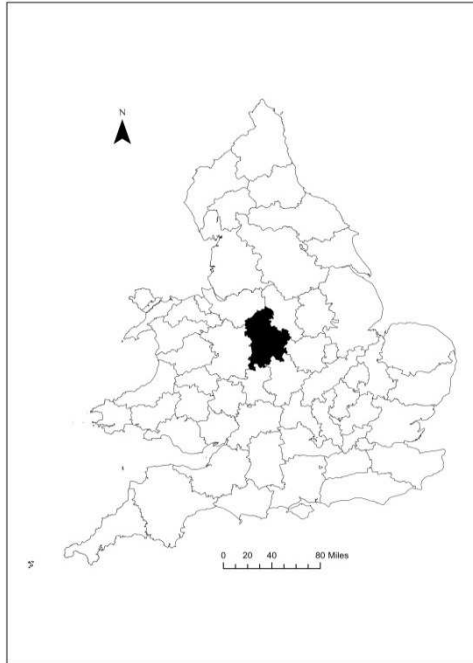
upon-Tyne, Shropshire and London although it is clear that some of these, for London at least, were designed in the registered region but manufactured elsewhere.<sup>10</sup> Nevertheless, when we think of earthenware production in England from the later Early Modern period to the twentieth century our attention is invariably drawn towards North Staffordshire.

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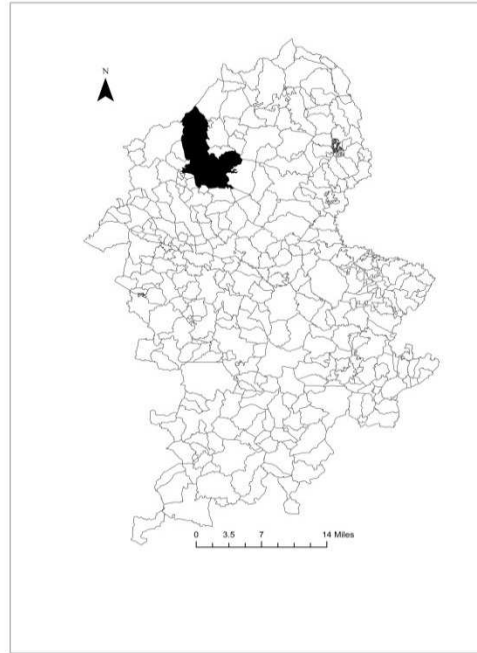
<sup>10</sup> *Great Exhibition of the Works of Industry*, pp. 709-728.

Figure 3.1: The location of the North Staffordshire Potteries

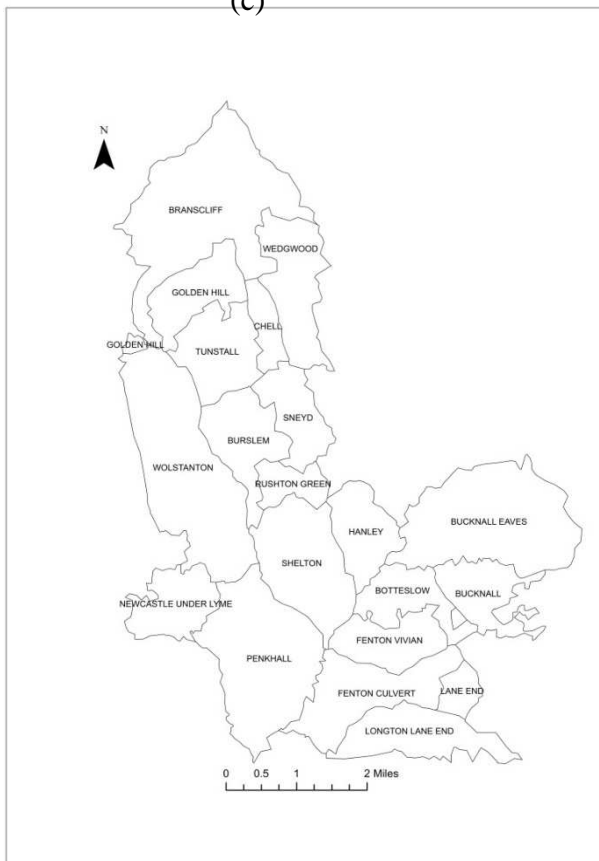
(a)



(b)



(c)

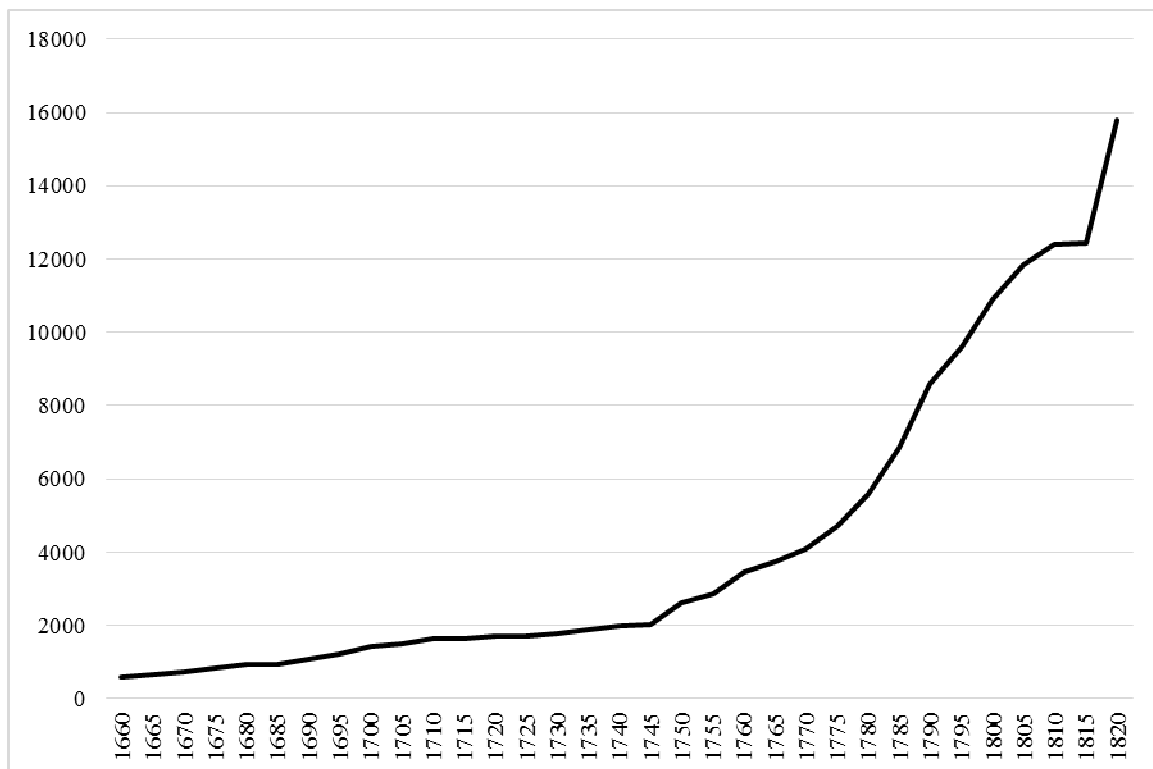


**Notes:** These maps were produced using ArcGIS. (a) shows counties after the administrative boundary changes of the 1840s; (b) shows the historic parish boundaries to reflect the layout of the county before 1851; (c) shows the parishes that constitute the North Staffordshire Potteries

**Sources:** (a) raw data for shapefiles in "Great Britain Historical GIS Project (2012) 'Great Britain Historical GIS'. University of Portsmouth"; (b) and (c) raw data for shapefiles taken from: Burton, N., Westwood, J. and Carter, P., *GIS of the Ancient Parishes of England and Wales, 1500-1850* [computer file]. Colchester, Essex, UK: Data Archiving

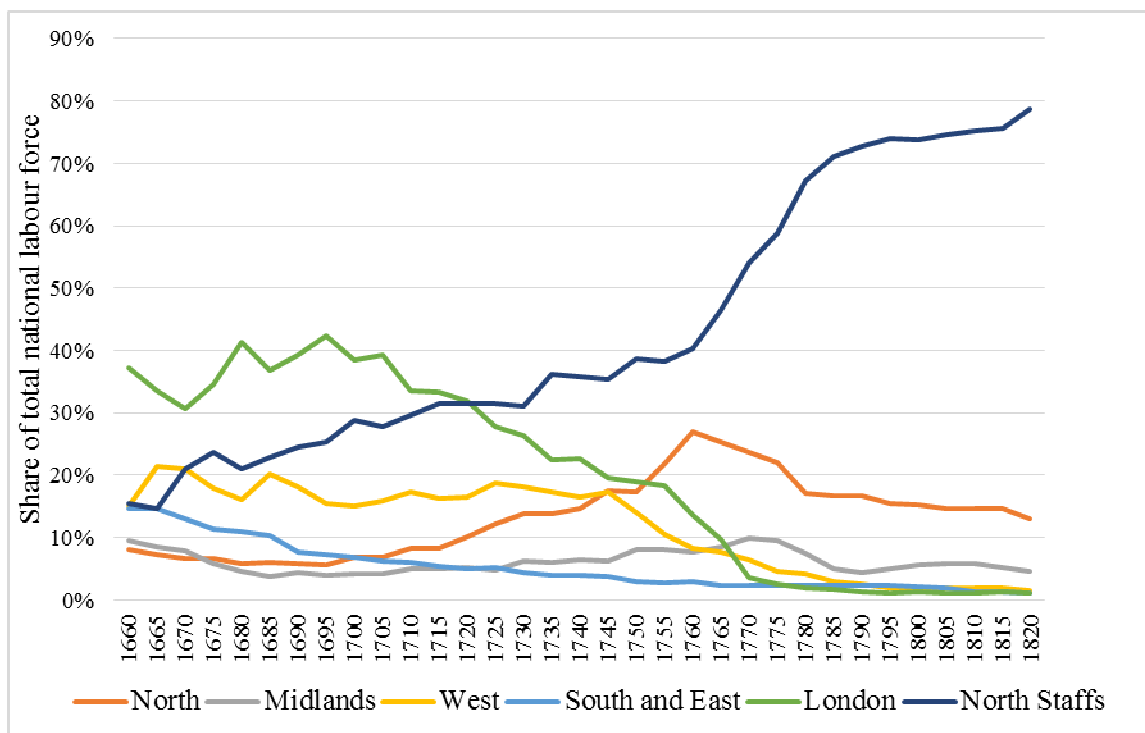
The discussion below will argue that whilst the rise of Staffordshire earthenware production cannot and should not be viewed *ex ante* as in any way inevitable, it can at certain points in history be seen *ex post* as immutable. The empirical evidence shows us that by 1725 the small region had overtaken London to become the largest concentration of earthenware producers with a third of the national industry in terms of the labour force. Figure 3.2 shows Weatherill's estimates for the growth of the national labour force in earthenware production, and Figure 3.3 shows the shares of this labour force present in different regions of England. North Staffordshire's dominant share was retained and consolidated throughout the eighteenth and nineteenth centuries such that by 1820 almost eighty per cent of the national labour force was based in North Staffordshire. The North of England (production areas such as Leeds, Wakefield, Hull and Newcastle) did experience some impressive growth until around 1760, although this was curbed and the trend reversed over the proceeding half century.

Figure 3.2: Growth of earthenware labour force in England, 1660-1820



Source: Employment estimates taken from Weatherill, *The growth of the pottery industry*, p. 453, table A1-9

Figure 3.3: Geographical distribution of earthenware labour force in England by region, 1660-1820



Sources: Employment estimates taken from Weatherill, *The growth of the pottery industry*, p. 453, table A1-9

Notes: The regions listed include the following production sites

*The North:* Hull, Lancaster, Leeds, Liverpool, Newcastle-upon-Tyne, Wakefield, Whitehaven

*The Midlands:* Derby, Nottingham, Ticknall, Wednesbury, Worcester

*The South and East:* Essex potteries, Hampshire-Surrey borders, Lowestoft, Northampton, Wrotham

*The West:* Barnstaple, Bristol, Exeter, Plymouth, Poole

Thus, we are left with a historical phenomenon to explain; the absolute and relative rise of the Staffordshire Potteries and the concurrent decline of other regions. The growth of North Staffordshire as a centre for pottery production accounted for the majority of the growth in the national labour force. Other regions in England experienced significantly different fortunes. The North of England was the only other region to increase its overall share of the labour force in the century up to 1760, although it did start the period with the lowest share. With slightly more than a quarter of the national labour force, the North was home to the second largest share of earthenware producers in England. However, the levels of spatial concentration found in North Staffordshire were not found in the North, where production was spread out in different towns, cities and counties.

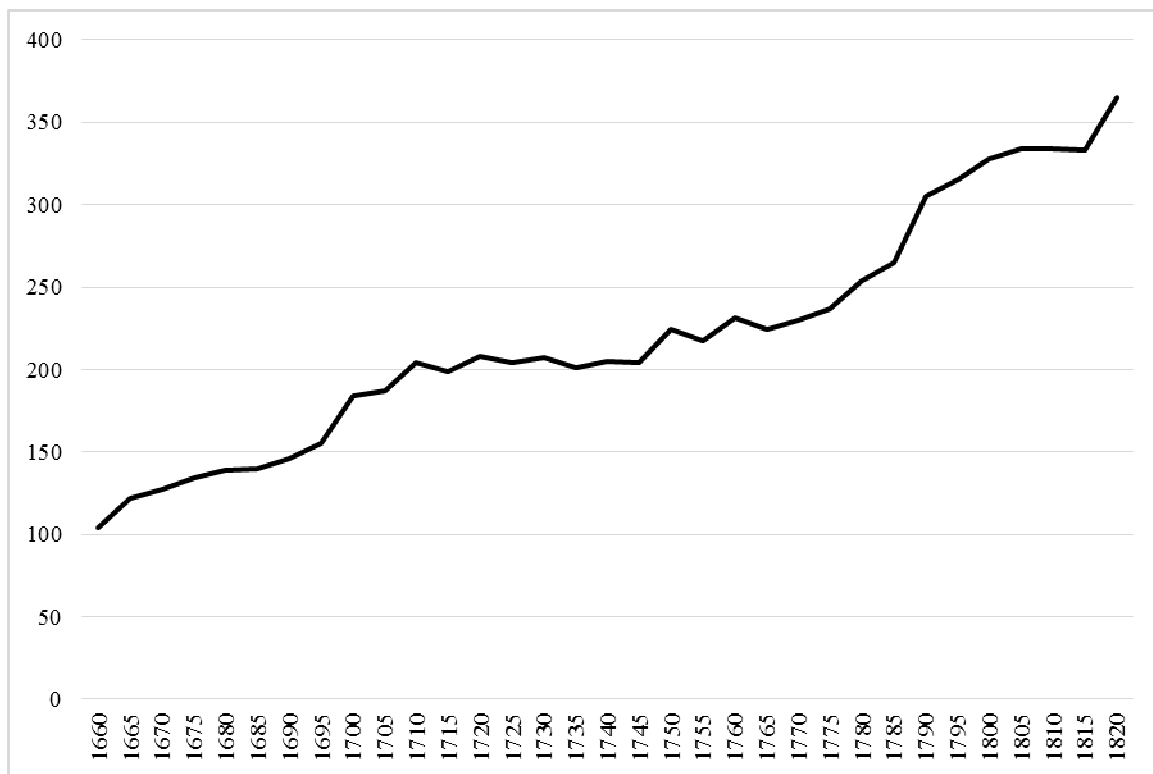
Despite an equal footing in 1660, the West, and the South and East of the country experienced different trajectories. The West stagnated for almost a century before entering a period of rapid decline almost to the point of insignificance, whereas the South and East experienced an immediate but more gradual decline over a century and half. The Midlands largely stagnated before a brief and slight recovery in the middle of the eighteenth century with a subsequent period of decline faring only slightly better than the west, south and east. The most striking trends are those of North Staffordshire and London with the rise of one seeming on the basis of this graph to cement the decline of the other. Based on the concentration of the labour force, what seems in 1660 to have been far from certain or probable given the dominance of London and the equal positions of the West, the South and East, and the Potteries, was, by 1780, and possibly even by 1760, plain to see and, ultimately, irreversible.

The regional variation in development is also clear when we examine estimates of the number of potteries in each region over the same period. Figure 3.4 shows the growth in the number of potteries in England, and Figure 3.5 shows the geographical distribution of these. The dynamic fluctuations within and between regions are much more complex here but do allow us to calculate crude estimates of workers per pottery over a period of 160 years. It is clear that the west of England experienced relative decline in both the number of workers and the number of potteries with only London exhibiting a worse trend. Both the west and the capital experienced some growth in the number of potteries in the late seventeenth and early eighteenth century although London started its decline around 1705 while the west managed to grow in absolute terms until around 1750. Outside of North Staffordshire, as with labour force shares, the north seemed to buck the trend of the other regions and experienced considerable growth in the absolute number of potteries throughout the period with its relative growth being curbed around 1760. Again, the decades either side of 1760 are of particular significance in the regional development of the English pottery industry.



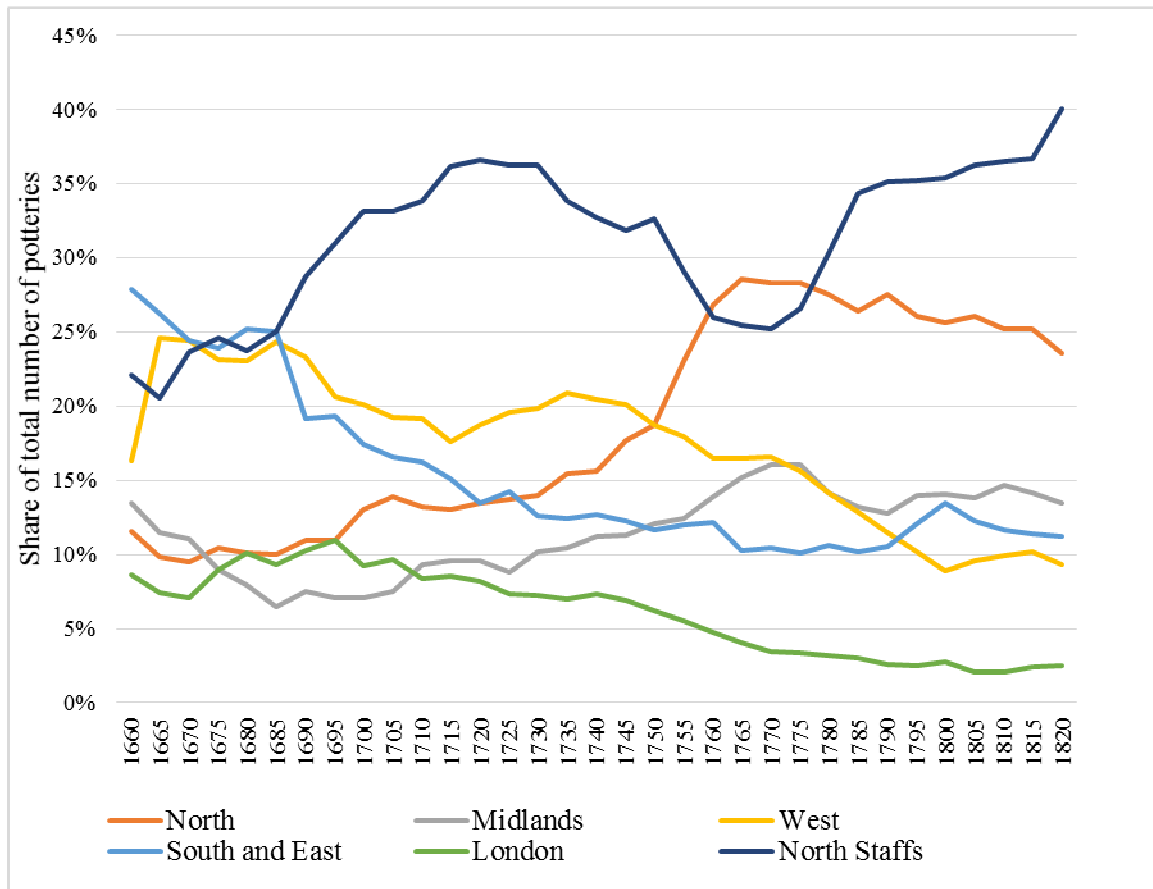
Figure 3.5 shows that for a short period between 1760 and 1780 the north of England was increasing its absolute and relative share of the total number of potteries, at the same time that North Staffordshire experienced a period of contraction in terms of the number of potteries in the region. Perhaps most importantly, Figure 3.2-3.6 show that these dynamics were occurring during a period of overall absolute growth in both the number potteries in England, and the size of the national labour force; with the exception of London, all regions of England experienced an increase in the number of potteries and workers during the period 1660-1820.

Figure 3.4: Growth of the number of potteries in England, 1660-1820



Sources: Regional estimates of number of potteries taken from Weatherill, *The growth of the pottery industry*, p. 452, table A1-8

Figure 3.5: Geographical distribution of potteries in England by region, 1660-1820

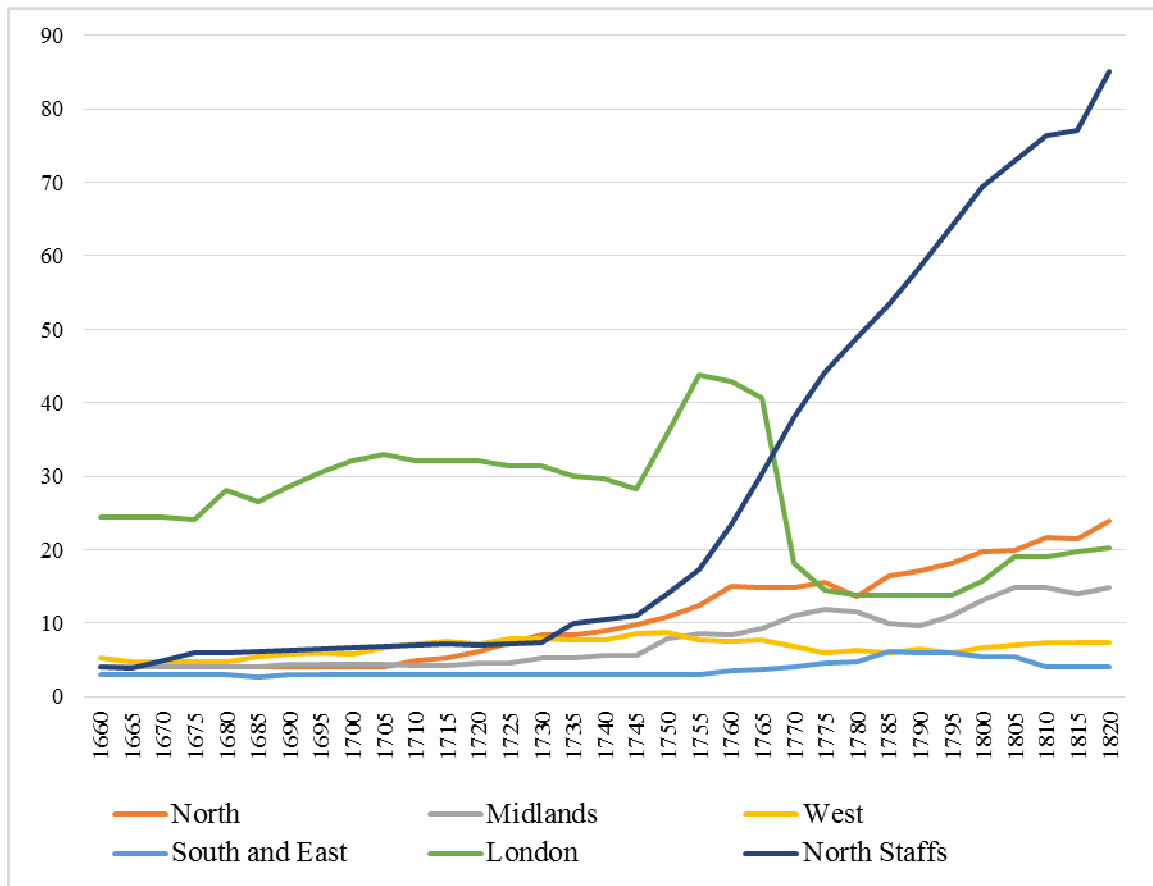


Sources: Regional estimates of number of potteries taken from Weatherill (1986), p. 452, table A1-8

However, the apparent short-term dominance of the North in around 1760 is less pronounced when we take into account the average number of workers per firm as shown in Figure 3.6. From around 1740, according to the best available data, the average size of potteries in North Staffordshire began to increase significantly and at a much faster rate than the rest of the country. London, on the other hand, was the site of the highest average number of workers per pottery from the middle of the seventeenth century. It maintained this ratio with experienced a substantial shift in the structure of its pottery industry in the decades either side of the mid-point of the eighteenth century, with a dramatic decline in the average size of firms bringing the capital back in line with the other regions. Weatherill attributes this ‘spectacular decline’ of pottery in London to the closure of several key delftware manufactories in Southwark and Lambeth in the early eighteenth century. The growth of

the size of enterprises in London in 1745 was only short-lived and was probably the result of increased labour demands from the new porcelain factories in Bow and Chelsea which were in operation from 1747 and 1743 respectively, but had both closed by the 1770s, thus reversing the trend.<sup>11</sup>

Figure 3.6: Average number of workers per pottery in different English regions, 1660-1820



Sources: estimates calculated from data provided in Weatherill (1986), p. 452

The sharp rise in the average number of workers per pottery in North Staffordshire is probably explained by the introduction of the pottery factory by very large firms owned and operated by Master Potters. Josiah Wedgwood's Etruria works (est. 1769), Josiah Spode's works at Church Street (est. 1776) and the jointly owned and operated New Hall Works (est. 1781). Records survive

<sup>11</sup> Weatherill, *The growth of the pottery industry*, p. 264.

for Wedgwood's Etruria works, which was separated into two separate factories, one for producing ordinary useful ware, and another for producing high end ornamental wares. Table 3.1 lists the number and occupation of employees across both Wedgwood's factories as recorded in his Commonplace Book for June 1790.

Table 3.1: Workers recorded at Etruria Works, June 1790

Useful Works		Ornamental Works	
Apprentices	30	Black Handlers	5
Biscuit House	2	(Apprentices)	-
Biscuit Oven	6	Cameo Bat Makers	2
Clay Beaters	2	Cameo Placer	1
Cooper	1	Colour Grinders	4
Counting House	5	Counting House	1
Dish Makers	4	Firemen	2
Enamelling & Printing	9	Glossman Dipper	1
Flat Ware Turners	[Illegible]	Green Ware Looker	1
Gilders	2	Jasper [illeg]	1
Gloss Ware Hands	2	Mould Maker	2
Goss Oven	11	Mr Shufflebottom (Printer and Figurer)	1
Handlers	7	(Apprentices)	2
Hollow Ware Turners	14	Mr Webber (Modeller)	1
Locker's Oven	6	Odd Man	1
Modeller	1	Overlookers	3
Mould Looker	1	Packer	1
Mould Maker	1	Painters	22
Odd Men	4	(Apprentices)	[Several]
Plate Makers	18	Polisher	1
Pressers / Hollow Ware Makers	20	Pressers and finishers	23
Sagar Maker	2	(Apprentices)	13
Slip House	8	Scourers	4
Throwers	9	Slip Makers	3
Warehousemen	12	Throwers	3
		Turners	9
		(Apprentices)	-
		William Hackwood (Modeller)	1
		(Apprentices)	3
<b>Subtotal</b>	<b>177</b>		<b>111</b>
<b>Total</b>			<b>306</b>

Source: 'Wedgwood', Add MS 71093, British Library Wedgwood Documents, ff50-52

In addition to over two hundred and twenty workers directly engaged with the production of earthenware, there were at least fifty apprentices assisting and learning from their masters, two separate counting houses, and a dozen men employed in warehouses coordinating the packaging

and distribution of wares. The *Commonplace Book* notes that 18 women worked across the ordinary and useful works. Although their roles were not listed here although we know that they were often involved more heavily in the decorative stages of production. In total, Wedgwood amassed a huge workforce of over three hundred employees. Examining this against Weatherill's estimates for the national labour force, Wedgwood employed around four per cent of the national labour force in his factories in 1790. By comparison, at its height of production in the 1750s, Bow Porcelain Factory was said by a painter working there to have employed around three hundred workers.<sup>12</sup> The works owned by Josiah Spode and the New Hall syndicate were of comparable size, if not larger. In addition to these larger firms, as Figure 3.5 shows, there was a steady increase in the number of potteries in Staffordshire.

What these data tell us is that in general, outside of London the average size of pottery producing enterprises in England remained small and grew at a slow pace until the middle of the eighteenth century. We then see a dynamic shift in the structure of the different regions. North Staffordshire's growth was characterised by a sharp increase in the average size of firms which began around 1750. London experienced a reversal of fortune around this time and retained only a few medium-sized manufactories. The north of the country also experienced a turning point around the middle of the eighteenth century when its extensive growth was supplanted by a period of consolidation in which potteries got larger and grew in number in absolute terms but could not match the tremendous growth of North Staffordshire. As the eighteenth and nineteenth centuries progressed, the district became more spatially concentrated in terms of the number of firms and workers.

The industry was also characterised by a considerable division of labour. We know from the discussion of industrial district theory that the division of labour was central in building Marshall's

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<sup>12</sup> William Chaffers, *Marks and monograms on pottery and porcelain, of the Renaissance and modern periods: with historical notices of each manufactory, preceded by an introductory essay on the vasa fictilla of England, of the Roman-British and mediaeval eras* (Bickers: London, 1872), p. 680.

‘industrial atmosphere’.<sup>13</sup> Table 3.1 shows the different rooms in five factories visited by Samuel Scriven in his report to Parliament on the conditions of child labour in the trades and industries of Britain during the 1840s. The actual number of rooms is likely to be underestimated in these reports as only those rooms in which children were at work were listed.<sup>14</sup> This shows that the factories of some of the most famous potters of the first half of the nineteenth century were not only very large, as indicated by the number of different rooms listed in parentheses in the right hand column, but were also organised according to the specific tasks being performed by increasingly specialised workers. Scriven also calculated average weekly wages for 28 different jobs within the production side of the business which have not been analysed here but are listed in Appendix Four. This is important when we consider that one of Marshall’s key characteristics of industrial districts was the division of labour.

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<sup>13</sup> Marshall, *Industry and Trade*, pp. 284. 287; see also the literature review of this thesis.

<sup>14</sup> *Parliamentary Paper, PP, [431]: Children’s Employment Commission. Appendix to the Second Report of the Commissioners. Trades and Manufactures. Part 1, (1842), pp. C1-C18*

Table 3.2: Division of labour in the Potteries, c.1840

<b>Manufactory</b>	<b>Rooms listed in Scriven's Report</b>
Minton & Boyle; Eldon Place, Stoke	(9) Press Room; Hot-House; Throwing Room; Turning Room; Handlers' Room; Printing Room; Painting Room; Gilding Room; Dipping Rooms
Minton & Boyle; China Factory, Trentham Road	(23) Slip House; Slip Kiln; Wedging and Throwing House; Hot-House; Turning Room; Scolloping House; Handlers' Room; Green House; Saggar House; Scouring Rooms; Dipping or Gloss House; Saggar Rooms for 2nd Firing; Painting Rooms; Enamel Kiln; Gloss Warehouses; Painting Rooms and Gilding for men; Painting for boys; Ground-laying and Stenciling room; Modelling Room; Ornamental Flower Room; Blue Printing Room / Transferring Room; Moulding Room; Burnishing Room
Copeland & Garratts; Stoke upon Trent	(9) Biscuit Warehouse; Dipping House; Printing Room; Painting Room - Women's; Painting Room - boys'; Painting Room - girls'; Scouring Rooms; Throwing Room; Office
Messrs Adams' Factory	(6) Painting Room; Printing Room; Hardening Kiln; Transferring Room; Office; Handling Room
Daniel & Sons; China Factory	(7) Painting and Gilding Room, men and boys; Girls' painting room; Painting Room; Enamelling room; Ground-laying room; Dipping House; Scouring Room

Sources: *PP [431], pp. C1-C18.*

### 3.2 Spatial proximity

Concentration and geographical proximity of production is important for many reasons. Proximity of firms and producers promoted frequent and repeat exchanges and constituted a large part of the industrial atmosphere noted by Marshall.<sup>15</sup> Proximity is also one of the pillars of Harrison's industrial district paradigm: spatially clustered firms gain experience and develop trust, which leads

<sup>15</sup> Marshall, *Industry and trade*.

to collaboration and economic growth at the regional level.<sup>16</sup> Such was the geographic concentration in the Potteries that active manufacturers travelling around the district on business and social matters would certainly have encountered their peers and competitors on a regular basis. As we know from the discussion of Storper and Venables, face-to-face contact presents both opportunities and challenges regarding the transfer of knowledge and information.<sup>17</sup>

We are fortunate that in 1802 J. Allbut published a regional directory of the Staffordshire Potteries that included a hand drawn map of the district.<sup>18</sup> It is clear that Allbut was not a cartographer and this map is rather basic in details of topography and was certainly not drawn to scale. However, it did include several of the major road names, their destination, some estimated distances and a few scattered local landmarks such as town halls, churches and meeting houses. Most importantly for geo-referencing, the map clearly showed the River Trent and the various canal branches that ran through the Potteries. The purpose of the map was to indicate the location of each of the potteries and workshops listed in the directory for that year. Each pottery was represented by an L shaped symbol and a unique number which referred to the corresponding entry in the directory proper. These features make it possible to orient and geo-reference the hand drawn map with considerable accuracy and thus identify the location of each and every pottery listed for 1802. Visits to the district allowed me to confirm and cross-check sites as some parts of the industrial architecture are still intact and allow for easy identification of, for example, the frontage of various workshops which remain. Ordnance survey maps from the 19<sup>th</sup> century and a map of the county produced in 1775 by William Yates were also useful in locating and identifying potworks.<sup>19</sup>

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<sup>16</sup> Harrison, 'Industrial Districts'.

<sup>17</sup> Michael Storper and Anthony J. Venables, 'Buzz: face-to-face contact and the urban economy' *Journal of Economic Geography* Vol. 4, No. 4 (2004), pp. 351-370.

<sup>18</sup> J. Allbut, *The Staffordshire Pottery Directory: To which is Prefixed, an Historical Sketch of the Country. And an Account of the Manufacture of Earthenware. With a Map.* (J. Allbut & Son: Hanley, 1802), insert.

<sup>19</sup> William Yates, *A topographical map of the county of Stafford: from an actual survey begun in the year 1769 and finished in 1775*, (William Faden: London, 1799).



The geo-referencing was done using the geographic information system (GIS) software ArcGIS. Allbut's map was consulted and a data file was created containing the precise latitude and longitude of each site. Using ArcGIS this data was then layered on top of historic Ordnance Survey maps of the region from the nineteenth century to ensure a good fit. This base file then projected the geo-referenced pottery sites accurately onto historical maps. The maps presented in Figures 3.7 and 3.8 have been geo-referenced and calibrated to the correct scale. Both maps show the location of pottery workshops and factories as listed in Allbut's 1802 directory.

Figure 3.7 shows the location of the manufactories projected onto William Yates' map of the county from 1775. Figure 3.8 shows the manufactories projected onto the corresponding grids from an Ordnance survey map of the county of Staffordshire produced in 1856.<sup>20</sup> Reliable contemporary spatial and geographic data required to geocode the maps is only available for one year, 1802. Later directories did detail the street address of producers, although these are not precise enough to produce geocoded maps. Moreover, some directories listed the residential addresses of the lead potter or partner in a firm rather than the manufactory and it is difficult to ascertain the consistency in which this method was applied. However, examination of Ordnance survey maps from the 1870s (Figure 3.9), with a far more detailed scale of 1:2500, shows the level of geographical concentration remained at least as constant as earlier in the century. Larger, substantial factories with multiple kilns and ovens filled the towns of Tunstall, Burslem, Hanley, Cobridge and Longton. Coupled with the increase in number of firms, workers and output shown in this chapter, it is reasonable to assume that such concentration continued in the region well into the nineteenth century. Indeed, archaeological evidence which can be seen when walking through the district today supports the comments of visitors to the region in 1838. Wilbur Fisk wrote:

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<sup>20</sup> See bibliography for map references.

*It seemed as though all the porcelain and earthenware for the supply of the world might be made here. Acre after acre and mile after mile of kilns and furnaces, crowded together in some instances, or a little more scattered in others, covered this region.<sup>21</sup>*

The reality of Fisk's portrayal is borne out in Figures 3.7-3.9.

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<sup>21</sup> Wilbur Fisk, *Travels on the Continent of Europe, with engravings* (Harper & Brothers: New York, 1838), p. 503.

Figure 3.7: Location of potteries and workshops in 1802, layered on Yates' 1775 map of the county of Staffordshire (Scale: 1:63360)

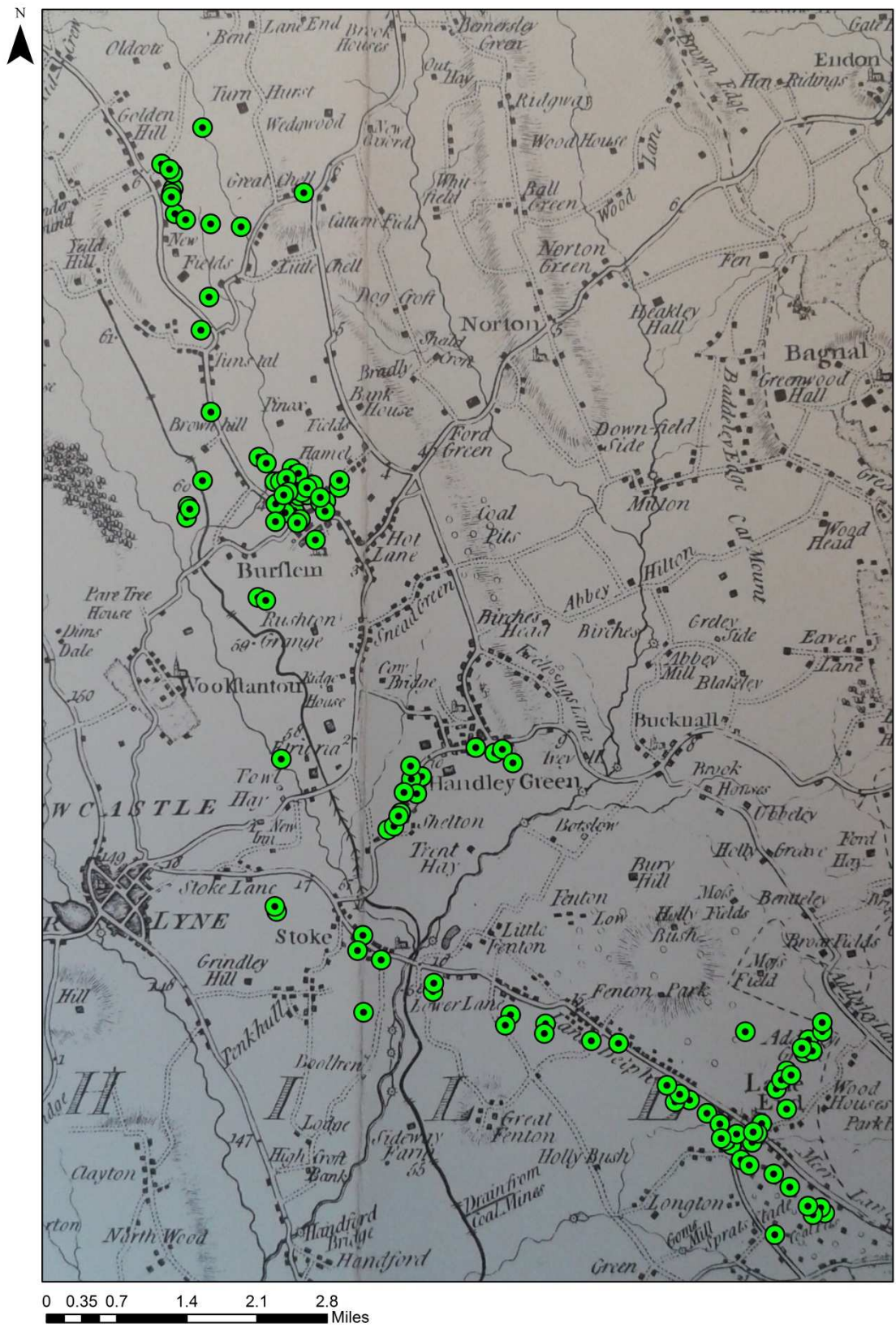
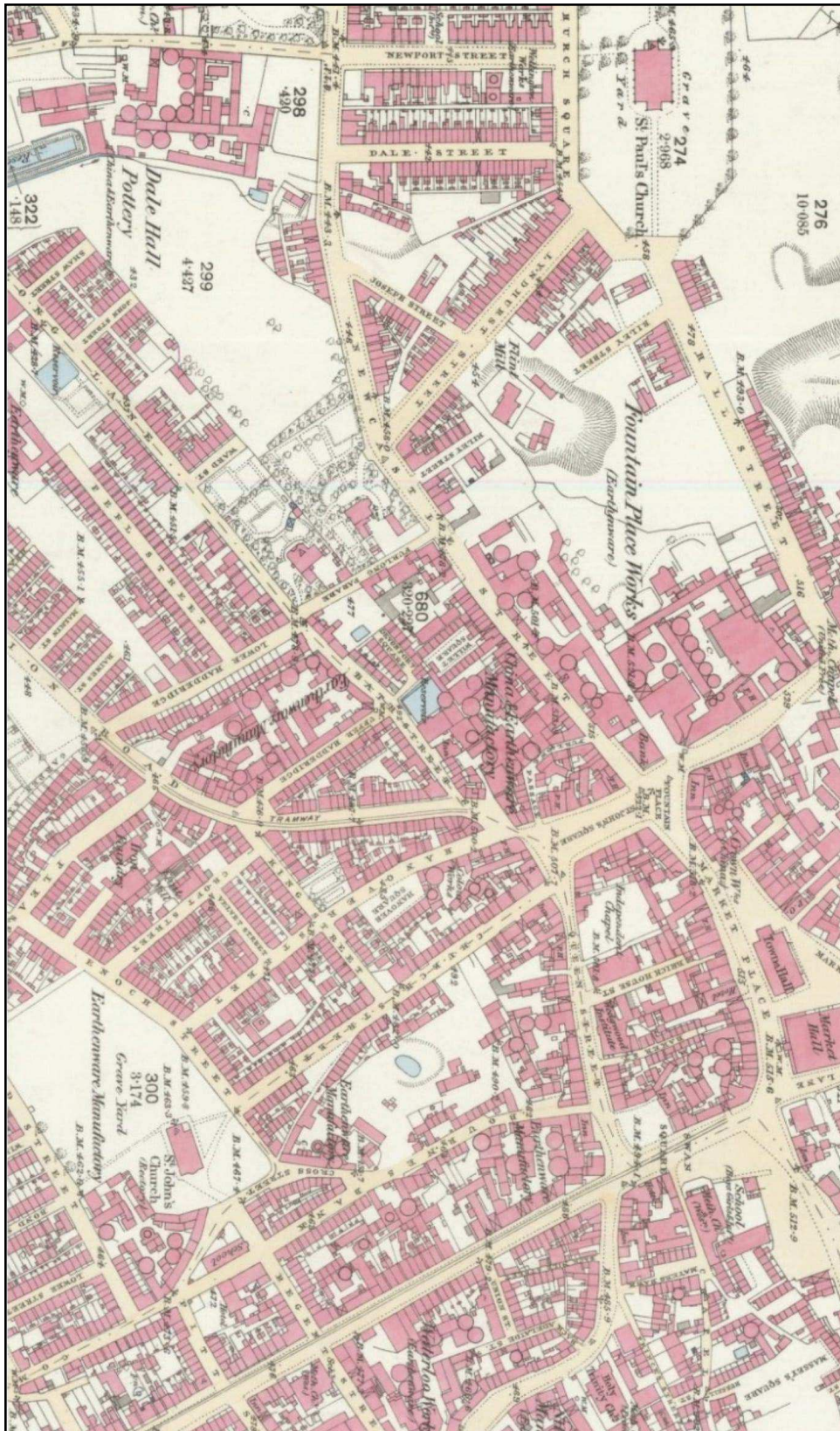


Figure 3.8: Location of potteries and workshops in 1802, layered on 1856 OS Map, Sheet 72, (Scale 1:63360)



Figure 3.9: Ordnance Survey Map, Burslem, 1877, Staffordshire Sheet 12.09 (1:2500)



Several inferences can be made from the maps. In the 0.67 square mile area that constituted Burslem proper, (approximately that shown in Figure 3.9) there were thirty-three potshops and factories listed as operating in 1802. Within a 250-meter radius around the Town Hall (pictured in the top-right of the map), there were seventeen sites of earthenware production. These can clearly be seen to the centre of Figure 3.9 and countless kilns and chimneys are visible as small circles intertwined with factory and residential buildings. If any individual, potter, factory owner, or outsider wanted to visit the centre of Burslem, they would have to pass at least four or five potteries on any of the access roads into the town. A similar scenario would occur for any person travelling across Shelton, Cobridge, Stoke, Lane End or Longton. As the maps in Figures 3.7 and 3.8 the spatial concentration of potteries in Lane End and Longton was such that any person coming into the region from a south-easterly location would pass no fewer than 27 potteries.

Employment estimates and the number of potteries alone are insufficient to explain the rise of North Staffordshire and additional quantitative empirical evidence is needed in order to characterise the broader growth of the pottery industry in England. Knowledge of the quantitative history of aspects of pottery production is limited by the usual caveats that source materials are often incomplete and rarely cover periods long enough for meaningful time series analysis. Most data available are firm specific and limited to the larger well-known firms such as Spode, Minton's and Wedgwood. Only in several cases do consistent and reliable data exist for the period 1750-1820 and no pottery business records have survived from before the 1740's.<sup>22</sup> Whilst Weatherill's research has highlighted the lack of robust data, her creative and impartial use of a wide array of sources has provided some reliable figures for fixed points during the eighteenth and nineteenth centuries. For example, alongside the employment figures discussed above, examining output over time demonstrates that reliable measure of imports and exports of earthenware at the local and national level are problematic because data for earthenware were combined with glassware until at least

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<sup>22</sup> Weatherill, *The growth of the pottery industry*, p. 130.

1814.<sup>23</sup> Some estimates of the number of crates of earthenware produced in the Potteries exist based on freight volumes recorded for the River Weaver which runs between Merseyside and the north-west of Staffordshire. Weatherill calculates that over 35,000 crates, around 600 tons, of wares were produced in the Potteries in 1760 although this is based on the assumption that a third of ware made in the region were transported on the river and that this proportion remained constant over sixty years.<sup>24</sup> There are also significant inconsistencies in the source material concerning measurement with no standardised system of packing wares for carriage, and there are unknown measurements of 'pcl' reported in potters' log books of the eighteenth century which make estimates of production difficult.<sup>25</sup>

Unfortunately, no freight records have survived for the Trent and Mersey Canal which was completed in 1777 and ran through the heart of the Potteries replacing the River Weaver as the primary transportation network.<sup>26</sup> This lack of suitable data has resulted in no standard estimates for industry level output. However, using the above data and estimates based on the analysis of a small number of firms whose records survive we can be reasonably confident that there was a period of considerable expansion both in the number of firms operating, their output, and the value of wares produced. For example, there are several instances in which the use of crate books recorded the contents packed into crates over several consecutive years, making it possible to produce reasonable, if somewhat abstract, estimates of quantities. The date ranges also allow for changes in packing and transportation techniques to be taken into account with the introduction of better quality turnpike roads and the Trent and Mersey Canal during the 1770s.<sup>27</sup> For example, estimating the average number of pieces packed per container at just over 300, Weatherill calculates that the

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<sup>23</sup> *Ibid.*, pp. 425-6.

<sup>24</sup> *Ibid.*, pp. 160-165

<sup>25</sup> *Ibid.*, pp. 428-9.

<sup>26</sup> *Ibid.*, pp. 233-34, 431; Thomas, *The Rise of the Staffordshire Potteries*, pp. 86-94.

<sup>27</sup> Crate books exist covering periods of several years at a time such as crates packed by Jonah Malkin 1747-54, John Wedgwood between 1770-73 referenced in Weatherill, *The growth of the pottery industry*, p. 428; and the Wood family pottery between 1810 and 1817, Stoke on Trent City Archives, D4842/16/4/1. 'Crate Book', *Records of the Wood Family of Brownhills, Burslem, 1810-1817*

number of pieces produced at Minton's manufactory increased six-fold in twenty years from around 80,000 pieces in 1796 to 527,000 pieces in 1815. John Wood also experienced a growth in output during an earlier period which, if we use the estimates of 300 pieces per container, amounted to a six-fold increase from 143 crates (43,000 pieces) in 1777, to 920 crates (276,000 pieces) in 1796.<sup>28</sup> However, as Weatherill clearly states, whilst this turning point of the mid- to late eighteenth century is 'deceptively clear', it 'defies precise explanation'.<sup>29</sup>

### **3.3 Reconstructing the district**

In order to explain the dynamic growth of the region, and offer a granular perspective of the district not seen before, an empirical strategy has been employed which involves the construction of a database of all known pottery producers in the region between the years 1781 and 1846. The key primary sources used to construct this database are twenty-one published regional, local and national level trade directories which include entries for North Staffordshire.<sup>30</sup> The publication years and authors are shown in Table 3.3.<sup>31</sup> Trade directories allow for comparative study of business communities between and within different regions. A single directory offers a snapshot of an industry or region at a given point in time, a useful tool for identifying businesses and producers. Using a range of directories covering a single region over the long-run allows the character of that region to be observed and the dynamism of structural changes that a single directory cannot reveal.

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<sup>28</sup> Calculated using data from Weatherill, *The growth of the pottery industry*, p. 390.

<sup>29</sup> *Ibid.*

<sup>30</sup> To the author's knowledge this is every known trade directory in the period which sufficiently covered North Staffordshire.

<sup>31</sup> See bibliography for full titles of each directory.



Table 3.3: Trade directories covering North Staffordshire, 1781-1846

Publication Year	Author(s)
1781	William Bailey
1783	William Bailey
1784	William Bailey
1796	Chester & Mort
1798	Peter Barfoot & John Wilkes
1800	Thomas Allbut
1802	Thomas Allbut
1805	William Holden
1809	William Holden
1811	William Holden
1816	Thomas Underhill
1818	W. Parson and T. Bradshaw
1818	James Pigot and R. & W. Dean
1822	James Pigot
1822	Thomas Allbut
1828	James Pigot
1830	James Pigot
1834	William White
1835	James Pigot
1841	James Pigot
1846	J. Williams

This methodology follows several large-scale research projects which have used trade directories to reconstruct the occupational structures of urban regions during the eighteenth- and nineteenth-centuries. For example, Tilley *et al* conducted a study of the ‘changing business environment’ of London during a period of urbanisation from 1759 to 1828.<sup>32</sup> The project recorded and electronically coded all London business entries listed in four volumes of Kent’s Business Directories for the years 1759, 1768, 1801 and 1828. The occupations were then classified and coded and made available for public use. This made it possible to reconstruct London’s pottery industry during this period. It is worth noting that all the directories used in Tilley’s study were compiled by the same author. In contrast, a similar project to study urban occupations in Britain during the late eighteenth century was conducted by Corfield and Kelly who examined major urban centres in Britain for the period 1772-1787. Their study consulted sixteen directories by fourteen

<sup>32</sup> Erica Stanley, ‘Kent’s Directories of London, 1759-1828: A Guide to the Machine-readable Transcription’, *Inter-university Consortium for Political and Social Research*, (1983), p. 1.

different authors.<sup>33</sup> This is an important note to make as the nineteen directories used to construct the pottery database for this thesis were published by eleven different authors. Such variety in the authorship of the directories does have the potential to be problematic in terms of coverage and accuracy, as we cannot account for the potential differences in methodologies and rigour between authors. However, regional and trade directories were commercial ventures, and as such, were intended to make money for the author and publisher. There was therefore competition amongst publishers and a commercial incentive to maintain coverage and accuracy. The use of directories with different authors also helps mitigate a further potential problem in time series analysis; the potential to capture trends in the source itself rather than the subject. The use of a broad range of authors is common practice in local and regional studies using trade directories.<sup>34</sup>

There is one outstanding limitation of using trade directories during this period: the time periods between the publication of each directory are unequal.<sup>35</sup> The length between publications of directories that cover North Staffordshire ranges from one to twelve years. There is no way of knowing with certainty why directories were published in a given year. To be useful, trade directories need to accurately reflect the business communities they serve, and are thus intimately connected with the fate and fortunes of businesses and producers. As a region's business community and character changes, so a new trade directory will be required to reflect those changes in order to maintain accuracy. Unfortunately, the largest gap between publications is twelve years between the directories of William & Bailey in 1784 and Chester & Mort in 1796. This substantial gap cannot be mitigated statistically and is unfortunately a problem inherent to the use of trade

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<sup>33</sup> P. J. Corfield and S. M. Kelly, *Directories Database, 1772-1787* [computer file]. Colchester, Essex: UK Data Archive [distributor], December 1995. SN: 3443, <http://dx.doi.org/10.5255/UKDA-SN-3443-1>

<sup>34</sup> Neil Raven and Tristram Hooley, 'Industrial and urban change in the Midlands: a regional survey', in Jon Stobart and Neil Raven (eds.) *Towns, regions and industries: Urban and industrial change in the Midlands, c. 1700-1840* (Manchester University Press: Manchester, 2005), p. 24.

<sup>35</sup> Neil Raven, 'The Trade Directory: A Source for the study of early nineteenth century urban economies', *Business Archives Sources and History* (74), 1997, pp. 13-16

directories. However, the rest of the period has good enough coverage to allow for robust conclusions to be drawn.

The directories provide a wealth of information on the district at the business level with each entry listing the following attributes: *Name* (from which the gender and organisational form); *Location*, at the village or town level (these were often at the street level from 1802 onwards); *Specialisation*, such as Egyptian Blackware, Creamware etc. (this was not always listed in earlier directories in the eighteenth century). Each entry was cross checked with scattered compiled lists of potters from contemporary and secondary accounts, various local histories, maps and collector's encyclopaedias of pottery marks before being recorded and coded electronically.<sup>36</sup> The directory published by William Bailey in 1783 was an exact facsimile of his directory published in 1781 but has been retained for this analysis for the sake of completeness. There were two competing directories published in the years 1818 and 1822. For these two years, all entries were cross checked with each other and other sources to produce composite directories which take into account duplications and omissions on the part of the different publishers. The figures shown in the resulting analysis for the years 1818 and 1822 are compiled using these composite directories. Upon examination, the directory published by Thomas Allbut in 1800 contained no listings for earthenware manufacturers and does not appear in the database.

From this information, it is possible to reconstruct the business community in the North Staffordshire Potteries and to classify each producer based on their organisational form. Earthenware producers were recorded in directories in one of five ways.: the individual or sole trader (e.g. *Anthony Keeling*, *Thomas Brammer*); non-familial partnerships of two or more named potters (e.g. *Keeling & Ogilvy* or *Batkin*, *Walker & Broadhurst*); firms which adopted a variant of '& Co' (*Keeling*, *Toft & Co.*); family firms in which a son or sons are listed (*J Robinson & Sons* or *Copestake & Son*); and familial partnerships which include siblings and cousins (*John & Edward*

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<sup>36</sup> See bibliography for sources consulted.

Baddeley). For each directory, every entry was identified, classified, given a location code to allow for geographical analysis, and was coded in order to mark the history of the business. Erroneous entries identified and accounted for as far as possible and duplications removed. The resulting database contains 2198 separate entries. Each entry was examined and compared with all entries from previous directories to determine whether they had appeared before in the same form, or whether they were a new business, or an existing business that had undergone a structural change. The construction of a database of all entries allowed for long run analysis of the character of the region and the identification of these producers and businesses that dropped out of the directory listings for any given reason. Given the imperfect temporal coverage of the directories already noted, each instance where a business features in one directory but not the next needs to be taken carefully. In the case discussed above, a twelve-year gap between publications does not really reveal much about the dynamics of the district during this time; a firm listed in 1784 could have gone out of business or changed ownership or structure at any point before the publication of the directory in 1796. In contrast, the one year gap between the directories of William White in 1834 and James Pigot in 1835 offer a tighter grip on analysis at the firm level.

The terms 'firm' and 'business' 'producer' are used here to describe earthenware manufacturers listed in the trade directories. Undoubtedly, being a craft industry that was so heavily concentrated in North Staffordshire there were smaller scale producers who rented kiln space in larger manufactories.<sup>37</sup> These smaller concerns may not be captured by the trade directory listings. It is therefore assumed that producers listed in directories were substantial enough to be composed of more than a single individual and are, for simplicity, referred to as a business, producer or firm. The resulting database allows us to examine the organisation of producers during a period of sustained growth and to hypothesise about the observed trends in the organisational make-up of the region.

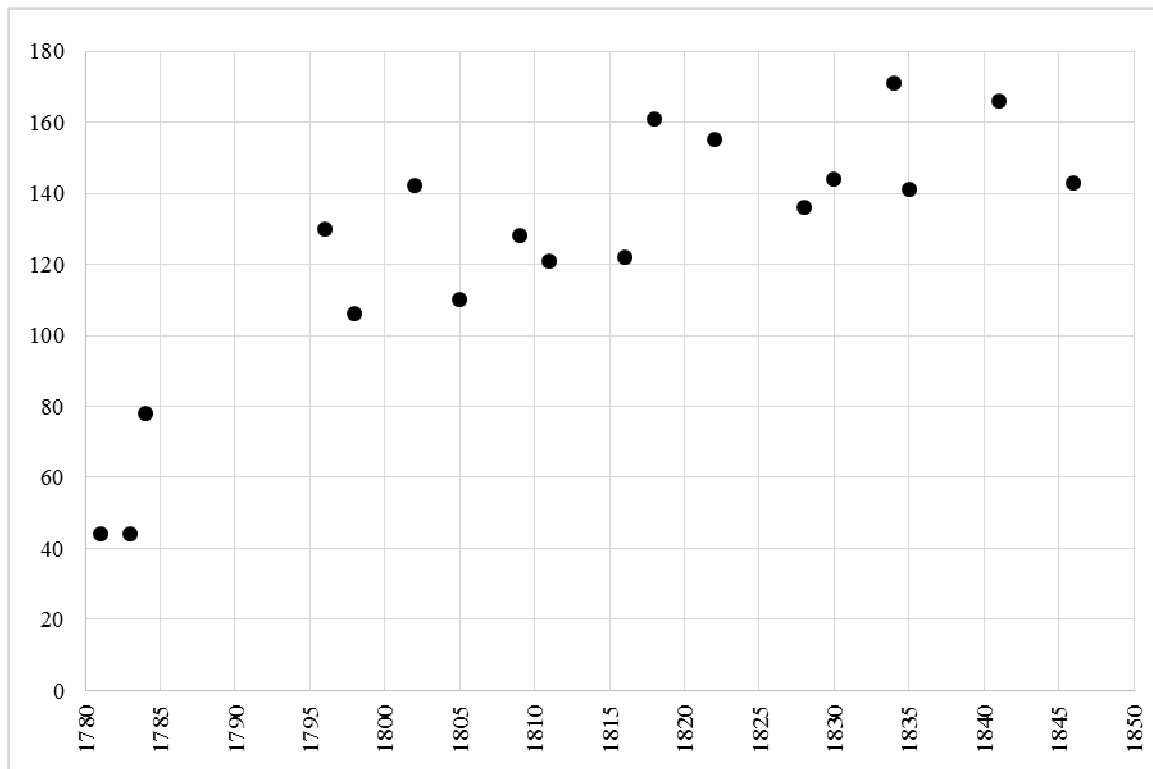
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<sup>37</sup> Maxine Berg, 'In Pursuit of Luxury: Global History and British Consumer Goods in the Eighteenth Century', *Past & Present*, Vol. 182, No. 1 (2004), p. 118.

### 3.4 The organisation of the district

Basic data compiled from the trade directory analysis is displayed in Figure 3.10. This shows the total number of earthenware producers listed in each published trade directory in England that covered North Staffordshire between 1781 and 1846. Each point represents one directory. The upward trend is clear and supports the notion that this was a period of growth and expansion of the district.

Figure 3.10: North Staffordshire earthenware producers listed in trade directories, 1781-1846



Sources: See bibliography for trade directory sources

Notes: These are the author's own estimates based on trade directory entries.

The database also allows us to break down the structure of the region in various ways. For the 50 years between 1781 and 1830, trade directories recorded 782 different producers which operated at some point during the period. These were accounted for by around 290 separate family names with several members of one family often operating numerous separate businesses concurrently. For example, the Wood family in Burslem accounted for four of the producers listed in 1802: John, and

Ralph Wood both operated as individuals trading under their own name, William Wood was in partnership with an unknown number of anonymous potters under the firm *William Wood & Co.*, and Enoch Wood was in partnership with James Caldwell operating as *Wood & Caldwell*. Similarly, the Booth family from Stoke were responsible for different firms between 1781 and 1818 which are shown in Table 3.4.

Table 3.4: Booth family pottery firms, 1781 - 1818

Directory year(s)	Firm listed
1781, 1784	Hugh Booth
1796	Booth & Marsh
1796	Ephraim Booth & Sons
1798	Booth & Dale
1802	Booth & Co.
1802	Booth & Marsh
1802	Booth & Sons
1805	Booth & Bridgewood
1805	Hugh and Joseph Booth
1816	Booth & Bentley
1818	J. and T. Booth

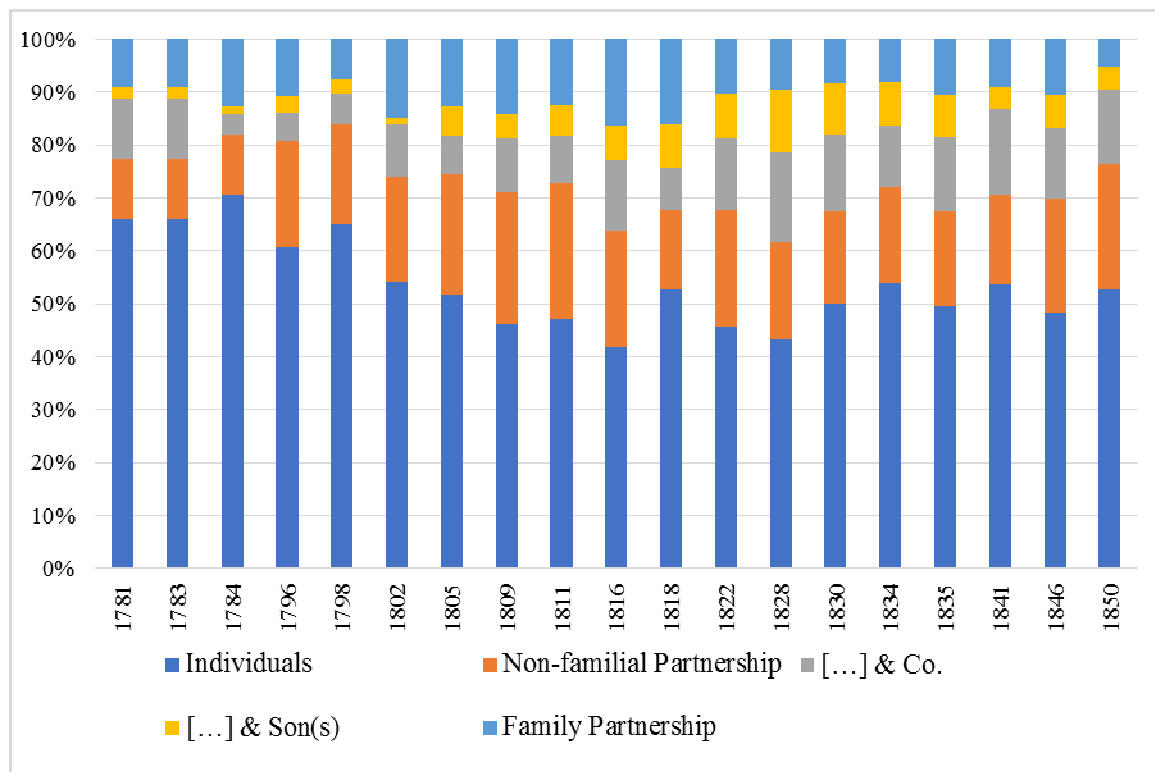
Evidence for the character of the district changing over time is shown in the changing composition of the firms listed in each directory (

Figure 3.11). In the last quarter of the eighteenth-century Staffordshire potters listed in trade directories were predominantly individuals, or sole traders. This changed over the turn of the century. In 1781 the share of pottery producers that were listed as individuals was 65.9 per cent, and fell to 52.6 per cent by 1850 with a low of 40.98 per cent in 1816. There were fluctuations in this share over time, especially around the time of the Napoleonic Wars, although the general trend was that the number of individuals operating pottery firms listed in directories fell as the nineteenth century progressed. Some of these ventures were family oriented: 11.4 per cent of the partnerships recorded in 1781 were between siblings and cousins or fathers and cousins. This proportion

increased over the turn of the century although began to decline steadily after peaking in 1818. Non-familial partnerships were consistently more popular than family ventures and the proportion of these grew steadily, with some fluctuations, over the whole period.

In general, Staffordshire potters showed an increasing preference for collaboration with their peers as the industry and district grew over the eighteenth and nineteenth centuries. Whilst family firms were certainly responsible for some of the most famous names in English earthenware, partnerships between multiple potters forged connections outside of the family sphere.

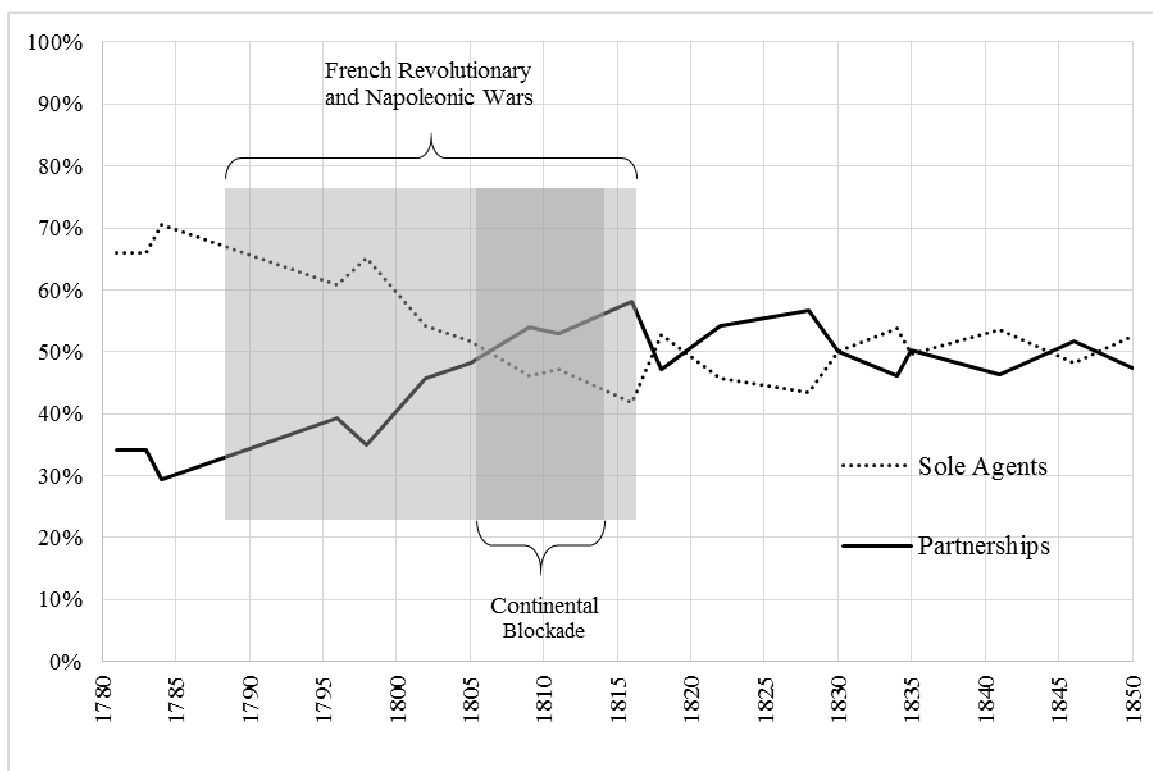
Figure 3.11: Composition of earthenware producers in North Staffordshire, 1781-1850



The number of firms which were recorded as a variant of *[...] & Co.* was relatively small although this did fluctuate over the period. With many of the smaller and lesser known partnerships it is difficult to identify the named partners. At present, it is impossible to determine whether these individuals were financial backers, family members or fellow potters. This is an issue which needs resolving as these producers accounted for a small, but consistent proportion of all entries. However, based on what we know about credit and capital formation in the region in the late-

eighteenth century it is unlikely that the ‘invisible’ partners were outsiders to the industry providing credit to manufacturers.<sup>38</sup> Unlike other manufacturing industries, the principal source of credit for the earthenware industry during the eighteenth century was the earthenware producers themselves with customer debts owed to many potters often running at several times the value of their own debts.<sup>39</sup> A particularly striking example is that of John Baddeley who, in 1769, was owed just short of a staggering £7000 by his customers and owed just under £600 to his own creditors.<sup>40</sup> This is perhaps a somewhat extreme example although it does suggest a rather more complex credit network and presents an avenue for further research to build on Weatherill’s work on the earlier eighteenth century. Thus, the increase in the number of partnerships is perhaps not unexpected when we consider the overall expansion of the industry, the complex credit networks and the overall increasing capital costs of production noted by Weatherill.<sup>41</sup>

Figure 3.12: Composition of earthenware producers in North Staffordshire, 1781-1846



<sup>38</sup> Weatherill, *The growth of the pottery industry*, pp. 295-6.

<sup>39</sup> *Ibid.*, pp. 296-7.

<sup>40</sup> *Ibid.*, p. 297

<sup>41</sup> *Ibid.*



Figure 3.12 shows the total share of partnerships of any sort during the same period and shows a process of stabilisation occurring as the nineteenth century progresses. The periods roughly corresponding with the French Revolutionary and Napoleonic wars (1789-1815) and the Continental Blockade (1806-1813) are interesting as it was during this time that the proportion of partnerships increased significantly and overtook the proportion of sole agents. Davis and Engerman identify a total of twelve wars which involved Britain and France during the period 1665-1815, with conflict between the two nations in approximately 98 of the 150 years.<sup>42</sup> The period 1793-1815 was a period of prolonged conflict between nations seeking European dominance. The economic impact of the European wars was felt globally. Trade was ‘seriously disrupted’ through control and prohibition policies which were employed by both Britain and France, and the introduction of naval blockades.<sup>43</sup> On the French side, O’Rourke points to evidence to suggest that the impact of the wars and blockades affected maritime industries that were heavily reliant on transatlantic trade such as ship building and rope making. Cotton textile production was also impacted in the United States, Britain and on the Continent. However, O’Rourke argues that the blockades affected Britain far less than France, and that exports and imports were ‘essentially unaffected’, providing support for Davis and Engerman’s contention that whilst the French blockades were ambitious, they were not effective.<sup>44</sup> This is supported by the export data shown in Figure 3.13 which, whilst somewhat problematic due to the inclusion of glass as previously noted, does show an increasing volume of exports for the period 1793-1815.

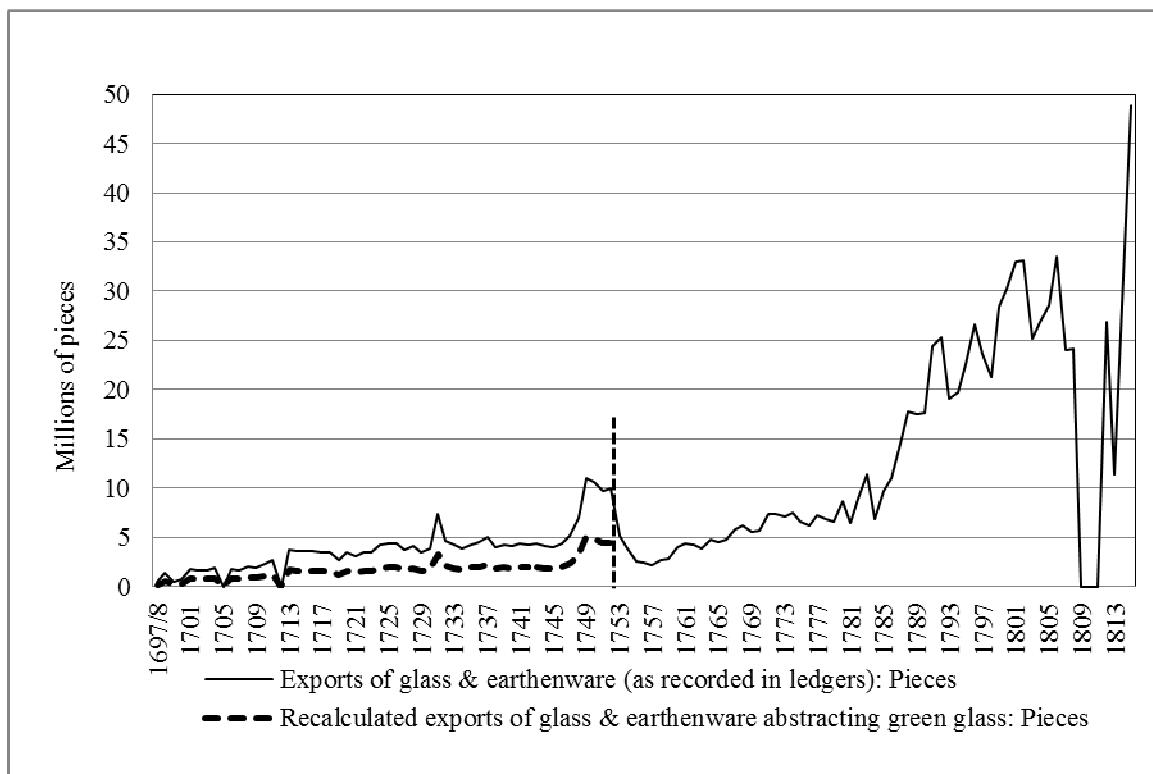
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<sup>42</sup> For a discussion of these periods of war see chapter 2 of: Lance Davis and Stanley Engerman, *Naval blockades in peace and war: an economic history since 1750* (Cambridge University Press: Cambridge, 2006), pp. 25-52.

<sup>43</sup> *Ibid.*, pp. 26-7; Kevin O’Rourke, ‘The worldwide economic impact of the French Revolutionary and Napoleonic Wars, 1793–1815’, *Journal of Global History*, Vol. 1, No. 1 (2006), pp. 146.

<sup>44</sup> *Ibid.*, p. 129; Davis and Engerman, *Naval blockades*, p. 52.

Figure 3.13: Exports (in pieces) of glass and earthenware from England, 1697-1815



Sources: Lorna Weatherill, *The growth of the pottery industry in England, 1660-1815*, pp. 440-441, based on Schumpeter: English Overseas trade Statistics 1697-1808 (Oxford, 1960), Table XXIV, p. 64.

Notes: the values for 1814 and 1815 are for earthenware only. The vertical dotted line indicates 1752, the year after which it is no longer possible to separate green glass articles from figures. No figures exist for 1809-1811.

Taking the evidence presented in Figure 3.11 and Figure 3.12 the period 1793-1815 can be seen as one of particular interest both because this is the point at which partnerships became more popular as the preferred form of business organisation in the Potteries, and also because this came in the middle of a protracted war and at a time when exports, whilst volatile, were increasing significantly overall. Despite the impact of war, the Potteries continued to enjoy growth and its potters adapted changing business environments despite being squeezed. Further exploration of the trade directory data reveals additional dynamics and shows how potters adapted their business strategies over this period.

Table 3.5 shows a more detailed breakdown of the trade directory entries for the years 1781-1830. The first column shows the number of newly listed firms in each directory. The second column shows the number of firms that had dropped off, or exited, the listing since the previous directory.

The third column gives the number of producers in each directory that were also listed in the previous directory. The total number of entries is shown in the fourth column. It also shows the number of firms that had dropped out of the listings since the publication of the previous directory. For example, a reading of the third column tells us that of the forty-four firms listed in Bailey's 1783 directory, nineteen of these did not then subsequently appear in Bailey's 1784 directory, twenty-five were re-listed as the same business and these were joined by fifty-three newly listed firms.<sup>45</sup>

Table 3.5: North Staffordshire potters listed in trade directories, 1781-1830

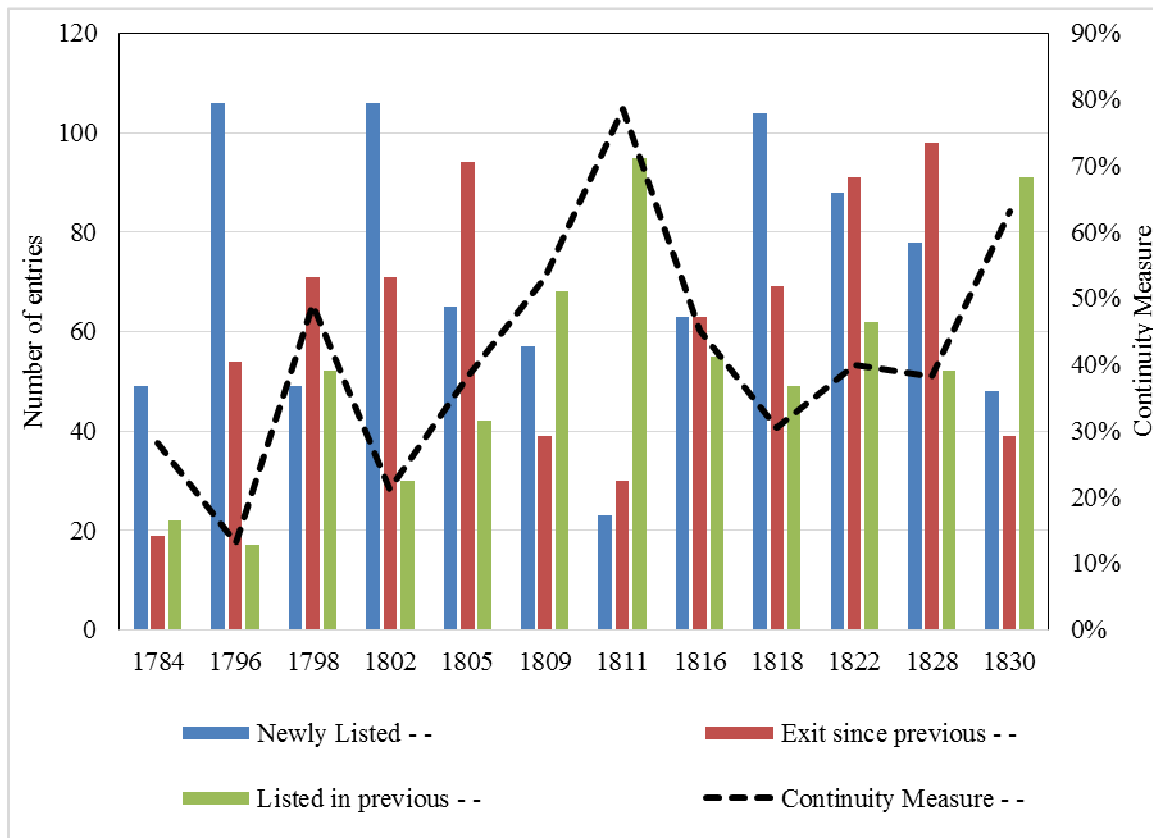
	<b>Newly Listed</b>	<b>Exit since previous</b>	<b>Listed in previous</b>	<b>Stock</b>
1781	-	-	-	-
1783	-	-	-	-
1784	49	19	22	78
1796	106	54	17	130
1798	49	71	52	106
1802	106	71	30	142
1805	65	94	42	110
1809	57	39	68	128
1811	23	30	95	121
1816	63	63	55	122
1818	104	69	49	161
1822	88	91	62	155
1828	78	98	52	136
1830	48	39	91	144

Figure 3.14 shows this information for 1784-1830 alongside a continuity measure which is the number of producers in each directory that were also listed in the previous directory, expressed as a share of the total entries for each given year. The fourth column shows the stock of producers in the district at each point in time. The continuity measure can be used as a proxy for the turnover of firms and is influenced by a recent study by Molina-Morales *et al* which studied the Spanish

<sup>45</sup> The directory for 1783 was an exact replica of the directory for 1781 and therefore no analysis on new firms is possible.

ceramic tile industrial district in Castellón from 1985-2000.<sup>46</sup> They found that during this period there were over three times as many new firms created as old firms ceasing to exist and argue that this signifies a high vitality for the district.<sup>47</sup> Table 3.5, however, shows that the Potteries also experienced high failure or exit rates throughout the period.

Figure 3.14: Turnover of Staffordshire potters listed in trade directories, 1784-1830



Looking at these various measures at the producer level, we see evidence of an internal dynamic process: the period 1802-1811 witnessed a significant increase in the continuity measure as we see an increase in the number of firms listed in consecutive directories. This was accompanied by a corresponding sharp decrease in newly listed firms.<sup>48</sup> During this time, the total number of producers had stagnated somewhat, recovering after 1816. A point between the publication of the

<sup>46</sup> F. Xavier Molina-Morales, M. Lopez-Navarro and J. Guia-Julve, 'The Role of Local Institutions as Intermediary Agents in the Industrial District', *European Urban and Regional Studies*, Vol. 9, No. 4 (2002), pp. 315-329.

<sup>47</sup> *Ibid.*, p. 323.

<sup>48</sup> It is important to note here that newly listed firms in 1805 are not necessarily firms which have not been listed in *any* previous directory, merely that they were not listed in the previous directory.

directories for 1811 and 1816 seems to be the moment when the turnover of the region began to increase significantly once more, as the number of new entries and exits in the directory listings increased.

Throughout this whole period there was a high turnover of producers with a significant number of new firms in periods of more rapid growth of the district such as 1816-22. The dynamism and turnover of the region is even more pronounced when we examine the average lifetime of each separate firm.

Table 3.6 shows the maximum number of consecutive entries for each producer. A total of 807 distinct firms were listed between 1781 and 1830. The majority of these were short lived and did not appear in more than one trade directory in a row. The reasons for this will be discussed in more detail below. With the average length of time between the publications of directories just 3.7 years it is clear that the prevailing trend in the region throughout this period was for short term business ventures. This evidence supports the data presented in Figures

Figure 3.11 and Figure 3.12. Short term collaborative business ventures increasingly became the preferred option, with firms frequently changing partners and composition.

Table 3.6: Consecutive entries of potters in trade directories, 1781-1830

<b>Consecutive Entries</b>	<b>Number of Producers</b>	<b>Share of total</b>
1	471	58.4%
2	167	20.7%
3	84	10.4%
4	41	5.1%
5	19	2.4%
6	7	0.9%
7	6	0.7%
8	8	1.0%
9	2	0.2%
10	1	0.1%
11	1	0.1%
<b>Total</b>	<b>807</b>	

### 3.5 The dynamics of growth

The underlying reasons for these features of the dynamic growth of the region will now be explored in further detail. The total number of producers in the region stagnated from the mid-1790s until the end of the Napoleonic wars. Examining this stagnation shows that the number of new producers entering the market reduced over the same period. The continuity measure for the district thus increased as a result of an increase in the average life-span of partnerships although this peaked slightly earlier and had already started to decline by 1816. A shift in the dynamics of the region occurred in the early nineteenth century with an influx of new entries to the market increasing the total number of producers. The increasing preference for partnerships was also curbed and even reversed for a short period in the 1830s as the organisational composition became closer to an equal split between individual enterprises and partnerships. Given the timing of these shifts it is clear that earthenware producers in the Potteries began to implement strategies to adapt and deal with changing national and international dynamics. The vitality and growth of the region from the 1790s until the end of the Napoleonic era was characterised by strategies of forming partnerships from an existing pool of producers. The fact that these firms were operating the way they were, in conditions of intense spatial concentration, is suggestive of the presence of local social and business networks. This could be fit into Marshall's paradigm under the umbrella of 'Industrial Atmosphere', whereby the geographical proximity and frequent interaction between producers fosters socialisation (see Figure 2.1).

However, given the discussion in the literature review concerning the rigidity and limitations of the Marshallian perspective, it is more appropriate to draw on Popp and Wilson's life-cycle approach and their framework underpinned by empirical studies of early English industrial districts (Figure 2.2 and Figure 2.3).<sup>49</sup>

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<sup>49</sup> See discussion in literature review on pp. 32-33.

The theme of networks will be taken up in more detail in chapter four although they are relevant here as they form part of the framework for understanding the behaviour exhibited by Staffordshire potters. The nature of these partnerships highlights the dynamic character of the district and along with the spatial concentration that became more intense as the eighteenth century progressed, is indicative of the ‘buzz’ that comes about with face-to-face contact and repeated interaction.<sup>50</sup> Popp and Wilson refer to this as social cohesion and draw connections with the establishment of a local identity. Repeat business transactions and partnerships with a concentrated but growing pool of producers helped foster both strong and ‘weak’ ties between Staffordshire potters.<sup>51</sup> Strong ties were created as partnerships between potters were formed, bringing competitors into direct collaboration with one another. Familial partnerships with fathers and sons or between partnerships also took advantage of these pre-existing strong ties. Weak ties were driven largely by the turnover of firms and established over the course of the eighteenth and nineteenth century as the number of potters that had been in partnership with other potters increased and the length of these partnerships remained relatively short. As the eighteenth and nineteenth centuries progressed, potters who were forming non-familial partnerships were more likely to be entering a partnership with a potter who had already been in partnership, and thus formed strong ties with other potters. The strong ties of one potter became the weak ties of his or her future business partner.

The evidence shows that potters engaged in ventures either on their own or in partnership with local competitors for short-term gain. This rapidly changing melting pot of cooperative competition clearly served the district well, as all available measures show positive overall growth for the period 1750-1851. Potters seeking short-term gains by actively pursuing collaboration with their competitors were adaptive and flexible to their environment. This created positive externalities for the district in the long-run. This last feature of the district, cooperative competition, shows that according to the life-cycle model of Popp and Wilson (Figure 2.2), the Potteries reached this third

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<sup>50</sup> Storper & Venables, ‘Buzz: face-to-face contact’.

<sup>51</sup> Granovetter, ‘The Strength of Weak Ties’.

and pivotal stage at least by the 1780s. The advantages of clustering that occurred during the earlier eighteenth century were manifest, and the region quickly began to pull far ahead of competing clusters of pottery production in the rest of the country.

As noted in the literature review, any analysis of the Potteries as an industrial district must be undertaken with the assumption that the life-cycle and progression through it are nondeterministic. That is, that achieving clustering of expertise and factors of production does not guarantee progression through take-off and on to further stages of development. This is clearly shown in the experience of other pottery producing regions in England that failed to evolve into mature industrial districts. Therefore, in order to understand why the Potteries developed in the way that it did, we need to understand the behaviour and decision making of its inhabitants; the individuals who made the pottery and formed the partnerships. The new empirical evidence presented in this chapter must be followed with a discussion of *why* potters chose partnerships at particular times. Other strategies and business models could have been adopted, but were not. By focussing on illuminating some of the finer points of the environment in which these decisions were made we can begin to understand more about how and why North Staffordshire became and remained such a dynamic and successful industrial district.

In 1822 there were 155 pottery producers in North Staffordshire listed in the directory published by James Pigot. Of these, 65 (42 per cent) had been operating under the same name and structure since the previous directories published in 1818.<sup>52</sup> 90 entries related to new ventures established at some point between the publication of the directories of 1818 and 1822. There were 13 new firms that had reappeared in Pigot's 1822 directory after a period of absence. Most of these 13 were family firms and are considered new because they changed structure with sons and brothers being introduced to the firm, such as John, James and Richard Barker, and Thomas and Henshall Moss,

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<sup>52</sup>

Table 3.3 for a list of the trade directories and their publishers.

See



who alternated between operating on their own, in pairs, or as a family unit. Some were potters who operated on their own for a short time in between two different partnerships. Of the 90 new entries for 1822, 77 were completely new firms that had not been listed before in any directory since 1781. A large number of these firms were comprised of ‘serial partners’, or those producers who very rarely appear as individuals; producers such as Ann Chetham, a widow who survived in the industry after her husband’s death in 1807 by continuing and forming consecutive partnerships. Upon her husband’s death Ann Chetham continued the partnership he had formed with Richard Wooley under the name *Chetham & Wooley* in the 1790s and which first appears in Chester & Mort’s directory of 1796.<sup>53</sup> This was dissolved in 1809 and Ann went into partnership in the same premises with her son the following year in 1810 under the name *Chetham & Son*, a firm that would later become *Chetham & Robinson* in 1822 and *Chetham Robinson & Son* in 1837 before finally closing its doors in 1841. The longest surviving firm for the period 1781-1830 operated under the name of a single potter, Robert Garner. He had a manufactory in Lane End near present-day Uttoxeter Road which operated from 1781 until it was offered to let in March 1821, eighteen months before his death in November 1822.<sup>54</sup> This episode surrounding Garner’s death also provides more evidence that the directories were accurate and researched and compiled close to the publication date. Robert Garner does not appear in either of the directories for 1822 published by Pigot and Allbut, meaning that the research and listings were compiled at least in the last nine months of 1821, after his death. Garner was exceptional in that he, unlike many of the other firms that operated continuously for decades, was not a famous potter (at least not outside of North Staffordshire). The majority of the twenty or so other pottery firms that survived longer than a decade were operated by potters who

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<sup>53</sup> *Staffordshire Advertiser*, 16 Dec 1809, p. 1.

<sup>54</sup> *Staffordshire Advertiser*, 3 Mar 1821, pp. 3-4; 2 Nov 1822, p. 4.

were, and remain, household names. These master potters such as Spode, Minton, Wedgwood, Shelley and Wood feature heavily in collector's handbooks and more general studies of the trade.<sup>55</sup>

There are several questions we must ask when faced with such a high turnover of firms and a majority of partnerships existing predominantly in the short term. What does it mean when a firm disappears from directory listings? How can we explain the high turnover of producers? To what extent can this be explained by the cooperative competition phase of the industrial district life cycle?<sup>56</sup>

The answer to the first of these questions is that when a firm is no longer listed in a trade directory, it does not necessarily mean that the potters, or indeed the firm itself, has exited the market permanently. The inability of trade directories to capture the smallest scale producers is well known; those potters operating independently on a very small scale, perhaps renting work- and kiln-space from larger manufactories. It is possible that some of the firms that drop off the listings reduced in size over time and therefore did not meet the publishers' criteria for inclusion in the listings. Due to the lack of records available it is extremely difficult to find any direct reference of any such instances. There are also numerous producers who appear, disappear, and then reappear in various partnerships throughout the period. A prime example is the potter Ralph Baddeley (d. 1809).<sup>57</sup> He appears in Bailey's directory of 1781 as a potter in Shelton operating under his own name with no known partners. He then reappears in Chester & Mort's 1796 directory under his own name, again in Shelton. In Barfoot & Wilkes Universal directory of 1798 Ralph appears in partnership with his brother John Baddeley under the name *John & Ralph Baddeley*. Ralph appears in no subsequent directories and there is evidence that he retired around the turn of the century. Entries in the *Staffordshire Advertiser* show that his house and pot works were up for auction in

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<sup>55</sup> See: Geoffrey Godden, *British Pottery: An Illustrated Guide* (Barrie and Jenkins: London, 1974); J. P. Cushion, *Handbook of pottery and porcelain marks* (Faber and Faber: London, 1956); A. W. Coysh and R. K. Henrywood, *The dictionary of blue and white printed pottery 1780-1880* (Antique Collectors' Club: Woodbridge, 1982).

<sup>56</sup> Popp and Wilson, 'Life cycles, contingency and agency', p. 2978.

<sup>57</sup> *Staffordshire Advertiser*, 27 June 1812,

October 1801, advertised to be let in February and August 1802, and his utensils and other paraphernalia were up for auction in October 1802.<sup>58</sup> Aside from these references, Ralph Baddeley does not appear by name in any other trade directories. However, upon further investigation it is clear that the potter was involved in a partnership with four other potters, Ephraim Booth (d. 1802), Charles Bagnall (d. 1815), Edward Keeling (d. 1833) and Samuel Perry (d. unknown).<sup>59</sup> The precise date on which the partnership was entered into is not known, although it could possibly be connected to 1784 lease agreement for forty one years, relating to access to coal between Samuel Perry, Charles Adderley, Ralph Baddeley and Hugh Booth.<sup>60</sup> This earlier agreement suggests that the pottery producing partnership was not the first partnership entered into by several of the group, pointing again to strong and weak ties in their networks. The partnership was dissolved by mutual agreement on 29<sup>th</sup> September 1796.<sup>61</sup> The directory entry for 1796 shows that Ralph Baddeley continued producing pottery on his own after the dissolution of the partnership. Ephraim Booth went into partnership with his sons for several years before his death, Edward Keeling operated on his own for several years before entering into a partnership with a family member, Anthony Keeling, and Charles Bagnall continued his work as a founding partner in the *New Hall Porcelain Company* (est. 1781). There is no record of Samuel Perry after the dissolution of the partnership. With the exception, then, of Perry, all the partners in *Samuel Perry & Co.* continued producing pottery in North Staffordshire after this joint venture had run its course. Whilst it is impossible to determine the fate of all potters that dropped off directory listings, this case shows that for some, at least, this marked one of many collaborative enterprises undertaken in the district.

The legal framework surrounding partnerships during the eighteenth and early nineteenth centuries meant that a partnership did not have a separate legal identity to that of its named partners. Partners in firms held the capital and property, were named and party to any and all contracts undertaken by

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<sup>58</sup> *Staffordshire Advertiser*, 24 Oct 1801; 20 Feb 1802; 28 Aug 1802; 2 Oct 1802; 9 Oct 1802.

<sup>59</sup> *Staffordshire Advertiser*, 20 Nov 1802, p. 4; 15 July 1815, p. 1; 9 Nov 1833, p. 3.

<sup>60</sup> MS 3878/682, Birmingham Archives, Heritage and Photography Collections.

<sup>61</sup> *Staffordshire Advertiser*, 29 April 1797, p. 1.

the firm, and were subsequently named in litigation cases. The concept of a partner being immune to claims on the business was contradictory to English common-law. In essence, this meant that the continuity of a firm trading or operating under a certain name was tied to the individuals concerned. If one partner died, retired, was declared bankrupt or insane, the partnership could not carry on and had to be legally dissolved. Any existing partners who wished to carry on business had to agree to a new partnership. This did not pose any significant issues as partnerships, unlike corporations, could be freely formed without the need for permission from the state.<sup>62</sup>

Notices of dissolution and bankruptcy listings in the *London Gazette* and local newspapers are often used as a way of identifying named partners in industrial firms. Examination of these may also help explain some of the high turnover. Although such public notification was not a legal requirement during this period, using the *London Gazette*, Solar and Lyons found that between 1770 and 1840 a large proportion of partnerships in the cotton textile industry that were dissolved or claimed bankruptcy chose to notify their creditors and debtors. This publication could also serve as a way of ‘terminating joint liability for debts’.<sup>63</sup> There is evidence to suggest that some Staffordshire potters also took this course of action. A partnership between two potters in Shelton, Joseph Boon and Samuel Lovatt, was listed in the *Gazette* as having been dissolved ‘by mutual consent’ on 2<sup>nd</sup> March 1811. Information for debtors or creditors was provided: ‘all debts due and owing to and from the said partnership concern will be received and paid by the said Joseph Boon’.<sup>64</sup> The dissolution of a partnership between John Lockett, John Hulme and John Robinson on 11<sup>th</sup> November 1818 was announced in the *Gazette* only in April 1819. Rather than collecting or paying debts themselves, these potters ordered that all ‘debts due and owing [...] will be received and paid

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<sup>62</sup> Ron Harris, *Industrialising English Law: Entrepreneurship and Business Organization, 1720-1844* (Cambridge University Press: Cambridge, 2000), pp. 19-21.

<sup>63</sup> Peter Solar and John Lyons, ‘The English cotton spinning industry, 1780-1840, as revealed in the columns of the *London Gazette*’, *Business History*, Vol. 53, No. 3 (2011), pp. 308-9

<sup>64</sup> *The London Gazette*, 16 March 1811, Issue 16464, p. 513.

by Messrs Charles and John Harvey of Lane End'.<sup>65</sup> It is not known why the partners' debts owed and due were to be dealt with by other Staffordshire potters. In other cases where a third-party handled debt, these were usually executors acting for the deceased, or a local solicitor. In the cases of the dissolution of partnerships between Joseph Leigh and William Breeze in December 1808, and John and Benjamin Shirley in August 1821, the solicitors Mr Hammersley and Mr Griffin were listed respectively.<sup>66</sup>

The listings in the *Gazette* were often also printed in the *Staffordshire Advertiser*. Bankruptcies and dissolutions of Staffordshire partnerships were often listed under their own headings as individual items. From the inception of the paper in 1795, a section entitled 'From the London Gazette', 'From Friday's Gazette' or 'From Tuesday's Gazette' would run in each issue and list the bankrupts, dividends and other notable business news from across the country. Readers of the *Staffordshire Advertiser* were well-informed. In some cases, these listings in the *Advertiser* and *Gazette* are the only surviving records giving the details of partners in larger complex firms and must be combined with other records in order to build a complete picture of a particular firm. In this, they help flesh out the information gleaned from trade directories which do not contain all named partners. For example, *Keeling, Toft & Co* was first listed in Holden's directory of 1805 and then appeared under the same name in the directories for 1809, 1811, 1816, 1818 and 1822. From the trade directories alone it is only possible to identify two of the partners, James Keeling, and Thomas Toft. However, more details about the firm are found in various articles and notices published in the *Staffordshire Advertiser* between 1801 and 1819.<sup>67</sup> These reveal a much larger company that changed and adapted on numerous occasions over its lifetime. The firm produced porcelain and earthenware in Hanley, and was originally founded by seven partners at some point before 1801. The exact date of incorporation is unknown although a notice in the *Advertiser* on the 20<sup>th</sup> September 1806 lists seven

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<sup>65</sup> *The London Gazette*, 3 April 1819, Issue 17465, p. 595.

<sup>66</sup> *The London Gazette*, 17 Dec 1808, Issue 16210, p. 1716; 14 Aug 1821, Issue 17737, p. 1689.

<sup>67</sup> *Staffordshire Advertiser*, 11 Dec 1819; 2 March 1816; 20 Sep 1806; 7 March 1812; 31 Dec 1814; 4 Feb 1815.

founding partners: William Mellor (d. 1801), James Keeling d. 1837, Thomas Toft (d. 1834), Philip Keeling (d. unknown), John Howe (d. unknown), Samuel Hatton (d. unknown) and Thomas Dimmock (d. 1827).<sup>68</sup> For William Mellor to have been listed as a partner, the firm must have been in existence before his death in 1801.<sup>69</sup> The same notice also details several changes to the business. After the death of William Mellor, his executors (the potters John Mare, John Whitehead and John Daniel) carried on business with the partnership in his stead. In September 1801, John Howe retired from the partnership and sold his shares and interest to Mellor's wife, Ann. The firm continued operation with Ann Mellor and her husband's executors, James and Philip Keeling, Thomas Toft, Samuel Hatton and Thomas Dimmock as partners until the 14<sup>th</sup> July 1806. At this point, Ann Mellor and her husband's executors retired from the business, vesting their shares and interest to two potters, Sampson Wright and James Greaves, returning the number of partners to seven. This level of detail is not possible for all firms listed in the directories, although it does show how dynamic individual firms were, with constant turnover within firms as well as between them.

Changes in partnerships due to bankruptcy are a little easier to trace through the *London Gazette* and the *Bankruptcy Directory* published in 1843. Table 3.7 shows all bankruptcy notifications between 1809 and 1843 for producers and dealers of earthenware and china in North Staffordshire listed in the *London Gazette* and the *Bankruptcy Directory* of 1843.<sup>70</sup>

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<sup>68</sup> The details of this firm were collated through examination of articles published in the *Staffordshire Advertiser*

<sup>69</sup> *Staffordshire Advertiser*, 7 March 1801, p. 4.

<sup>70</sup> Elwick, George, *The Bankrupt Directory: Being a complete register of all the bankrupts, with their residences, trades, and dates when they appeared in the London Gazette, from December 1820 to April 1843* (Simpkin, Marshall, and Co.: London, 1843).

Table 3.7: Pottery related bankruptcies listed in London Gazette for North Staffordshire, 1809-1843

<b>Date</b>	<b>Name(s)</b>	<b>Trade</b>
23.09.1809	Forrester, John	Earthenware Mfc.
10.03.1810	Whitehead, James & Charles	Earthenware Mfc.
24.10.1812	Whitehead, James & Charles	Earthenware Mfc.
07.11.1812	Wilson, Thomas & Thomas Green	Earthenware Mfc.
01.02.1814	Gater, William	Earthenware Mfc.
13.03.1819	Booth, John	Dealers in Earthenware & China
11.08.1821	Baggaley, Robert & Thomas Taylor	China Mfc.
17.11.1821	Scott, Charles	Earthenware Mfc.
07.05.1822	Marsh, William & William Willatt	Earthenware Mfc.
27.07.1822	Rivers, William & John Clowes	Earthenware Mfc.
25.02.1826	Mare, John	China Mfc.
02.12.1823	Robinson, John	Dealers in Earthenware
12.08.1823	Shorthose, John	Dealers in Earthenware
25.11.1823	Hamilton, Robert	Earthenware Mfc.
04.09.1824	Johnson, Ralph	Earthenware Mfc.
18.05.1824	Tomkinson, Samuel	Earthenware Mfc.
16.11.1824	Simpson, Nicholas	Earthenware Mfc.
29.02.1828	Handley, James & William	China Mfc.
14.03.1828	Greatbatch, William Junior, Thomas & Joseph	Dealers in Earthenware
21.10.1828	Swettenham, Thomas	Earthenware Mfc.
24.04.1829	Gallimore, Thomas	Earthenware Mfc.
20.01.1829	Brindley, John	Earthenware Mfc.
12.06.1829	Greatbatch, William Junior	Earthenware Mfc.
17.11.1829	Breeze, John, Michael Lewis, William Reade & William Handley	Earthenware Mfc.
12.06.1829	Wood, Stephen & Thomas Blood	Earthenware Mfc.
16.11.1830	Edwards, William	Earthenware Mfc.
22.01.1830	Weston, George	Earthenware Mfc.
30.08.1831	Smith, William & Michael Lewis	Earthenware Mfc.
01.11.1831	Mansfield, Thomas & James Hackney	Earthenware Mfc.
10.07.1832	Hall, John Snr, Joseph & Thomas	Earthenware Mfc.
18.11.1834	Clews, Ralph & James	Earthenware Mfc.
28.08.1835	Jackson, Job	Earthenware Mfc.
29.12.1835	Stevenson, Ralph & John	Earthenware Mfc.
24.05.1836	Shaw, Kitty	China Mfc.
29.03.1836	Jackson, John Clews	Earthenware Mfc.
05.12.1837	Jones, Henry	China Mfc.
06.06.1837	Marsh, Samuel	Earthenware Mfc.
16.05.1837	Wright, James Thomas & Nathan Hackney	Earthenware Mfc.
12.06.1840	Mayer, Samuel, Joseph Mawdesley, Ralph Lees & Jesse Bridgwood	Earthenware Mfc.
03.07.1840	Hood, George	Earthenware Mfc.
14.08.1840	Lowndes, Thomas & Samuel Ingram Hill	Earthenware Mfc.
26.05.1840	Lees, Ralph	Grocer & Earthenware Mfc.
22.01.1841	Ellis, George	Earthenware Mfc.
10.05.1842	Keys, Edward	China Mfc.
01.03.1842	Rogers, Spencer	Earthenware Mfc.
24.02.1843	Tams, Jesse	Earthenware Mfc.
14.03.1843	Wright, Thomas, Richard Burges & Ralph Taylor	Earthenware Mfc.

Sources: *The London Gazette* (on dates listed); Elwick, *The Bankrupt Directory*.

Of the 47 entries during this period, four were dealers in earthenware (nine per cent) and 43 were manufacturers (91 per cent). Compared to the national figures for the pottery industry taken from the *Directory* for the period 1820-43, there were 116 entries (75 outside the Potteries, and 41 within). Those outside the district were composed of 43 dealers (57 per cent) and 32 manufacturers (43 per cent). Because not all bankruptcies were recorded in the *Gazette*, and we do not know the exact number of dealers in North Staffordshire, it is not possible to draw robust conclusions concerning the district effect observed in these figures. However, between 1820 and 1843, there were far fewer bankrupt dealers registered within North Staffordshire than in the rest of the country.

Notification of the dissolution or bankruptcy of a partnership can therefore help to explain some of the turnover observed in the district. However, there were over 800 distinct firms listed in the directories for the period 1781-1830. As such, these notifications can only reliably explain a small amount of the turnover. For example, bankruptcy notifications account for just seven of the 77 firms that were listed in the 1822 directory, but not in the subsequent directory of 1828. Notifications certainly increase our knowledge of individual cases of bankruptcy or dissolution; however, we are still lacking a conclusive explanation for the high turnover and short lifetime of partnerships in the region.

In his history of the region, Thomas argues that the main reason for the short lifespan of partnerships and other syndicates in the Potteries was the highly speculative nature of clay mining and the 'loose associations' on which manufacturing partnerships were formed.<sup>71</sup> This argument may hold for a small number of larger scale collaborations between potters and clay merchants. For example, Thomas refers to *Hendra Co.*, a syndicate formed in 1781, which secured raw materials through the purchase of land and mines in Cornwall, although by 1821 it had fallen into arrears and lost most of its members. However, a partnership of 40 years is far longer than the majority of pottery manufacturing partnerships identified in this thesis. There was also a formal agreement to

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<sup>71</sup> Thomas, *The Rise of the Staffordshire Potteries*, p. 41.



secure raw materials in 1791 between twelve leading Staffordshire potters who agreed to purchase a minimum of 1,200 tons of clay per annum from a Cornish clay merchant, Mr Pike, at a minimum price of £120 each year for five years. This agreement does not seem to have lasted longer than this initial period as a new syndicate was formed in 1797 with an initial twenty-one-year lease on a Cornish mine, although this too seems to have run its course out by the turn of the century.<sup>72</sup>

Thomas argues that there is a case to be made that Cornish merchants and landowners, outsiders to the industry and district, and therefore subjected to a degree of information asymmetry, may have been somewhat reluctant to extend leases to partnerships which could be liable to change or unforeseen termination. However, the length of the leases offered are much longer than the partnerships between potters, and do not explain the turnover observed. Thomas' argument is based on specific evidence drawn from externally oriented ventures directed *outside* of the region for the provision of raw materials rather than production itself and thus cannot be generalised. These partnerships listed by Thomas were very different in their nature and intentions, with partners directly involved in the production of wares *within* the district, often collaborating with one-time or future competitors.

Problems of inter-generational succession inherent in family businesses have, in the past, been put forward to explain the high turnover of small firms in a number of industries during the eighteenth and nineteenth century.<sup>73</sup> A number of studies in the 1990s argued that much of the empirical evidence suggests that family and small firms of the Industrial Revolution era were unlikely to have been long-lasting or continued into a second generation, prompting accusations of economic failure, bad management and the inherent fragility of such enterprises.<sup>74</sup> More recent research has shifted perceptions of these phenomena into a more positive light with Barker and Ishizu arguing for the

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<sup>72</sup> *Ibid.*, pp. 35-40.

<sup>73</sup> Stana Nenadic, 'The small family firm in Victorian Britain', *Business History*, Vol. 35, No. 4 (1993), pp. 86-114.

<sup>74</sup> Barker and Ishizu summarise these arguments neatly in the introduction to their recent article: Hannah Barker and Mina Ishizu, 'Inheritance and continuity in small family businesses during the early industrial revolution', *Business History*, Vol. 54, No. 2 (2012), pp. 227-44.

importance of informal, as well as formal, inheritance practices. In addition to formal estate distribution through the use of legal documents such as wills and testaments, inheriting family members could exercise their own judgment and influence concerning the interests of those surviving the deceased.<sup>75</sup> Using wills and trade directories Barker and Ishizu provide evidence from Liverpool and Manchester during the late eighteenth and early nineteenth centuries to suggest that family firms continued or remained in family hands far more than was previously thought. Often, this was done as a means of supporting widows and children.<sup>76</sup> Our previous example of the widow Ann Chetham continuing on the family business of her husband with her sons is probably an example of such an ‘informal’ practice which only reveals itself through micro-level analysis. However, this exception does not explain the general pattern of recurring short-term partnerships. The high turnover of firms in North Staffordshire cannot be adequately explained by forced dissolutions and reorganisation due to bankruptcy or permanent dissolution, nor can Thomas’ argument relating to the speculative nature of some branches of the industry be supported.

By examining potentially useful theories in the light of initial empirical evidence, the discussion in this introductory chapter has illuminated the incredibly complex case of an early industrial district. It has shown that some elements of the development of the North Staffordshire Potteries fit existing theories and models. For example, just as with the cotton textile industry in Lancashire, the Potteries benefitted from ‘original’ locational advantages with the easily accessible factor endowments of clay and coal, crucial to the production process.<sup>77</sup> However, these were quickly surpassed as raw materials came from further afield as demands for certain characteristics from the industry became ever more exacting. Cornish clays and coal were commonly being imported in large amounts by Staffordshire potters already by the 1780s. Since the 1740s English potters and porcelain makers had been experimenting with a clay known as *unaker* or ‘Cherokee’ clay, and in

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<sup>75</sup> *Ibid.*, pp. 229-232.

<sup>76</sup> *Ibid.*, pp. 236-238.

<sup>77</sup> Crafts and Wolf, ‘The Location of the UK Cotton Textiles Industry in 1838’, p. 1134.

1744 Edward Heylyn and Thomas Frye who both worked at Bow porcelain factory, filed a patent which used ‘the produce of the Cherokee nation in America’.<sup>78</sup> Wedgwood had been actively seeking exotic clays from North America since the 1760s and negotiated access through his partnership with Thomas Bentley to several tons of clay from Pensacola in modern-day Florida.<sup>79</sup>

Some features of the district either do not fit within conventional industrial district frameworks, or cannot easily be explained by the analysis conducted so far. The churn of the district acts as a functional characteristic that is not explained by the familiar arguments in business history concerning fragility, bad management or a failing industry in decline. The turnover of firms is functional because it is a constant feature of the district. In addition to the entry of new firms to the industry, the turnover of firms helped the industry thrive, helps firms survive. Figures 3.10 and 3.14 show that the number of new firms entering the industry, and firms either leaving the industry or forging new partnerships changed over time. During the early nineteenth century in particular, Staffordshire potters responded to pressures and constraints on the industry by adapting their behaviour. A period of slower growth and constraints on exports during around the turn of the nineteenth century (Figure 3.13) saw the turnover of firms decrease as potters increased the length of their partnerships. During periods of more rapid growth before and after the Napoleonic wars the turnover of firms increased and defined the vitality of the district as existing firms sought new partnerships more frequently and new pottery firms entered the market. Certainly, there were some potters who were bad businessmen and incapable of successfully running a manufactory without continuously facing, or indeed falling into, financial ruin as shown by the bankruptcy records. It is impossible to ascertain whether this was down to a lack of skill in producing wares on the part of the potters or themselves. On the whole, though, this characteristic of a high firm turnover rate was distinctly local and an asset to the district in the long-run.

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<sup>78</sup> Patent 610, December 6, 1744, in Woodcroft, *Patents for Inventions: Abridgments*, p. 6; W. R. H. Ramsay & E. G. Ramsay, ‘A classification of Bow porcelain from first patent to closure: c.1743–1774’, *Proceedings of the Royal Society of Victoria*, Vol. 119, No. 1 (2007), pp. 1-68.

<sup>79</sup> Josiah Wedgwood to Thomas Bentley, 17 Nov 1766, Wedgwood Museum Archives, Wedgwood MS, 25/18133.

It is clear that Popp and Wilson's life-cycle theory for English industrial districts is a useful structure when considering long-term trends and examination of some of the more macro-level features of the district such as population, employment and the number of firms in operation. The first stage of critical mass had been achieved through the clustering of the human and physical capital required. Take-off had been achieved by the later eighteenth century. There is also evidence that the character of the district was one of cooperative competition. Similarly, Popp and Wilson's underlying logic as shown in Figure 2.3 provides an initial focus on the individual and can help us explain, where Marshall cannot, the more social features of the district such as the generation of trust, cooperation and the embedding of economic actions within a social context. The chapters following this one will address these characteristics of the district.

At this stage, it is important to note that a high turnover of firms is not a feature unique to North Staffordshire or to the pottery industry. Indeed, Jones and Rose suggest that small family firms and the 'vital dynamism' of their 'rapid formation' and high turnover was a feature of industrialisation processes in many countries.<sup>80</sup> Moreover, a high turnover is a feature which Popp and Wilson argue is characteristic of many industrial districts in England during the eighteenth and nineteenth centuries. The cotton textile industry in Manchester during 1815-1841 exhibited a large proportion of 'exit firms'; firms that had left the industry. Using rate books and the 1841 *Factory Inspector's Report*, Lloyd-Jones and Le Roux found that more than three-quarters of the 90 firms that were recorded in 1815 had exited the industry by 1833. The majority of these were classified as small firms with less than 150 employees. Medium and larger firms with 151-500 and over 501 employees respectively survived for longer.<sup>81</sup> Other industrial districts such as cutlery in Sheffield,

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<sup>80</sup> Geoffrey Jones and Mary B. Rose, 'Family Capitalism', *Business History*, Vol. 35, No. 4 (1993), p. 1.

<sup>81</sup> Lloyd-Jones and le Roux, 'Marshall and the birth and death of firms', pp. 143-5.

jewellery and metal wares in Birmingham, gloving in Worcester and chemicals in Widnes all exhibited high turnover of firms generated by the entry and exit of new firms.<sup>82</sup>

Many modern and twentieth century industries also exhibit high turnover rates and this is known, in some cases, to be a positive growth characteristic more so than the absolute number of firms in an industry. In a quantitative study on the Swedish IT industry between 1994 and 1998, for example, Johansson explored the impact of firm entry and exit rate and found that the high turnover in the industry had a significant positive effect on its growth.<sup>83</sup> In a study of US manufacturing industries from 1963-1982, Dunne, Roberts and Samuelson highlighted the heterogeneity of turnover rates across different industries. By tracing patterns of firm entry and exit by cross-sections and longitudinally, they were able to identify those industries with high or low rates. They found that industries with the highest firm entry and exit rates were those such as instrument making, lumber, furniture, printing. Stone, clay and glass industries exhibited some of the lowest entry and exit rates.<sup>84</sup>

The high turnover in the Potteries during the eighteenth and nineteenth centuries should not be viewed simply as the entry and exit of firms in the marketplace. The character of the district was far more complex and dynamic. The turnover and organisational churn was layered. A steady supply of entirely new firms entered the industry, and those that could not survive ceased operation and exited. A small number of these new entries survived relatively unchanged for long periods and became major competitors in the district. Other survived by continually changing and reinventing themselves after short-run partnerships ran their course. Together, these strategies generated a fast moving and dynamic business environment where the majority of producers did not stand still. The

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<sup>82</sup> Popp and Wilson, 'The emergence', pp. 48-50.

<sup>83</sup> Dan Johansson, 'The Turnover of Firms and Industry Growth', *Small Business Economics*, Vol. 24, No. 5 (2005), pp. 487-95.

<sup>84</sup> Timothy Dunne, Mark J. Roberts and Larry Samuelson, 'Patterns of firm entry and exit in U.S. manufacturing industries', *RAND Journal of Economics*, Vol. 19, No. 4, (1988), pp. 495-515.

pursuit of short-term gain and survival by producers at the firm level, became a means of long-term growth and vitality at the district level.

The Potteries exhibited a complex growth process which requires significant research into the reasons why and how, in a knowledge and skill intensive industry, successful firms chose to, and could successfully survive on a business model of multiple, occasionally repeated, short-term partnerships with their competitors. Sabel and Zeitlin's theory of flexible specialisation may help here as one of the five core features of such a system is that 'competitive cooperation was key for all firms regardless of their strength and position in system'.<sup>85</sup> However, the extent to which such a strategy takes into account knowledge creation and sharing is unclear in this instance. If the creation and appropriation of knowledge are means of garnering a competitive advantage, we might expect longer-term partnerships to be the strategy adopted by most producers as a means of protecting certain types of knowledge. It is extremely difficult to keep control of knowledge once it leaves the boundary of the firm. It is even more difficult to keep control of this if the bulk of the tacit knowledge and skill is attached to individuals who move with their employers between partnerships. As already noted, it is important to determine what types of knowledge were being created, used and shared in the district. This will then allow further analysis of the strategies adopted by Staffordshire Potters. These questions and themes will be addressed in part two of the thesis. The next chapter will introduce network analysis and examine the social connections in the district that underpin the turnover of firms and behaviour of producers.

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<sup>85</sup> Sabel, 'Flexible Specialisation', p. 17.

## 4 Networks, identity and cooperation

The motivations for this chapter are two-fold. Firstly, the features and character of the district examined in the previous chapter have raised further questions that remain to be answered. Given the intense spatial concentration, the dominance of pottery production as the main industry in the district, the myriad business connections as a result of the high turnover of firms and partnerships, and the clear identification of a distinct district known as ‘the Potteries’, there is a case to be made for the exploration of the social context in which these economic activities took place. Granovetter’s concept of embeddedness focuses on the relationships between individuals and their networks of connections. Staffordshire potters clearly developed considerable business networks over the course of their careers through repeat transactions.

Such networks can be crucial to the success of a business through the amalgamation of strong and weak ties. The study of networks in economic and business history has increased in recent years alongside the growth in industrial district study with an early example provided by Scranton.<sup>1</sup> The use of network visualisation techniques and SNA software were later to develop and have been effectively used to study transatlantic business networks of the eighteenth and nineteenth centuries.<sup>2</sup> This chapter utilises cutting-edge methodologies regarding the use of social network analysis software (SNA) to analyse social and business networks of producers and their contacts. Recent publications have developed the historical application of SNA software such as *Pajek* and *UCINET* which allowed Haggerty and Haggerty to identify brokers with business connections spanning the

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<sup>1</sup> Scranton, *Endless Novelty*.

<sup>2</sup> Emily Buchnea, *Bridging the middle Atlantic: the Liverpool-New York Trading Community, 1763-1833*, Unpublished PhD Thesis, University of Nottingham, 2013; John Haggerty and Sheryllyne Haggerty, ‘The life cycle of a metropolitan business network: Liverpool 1750-1810’, *Explorations in Economic History*, Vol. 48 (2011), pp. 189-206; Sheryllyne Haggerty, *Merely for Money? Business Culture in the British Atlantic, 1750-1815* (Liverpool University Press: Liverpool, 2012).

Atlantic that facilitated the transfer of useful knowledge into Liverpool between 1750 and 1810.<sup>3</sup> This new methodological innovation has allowed historians to broaden their perspectives on network relationships and behaviour. In particular, using such methods allows for large-scale analysis of networks over time, capturing and quantifying the dynamics of the relationships in a clearer and more comprehensive manner than previous network studies using graphs and tables. Moreover, in their recent revisionist interpretation of the future of business history Scranton and Fridenson argued that networks are ‘a thick soup of intentions, arrangements, and connections that facilitated business activity, a dish whose historical recipes and forgotten chefs are worth rediscovering’.<sup>4</sup> The analysis of networks in this chapter, and the introduction of SNA software offers an answer to this call and provide some first steps in applying network theory to an extremely dynamic period of development.

The second key motivation for this chapter comes from a specific set of documents in the Wedgwood archives that were identified by Schofield in the 1950s.<sup>5</sup> These documents, dated 1775, suggested that North Staffordshire was the site of one of the earliest known proposals in England of a joint-stock research and development organisation. Whilst Schofield acknowledged the significance of the documents, neither he nor subsequent scholars have engaged with them in any critical or analytical manner. Schofield’s article contained a composite transcription of the company proposals and some brief contextual information but did not provide adequate detail or explanation of the episode.<sup>6</sup> This chapter examines the company proposals in detail. The composite document has been reproduced in the appendix (See Appendix One).

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<sup>3</sup> Haggerty and Haggerty, ‘The life cycle’; ‘Visual Analytics of an Eighteenth-Century Business Network’, *Enterprise and Society*, Vol. 11, No. 1 (2010), pp. 1-25.

<sup>4</sup> Philip Scranton and Patrick Fridenson, *Reimagining Business History* (Johns Hopkins University Press: Baltimore, 2013), p. 182.

<sup>5</sup> Robert E. Schofield, ‘Josiah Wedgwood and a Proposed Eighteenth-Century Industrial Research Organization’, *Isis*, Vol. 71, No. 1 (1956), pp. 16-19.

<sup>6</sup> *Ibid.*



## 4.1 Cooperative competition

The company proposal is interesting for several reasons, not just because of the early emergence of such behaviour. The company was set forth by committee and was the result of a collaborative effort by a group of potters under the figurehead of Josiah Wedgwood I. In 1775 the group had successfully led a petition in Parliament against the extension of a patent held by Richard Champion (1743-1791), a Bristol based merchant. The roots of the petition can be found almost a decade previously. In 1768, a patent was awarded to the Quaker minister and potter William Cookworthy (1705-1780) for the production of English porcelain ‘from ingredients distinguished in the counties of Devon and Cornwall [...] equal to the best Chinese or Dresden Ware’.<sup>7</sup> The patent was intended to secure and protect privileged access to growan stone, also known as china-clay. Cookworthy claimed to have discovered this raw material, crucial to the production of English porcelain, in Devon and Cornwall. However, Cookworthy ran into difficulties when attempting to capitalise on his patent by producing porcelain. Such were the challenges and R&D costs required to successfully commercially produce English porcelain that Cookworthy abandoned his attempts and sold the patent. Thomas Pitt, on whose land the raw materials were discovered estimated that Cookworthy had spent around £2-3,000 in the process.<sup>8</sup> To put these costs in perspective, in 1766 the assets of Bow Porcelain Company listed the value of all the buildings, kilns, mills, utensils and stock in the factory and warehouses at approximately £2,880.<sup>9</sup>

In May 1774, Champion, a business partner of Cookworthy with no previous practical experience of producing pottery, purchased the patent. In 1775, Champion petitioned Parliament in an attempt to extend the term of the patent.<sup>10</sup> It was at this point that Wedgwood and a group of potters sought

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<sup>7</sup> (1769) *The Statutes at Large, from Magna Charta to the End of the eleventh Parliament of Great Britain, anno 1761*, Vol. XXIV, p. 112; See also Patent No. 898: Woodcroft, *Patents for Inventions: Abridgments*, p. 8.

<sup>8</sup> David Holgate, *New Hall* (Faber and Faber: London, 1987), p. 7.

<sup>9</sup> Weatherill, *The growth of the pottery industry*, p. 278.

<sup>10</sup> Karin Walton, ‘Champion, Richard (1743-1791)’, in H. C. G. Matthew and Brian Harrison (eds.) *Oxford Dictionary of National Biography* (Oxford University Press: Oxford, 2004) online at <http://www.oxforddnb.com/view/article/5094> [accessed 14 June 2017].

to challenge the patent. According to the Parliamentary papers and reports, this caused considerable commotion in the North Staffordshire Potteries. There were a range of issues raised, mostly focussing on the ‘want perhaps of Skill and Experience [on the part of Champion] to bring to any useful Degree of Perfection’, and the monopoly on raw materials that would prove ‘injurious to the Community at large’.<sup>11</sup> This process galvanised the group of potters enough to facilitate the proposal of a research and development company in order to succeed where Cookworthy and Champion had failed.

The draft documents describe the terms and conditions of entry into the company and set out strict regulations and control over any knowledge or innovation produced as a result of the collaborative efforts. The eighth and ninth tenets of the drafted agreement illustrate these points:

*8. No member shall disclose the experiments made by this Company or the knowledge obtained by them to any person or persons not in the Company, on pain of forfeiting his share in the joint Stock, and of incurring a penalty of One Thousand Pounds.*

*9. That no one of us shall take advantage of the knowledge acquired by the experiments of this Society, by adopting any of the improvements made thereby in our own private manufactories or otherwise, until the plan and time of generally adopting and removing such improvements into the manufactory at large be agreed upon by the Society under the penalty of One Thousand Pounds.*<sup>12</sup>

The desire to control the flow of useful knowledge within the confines of the company is evident, although the ninth clause also suggests that it would have the potential to wield considerable influence over the individual businesses of each partner, especially in terms of implementing innovations. The collective character and expression of utilitarian sentiment is limited to those members of the company and is not to be extended to non-members. In fact, strict regulations and sanctions were drawn up in the event of a dissolution of the company:

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<sup>11</sup> Llewellynn Jewitt, *The Wedgwoods: being a life of Josiah Wedgwood; with notices of his works and their productions, memoirs of the Wedgwood and other families, and a history of the early potteries of Staffordshire* (Virtue Brothers and Co.: London, 1865), p. 238. The records of Parliamentary process and speeches are found in: *Papers relative to Mr Champion’s application to Parliament, for the extension of the term of a patent* (n. p.: 1775).

<sup>12</sup> *Ibid.*, pp. 18-19.

*On a Dissolution [...] The Experiment Books and the Results to which [illeg.] refer, should be put up by auction to the Company only and sold to the best bidder – Any Member having first had the liberty to copy the Experiments from the book.<sup>13</sup>*

Any of the valuable knowledge or secrets that were produced as part of the joint venture were to remain within the hands of Members, even after dissolution. However, provision was clearly made for each partner in the company to be able to benefit from the venture in its entirety, regardless of their contributions. The ability to copy material from the experiment books before one partner took ownership through auction ensured all left on a level playing field, assuming of course that fraud and deception had not influenced the recording of experimentation results.

In an intriguing way, the company documents were drawn up in such a way that drew clear demarcations between members and non-members, those who produced and could use useful knowledge, and those who did, or could, not. By seeking to bring a small group of potters together, the proposed company took an active role in identifying, defining and ‘othering’ its competitors. By proposing such tight sanctions and limitations on its prospective members the company was effectively imposing an additional identity onto a small group of potters. We know from the work of Porac *et al* that identity is extremely important in a competitive marketplace.<sup>14</sup> How a firm or group of firms identifies themselves in relation to others (their rivals) affects their attitudes and strategies towards competition, as it is between these firms and groups that economic transactions take place and relationships are fostered. In the case of the Scottish knitwear industry during the mid-1980s, Porac *et al* argue that the strategic choices of managers and decision makers are heavily influenced by ‘core identity and causal beliefs’ shared by the majority of firms in the particular branch of an industry. These shared beliefs and values were crucial in defining the boundaries of

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<sup>13</sup> Ibid.

<sup>14</sup> Joseph F. Porac, Howard Thomas and Charles Baden-Fuller ‘Competitive groups as cognitive communities: The case of Scottish knitwear manufacturers’ *Journal of Management Studies*, Vol. 26, No. 4 (1989), pp. 397-416.

competition between firms and could influence their strategic choices.<sup>15</sup> Clearly, in the case of the proposed research company in 1775, the notion that members would join a tightly controlled venture which explicitly pitched them against ‘any person or persons not in the Company’ shows similar mechanisms at work. Self-identification above and beyond being *Staffordshire Potters*, an accolade in its own right by this time, but as those potters who were capable and able to produce the innovations so dearly sought after in the region, and shown in the case of Richard Champion to be unachievable by others, prompted an innovative strategy.

The company was imposing an *additional* identity because as we have already mentioned and shall see in more detail later in this chapter, there was a distinct sense of commonality and cohesion that came with being a *Staffordshire Potter* from sometime in the middle of the eighteenth century to sometime in the middle of the nineteenth century. In his history of the Staffordshire Potteries written in 1829, Simeon Shaw refers to the inhabitants of the Potteries as being ‘regarded as a body’ who united to achieve local progress.<sup>16</sup> The period 1750-1850 very roughly coincides with the heyday of those original founding pioneers of the district such as Wedgwood, who arguably became less prominent as the nineteenth century progressed. Whilst this is not, strictly speaking, the most useful way to define this epoch, there were several significant events which signalled perhaps a change in fortunes and direction of some of the most influential names in the industry. For example, the financial difficulties during the 1840s of Etruria under Francis Wedgwood, the grandson of Josiah I, the death, in 1858, of Herbert Minton, son of Thomas Minton, and the sale of Josiah Spode II’s company in 1833. Francis Wedgwood made repeated attempts to sell Etruria and its surrounding lands and developments during the mid-1840s. An advertisement placed in the *Staffordshire Advertiser* lists, amongst numerous items, ‘about 260 acres [...] a large, convenient,

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<sup>15</sup> *Ibid.*, p. 412.

<sup>16</sup> Shaw, *History of the Staffordshire Potteries*, p. 10.

well-built handsome mansion [...] upwards of 130 houses [...] large and convenient potworks' and a Boulton and Watt 36-horsepower steam engine.<sup>17</sup>

Popp presents a radically different social and business environment in the Potteries during the second half of the nineteenth century; identification as a 'true potter' was highly contested and Staffordshire firms failed to orient themselves around a common identity. Popp argues that by this time trust, an essential element in any business context, was lacking in the district. Without trust and a strong sense of local or regional identity, business networks were 'fragile' which, in turn, resulted in firms often operating in relative isolation and competing bitterly in an *every-man-for-himself* milieu.<sup>18</sup>

The inaugural meeting of the company was proposed for Lady Day (25<sup>th</sup> March) at 10am.<sup>19</sup> However, despite the level of planning that went in to this joint venture, the company was never formed. In June 1775, Wedgwood wrote to Bentley that at a 'general meeting of the Potters [...] at Moretons on the Hill [...] they were highly pleas'd with our negotiations, & the generosity with which the Pottery at large had been treated'.<sup>20</sup> However, already by 3<sup>rd</sup> July objections were being raised 'that all of [the] improvements when they are known to 100 Members of an experimental work will instantly be carried out of the Country & out of the Kingdom'.<sup>21</sup> Indeed Wedgwood himself voiced his concerns in this regard to Bentley, writing 'we have some People now make a trade of carrying our present improvem<sup>ts</sup>. to distant works & receiving sums of money for the service.'<sup>22</sup> Essentially, Wedgwood and his colleagues were concern about secrecy and industrial espionage, a theme that will be taken up in part two of the thesis.

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<sup>17</sup> *Staffordshire Advertiser*, 22 June 1844, p. 2.

<sup>18</sup> Popp, 'The True Potter', pp. 325-36

<sup>19</sup> See Clause 14 in Appendix One.

<sup>20</sup> Wedgwood to Bentley, 23 June 1775: Wedgwood Museum Archives, Wedgwood MS 25/18603.

<sup>21</sup> Wedgwood to Bentley, 3 July 1775: Wedgwood Museum Archives, Wedgwood MS 25/18605.

<sup>22</sup> *Ibid.*

By November the experimental works project had dissolved with disagreements over the financial requirements associated with pooling research and development. The anonymous prospective members 'could not settle the question whether the Partners in Co<sup>y</sup> sh<sup>d</sup> pay seperately, or jointly', and there were 'too few people [who] were sufficiently convinced of the importance of research to be willing to pay for it'.<sup>23</sup> Wedgwood's entrepreneurial drive, however, meant that he sought to take advantage of this failed attempt when telling Bentley, his business partner, that the 'Experimental work expir'd in Embrio last night.' The potter expressed his scepticism that he would ever have been able to pursue his own line of experimentation 'whilst the Partnership plan was in agitation'; he was now able to 'take [his] own course quietly'.<sup>24</sup>

This proposed joint-venture points to the existence of strong commercial ties and business relationships. The fact that such a company was mooted at all, and the considerable level of detail in the planning, is indicative of a group of entrepreneurial, innovation seeking potters, locked in fierce competition yet acutely aware of the advantages of cooperation. For this group of potters there was a shared common interest and goal. However, a closer examination of the case of the proposed R&D company reveals that trust, in this case it would seem, was not strong enough to be assumed; it required careful structuring through a series of clauses and rules designed to protect a most valuable asset, knowledge.

This type of cooperative-competition is a familiar concept in business history and management studies. For example, Allen's study of collective invention in the Cleveland pig-iron identified firms that were competing intensely with one-another whilst also openly sharing innovations.<sup>25</sup> In management studies, the term 'coopetition', coined by Nalebluff and Brandenburger, is used to

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<sup>23</sup> Robert E. Schofield, *The Lunar Society of Birmingham* (The Clarendon Press: Oxford, 1963), p. 140.

<sup>24</sup> Wedgwood to Bentley, 14 November 1775: Wedgwood Museum Archives, Wedgwood MS 25/18624.

<sup>25</sup> Robert Allen, 'Collective Invention', *Journal of Economic Behaviour and Organization*, Vol. 4, No. 1 (1983), pp. 1-24.

describe a context where relationships between firms can be both one of competition and cooperation.<sup>26</sup>

The example of notional communal R&D and sharing of knowledge in the 1775 company is not on the same scale as the full ‘information disclosure networks’ identified by Allen, although it does precede it by almost a century.<sup>27</sup> The regulations laid out in the proposal tell us much about the potters’ perceptions of competition and cooperation, and more precisely, *who* they deemed to be their rivals. Regulations and the general makeup of the company appear equitable and relatively open for those fortunate to be deemed suitable members but were strict and unwavering in their desire to restrict access to outsiders. Already by this time a strong local identity had been established; an identity that Popp argues underwent a period of crisis in the late nineteenth century.<sup>28</sup>

However, what we do not yet know is how collective action and cooperation changed over time. We have shown in previous chapters that the region was not static in its development; the period 1750-1851 was an incredibly dynamic one in terms of growth, organisation and output. Were the efforts to create the 1775 research company representative of the types of behaviour exhibited by potters throughout this period? The following discussion will begin by focusing on Josiah Wedgwood, his networks and exploits concerning cooperation with his fellow potters. It will then extend beyond 1795, the year of his death, to examine whether similar episodes of cooperation continued into the nineteenth century.

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<sup>26</sup> Barry Nalebluff and Adam Brandenburger, *Co-Opetition* (Harper Collins: London, 1996).

<sup>27</sup> Allen, ‘Collective Invention’.

<sup>28</sup> Popp, ‘The True Potter’.

## 4.2 Egocentric network analysis

Josiah Wedgwood has long occupied a position in local, national and international imaginations as the Crown Prince of English pottery production. The company he founded in 1759 still lives on, albeit having undergone significant organisational and ownership changes in the twentieth century, and is still portrayed as a producer of luxury and prestige in which design and English craftsmanship reign supreme.<sup>29</sup> The Master Potter's rise to prominence and renown was rapid and already by the 1760s he was seen as one of the key players in the industry. His business talents and managerial acumen are well known and research of his marketing prowess, along with his key business partner Thomas Bentley, are a path well-trodden.<sup>30</sup> Wedgwood was also incredibly well connected and liked to keep in touch with his contacts. He wrote countless letters to not only his business partner Thomas Bentley, but to merchants (both those based in the England and in North America) and customers, leading aristocracy, socialites and, of course, his close friends such as the physician and natural philosopher Erasmus Darwin.<sup>31</sup>

Figure 4.1 was created using the social network analysis software *Pajek*, and shows some of the personal and business relationship of Josiah Wedgwood between 1770 and 1791. The sources used for the construction of this network are his personal correspondence and secondary histories of some of the individuals and companies.<sup>32</sup>

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<sup>29</sup> 'Wedgwood – English Tableware & Homeware, Est. 1759', online at [www.wedgwood.co.uk](http://www.wedgwood.co.uk)

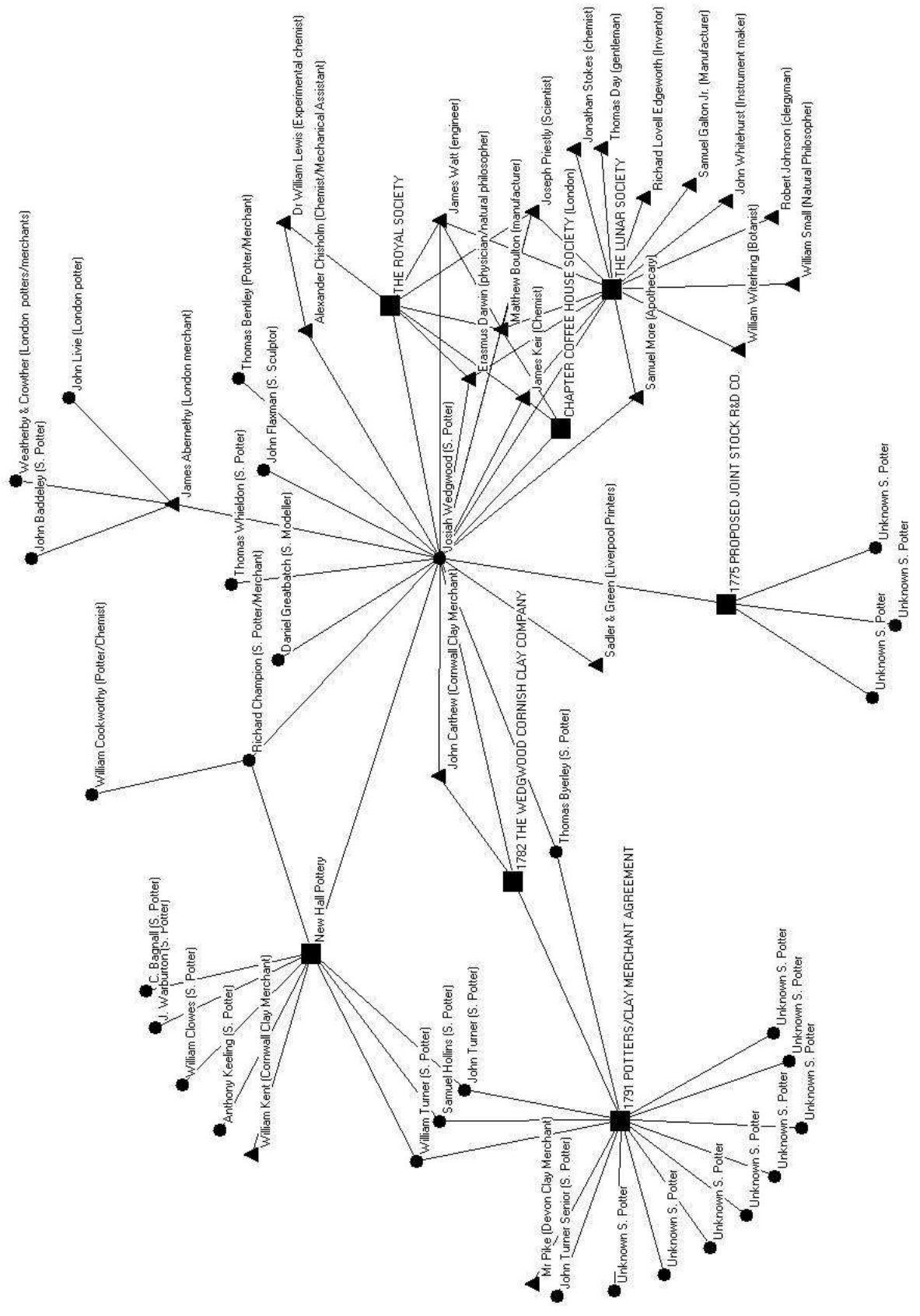
<sup>30</sup> Blaszczyk, *Imagining Consumers*; McKendrick, 'Josiah Wedgwood: An Eighteenth Century Entrepreneur', 'Josiah Wedgwood and Factory Discipline', 'Josiah Wedgwood and Thomas Bentley', 'Josiah Wedgwood and cost accounting'.

<sup>31</sup> The archives at the Wedgwood museum house some fifteen volumes of Josiah Wedgwood's letters which contain over one thousand letters.

<sup>32</sup> Farrer (Wedgwood), *Letters of Josiah Wedgwood*; Holgate, *New Hall*; Robin Reilly, *Josiah Wedgwood, 1730-1795* (Macmillan: London, 1992).



Figure 4.1: Network of Josiah Wedgwood's personal and business connections, 1770-1791



The potter occupies a central position in the network due to the fact that this is an egocentric network; these are *his* relationships. The graphs have been ‘energised’ in *Pajek* using a force-directed graph algorithm known as *Fruchterman Reingold* after its creators. The algorithm is useful for network visualisation as it separates out parts of the network which are not connected, thus allowing us to identify and analyse individual relationships and connections. This algorithm has been favoured over the *Kamada Kawai* energy command, which is also force directed; the *Kamada Kawai* algorithm draws network elements on top one another including those that are unconnected and can result in network graphs which appear more crowded and harder to distinguish separate components.<sup>33</sup> Whilst Granovetter’s theory of strong and weak ties would necessitate that an egocentric network such as this would require the ego (Wedgwood), his contacts *and* their contacts, unfortunately the historical record does not allow for such a network to be formed. Thus, the networks below are not ‘complete’ networks and do not represent the full population of Wedgwood’s business and personal relations. The networks are representative of the types of some of Wedgwood’s contacts, although the extent to which his contacts knew each other or dealt with each other is difficult to ascertain.

The potter occupies the central position in this network and we can now see visually that he was an astoundingly well-connected individual through both his business and personal relationships. Taking a broad view of the network there are several features which are immediately obvious and some which require further investigation. The network contains several clusters of varying importance which are all connected to Wedgwood. We can clearly see some of the key societies and syndicates of potters and clay merchants in which Josiah Wedgwood held commercial interest and had a hand in forming. The three most apparent are the *1791 Potter/Clay Merchant* agreement to the far left of the graph, the *New Hall Pottery* in the bottom centre, and the *Lunar Society* to the far

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<sup>33</sup> The differences between the two algorithms are not acute due to the size of the network. For a detailed explanation of the differences between these two algorithms see: Wouter de Nooy, Andrej Mrvar and Vladimir Batagelj, *Exploratory Social Network Analysis with Pajek* (Cambridge University Press: Cambridge, 2005), pp. 16-17.

right. Wedgwood was also a member of the Chapter Coffee House Society (CCHS) which met in London and served as a meeting point for a diverse range of professionals and luminaries interested in science and industry.<sup>34</sup>

As a member of the famous Lunar Society of Birmingham, Wedgwood had access to enlightened minds and a privileged pool of knowledge, experiment and reputation.<sup>35</sup> Smiles, biographer of engineers of the Industrial Revolution described the society as ‘minds of the highest culture’ pursuing an ‘active and liberal spirit of enquiry’.<sup>36</sup> Several of its members were also members of the Royal Society, which explains the dense web of connections to the right of Figure 4.1. Wedgwood was an active member of the society and developed close personal and business relationships with other members. Among others, the society helped foster Wedgwood’s relationships with Matthew Boulton (1728-1809) and James Watt (1736-1819), and it is no coincidence that the potter was the first to employ one of their steam engines in his Etruria works, ordered in 1782 and installed in 1784. Potters such as John Turner (1737-1787) and Josiah Spode (1755-1827) had already installed Newcomen engines to raise water to power water-wheels for grinding raw materials by the 1770s. It was Wedgwood, however, who was the first to use steam power to directly drive his grinding machinery. The innovative potter had previously experimented with wind power for his manufactory and sought the expertise of his friend, family member and fellow ‘Lunatic’ Erasmus Darwin.<sup>37</sup> In 1768, Wedgwood travelled to Lichfield to meet with Darwin and examine one of his new inventions, a horizontal windmill, writing, as ever, to Bentley of the ‘very ingenious invention’

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<sup>34</sup> Membership lists for the societies taken from: Robert E. Schofield, ‘The Industrial Orientation of Science in the Lunar Society of Birmingham’ *Isis*, Vol. 48, No. 4 (1957), p. 410; T. H. Levere and G. L’E. Turner, *Discussing chemistry and steam: the minutes of a coffee house philosophical society, 1780-1787* (Oxford University Press: Oxford, 2002); John Timbs, *Club Life of London, with anecdotes of the clubs, coffee-houses and taverns of the metropolis during the 17<sup>th</sup>, 18<sup>th</sup> and 19<sup>th</sup> centuries*, Vol. 2 (Richard Bentley: London, 1866).

<sup>35</sup> Schofield, *The Lunar Society*; ‘The Industrial Orientation of Science’.

<sup>36</sup> Samuel Smiles, *Lives of Boulton and Watt, Principally from the original Soho MSS, comprising also a history of the invention and introduction of the steam-engine* (John Murray: London, 1865), pp. 367-8.

<sup>37</sup> Josiah Wedgwood and Erasmus Darwin were maternal and paternal grandfather to Charles Robert Darwin, the naturalist. The two famous families were intertwined throughout the eighteenth and nineteenth centuries, see: Barbara Wedgwood and Hensleigh Wedgwood, *The Wedgwood Circle, 1730-1897: four generations of a family and their friends* (Eastview Editions, Inc.: Westfield, N.J., 1980). Members of the Lunar Society were popularly called ‘Lunatics’ by contemporaries: see Smiles, *Lives of Boulton and Watt*, p. 413.

yet remaining critical and exacting, pointing out ‘blunders’ in the design that would need to be corrected.<sup>38</sup> The lunar society had proved helpful to Darwin too as he sought help from fellow members Watt and the inventor and engineer Richard Lovell Edgeworth (1744-1817) to develop his new windmill.<sup>39</sup>

Wedgwood also used his Lunar Society networks to seek advice on more business matters. For example, on 15<sup>th</sup> May 1782, the potter wrote to Watt about raw materials in Cornwall, and in the postscript, took advantage of Watt’s business connections in Cornwall to ask for a recommendation: ‘PS: I am in greatest want of a captain in Cornwall to look after some workmen & to pay my rents & other matters for me there. Can you think of such a person on the spot for me.’<sup>40</sup>

The 1791 agreement is important for several reasons. The *Wedgwood Cornish Clay Company*, pictured to the left of the centre of the graph, was set up by Josiah Wedgwood and the Cornish clay merchant John Carthew in 1782. Records show that the stated purposes of the company could be construed as altruistic, maintaining clay supplies for fellow Staffordshire potters and avoiding the increasing demand driving prices up too high.<sup>41</sup> In reality, this was more likely a monopolistic attempt to secure clay supplies at a fixed price. This was followed in 1791 by a more substantial and formal agreement between twelve leading Staffordshire potters, in addition to Wedgwood and his partner Thomas Byerley. The potters agreed to purchase a minimum of 1,200 tons of clay per annum for five years from the merchant, Mr Pike, who was also a partner in the company.<sup>42</sup> (*Ibid* 1971, pp. 35–38). This substantial agreement does not seem to have lasted more than six years as a

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<sup>38</sup> Letter, Wedgwood to Bentley, 15/03/1768; Wedgwood Museum Archives, Wedgwood MS, 25/18193.

<sup>39</sup> Letter, Wedgwood to Bentley, 30/07/1779; Wedgwood Museum Archives, Wedgwood MS, 26/18951.

<sup>40</sup> Farrer (ed.), *Letters*, vol. 3, p. 3.

<sup>41</sup> Thomas, *The Rise of the Staffordshire Potteries*, p. 36.

<sup>42</sup> *Ibid.*, pp. 35-38.

new syndicate was formed in 1797 with twelve new partners and a twenty-one-year lease on a Cornish clay mine.<sup>43</sup>

A sub-network surrounds the 1791 Agreement and introduces a second important pottery partnership built on cooperation and trust between competing potters. Perhaps the most successful consortium formed during the late eighteenth century was the *New Hall Porcelain Company* which operated 1781-1835 and later became the *New Hall Pottery* group. The company's manufactory occupied a commanding position close to the centre of Hanley. In his history of the region, Shaw noted that in 1800 there were thirty-four manufactories in the two liberties of Hanley and Shelton, which were united as one market town in 1812 (1829, pp. 38–47). The site of the *New Hall* works close to the centre of Hanley provided both easy access to raw materials and shipping goods out by horse railway from the Trent & Mersey, and Caldon Canals.<sup>44</sup> Although Josiah Wedgwood I was not a partner in the company, he was instrumental in its formation in fostering a collaborative spirit in the aftermath of the successful petition against Richard Champion's patent in 1775.

Liu's recent study of the petition raised against Champion argues that Wedgwood's motives for the opposition were far from altruistic, and points to evidence suggesting that 'self-interest' was a key driver.<sup>45</sup> Wedgwood acted on his own at first under the ostensible motive of protecting the interests of his peers and was only later joined by John Turner and other Staffordshire potters.<sup>46</sup> However, Wedgwood's motives did not need to be 'altruistic' to be beneficial to the wider community of potters operating in North Staffordshire. Rather, they needed to be opportunistic, innovative, and relentless; Wedgwood delivered lengthy speeches in Parliament which were printed as pamphlets and distributed throughout the House of Commons. He unleashed a barrage of complaints against

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<sup>43</sup> This is not shown in the network as it was formed after the death of Josiah Wedgwood; it is not clear how long this syndicate operated for although there is limited reference to it after 1800: *Ibid.* p. 39.

<sup>44</sup> Holgate, *New Hall*, pp. 26-9.

<sup>45</sup> Deming Liu, 'Wedgwood, Innovation and Patent' *14<sup>th</sup> Intellectual Property Scholars Conference* (Boalt Hall School of Law, University of California: Berkeley, 2014), p. 8.

<sup>46</sup> Holgate, *New Hall*, pp. 13-42; John Penderill-Church, *William Cookworthy, 1705-1780: a study of the pioneer of true porcelain manufacture in England* (Bradford Barton: Truro, 1972), p. 72.

the extension sought by Champion; ranging from the ‘injurious’ impact that would be felt by the region in competition with other parts of Europe, stifling competition within the district in the quest for English porcelain, a downward pressure on employment in the transportation of the raw materials being appropriated, and the lack of quality wares being made available to the public.<sup>47</sup> The potter’s comments were directed at both Cookworthy and Champion. The former for failing to capitalise on his initial monopoly or producing a specification of his true innovation, in breach of the stringent patent requirements; the latter for similarly failing to meet the same obligations despite, in Wedgwood’s eyes, the clear opportunity to do so.

*That Mr Cookworthy contracted, as the condition upon which he held the privilege of his monopoly, that he would make a full and true specification of the art by which he converted these materials into porcelain; and that he entirely failed in fulfilling this obligation.*<sup>48</sup>

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*If Mr Champion had accurately defined the nature of his own invention; if he had described the proportions of his material necessary to make the body of his ware; if he had also specified the proportions of his materials necessary to produce his glaze, as every mechanical inventor who takes out a patent is obliged to specify the nature of the machine by which he produces his effect;<sup>49</sup> if Mr Champion could have drawn a distinct line between the various kinds of earthenware and porcelain that have been made, and are now made in this kingdom, and his porcelain, a clause might have been formed to have confined him to the invention which he says he possesses, and to have prevented him from interrupting the progress of other men’s improvements, which he may think proper to call imitations of his porcelain but, as he has not chosen to do the former, nor been able to do the latter, no manufacturer of stoneware, Queen’s ware, or porcelain, can with safety improve the present state of his manufacture.*<sup>50</sup>

With opposition and criticism as strong and substantial as this put forward by one of the foremost potters of his generation, Cookworthy’s comments on the confrontation are telling: ‘Poor Richard is like a lamb, facing the lions. I pray that the Lord will give him the courage to endure’.<sup>51</sup> In the face of concerted opposition the bill was passed through both Houses in May 1775; although Champion

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<sup>47</sup> *Papers relative to Mr Champion’s application*, pp. 15-16.

<sup>48</sup> *Ibid.*, p. 17.

<sup>49</sup> Part Two of this thesis will address issues around innovation, patenting and secrets in the industry.

<sup>50</sup> *Ibid.*, p. 20.

<sup>51</sup> Penderill-Church, *William Cookworthy*, p. 75

was granted an extension of fourteen years for the patent until 1796 (the original patent still had seven years remaining), he was forced to admit ‘some amendments’ as proposed by the House of Lords.<sup>52</sup> The first amendment required Champion to submit a ‘specification of the mixture and proportions of the raw materials of which his porcelain is composed’ within four months.<sup>53</sup> A second amendment took away the appropriation of the raw materials that both Cookworthy and Champion had enjoyed:

*‘nothing in this Act contained shall be construed to hinder or prevent an Potter or Potters, or any other Person or Persons, from making use of any such raw materials, or any mixture or mixtures thereof (except such mixture of raw materials, and in such proportions, as are described in the specification herein before directed to be inrolled [sic]).’<sup>54</sup>*

Whether Wedgwood was acting in his own self-interest or as a benevolent utilitarian, potters were now able to experiment themselves with new bodies using the raw materials Cookworthy discovered. As a Staffordshire potter and competitor to Champion, regardless of the motives behind Wedgwood’s actions, the outcome was advantageous. For historians trying to understand the behaviour of potters and their consequences, this is far from trivial and tells us a great deal about the business dynamics of the region and industry.

This is also an important episode to discuss because it introduces competition and cooperation to the narrative. Wedgwood was in competition with his fellow Staffordshire potters, yet his actions gave them, and in particular the potters who formed the *New Hall Pottery*, a distinct advantage. That advantage was knowledge, and the ability to pursue it as in 1780 Champion offered to sell the patent and sought Wedgwood’s suggestions of suitable purchasers.<sup>55</sup> Thomas’ account of Wedgwood’s reasons for not joining the partnership at *New Hall* suggests he was not interested in the manufacture of porcelain, and did not wish to purchase the knowledge Champion offered and

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<sup>52</sup> *Journals of the House of Commons, Volume 35, From November the 29<sup>th</sup>, 1774, in the Fifteenth Year of the Reign of King George the Third, to October the 15<sup>th</sup>. 1776, in the Sixteenth Year of the Reign of King George the Third, (1775), p. 393.*

<sup>53</sup> *Ibid.*

<sup>54</sup> *Ibid.*, p. 394.

<sup>55</sup> Holgate, *New Hall*, p. 9.

that his disinterest in porcelain preceded the 1775 petition.<sup>56</sup> However, Holgate's account differs markedly. A letter written by Wedgwood to Bentley in November 1780 does note the potter's empathy for Champion's financial position having spent around fifteen thousand pounds attempting to make good on the patent.<sup>57</sup> Yet Wedgwood's actions in the immediate aftermath of the petition reveal his unyielding drive for innovation; the potter travelled straight to Cornwall to collect growan stone and china clay for experimentation. He also embarked on a search for Cornish raw materials in 1781 as *New Hall* was in the process of being formed.<sup>58</sup> In late 1775, once he had knowledge of and access to the raw materials, Wedgwood drew up his proposals for an R&D Company and put them to a group of his fellow potters. Thomas' somewhat confused account of these events is challenged by the actions of the master potter; Wedgwood clearly had the desire to produce porcelain when suggesting a company 'to establish an Experimental Work for the purpose of trying materials lately brought from Cornwall [...] and make an Useful White Porcelain Body'.<sup>59</sup> This venture failed to come to fruition although *New Hall* took up the mantle in 1781.

There were several changes in partnership at *New Hall* during its formative years, including the departure of Champion to London and then later America, where he had developed political and business interests in Philadelphia although the company quickly established production.<sup>60</sup> Its premises occupied a prime position in the Potteries and the partners were well connected and skilled potters. All that remained was to produce high quality china that would meet the standards and expectations of a ready market. The potters at *New Hall* had to succeed where Cookworthy and Champion had failed by producing commercially successful production of English porcelain. The protection of the patent certainly helped protect the company from competition to a large degree, although the practical skills of its partners, its location in Staffordshire and targeting of the middle

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<sup>56</sup> Thomas, *The Rise of the Staffordshire Potteries*.

<sup>57</sup> Holgate, *New Hall*, p. 9.

<sup>58</sup> Smiles, *Lives of Boulton and Watt*, p. 313.

<sup>59</sup> Schofield, 'Josiah Wedgwood and a Proposed Eighteenth-Century Industrial Research Organisation', p. 17.

<sup>60</sup> G. H. Guttridge, *The American correspondence of a Bristol merchant, 1766-1776: letters of Richard Champion, edited, with an introduction* (University of California Press: Berkeley, 1934), pp. 58-62.



range of society played a large role in its success.<sup>61</sup> The network graphs show the importance of Wedgwood to the events that resulted in the formation of the company in bringing together groups of potters and providing connections.

Whilst societies and large companies were important, Wedgwood's commercial network was vast and there are several key individual relationships that Figure 4.1 highlights. The potter's relationships with merchants were some of the most important in establishing a broad reaching network. The prowess of his business partner Thomas Bentley is well known and his connections and networking conducted at the pair's Greek Street showroom were impeccable, ensuring Wedgwood stayed alert to the changing fashions and markets across Europe.<sup>62</sup> During the 1760s and 1770s, Wedgwood's business relationship with James Abernethy, a London merchant provided him with a more substantial link to John Baddeley, a Staffordshire potter whose Creamware he held in high esteem. Baddeley was also a lathe maker so had experience with machine tools, and had strong connections to fine earthenware and china producers in Liverpool. Wedgwood strengthened his connection to the Liverpool trade through a commercial relationship with the printing firm, Sadler and Green. The potter and printers produced finely decorated earthenware, with Wedgwood producing the wares, and Sadler and Green transfer printing designs.<sup>63</sup> Relationships between known individuals in Wedgwood's network provided indirect access to a range of contexts and environments for potentially useful ideas and knowledge.

In this light, the network graph also allows us to illustrate the importance of more elusive connections; artisans or assistants who remained relatively anonymous but played key roles in the development of particular branches of science, mechanics and instrument making. It does this by providing a visualisation of relationships between individuals. A network graph represents

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<sup>61</sup> Holgate, *New Hall*.

<sup>62</sup> Błaszczyk, *Imagining Consumers*; McKendrick, 'Josiah Wedgwood and Thomas Bentley'.

<sup>63</sup> The V&A Museum houses collections of collaborative pieces by Wedgwood and Sadler and Green dating from the 1760s until 1780.

relationships between different nodes as straight lines called edges. The benefit of using SNA software to construct such a network around an individual that represent relationships over time is that connections of varying types and importance take on more prominent roles in the graph. Viewing many of these relationships together emphasises the weak ties that Granovetter argues are so important for the transfer of information across networks; weak ties such as those that existed between Josiah Wedgwood and the chemist to the Society of Arts, William Lewis (1708-1781). Network analysis helps to emphasise the role of ‘invisible technicians’ who brought skill and expertise to the laboratories and workshops of the eighteenth century. Their employment patterns often varied depending on who had the finances to hire them.<sup>64</sup> Alexander Chisholm, for example, was one such invisible individual, who through network analysis becomes far more visible in Wedgwood’s network. Figure 4.1 clearly shows the importance of Chisholm as the key node in providing the shortest distance between Wedgwood and the advanced chemistry of Lewis. Although Wedgwood’s membership of the Royal Society also provided the potter with a link to Lewis, there is no evidence that the two individuals ever collaborated or shared information with each other.

Traditional biographies of Wedgwood and histories of earthenware production refer to the Master Potter’s skill and expertise almost habitually, with attention focussing on his own experiments and achievements in the laboratory and workshop.<sup>65</sup> Reilly’s study of the potter mentions Chisholm only twice and very briefly, noting that many of the entries in Wedgwood’s *Commonplace Books*, in which experiments and daily notes were recorded, were in his assistant’s hand.<sup>66</sup> Stewart directs the spotlight elsewhere, and argues that the majority of Wedgwood’s experiments relied heavily on the expertise and insight of Chisholm.<sup>67</sup> The technician served from the late 1740s until 1781 as

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<sup>64</sup> Larry Stewart, ‘Assistants to enlightenment: William Lewis, Alexander Chisholm and invisible technicians in the Industrial Revolution’ *Notes and Records of the Royal Society*, Vol. 62, No. 1 (2008), pp. 17-20.

<sup>65</sup> Jewitt, *The Wedgwoods*; Eliza Meteyard, *The Life of Josiah Wedgwood from His Private Correspondence and Family Papers, Volume One* (Hurst and Blackett: London, 1865); Samuel Smiles, *Josiah Wedgwood, F. R. S., his personal history* (John Murray: London, 1894).

<sup>66</sup> Reilly, *Josiah Wedgwood*, p. 315

<sup>67</sup> Stewart, ‘Assistants to enlightenment’.

mechanical and scientific assistant to Lewis. He then worked as Wedgwood's experimental assistant and tutor to his children from 1781 until the potter's death in 1795.<sup>68</sup> Chisholm's impact on Wedgwood, his Etruria works and the wider industry in terms of knowledge and skill was significant.

Lewis was an experimental chemist and lecturer educated at Christ Church, Oxford and Emmanuel College, Cambridge.<sup>69</sup> He believed that useful knowledge and skills from a particular trade were often useful in others although they remained relatively unknown outside of the initial trade.<sup>70</sup> Such an instance can be understood, in network terms, as a structural hole; useful knowledge exists in one network, but not in another and therefore requires a bridge or connection between two nodes (individuals) from these different networks in order for it to travel further.<sup>71</sup> As a 'broker', Chisholm bridged the structural hole between Lewis and Wedgwood, and helped facilitate the transfer of useful and reliable knowledge within and between the scientific and experimental networks of the two pioneers.<sup>72</sup> Chemical knowledge relating to coloured glazes proved of crucial importance in the development of Wedgwood's distinctive wares.<sup>73</sup>

Social networks also worked in slightly different ways and were not always beneficial to all parties as demonstrated by Wedgwood's relationship with his friend and fellow 'Lunatic' James Keir (1735-1820). The pair were also members of the Chapter Coffee House Society and made fellows of the Royal Society in 1783 and 1785 respectively.<sup>74</sup> As a chemist and geologist with a glassworks near Stourbridge during the 1770s, Keir was important as the 'knowledge broker' or 'bridge'

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<sup>68</sup> *Ibid.*; Reilly, *Josiah Wedgwood*, p. 315.

<sup>69</sup> Frederick G. Page, 'Lewis, William (bap. 1708, d.1781)', in H. C. G. Matthew and Brian Harrison (eds.) *Oxford Dictionary of National Biography* (Oxford University Press: Oxford, 2004).

<sup>70</sup> Stewart, 'Assistants to enlightenment'.

<sup>71</sup> Burt, 'Structural Holes'.

<sup>72</sup> *Ibid.*, p. 356.

<sup>73</sup> Stewart, 'Assistants to enlightenment', pp. 22, 24.

<sup>74</sup> Membership lists of these societies taken from: Levere and L'E Turner, *Discussing chemistry and steam*, 2002; Schofield, 'The Industrial Orientation of Science' 1957.

between Wedgwood and relevant knowledge in glass production.<sup>75</sup> His deep understanding of flint glass proved invaluable in developing new glazes for earthenware which contained the raw materials of flint glass rather than lead based glazes which were previously used. These new materials and techniques were crucial in the development of Wedgwood's Jasperware, bold pieces composed of a body of one colour, most commonly pale blue, green, and black, with scenes or portraits depicted in bas-relief. These wares dominate museum collections and are some of the most recognisable of the potter's wares, indeed they are still produced today as part of the company's luxury *Heritage Collection* range. The glazes used for jasperware relied on the process of annealing, a method of slowing cooling the glaze in a similar fashion to glass in order to reduce cracks and tension in the glaze. Keir furnished Wedgwood with his knowledge and advice regarding this process in 1776.<sup>76</sup>

The transfer of useful knowledge was intended to be reciprocal as Wedgwood endeavoured to use the facilities and expertise available to him at this Etruria works to solve the problem of strata, or veins, imperfections in glass that made it unsuitable for optical use. The potter fixated on the problem and worked for years on a solution, eventually identifying different kinds of glass present in each pot of melted glass produced that each had their own specific gravity and were, thus, more or less prone to strata and imperfections.<sup>77</sup> Eventually, by 1783 Wedgwood had produced a formal fourteen page paper under the title 'An Attempt to discover the causes of cords and waviness in Flint Glass, and the most probably means of removing them', although this was never delivered publicly and remained unpublished.<sup>78</sup> In this case, Wedgwood and the pottery industry benefitted tremendously from the knowledge provided by Keir. Unfortunately, the same cannot be said for

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<sup>75</sup> Anita McConnell, edited by Jenny Bulstrode, *A Survey of the Networks Bringing a Knowledge of Optical Glass-Working to the London Trade* (Whipple Museum of the History of Science: Cambridge, 2016), p. 147.

<sup>76</sup> Schofield, 'Josiah Wedgwood and the Technology of Glass Manufacturing' *Technology and Culture*, Vol. 3, No. 3 (1962), p. 286.

<sup>77</sup> McConnell, *A Survey of the Networks*, pp. 147-9.

<sup>78</sup> A version of the paper was edited and transcribed and presented in: Robert E. Schofield, 'Josiah Wedgwood and the Technology of Glass Manufacturing'.

glass manufacturing in England; by the time Wedgwood had found a solution and produced his paper and notes, Keir had moved on from glass production. Wedgwood's discovery that flint glass could be prepared for use as optical glass by agitating to produce a more homogenous product and remove cords was independently discovered in Europe and did not make its way back to England until 1848. Fiscal policies and excise duties obfuscated attempts to introduce the knowledge by others, unaware that the English solution had been found by Wedgwood and lay ready and waiting in a finished paper.<sup>79</sup> Here, then, we see not only the advantages of networks, but the potential bias that can occur as a result of changes in circumstance. Information transfer is not always equal and may be entirely one-sided.

Although the network shown in Figure 4.1 is not 'complete' in the sense that it illustrates every connection Wedgwood made, or the connections of his connections, it does show that particular individuals were extremely important for the development of the industry and their connections in particular were instrumental. Chisholm's influence on the industry was entirely dependent on his employment by Wedgwood, for example. In addition, the formation of several notable productive syndicates and companies set up for the access and control of raw materials were predicated on several crucial relationships between Wedgwood and his peers.

The key points to take from this analysis so far are firstly, Josiah Wedgwood had considerable connections and his network encompassed social and business relationships. In addition to Chisholm, the potter himself served as a knowledge broker for the North Staffordshire pottery industry. He occupied a central role in the network as the key node through which the shortest paths ran between key groups of knowledge generating individuals and institutions. Strong ties in his social network relationships provided his business network relationships with weak ties to some of the foremost minds and ideas of the late eighteenth century. These ties formed a dense network around Wedgwood, and there is clear evidence that supports Granovetter's 'strength of weak ties'

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<sup>79</sup> *Ibid.*, pp. 295-6; McConnell, *A Survey of the Networks*, p. 149.

theory. The strong and weak ties in Wedgwood's network increased his awareness of activity in different spheres and sub-networks. The relationships that formed Josiah Wedgwood's network had a significant impact on what information was available to him, and others, when making important decisions that impacted on the business and economic fortunes of the pottery industry and more importantly, the Potteries district.<sup>80</sup> These relationships were not static or binary, however, and the potter was able to utilise his social contacts and relationships nurtured through societal memberships in order to glean valuable knowledge and put it to commercial use.

Egocentric social network analysis such as that presented in Figures Figure 4.1 and **Error! Reference source not found.** also lets us extract network features and emphasise the importance of specific ties in particular. Wedgwood's participation and connections with several individuals were instrumental in the formation of the *New Hall Pottery* in 1781 and the proposal for an R&D Company in 1775. His network had different parts and sub-networks that performed distinctive functions and featured different dynamics. His membership of societies and the social ties these offered fostered an 'effective network', in which the individuals he had ties to were far more likely to know each other. These memberships formed sub-networks with greater density, with an obvious example being the Lunar Society.<sup>81</sup> The potter's commercial network ties served as an 'extended network' of individuals who may not have been as formally connected with one another. Nevertheless, given the spatial concentration, firm turnover and repeated partnerships noted in the previous chapter, it is likely that these potters knew of each other, probably through weak ties of their own. These relationships provided much needed access to up to date information in addition to commercial opportunities. Networks, then, were clearly extremely important to the development and success of the region.

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<sup>80</sup> This was previously discussed in the literature review: Granovetter, 'Problems of explanation'; 'The Strength of Weak Ties'.

<sup>81</sup> A. Epstein, 'The Network and Urban Social Organization', in J. C. Mitchell (ed.) *Social Networks and Urban Situations* (Manchester University Press: Manchester, 1969), cited in Granovetter, 'The Strength of Weak Ties', p. 1370.

It is clear, then, that in addition to the spatial proximity noted in chapter three, social proximity also influenced Staffordshire potters during the late eighteenth and early nineteenth centuries. The commercial lives of potters were intertwined as a result of their social proximity which created tensions between their conflicting competitive and cooperative relationships. In addition to the cooperative ventures already discussed in this chapter, which were focused on specific commercial opportunities, there are examples of broader collaboration and a sense of communal identity around the turn of the nineteenth century. Granovetter refers to ‘cohesive groups’ in an effort to describe dense networks at the broader level and in a way that touches on the integrated character that such networks often suggest.<sup>82</sup> This can be explored through examination of ephemeral literature.

The *Staffordshire Advertiser*, a local newspaper which began circulation in 1795 contains numerous references to collective action and bargaining. Meetings were held by groups of Staffordshire Potters across the district during the eighteenth and nineteenth centuries. Although records are sparse, certain meetings can be identified. On 5<sup>th</sup> June 1795, a ‘general and very numerous meeting’ of potters gathered at Hanley Town Hall to discuss proposals for a regulation of prices of finished earthenware. Decreases in the price of earthenware were seen as ‘an evil of great magnitude, equally injurious to the Manufacturer, Dealer and Consumer’.<sup>83</sup> Concerns were raised over the perceived drop in quality that would be introduced to the market if prices were not regulated in order to combat rising wage bills and raw material costs. These concerns were voiced strictly at the district level, and the language used suggests that the Staffordshire potters thought of themselves as a distinct group with an identity and future to protect. The district was referred to in the singular as ‘The Pottery’, as opposed to the Potteries, which in itself suggests an identification with a single whole rather than an amalgamation of separate regions.

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<sup>82</sup> Granovetter, ‘Problems of explanation’, p. 35.

<sup>83</sup> *Staffordshire Advertiser*, 27 June 1795, p. 1

To manage regulations and decision making going forward, at the meeting in June it was agreed that a committee of potters would meet regularly. The committee would be formed of five potters from each pottery district (presumed to be the six towns: Tunstall, Burslem, Hanley, Stoke, Fenton, Longton) and number approximately 30 potters.<sup>84</sup> The committee featured a rolling council and chairman with meetings every six months to elect new members. During each period of six months the committee would meet every month, with financial penalties for members who did not attend (10s 6d for each meeting neglected). There was a real effort to ensure open decision making by ensuring as many representatives as possible were present at each meeting, Penalties for breaching the regulations were steep, with a fifty pound fine for a first offence, increasing to one hundred pounds for each subsequent offence. Considerable lengths were gone to in order to ensure a fair and transparent system, with the rolling committee membership ensuring all were represented. For the good of 'The Pottery', participation and cooperation were required; non-cooperation was met with strict rules and penalties.<sup>85</sup>

In Stoke, at the Wheatsheaf Inn on 4 March 1796, a 'Committee of Manufacturers' met to express disgust at a recent case of 'unjustifiable outrage' directed toward Mr Tomlinson, a local solicitor who handled many of their lettings, sales and auctions. The committee chair was John Harrison. A total of thirteen potters were present including Josiah's cousin and business partner, Ralph Wedgwood (1766-1837), Joseph Booth, Enoch Wood and Elijah Mayer. The report of the meeting voiced unanimous support for Mr Tomlinson and included a list of thirty-two firms that were 'happy in adding [their] signatures to that vindication, which is so justly Mr Tomlinson's due.'<sup>86</sup> This outpouring of support featured prominently as the lead article on the first page of the *Stafford Advertiser*. When members of their local community and business networks were perceived to be treated unfairly, Staffordshire potters responded by offering clearly expressed support *en masse*.

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<sup>84</sup> *Ibid.*

<sup>85</sup> *Ibid.*

<sup>86</sup> *Ibid.*, 19 March 1796, p. 1.



On 23<sup>rd</sup> October 1800, a meeting was held at the Swan Inn, in Hanley, to discuss proposals to create a joint partnership known as the *Hanley and Shelton Flour Company*, ‘establishing a public Mill for the use of Subscribers, in the Townships of Hanley and Shelton’. The mill was to produce flour and meal that was not adulterated, and at a price that was more reasonable for local consumers. The proposals offered to cut out the many middle-men, through whose hands goods pass ‘each having a profit before they come to the consumer’. This was a truly local venture which sought to include the community. There would be a stock of 15 partners, operating on a rolling basis with five leaving and being replaced each year. Shares were offered at 20 shillings each, with a maximum of 20 shares per person, with a total capital requirement of £2,000. Of the nine persons present, five were potters. This suggests that not only were potters engaging in joint ventures to benefit the communities they lived in, and certainly appropriate a portion of the profits themselves, they were also doing this outside of the sphere of earthenware production through collaboration, and in some cases, the provision of capital:<sup>87</sup>

Several months later in December 1800, a notice was printed by a committee of potters, chosen by manufacturers and with the potter Anthony Keeling as chairman. The notice informed readers that a committee had been set up to further the districts interests by re-opening communication channels along the River Weaver to the port of Liverpool. Connections between Liverpool and the Potteries were well established by the early 1700s, with the coastal city serving as a key Atlantic export hub for a whole host of goods and commodities including earthenware.<sup>88</sup> Riverine trade routes were already well established in the two regions by the 1730s although the construction and opening of the Trent and Mersey canal in the 1770s superseded the River Weaver as the main route north out of the Potteries.<sup>89</sup> More favourable freight terms were sought and a joint committee of potters to

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<sup>87</sup> *Ibid.*, 1 November 1800, p. 1

<sup>88</sup> Lionel Burman, ‘Wedgwood and Bentley in Liverpool and the north-west’, *Transactions of the Historic Society of Lancashire and Cheshire*, Vol. 146, (1996), pp. 67-91.

<sup>89</sup> Weatherill, *The growth of the pottery industry*, p. 431; for tonnage carried on the River 1733-1771 see Appendix Table A1-5, p. 451.

enter negotiations was deemed the most suitable approach.<sup>90</sup> The decision of the potters was justified as by February 1802 the newspaper declared the Committee to be a success and ‘the object of their appointment to be accomplished’ with their ‘powers of course at an end’.<sup>91</sup> Landings on the river had been secured at Anderton, near Northwich in Lancashire for clay, coal, ware and other raw materials. From Anderton, freight could then be transferred onto the Trent and Mersey canal which ran to the mouth of the River Mersey at Runcorn, Liverpool. From there, sea going transport could easily be arranged. The River Weaver had returned to being a prominent waterway for goods in and out of the Potteries. It is not clear whether this specific committee was fully wound up or continued to pursue causes, although the report states that in a meeting on 19<sup>th</sup> January 1802 the committee would ‘publicly decline all future interference therein, and every kind of responsibility.’<sup>92</sup> The number of potters involved in this venture is not known, although again, as in the canal agitation of the 1770s, we see an example of a collective solution to a problem that faced the district as a whole.

Canal agitation led by Josiah Wedgwood has been well researched and stands as a testament to his sustained and enigmatic leadership. However, by the early years of the nineteenth century, despite opening up the River Weaver, potters were reporting severe problems on the waterways of North Staffordshire. In September 1804, a letter was circulated warning of shipping agents stealing packages of earthenware and raw materials as they passed on their way in and out of the Potteries via river and canal. A ‘Committee’ is mentioned and notes were made detailing plans to orchestrate cooperation between the numerous companies handling the goods in transit. Checks were to be carried out at each stage on the journey and goods marked to confirm this had been done. Packages were not to be left on the wharf for too long as the straw packaging became damaged and unfit for use; a crucial element in transporting fragile earthenware.<sup>93</sup> Whilst it is unclear from this evidence whether this committee was the same mentioned in previous episodes, in 1804 the chairman was

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<sup>90</sup> *Staffordshire Advertiser*, 13 December 1800, p. 1

<sup>91</sup> *Ibid.*, 6 February 1802, p. 1.

<sup>92</sup> *Ibid.*

<sup>93</sup> *Staffordshire Advertiser*, 29 September 1804, p. 1

listed as Thomas Byerley (1747-1810) and the clerk as W. M. Craneson. The same Craneson was listed as the clerk in 1806 when a ten-guinea reward was offered for information leading to a conviction, suggesting a more permanent system. Two years after the committee initiative, Staffordshire manufacturers were still suffering from ‘great depredations [...] upon packages of porcelain and earthenware’ on the waterways, with ‘fraudulent embezzlements, or wilful negligent waste, by throwing overboard’ common complaints.<sup>94</sup>

Bennett’s study of local Chambers of Commerce provides a little more information on the committees noted here. North Staffordshire was one of the first regions to have activity related to local chambers of commerce with references as early as 1767 in relation to duties on china imports.<sup>95</sup> In its early years however, the committee was interchangeably referred to as a club, general assembly or society, and its operation was extremely sporadic with ‘one-off action’ until more formal organisation through the formation of a local Chamber of Commerce in 1784. This too met only sporadically and fell into a state of abeyance after 1835 although it is not known why this occurred.<sup>96</sup> Bennet’s summary of the North Staffordshire local chamber highlights its staggered development: operating infrequently as a Potters chamber c.1767–90; with only slightly more formality 1784–90. It was then officially founded in 1813, lapsed and re-founded 1851.<sup>97</sup>

Josiah Wedgwood was the first chair of the organisation, and certainly had considerable influence on the discussion and direction of the chamber to a large extent, especially using his connections with the local elite. He was clear, though, to stress the communal concerns of his peers. For example, in January 1792 Wedgwood wrote to the politician and penal reformer Baron Auckland, (William Eden, 1744-1814) complaining that the prime minister William Pitt the Younger (1759-1806) had not acted on a Memorial put forward by the potter and presented to the prime minister

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<sup>94</sup> *Ibid.*, 17 May 1806, p. 1

<sup>95</sup> R. J. Bennett, *Local Business Voice: The History of Chambers of Commerce in Britain, Ireland, and Revolutionary America, 1760-2011* (Oxford University Press: Oxford, 2011), pp. 14-15, 160.

<sup>96</sup> *Ibid.*, pp. 93, 160, 446.

<sup>97</sup> See Appendix 1, *Ibid.*, p. 867.

eight years earlier on 11 November 1784. Although the Memorial was signed by Wedgwood as chairman of the group in 1784 and put forward by him personally, he emphasised the collective when writing: ‘this is not my idea alone, but that of the manufacturers [...] unanimously resolved upon at a public meeting.’<sup>98</sup>

The *Staffordshire Advertiser* also allows us a somewhat candid glimpse of local life during this period and how people felt about their identity and place in society. In April and May 1806, a quarrel was ensuing between the writers of two anonymous two letters written to the paper’s editor concerning a map of the district which was under production. The two contributors put forward extensive arguments concerning the quality of the map that was promised, and the perceived quality of the map that would constitute the finished product; the first writer described it as a ‘schoolboy definition of a topographical delineation’.<sup>99</sup> However, a large part of the dispute and controversy noted by the second writer was focused on the identity of the first writer, whose letter was signed off by ‘An Independent Landowner’ from the parish of Stoke-upon-Trent. The second letter was in print on 10 May of the same year, and signed off with the direct statement: ‘I am, Mr. Editor, As my neighbours can testify, A Potter’.<sup>100</sup> This second letter proceeded to attack the land-surveyor who was producing the map and the ‘Independent Landowner’, whom the ‘Potter’ asserted were one and the same person, a man by the name of Adam McPhail. The second writer took issue with the notion that this man was commenting on affairs that were of importance to potters. One of the primary devices used by the ‘Potter’ was to denigrate the status of the surveyor as ‘no Potter’, and therefore cast in doubt and suspicion, and disregard his comments. This short episode hints at an active readership and suggests that the status and identity of being a Staffordshire Potter was coveted by those who held it (or at least purported to), and defended vigorously if misused or

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<sup>98</sup> Josiah Wedgwood to Lord Auckland, January 28 1792, Wedgwood Museum Archives, Wedgwood MS 28/18988.

<sup>99</sup> *Staffordshire Advertiser*, 26 April 1806, p. 1

<sup>100</sup> *Ibid.*, 10 May 1806, p. 1

brought into any disrepute. Clearly, there was a strong sense of what it meant to be a local potter, and this was a privilege not extended to all.

By the start of the nineteenth century the region's key assets, its potters and the wares they produced were clearly things potters were willing to collaborate to protect. With previous public champions of the industry such as Wedgwood and Bentley deceased, these examples suggest a regular desire to work together at the local industry level. The potters of North Staffordshire took it upon themselves to regularly elect their peers to further their collective interests and were willing to accept regulations and fines to achieve this. There existed a meta-level of cooperation, above individual- and firm-level competition, above even the considerable cooperative intentions behind the 1775 research company and the *New Hall Pottery*. We can see clear change over time, perhaps as a result of the absence of Wedgwood, in the form that cooperation took. The opposition to Champion's patent and the subsequent commercial ventures were spearheaded largely by the Master Potter, albeit under the umbrella and with the support of the committee. By the time of Wedgwood's death in 1795, Staffordshire potters were taking on a more collective identity and cohesive group that acted on issues that affected their shared livelihood. Over time, despite the intense competition, frequent turnover of firms, and risk of bankruptcy, cooperation developed to encompass a more formal, egalitarian structure and rotating committee member's broadened participation.

## 5 Conclusion to Part One

Part one of this thesis has introduced the North Staffordshire Potteries as an industrial district, and provided empirical evidence to lay out its growth and development through the eighteenth and nineteenth centuries. Evidence concerning the number and size of pottery producers and manufactories, their location in North Staffordshire and the degree of spatial concentration gives a broader illustration of the district and its pottery industry as a whole. Analysis of trade directories allowed the district to be reconstructed at the firm level between 1780 and 1851. It is this analysis that allows us to appreciate the dynamic character of the district and presents new evidence concerning the organisation and evolution of an industrial district undergoing a period of considerable growth and progress.

The key points to take from part one are firstly, pottery production became well established in North Staffordshire by the second half of the eighteenth century and achieved critical mass by around 1760 and experiencing ‘take-off’ around the time the regions’ early pioneers (Wedgwood, Spode, Minton, Copeland etc.) began production.<sup>1</sup> Output grew considerably in the century after 1750, alongside increasing exports which saw Staffordshireware being bought and sold in vast quantities in North, Central and South America, as well as parts of Africa and Asia.<sup>2</sup> The data presented illustrate the region’s ascension to the seat of English pottery production.

In addition, we are now able to individually identify over 780 distinct pottery firms in the region between 1780 and 1851, a period for which we have relatively few surviving business records. The method of using trade directories allows for far more detailed analysis and takes us into the district at a level not previously possible. We can now put names to the vast numbers of producers operating and, more importantly, we can analyse the structure of their businesses, their proclivity to

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<sup>1</sup> For discussion of life-cycle stages including critical mass and take-off see: Popp and Wilson, ‘Life cycles, contingency, and agency’, p. 2978.

<sup>2</sup> Table 82, *Tables of the Revenue, Population, Commerce, &c. of the United Kingdom and its Dependencies, Part VI*, (1836), p. 98.

form partnerships or operate as sole producers, and the stock and flow of firms in and out of the production market. Crucially, the methodology and evidence presented in part one allows for these characteristics to be analysed over time, thus revealing the changing tendencies of Staffordshire potters at the individual level, and a dynamic and responsive industry at the district level.

From the point at which the data permits empirical analysis at the firm level to begin, 1780, the average Staffordshire potter organised themselves with a preference for short-term partnerships. This was a flexible structure for both the individual and the district. At the individual level it enabled potters to cooperate and produce wares with a range of other producers, using short run batch production to keep up with, and at times dictate, the ever-changing trends in the market. At the district level, the turnover of partnerships and firms allowed the region to respond to stresses and strains, such as the impact of the Napoleonic Wars, by increasing the average partnership length during such periods, subsequently returning to shorter partnerships almost immediately after. An important point to note here is that the turnover of firms and partnerships shows that potters were actively choosing to cooperate with their competitors, albeit for short-run gain. However, this short-run individual gain served to become the region's long term gain due to the flexibility described above.

Part one of the thesis develops this characteristic of cooperative competition further by examining social networks and identity. The relatively recent methodological approach of historical social network analysis builds on the findings of the first two analytical chapters and takes us down yet another level to examine the personal and business relationships. The analysis shows that these, in addition to the formal business partnerships, enabled knowledge transfer both within the district, and from the outside in. The final key empirical and analytical contribution of part one of the thesis is the discussion of collective action and the proposed research and development company of 1775. This is a particularly enlightening episode in the history of the North Staffordshire Potteries and casts light on the fragility of trust between competing potters and entrepreneurs.

These findings of part one of the thesis are important for several reasons. As each chapter progresses, the level of analysis becomes finer and finer and each builds on the previous. The district level data when combined with the insights concerning the behaviour of potters from trade directory analysis allow us to reconstruct the district at a level not seen before. The former provides the context for the latter and the latter explains some of the characteristics of the former. The region has clearly been presented as a classic industrial district in the Marshallian sense. The analysis in chapter three and chapter four delves into some of the key characteristics that Marshall identified as central to industrial districts.<sup>3</sup> Together, the findings further our understanding of the empirical context for what Marshall would term the ‘industrial atmosphere’.

We will now return to some of the research questions and themes raised in part one of the thesis. Part one of the thesis aimed to expand our understanding of the dynamic evolutionary processes through which craft based industries could develop within the context of intense spatial and social proximity. This first part of the thesis, and the empirical findings presented in chapter three, has demonstrated that the Potteries can be seen as a ‘classic’ industrial district and an ideal case study in this regard.<sup>4</sup> Moreover, we have seen that the life-cycle model for English Industrial districts proposed by Popp and Wilson, is applicable to the Potteries, at least in the first three stages: critical mass, take-off and cooperative competition. We are also reminded of the longevity of the district and its success in staving off the final stages of its decline until well into the twentieth century.

Part one also set out to determine the organisational structure of the district, and how this changed over time. The discussion above has highlighted the contributions in this regard although it would be useful to reiterate several points here. Firstly, the character of the district has been shown to be far more complex and dynamic than the aggregate data and statistics in chapter three suggest. The firm level analysis highlights the fast-paced nature of business in the district. High turnover and a

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<sup>3</sup> See chapter two for a discussion of these.

<sup>4</sup> Popp and Wilson, ‘Districts, networks and clusters’, pp. 14-15; Popp, *Business Structure*.



steady supply of new firms entering the industry ensured the district was continually changing as partnerships and producers reinvented themselves and adapted to their changing business environment. The pursuit of short-term gain and survival by producers at the firm level, became a means of long-term growth and vitality at the district level.

Part one was also driven by a motivation to examine the context around the research and development company proposed in 1775.<sup>5</sup> In this case, one of the key research questions was to ascertain whether the efforts to create the company were representative of the types of behaviour exhibited by potters throughout this period. Or, in other words, how cooperative were Staffordshire potters outside of their short-term business partnerships? Here we clearly see that there was change over time. Whilst there were significant efforts to generate trust and collaboration in 1775, these were not acted upon in any meaningful way and, in any case, the episode revealed a level of suspicion and mistrust between potters that first needed to be alleviated. Over time, by the close of the eighteenth century potters were clearly more willing to collaborate to protect their interests. This was done strictly at the district level. The status and identity of being a Staffordshire Potter was keenly defined and vigorously defended, but was not a privilege extended to all. Suspicion of outsiders remained.

It is clear, then, that the spatial and social proximity that characterised the North Staffordshire Potteries impacted considerably on the behaviour and interests of the region's potters. The commercial lives of potters were intertwined as a result of their social proximity, which created tensions between their conflicting competitive and cooperative relationships. Chapter four in particular highlights some of these tensions. The network analysis also shows clear evidence in support of Granovetter's 'strength of weak ties' theory.<sup>6</sup> Potters, and in particular, Josiah Wedgwood, were able to utilise their social contacts, nurture them through business partnerships,

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<sup>5</sup> Schofield, 'Josiah Wedgwood and a Proposed Eighteenth-Century Industrial Research Organization'.

<sup>6</sup> Granovetter, 'Problems of explanation'; 'The Strength of Weak Ties'.

local and regional interest groups and societal memberships, and glean valuable commercial knowledge.

Part one, therefore, has provided significant empirical and theoretical contributions to our understanding of how industrial districts and their inhabitants behave in certain contexts. In answering these research questions, more have been raised which are directly addressed in part two. For example, the findings show a complex organisational growth process which raises the question: in a knowledge- and skill-intensive industry, why and how did successful firms and producers choose a business model which consisted of multiple, occasionally repeated, short-term partnerships with their competitors? In some ways the concept of cooperative competition helps to explain some of this behaviour.<sup>7</sup> This in itself raises further questions however, particularly considering the nature of knowledge in the district and the central role it played in innovation and development of new wares and methods. The analysis of cooperative competition in part one opens up further questions concerning the extent to which such a framework takes into account knowledge creating and sharing. As noted in chapter three, when we take into account the use of knowledge as a means of generating competitive advantage, then we might expect the short-term partnerships observed in trade directory data to be longer, or significantly reduced in frequency. Once knowledge leaves the boundary of a firm or organisation it is extremely difficult to control; the concerns that potters raised regarding the appropriation of knowledge around 1775 research and development company highlight this point. Moreover, when the nature of this knowledge is not clear, and the industry is dominated by tacit knowledge and skills attached to the individual and rarely codified, this becomes even more acute. We must investigate, then, how insight into knowledge and innovation practices in the industry will build on the conclusions drawn from part one of the thesis. Part two picks up on this theme and determines what types of knowledge were being created and

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<sup>7</sup> Sabel, 'Flexible Specialisation', p. 17; Popp and Wilson, 'Life cycles, contingency, and agency', p. 2978

used in the district, how this was appropriated, and what the impact of these characteristics were on the strategies employed by Staffordshire potters.

## Part Two: Innovation, Knowledge and Secrets

### 6 Introduction

Part two of the thesis continues the close study of the North Staffordshire Potteries, but shifts the perspective from the industrial district to the knowledge district, or ‘knowledge cluster’; a geographically bound agglomeration of producers in which useful and innovative knowledge is created and disseminated. This perspective is influenced by the turn in economic geography and organisation studies during the last twenty years which has led to a focus on the spatial organisation of knowledge production as opposed to purely commodity production, and which provides us with terms such as the ‘knowledge community’, ‘localised learning’ and a ‘knowledge based theory of spatial clustering’.<sup>8</sup> Focusing on the region in such a way allows us to complement the industrial district theory and literature which, as noted above, can struggle to fully incorporate the knowledge aspect of industrial production. This part of the thesis offers a new perspective on the nature of knowledge in the English pottery industry and speaks directly to a large body of economic history literature which focuses on the patterns of knowledge creation and dissemination.

As noted in the introduction, a global feature of pottery production throughout history has been the vast amount of knowledge and skill required to produce a diverse range of high quality products. The North Staffordshire Potteries during the eighteenth and nineteenth centuries were characterised by a growing body of just such useful and practical knowledge about the materials, processes and skills required to produce local goods that sold in global markets.<sup>9</sup> The region flourished, exporting over sixty-two million pieces to the global market in 1836 produced under conditions of extreme

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<sup>8</sup> In respective order of the terms cited: N. Henry and S. Pinch, ‘Spatialising knowledge: placing the knowledge community of Motor Sport Valley’, *Geoforum*, Vol. 31, No. 2, (2000), pp. 191-208; S. Pinch *et al*, ‘From ‘industrial districts’ to ‘knowledge clusters’: a model of knowledge dissemination and competitive advantage in industrial agglomerations’, *Journal of Economic Geography*, Vol. 3, No. 4 (2003), pp. 373-388; A. Malmberg, ‘The Elusive Concept of Localization Economies: Towards a Knowledge-Based Theory of Spatial Clustering’, *Environment and Planning A*, Vol. 34, No. 3, (2002), pp. 429-449.

<sup>9</sup> Weatherill, *The growth of the pottery industry*, p. 43.

social and geographical proximity where tacit knowledge and competition loomed large.<sup>10</sup> The Potteries quickly became a ‘cauldron of creativity’ which produced much of the earthenware, ceramics and porcelain often held up as key commodities of the Consumer Revolution.<sup>11</sup> Messrs Spode, Minton, Copeland and the celebrated Wedgwood dynasty led as pioneering figureheads for innovation and style, driving forward the development of new products and production methods.

Although it was not one of the more traditional lead sectors of the economy during the British Industrial Revolution, pottery production in North Staffordshire is an example of a ‘classic’ industrial district. A strong sense of local identity emerged early in the region’s history and for almost 250 years the district dominated British earthenware production; generating and meeting ever increasing demand for ‘Staffordshireware’. Unlike its more famous cousins, such as the cotton and metalworking districts of Lancashire and Sheffield, the Potteries did not experience the ‘terminal’ phase of its life-cycle until the close of the twentieth century.<sup>12</sup> The English pottery industry had concentrated within the six- by three-mile region by the middle of the eighteenth century with pot shops and firing ovens crowded together, often just feet apart. It continued to grow into the nineteenth century in terms of the number of businesses operating, the size of the labour force, resources used, output, and the extent to which it dominated the local economy.<sup>13</sup>

Storper and Venables argue that intense concentration and proximity creates ‘buzz’ and face-to-face contact between individuals which, alongside other benefits, is crucial for ‘creative activities’ based on rapidly changing tacit knowledge that is difficult to codify.<sup>14</sup> This suggests that the Potteries region described above would stand to benefit from the properties of such ‘buzz’. However, in specific sites of intensive material production such proximity also creates tensions between

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<sup>10</sup> Table 82, *Tables of the Revenue, Population, Commerce, &c. of the United Kingdom and its Dependencies, Part VI*, (1836), p. 98.

<sup>11</sup> Blaszczyk, *Imagining Consumers*, 4-9; Maxine Berg, *Luxury and Pleasure in Eighteenth-Century Britain* (Oxford University Press: Oxford, 2005), p. 43; McKendrick, ‘Josiah Wedgwood and the Commercialization of the Potteries’, pp. 100-145

<sup>12</sup> Popp and Wilson, ‘Districts, networks and clusters’, pp. 14-15.

<sup>13</sup> For estimated aggregate figures see: Weatherill, *The growth of the pottery industry*, pp. 440-453.

<sup>14</sup> Storper and Venables, ‘Buzz: face-to-face contact’, pp. 351-370.

knowledge transfer and spillovers, and the need to retain competitive advantage. Pottery production continued to be dominated by knowledge-intensive, craft-based processes and the skills of the master potter until well into the second half of the nineteenth century. Reliable automated machinery came into general use only by the 1870s.<sup>15</sup> Moreover, unlike other specialised artisanal trades such as weaving or brewing, and despite the importance of knowledge to the trade, the pottery industry did not have a legacy of a formal craft guild or institution with codified rules to govern behaviour and access to vital knowledge and skills. As such, we do not yet have much clear empirical evidence to suggest how potters in North Staffordshire during the eighteenth and nineteenth centuries sought to protect their knowledge in a fiercely competitive industry that had developed a strong sense of local identity.

Part two of the thesis considers the nature of knowledge in the North Staffordshire pottery industry between 1700 and 1851. It investigates formal and informal institutions of knowledge appropriation, and demonstrates how the types of knowledge being produced and used in the industry influenced the actions and strategies of potters and non-potters. The subject is addressed using new patent data and a detailed analysis of the specifications, alongside a range of contemporaneous qualitative evidence. The choices and behaviour of individuals are determined and evaluated through the extent to which they revealed the knowledge underpinning key innovations. The type of knowledge being revealed or kept secret is also examined. The evidence and analysis presented challenges current classifications of knowledge and propose a new typology for the pottery industry.<sup>16</sup>

After a discussion of some additional literature in chapter five, chapter six begins the empirical investigation into knowledge appropriation which uses patent data and specifications to determine who was patenting what, and where. All known pottery patents were collated and examined to

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<sup>15</sup> Burchill and Ross, *A History of the Potters' Union*, p. 154; Lamb, 'The Press', p. 6.

<sup>16</sup> See discussion in chapter seven.

identify trends in patenting activity and present the empirical landscape of formal protection of intellectual property in the pottery industry over time and space. The geographical and occupational characteristics of these data are analysed as well as the knowledge held within pottery patents that were granted through a close reading of the specifications themselves. This allows for the proposal of a typology of the nature of knowledge in the industry that goes beyond the contested binary tacit/explicit interpretations that are applied across a variety of disciplines.<sup>17</sup>

Chapter seven presents evidence of innovation outside of the patent system to further refine our understanding of the nature of pottery knowledge. It uses ephemeral trade literature and publications, exhibition reports, award citations and sales catalogues to present further examples of different types of knowledge being shared, protected and kept secret. Analysis of these additional sources helps explain the behaviour and strategies of potters who kept their knowledge secret through informal channels. It also helps us address the extensively studied yet ongoing problem summarised by Moser: 'It is well known that inventors do not patent all their innovations [...] but why inventors do not patent is less well understood'.<sup>18</sup>

The second part of the thesis concludes that patenting was not a widespread strategy used by North Staffordshire potters to protect their knowledge and appropriate returns from the majority of their innovations. Rather, secrecy was highly valued and maintained through a variety of techniques. Knowledge was actively managed by its holders and kept away from outsiders. Crucially, the specific type of knowledge held determined the level of protection required and the action taken. This analysis provides a new evidence of a highly concentrated, highly innovative industry in which the tensions between competition, collaboration and knowledge production were at their most acute. The findings provide further empirical and analytical support for Moser's findings that the

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<sup>17</sup> For an overview of the tacit/explicit interpretation across various disciplines see Table 1 in: Stephen Gourlay, 'Conceptualizing Knowledge Creation: A Critique of Nonaka's Theory', *Journal of Management Studies*, Vol. 43, No. 7 (2006), p. 1426.

<sup>18</sup> Petra Moser, 'Why don't inventors patent?', *NBER Working Paper Number 13294* (August 2007), p. 1.

efficacy of secrecy was industry specific and the key determinant of the propensity to patent and, moreover, that this was underpinned by the degree of scientific or technical knowledge required.<sup>19</sup> They also provide additional evidence concerning the study of collective invention with the region exhibiting some, but not all, of the core features of Allen and Nuvolari's now classic examples.<sup>20</sup>

## 6.1 Literature Review

Whilst there is general agreement amongst historians over the significance of technological development in the history of British industrialisation, there has been much debate regarding the causes and incentives for such innovation which accompanied Britain's transition towards modern economic growth. In particular, the study of invention and innovative activities during the British Industrial Revolution has developed considerably over the last few decades. A prominent feature of this debate is the dichotomy between the progressive theses of Allen, who stresses the importance of factor prices, endowments and induced invention, and Mokyr, who emphasises the accumulation and application of useful knowledge and the concept of the 'Industrial Enlightenment'.<sup>21</sup> Whilst Allen's factor price argument can be persuasive, and certainly holds in the cases discussed in his book, the 'intellectual underpinnings' of Mokyr's argument offer a more suitable framework innovation in the context of this study. Mokyr's assertion that invention is first and foremost something that happens to useful knowledge, and that this is controlled by individuals, prompts us to focus on individuals and their interactions and behaviour regarding knowledge and innovation.<sup>22</sup>

Alongside these macro-level studies, a growing body of region and industry specific case studies has progressed close examination of innovation systems and strategies of inventors and producers.

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<sup>19</sup> *Ibid.*, pp. 3, 25-26

<sup>20</sup> Allen, 'Collective Invention'; Nuvolari, 'Collective Invention', pp. 347-363.

<sup>21</sup> For key works in which these theses are presented see: Robert Allen, *The British Industrial Revolution in Global Perspective* (Cambridge University Press: Cambridge, 2009); 'Why the Industrial Revolution was British: commerce, induced invention, and the scientific revolution', *The Economic History Review*, Vol. 64, No. 2 (2011), pp. 357-384, and: Joel Mokyr, *The lever of riches: Technological creativity and economic progress* (Oxford University Press: Oxford, 1990); *The gifts of Athena: Historical origins of the knowledge economy* (Princeton University Press: Princeton, 2002).

<sup>22</sup> Joel Mokyr, *The Enlightened Economy: An Economic History Britain, 1700-1850* (Yale University Press: New Haven, 2009), pp. 40, 99.



Key among these are studies of historical patenting practices which have become increasingly quantitative in attempts to determine their importance as drivers of innovation.<sup>23</sup> There are general limitations concerning the utility of patents given that not all innovations were patented, and not all patents reflected true innovations.<sup>24</sup> The works of scholars such as Moser and Nuvolari have been instrumental in developing new methodologies and approaches which make it possible to address these limitations.<sup>25</sup> Their works have built on and revised earlier studies by Dutton and MacLeod on innovation and patenting in England during the transition to modern economic growth.<sup>26</sup> These developments notwithstanding, further work needs to be done to address differences in the propensity to patent in different historical periods and industries.

An influential concept in this line of enquiry has been that of ‘collective invention’, a term coined by Allen to describe a process in which innovators freely and openly published and shared knowledge about advances and improvements in an industry.<sup>27</sup> The conclusions he offered were based on observations of the English pig iron industry in Cleveland during the nineteenth century. He identified a framework of communication between firms based on a culture of testing and sharing technical information through two channels: informal disclosure, and formal publication. The role of such disclosure channels was to make new technical knowledge created by firms available to their competitors. In turn, this allowed for cumulative incremental advances in technologies and practices, thus increasing the rate of innovation in the industry.<sup>28</sup> Collective

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<sup>23</sup> Petra Moser, ‘Patents and Innovation: Evidence from Economic History’, *Journal of Economic Perspectives*, Vol. 27, No. 1 (2013), pp. 23-44.

<sup>24</sup> Schmookler, Jacob, *Invention and Economic Growth* (Harvard University Press: Cambridge, 1966), p. 24; Christine MacLeod, ‘Strategies for Innovation: The Diffusion of New Technology in Nineteenth-Century British Industry’, *The Economic History Review*, Vol. 45, No. 2 (May, 1992), pp. 288-9; Mokyr, *The lever of riches*, p. 251.

<sup>25</sup> Petra Moser, ‘Innovation without Patents – Evidence from World’s Fairs’, *The Journal of Law and Economics*, Vol. 55, No. 1, (Feb 2012), pp. 43-74; Alessandro Nuvolari and James Sumner, ‘Inventors, Patents, and Inventive Activities in the English Brewing Industry, 1634-1850’, *Business History Review*, Vol. 87, (2013), pp. 95-120; Alessandro Nuvolari and Valentina Tartari, ‘Bennet Woodcroft and the value of English Patents, 1617-1841’, *Explorations in Economic History*, 48 (2011), pp. 97-115.

<sup>26</sup> Dutton, *The patent system*; MacLeod, *Inventing*.

<sup>27</sup> Allen, ‘Collective Invention’.

<sup>28</sup> *Ibid.*

invention, Allen argues, was one of the most important sources of innovation in England during the nineteenth century.

This framework, however, rests on a key characteristic of the chosen industry. Innovation in pig iron production during the nineteenth century predominantly took the form of improved design and construction of blast furnaces. These were large, obtrusive structures ranging from forty to over ninety feet high and were thus very difficult to keep secret or limit knowledge of their existence. If a producer built a new blast furnace, it would be clear to his competitors, especially as the height of a furnace was the key factor in determining the efficiency of fuel consumption.<sup>29</sup> This has clear implications for strategies and decision making regarding secrecy vis-à-vis open knowledge sharing.

Nevertheless, Bessen and Nuvolari's revisionist approach to historical collective invention argues that knowledge sharing was far more common during the age of industrialisation than perhaps modern studies of innovation, or indeed some historical scholars, are willing to accept.<sup>30</sup> Whilst there has been a huge surge in the study of modern knowledge sharing and competition in innovation studies, a degree of scepticism remains as to how early this behaviour developed and how widespread or stable it was. Far from being 'vulnerable and ephemeral', as Bessen and Nuvolari quote Mokyr, collective invention extended far beyond the Cleveland iron or Cornish steam-engine industry.<sup>31</sup>

An important point to note is that Allen's notion of collective invention is characterised by three features: incremental improvements in technology; firms making knowledge publicly available through 'wilful dissemination'; and the utilisation of this common pool of knowledge resources to

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<sup>29</sup> See Table 1: *Ibid.*, pp. 6-7.

<sup>30</sup> James Bessen and Alessandro Nuvolari, 'Knowledge Sharing among Inventors: Some Historical Perspectives', in Dietmar Harhoff and Karim R. Lakhani (eds.) *Revolutionizing Innovation: Users, Communities and Open Innovation* (The MIT Press: Cambridge, Mass, 2016), pp. 135-156.

<sup>31</sup> *Ibid.*, p. 136; Joel Mokyr, 'The institutional Origins of the Industrial Revolution', in Elhanan Helpman, *Institutions and Economic Performance* (Harvard University Press: Cambridge, Mass, 2008), p. 81.

further improve technological performance. All of this occurred largely outside of the patent system.<sup>32</sup> Whilst many of the examples discussed by Bessen and Nuvolari are not ‘pure’ instances of collective invention, exhibiting all these features à la Allen, a European perspective does reveal active and often systematic knowledge sharing among inventors, alongside patent systems. Copying and adapting the innovations of competitors, petitioning for the repeal of specific patents and choosing not to take out patents for their own inventions were strategies adopted by inventors and producers across Europe during the eighteenth and nineteenth centuries.<sup>33</sup> Moser’s research into patenting during the same period provides empirical evidence of a low propensity to patent, and thus points to a large degree of inventive activity occurring outside of the patent system. Perhaps most importantly, Nuvolari has argued that ‘collective invention processes were probably a common feature of many local production systems during the nineteenth century’ and has called for more localised research to be conducted in light of this assertion.<sup>34</sup> There clearly existed two separate spheres of knowledge creation and dissemination; the formal and the informal. The extent to which one impacted upon the other is not clear and there are calls for more localised research to be conducted considering this.<sup>35</sup> This provides us with a hypothesis to test as we conduct this research. If the pottery industry in North Staffordshire can be seen as an example of Allen or Nuvolari’s collective invention we would expect to see some evidence of the core features: incremental innovation; wilful open dissemination of useful knowledge; the utilisation of this knowledge to further innovate; and the open sharing of technology. This chapter, and the ones that follow will also address these questions and the hypothesis that a very low propensity to patent in an industry is accompanied by open knowledge sharing between producers.

Underpinning all studies of knowledge, regardless of the time period and region, are conceptions, typologies and hierarchies. The classifications of knowledge in different disciplines are presented in

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<sup>32</sup> Allen, ‘Collective Invention’, p. 2; Nuvolari, ‘Collective Invention’, p. 361.

<sup>33</sup> Bessen and Nuvolari, ‘Knowledge Sharing among Inventors’.

<sup>34</sup> Nuvolari, ‘Collective Invention’, p. 360.

<sup>35</sup> *Ibid.*

Table 6.1 which is adapted from Gourlay's critique of Nonaka's theory of knowledge creation.<sup>36</sup> The two central columns list the terminology used in each discipline for two types of knowledge: *knowledge-how* and *knowledge-that*. The former refers to knowledge that is 'context dependent', in that it is not considered as a piece of knowledge *per se*, rather, that it refers to knowledge as a process being undertaken by someone; the knowledge is not independent from the user/performer. *Knowledge-that*, on the other hand, is knowledge that can exist explicitly and separately from an individual. This is perhaps the more traditional understanding of knowledge.<sup>37</sup>

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<sup>36</sup> Gourlay, 'Conceptualizing Knowledge Creation', p. 1426.

<sup>37</sup> *Ibid.*, pp. 1426-7.

Table 6.1: Typologies of knowledge

<b>Discipline</b>	<b>Knowledge-how</b>	<b>Knowledge-that</b>	<b>Reference</b>
<b>Philosophy</b>	Knowledge-how; procedural knowledge; abilities	Knowledge-that; propositional knowledge	Sahdra and Thagard (2003)
<b>Philosophy</b>	Tacit knowing	Explicit knowledge	Gourlay (2004); Polanyi (1983)
<b>Psychology</b>	Implicit knowledge; tacit abilities; skills	Explicit knowledge; declarative knowledge	Sahdra and Thagard (2003)
<b>Artificial Intelligence</b>	Procedural knowledge	Declarative knowledge	Sahdra and Thagard (2003)
<b>Neuroscience</b>	Covert knowledge	Overt knowledge	Weiskrantz (1997)
<b>Management Studies; Education</b>	Tacit knowledge	Explicit knowledge	Nonaka and Takeuchi (1995); Alexander <i>et al</i> (1991)
<b>IT Studies</b>	Knowledge as process	Knowledge as object	Kakihara and Sorensen (2002)
<b>Knowledge Management</b>	Know-how	Know-what	Whitehill (1997)
<b>Sociology of Science</b>	Tacit; encultured (forms of life)	Explicit/symbolic	Collins (1993, 2001)

Source: Gourlay, 'Conceptualizing Knowledge Creation', p. 1426.

The distinctions between these two types are based on the common approach of conceptualising knowledge as being formed of two dichotomous categories, *tacit* and *explicit*, and are largely influenced by the work of Polanyi and Collins.<sup>38</sup> Historical literature tends to prefer this simpler distinction between two types of knowledge rather than the more elaborate conceptions developed in other disciplines. Mokyr has diverged a little from this framework in his use of the terms 'propositional' to describe scientific knowledge, and 'prescriptive' to describe mechanical and

<sup>38</sup> Michael, Polanyi, *The Tacit Dimension* (Peter Smith: Gloucester, Mass., 1983); Harry Collins, *Tacit and Explicit Knowledge* (University of Chicago Press: Chicago, 2010).

engineering knowledge and does not draw clear distinctions between tacit and explicit knowledge.<sup>39</sup> A useful concept to take from Collins' more recent reflections on knowledge are the tensions he highlights between knowledge which 'is not' explicated on the one hand, and knowledge which 'cannot' be explicated on the other.<sup>40</sup> This distinction will become important when discussing strategies such as secrecy, whereby through various means knowledge 'is not' explicated in an attempt to keep it safe. The analysis in this part of the thesis will propose a new typology of knowledge for the pottery industry that captures the complexity and goes beyond

## **6.2 Sources for the study of invention and innovation**

There is one key issue we must address before proceeding: How can we identify or measure innovation? Smith, argues that this is problematic due to the very nature of innovation: 'innovation is, by definition, novelty [and] involves multidimensional novelty in aspects of learning or knowledge organization that are difficult to measure or intrinsically non-measurable.'<sup>41</sup> This assumption holds for both contemporary and historical studies of innovation. In order to mitigate this problem, the discussion that follows will use a range of indicators based on a variety of sources which will help us build up a picture of innovation in the pottery industry. The identification of these sources has been influenced by those used in the recently published *Handbook of Innovation Indicators and Measurement* alongside those indicators which have been used in other economic history studies.<sup>42</sup> They include patents, advertisements, exhibition entries and prizes and sales catalogues.

Patent records have featured extensively in economic history as a source, indicator and measure of invention and innovative activity, in particular with regards to processes of industrialisation and

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<sup>39</sup> Mokyr, *The gifts of Athena*, p. 4.

<sup>40</sup> Collins, *Tacit and Explicit*, pp. 1-4.

<sup>41</sup> Keith Smith, 'Measuring Innovation' in J. Fagerberg and D. Mowery (eds.) *The Oxford Handbook of Innovation* (Oxford University Press: Oxford, 2006), p. 149.

<sup>42</sup> Fred Gault (ed.) *Handbook of Innovation Indicators and Measurement* (Edward Elgar: Cheltenham, 2013).

technological development in Britain and the US.<sup>43</sup> The utility of patents as a historical source for the eighteenth and nineteenth century is well known and is perhaps best highlighted by Sullivan who notes that ‘for a period characterized by a scarcity of data, patents are a continuous series from well before the industrial revolution’.<sup>44</sup> This is potentially true for the pottery industry although the statement needs to be further qualified in our case as we have already seen that the industry yields very little in the way of continuous quantifiable data. Patents have traditionally been used to understand variations in national innovation over time and as a complement to lists of important inventions compiled from qualitative sources. Schmookler, for example, stressed the importance and usefulness of patents in identifying invention and technological change and, by extension, the drivers of economic growth; patents often help to complement the ‘generally very spotty’ coverage of invention which is afforded by other more fragmentary sources.<sup>45</sup> In our case, as the discussion below will highlight, the sample size for pottery related patents is small and the logic behind the use of patents as a source runs in the opposite direction. Because there are so few pottery patents it may be difficult to say anything meaningful about invention, innovation and knowledge in the industry based on this data alone; other sources of evidence must therefore be utilised and interrogated.

In short, there are two key limitations of patent data which recur in the economic history literature. Firstly, patents are imperfect measures of invention and innovation because not all innovations were patented.<sup>46</sup> There are numerous valid and varying reasons for why this is the case which will be discussed in further detail as the chapter progresses. Secondly, patents are imperfect measures of invention and innovation because not all patents reflect true innovations. Moser, along the same lines as Dutton, has argued that patents represent ‘new ideas’ that work ‘in theory’ but many of

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<sup>43</sup> For some of the most prominent studies covering Britain during the eighteenth and nineteenth centuries see: Richard J. Sullivan, ‘England’s “Age of Invention”’: The Acceleration of Patents and Patentable Invention during the Industrial Revolution’, *Explorations in Economic History*, 26 (1989), pp. 424-452; Dutton, *The patent system*; MacLeod, *Inventing the Industrial Revolution*; Sean Bottomley, *The British patent system during the Industrial Revolution*, (Cambridge University Press: Cambridge, 2014).

<sup>44</sup> Sullivan, ‘England’s “Age of Invention”’, p. 425.

<sup>45</sup> Schmookler, *Invention and Economic Growth*, pp. 1-20.

<sup>46</sup> *Ibid.*, p. 24; MacLeod, ‘Strategies for Innovation’, pp. 288-289; *Inventing the Industrial Revolution*, pp. 75-96; Dutton, *The Patent System*, pp. 6, 26-7

which do not proceed to later stages of development and integration; in essence patents do not specify the *quality* of inventions which can be subject to significant variation across industries and over time.<sup>47</sup> Schmookler also noted for the US that many inventions of the nineteenth century were not patented. The institutional context of intellectual property in the US was slightly different to that of the UK; American inventors were able to test their inventions commercially for one year before applying for a patent.<sup>48</sup> This is well known and perhaps an obvious comment to make but it must be dealt with nonetheless.

There are two main methodologies and approaches which have been applied in recent years to mitigate the limitations of patent data with regards to the *quantity* and *quality* of inventions and innovation. The first of these addresses the quantity of patents and is motivated by the pragmatic and frank statement offered by Schmookler:

*'Inventions have many attributes. Only one of them concerns whether they are patented or not, and it would be absurd to expect that the number patented would be perfectly correlated with all the other dimensions in which we might be interested.'*<sup>49</sup>

Despite a heavy focus on the quantifiable aspects of patent statistics, Moser is quick to acknowledge their limitations and has used data collated from records of world fairs during the nineteenth century in order to examine national innovation systems and the broader historical strategies of inventors toward the appropriation of returns to their innovations.<sup>50</sup> Similarly, MacLeod frequently uses sources such as biographical dictionaries to complement her patent data and has focused on the strategies of specific firms and industries in approaching innovation.<sup>51</sup> Studies of inventive activity rarely rely on quantitative patent data alone. Indeed Nuvolari and Sumner's study of inventive activity in the English brewing industry provide close readings of the

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<sup>47</sup> Petra Moser, 'How do patent laws influence innovation?', p. 1217.

<sup>48</sup> Schmookler, *Invention and Economic Growth*, p. 24.

<sup>49</sup> *Ibid.*, pp. 56-7.

<sup>50</sup> Moser, 'How do patent laws influence innovation'; 'Innovation without Patents'.

<sup>51</sup> MacLeod, 'Strategies for Innovation'; Christine MacLeod and Alessandro Nuvolari, 'Inventive Activities, Patents and Early Industrialization. A Synthesis of Research Issues', *Druid Working Paper*, No. 06-28 (2006).



patent specifications in addition to ephemeral literature and trade publications.<sup>52</sup> Similarly, Bottomley's quasi-revisionist study of the British patent system during the Industrial Revolution uses patent indexes and lists as a primary tool for empirical analysis, but makes extensive use of company documents, trade literature, government reports, letters and newspapers.<sup>53</sup> Studies have moved on significantly from an overly cautious view of patent data during the late 1980s and early 1990s and toward a more pragmatic approach to the use of patent data as historical sources. Mokyr's classic study of the causes of invention and innovation came at a time when patents were becoming 'fashionable' again in the field of economic history, and the consensus was still out on their use: 'it remains an open question whether a bad approximation such as patent statistics is better than no approximation at all'.<sup>54</sup>

In response to the second limitation of patent statistics, that they do not measure the quality of innovations, several recent studies have addressed this issue directly. Nuvolari and Tartari, for example, have employed a new methodology similar in form to those used in contemporary innovation studies to indicate the value of patents issued in England between 1617 and 1852 which allows for comparative quantitative analysis across industries.<sup>55</sup> The use of patent citations in contemporary studies of innovation is common, and has been used in relation to a firm's market value, for example.<sup>56</sup> Nuvolari and Tartari apply this approach to historical indices relating to patents. Rather than using patent citations (which were not prescribed by the English patent system), they used a historical index which listed references to patents in technical literature, journals and books, legal publications and official records such as Parliamentary Select Committee

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<sup>52</sup> Alessandro Nuvolari and James Sumner, 'Inventors, Patents, and Inventive Activities', pp. 95-120.

<sup>53</sup> Bottomley, *The British patent system*.

<sup>54</sup> Mokyr, *The Lever of Riches*, p. 251.

<sup>55</sup> Nuvolari and Tartari, 'Bennet Woodcroft and the value of English patents'.

<sup>56</sup> For an example of how patent citations can be used in contemporary studies see: B. H. Hall, A. Jaffe and M. Trajtenberg, 'Market Value and Patent Citations', *RAND Journal of Economics*, Vol. 36, No. 1 (Spring 2005), pp. 16-38

reports.<sup>57</sup> Using a similar logic to citation studies, these references were used to measure the ‘technological and economic significance’ of an innovation; working on the assumption that the more references a patent has the more significant that patent is, and thus, more valuable.<sup>58</sup> From these references, each patent could be assigned a score based on their perceived economic value, or ‘quality’, on the basis that patents with high economic value, for example, are more likely to be referred to in legal disputes and thus receive more references, and patents with high technical value are more likely to be referenced in contemporaneous technical literature.<sup>59</sup> However, it is not the intention to utilise this methodology, or to use it to construct a proxy for innovation, merely to highlight that historical patent analysis is an area where methodologies are being developed and applied in new ways.<sup>60</sup>

The patent analysis presented in this chapter is based on three sources compiled by Bennett Woodcroft during his time as Superintendent of Specifications at the Patent Office during the 1850s and 1860s. Woodcroft compiled and published numerous indexes of patents during his tenure; the two volume *Titles of Patents of Invention, Chronologically arranged*, (1854) , the single volume *Subject-Matter Index of Patents of Invention* (1857), and one of a series of industry specific indexes, *Patents for Inventions: Abridgments of the Specifications relating to Pottery* (1863).<sup>61</sup> The first two publications have been used extensively in classic studies of patenting in Britain between the seventeenth- and twentieth-centuries such as Dutton and MacLeod, and more recently by Bottomley’s study of the patent system during the Industrial Revolution, and Nuvolari and

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<sup>57</sup> The author of this index also created several other key indices which are used in this analysis (see fn. 54): Bennet Woodcroft, *Reference Index of Patents of Invention, From march 2, 1617 (14 James I.) to October 1, 1852 (16 Victoria)*, (Great Seal Patent Office: London, 1862).

<sup>58</sup> Nuvolari and Tartari, ‘Bennet Woodcroft and the value of English patents’, p. 98.

<sup>59</sup> *Ibid.*, pp. 97-102.

<sup>60</sup> James Dowey, a recent PhD student graduated from the Economic History Department at the LSE conducted research into technological innovation during the Industrial Revolution at the economy-wide level and uses a variation of Nuvolari and Tartari’s index as a proxy for innovation: *Mind over matter: access to knowledge and the British industrial revolution*, unpublished PhD Thesis, London School of Economics (2017).

<sup>61</sup> Bennet Woodcroft, *Titles of Patents of Invention Chronologically Arranged, 1617–1852*, Two Volumes (Patent Office: London, 1854); *Subject-Matter Index of Patents of Invention, vols. 1 and 2* (Patent Office: London, 1854); *Patents for Inventions: Abridgments*.

Sumner's case study of patenting in the brewing industry.<sup>62</sup> The *Abridgments* relating to pottery have not hitherto been used as widely and to the author's knowledge, this is first such study to engage with the source in systematic detail. The *Abridgments* draws on the previous indexes as a base and is unfortunately subject to some problems which will be discussed further.

Patents are just one indicator of innovation, and are therefore just one source of evidence on the types of knowledge being created and applied in the pottery industry. The following chapter focuses on using patent data to set out the empirical landscape in terms of formal protection of intellectual property. It will then provide a profile of the patents and patentees in order to determine what types of knowledge could and were being patented in the industry, and by whom. Subsequent analysis, applying a converse logic of Schmookler's approach, uses a variety of alternative 'fragmentary' sources in order to complement the limited coverage of patents.

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<sup>62</sup> Dutton, *The patent system*; MacLeod, *Inventing the Industrial Revolution*; Bottomley, *The British patent system*; Nuvolari and Sumner, 'Inventors'.

## 7 Innovation and patenting in the pottery industry

### 7.1 Trends in pottery patenting

The following discussion uses patent data to set out the empirical landscape of formal protection of intellectual property in the pottery industry of North Staffordshire between 1700 and 1851. It then provides a profile of the patents and patentees to determine which types of knowledge were being patented in the industry, and by whom. This is the first research to examine patenting in the pottery industry in a systematic and detailed manner. The temporal scope is important because 1852 saw the introduction of the Patent Amendment Act which significantly increased the propensity to patent in Britain through a large reduction in the cost of the patent itself. This was accompanied by a new centralised ‘British’ administrative process, and reforms in the reporting and requirements of specifications.<sup>1</sup>

Figure 7.1 shows that from the middle of the eighteenth century patenting took off in England and continued to grow with a marked increase after the Patent Amendment Act of 1852.<sup>2</sup> Sullivan argues that a structural break occurred in 1757, after which ‘England became more inventive’. Although Bottomley rejects this precise dating he does agree that after the 1750s patenting increased considerably.<sup>3</sup>

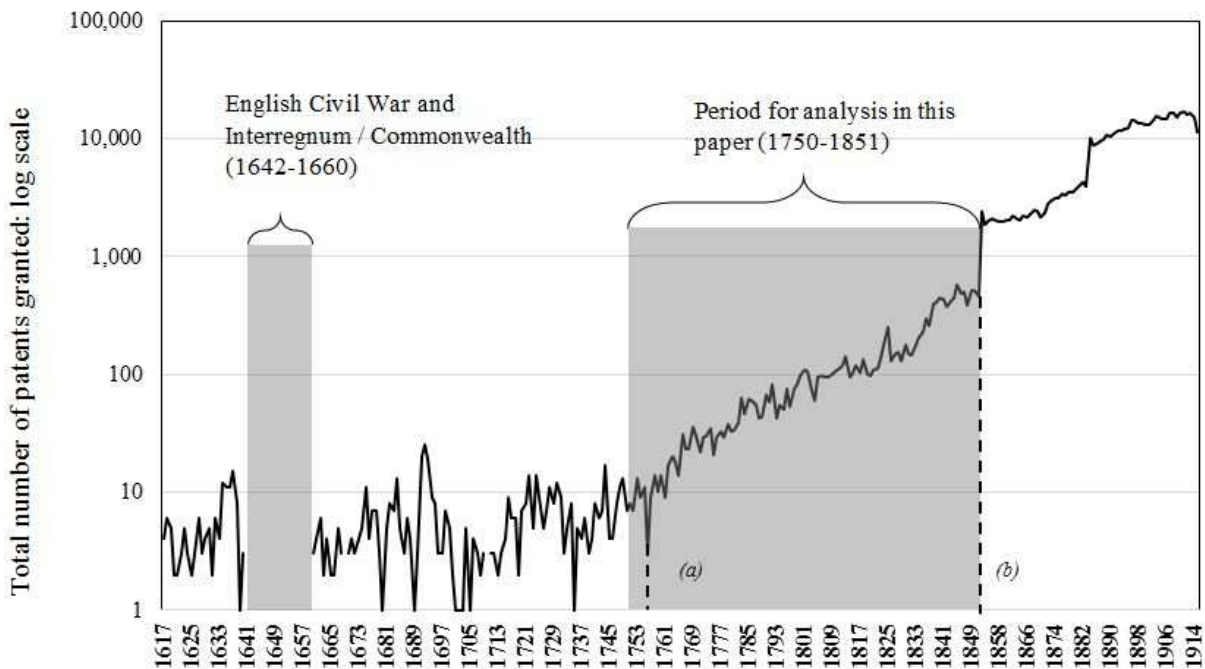
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<sup>1</sup> Bottomley, *The British patent system*, pp. 64-5, 161-168.

<sup>2</sup> Sullivan, ‘England’s “Age of Invention”’, pp. 443.

<sup>3</sup> *Ibid.*, p. 443; Bottomley, *The British Patent System*, p. 17.

Figure 7.1: Total patents granted each year in England, 1617-1915



Notes: Yearly observations.

- a) dotted line highlights the structural break point identified by Sullivan.
- b) dotted line marks introduction of Patent Amendment Act, 1852.

Sources:

For raw number of patents issued in England 1617-1851: Sullivan ‘England’s “Age of Invention”’, pp. 448-9. These data have been cross checked and adjusted using Woodcroft’s publications: *Reference Index of Patents of Invention; Titles of Patents; Subject-Matter Index*. For Patents issued between 1852 and 1915 the records held by the National Archives were used: Intellectual Property Office, ‘Patent applications filed and patents granted each year 1852 to 1915’, online at <http://webarchive.nationalarchives.gov.uk/20140603093549/http://www.ipo.gov.uk/types/patent/p-about/p-what-is/p-oldnumbers/p-oldnumbers-1852.htm>

Woodcroft’s indexes record 143 ‘pottery related’ patents granted in England and Wales between 1617 and 1851.<sup>4</sup> The *Abridged* pottery index compiled by Woodcroft may be somewhat misleading due to the chance that any reference by the patentee to a specific industry ‘may be entirely speculative’.<sup>5</sup> To mitigate this problem as far as possible, each of the 143 ‘abridged’ specifications have been examined by the author to remove those very broad patents with tenuous or irrelevant

<sup>4</sup> Woodcroft, *Reference Index of Patents of Invention; Patents for Inventions: Abridgments; Titles of Patents; Subject-Matter Index*.  
<sup>5</sup> Nuvolari and Sumner, ‘Inventors’, p. 99.

references to pottery. The patents in each index were cross-referenced with each other, and with other published sources of patents as far as possible in order to ensure accuracy. Patent specifications were available through publication in numerous trade magazines and periodicals.<sup>6</sup> The process of cross-checking and the removal of unrelated patents leaves 108 ‘specific’ pottery patents for the entire period 1617-1851. The basic information for each of these patents is presented in Table 7.1. The first five columns from left to right record the information as it is found in the patent records. The two columns ‘Innovation Category’ and ‘Sub Category’ have been created by the author after reading the specifications. These classifications will be discussed in more detail below.

Notable patents listed in Table 7.1 include number 939, for Josiah Wedgwood’s innovation in encaustic decoration, and numbers 8338-8340, held jointly by John Ridgway and George Wall Junior. These latter patents were for innovations as a result of early attempts to mechanise the production of flat-ware with the use of levered arms; these were precursors of the jigger and jolly machines which were used through the later nineteenth and early twentieth centuries.

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<sup>6</sup> The sources used to verify the patents are too numerous to include in the footnotes. Please see the ‘Patent Sources’ section of the bibliography.

Table 7.1: Basic patent information for pottery patents granted in England, 1750-1851

Date	Pat. No.	Name	Occupation	County	Innovation Category	Sub Category
25.01.1762	767	White, William	Potter	Middlesex	Raw Materials	Earthenware
05.12.1764	821	Williamson, James	Founder	Middlesex	Process	Machinery
10.06.1766	849	The Count de Lauraguais	Gentleman	London	Process	Porcelain
17.03.1768	898	Cookworthy, William	Chemist	Devon	Product	Porcelain
16.11.1769	939	Wedgwood, Josiah (J)	Potter	Staffordshire	Product	Decoration
31.05.1783	1374	Cartledge, Joseph	Doctor in Physics	Yorkshire	Process	Earthenware
05.02.1784	1418	Cartledge, Joseph	Doctor in Physics	Yorkshire	Process	Earthenware
03.05.1785	1475	De La Mayne, Thomas	Gentleman	London	Process	Earthenware
16.10.1790	1776	Hempel, Johanna	Potter	Middlesex	Ancillary	Utensils
20.06.1796	2117	Keeling, James	Potter	Staffordshire	Process	Decoration
05.07.1796	2127	Close, Valentine	Merchant	Staffordshire	Process	Firing
03.10.1796	2137	Wedgwood, Ralph	Potter	Staffordshire	Process	Earthenware
03.10.1796	2139	Wedgwood, Ralph	Potter	Staffordshire	Process	Firing
03.10.1796	2140	Pepper, John	Builder & Architect	Staffordshire	Process	Firing
09.01.1800	2367	Turner, William	Potter	Staffordshire	Recipe	Porcelain
20.01.1800	2368	Sanford, Isaac	Gentleman	Middlesex	Process	Moulded Ware
06.11.1806	2986	Vazie, Robert	Civil Engineer	Surrey	Process	Machinery
07.02.1807	3009	Sperscott, James	Clay Merchant	Staffordshire	Process	Earthenware
26.07.1809	3248	Murphy, James Cavanah	Architect	Middlesex	Ancillary	Ornaments
29.09.1809	3269	White, John (the younger)	Gentleman	Middlesex	Recipe	Materials
22.05.1810	3341	Docksey, William	Millwright	Gloucestershire	Process	Ivory Black
14.06.1811	3457	Waters, Richard	Potter	Surrey	Process	Earthenware
07.08.1811	3473	Gilbert, Thomas	Gentleman	Norfolk	Process	Machinery
16.12.1812	3623	Hamilton, Joseph	Gentleman	Ireland	Process	Earthenware
28.04.1813	3685	Hamilton, Joseph	Gentleman	Ireland	Process	Machinery
23.07.1813	3724	Mason, Charles James	Potter	Staffordshire	Process	Porcelain
05.12.1817	4183	Busk, William	Victualler	Hertfordshire	Process	Porcelain
16.04.1818	4247	Clayton, Robert	Artist	Ireland	Process	Decoration
02.06.1820	4466	Hague, John	Engineer	Middlesex	Raw Materials	Preparation
26.07.1821	4576	Bagshaw, Samuel	Gentleman	Staffordshire	Process	Ornamental Ware
22.11.1823	4871	Bourne, Joseph	Stone Bottle Mfc.	Derbyshire	Process	Firing
13.03.1828	5626	Jones, Robert Griffith	Gentleman	Middlesex	Process	Decoration
26.01.1830	5890	Wright, Samuel	Potter	Staffordshire	Process	Bricks

Date	Pat. No.	Name	Occupation	County	Innovation Category	Sub Category
17.09.1831	6162	Potts, John	Engraver	Derbyshire	Process	Decoration
11.05.1833	6422	Sminney, Thomas	Gas Engineer	Gloucestershire	Ancillary	Raw Materials
11.12.1833	6523	Wisker, John	Potter	Surrey	Process	Machinery
14.04.1835	6817	Embrey, Godwin	Potter	Staffordshire	Product	Decoration
03.12.1835	6938	Potts, William	Engraver	Staffordshire	Process	Decoration
14.09.1837	7433	Davies, Richard	Earthenware Mfc.	Northumberland	Ancillary	Mechanical
23.04.1839	8042	Singer, Alfred	Potter	Surrey	Ancillary	Tiles
22.06.1839	8124	Turner, Wilton George	Doctor in Phil.	Middlesex	Product	Porcelain
03.07.1839	8142	Yates, James	Ironfounder & Earthen. Mfc.	Yorkshire	Ancillary	Construction
02.11.1839	8254	Cutten, John	Coal Merchant	Kent	Product	Domestic
12.11.1839	8267	White, James	Engineer	Surrey	Process	Machinery
21.11.1839	8278	Ducôté, Pierre Auguste	Not Listed	Middlesex	Process	Decoration
04.12.1839	8295	Trewhitt, Henry	Esquire	Northumberland	Process	Machinery
16.12.1839	8319	Wood, John	Colour Mfc.	Staffordshire	Process	Decoration
11.01.1840	8338	Ridgway, John	China Mfc.	Staffordshire	Process	Machinery
11.01.1840	8339	Ridgway, John	China Mfc.	Staffordshire	Process	Machinery
11.01.1840	8340	Ridgway, John	China Mfc.	Staffordshire	Process	Machinery
17.06.1840	8548	Prosser, Richard	Civil Engineer	Warwickshire	Ancillary	Buttons
29.04.1841	8945	Gibbs, Joseph	Civil Engineer	Surrey	Recipe	Machinery
12.06.1841	8987	Palmer, Edward	Gentleman	London	Process	Decoration
20.11.1841	9161	Venables, John	Earthenware Mfc.	Staffordshire	Process	Firing
23.07.1842	9424	Ayers, Charles Robert	Architect	Middlesex	Process	Decoration
15.11.1842	9518	Brown, Robert	Tile, Pot & Brick Mfc.	Surrey	Product	Domestic
14.01.1843	9587	Fontainemoreau, Pierre de	Not Listed	London	Recipe	Ceramic Paste
03.06.1843	9757	Brown, William	Merchant	Scotland	Product	Slip
15.06.1843	9784	Booth, George Robins	Mfc. and Chemist	Staffordshire	Process	Firing
05.10.1843	9889	Boote, Richard	Earthenware Mfc.'s Clerk	Staffordshire	Process	Decoration
05.10.1843	9901	Wall, George (Junior)	Gentleman	Lancashire	Process	Machinery
18.10.1843	9912	Graham, James	Not Listed	Middlesex	Ancillary	Moulded Ware
28.12.1843	9996	Thorneycroft, George	Iron Master	Staffordshire	Raw Materials	Machinery
20.01.1844	10020	Basford, William	Brick & Tile Mfc.	Staffordshire	Ancillary	Moulded Ware
22.05.1845	10675	Hullmandel, Charles J.	Lithographer	Middlesex	Process	Decoration
24.05.1845	10687	Simpson, Jeremiah	Oven Builder	Staffordshire	Process	Firing



Date	Pat. No.	Name	Occupation	County	Innovation Category	Sub Category
20.11.1845	10968	Skinner, George	Merchant	Durham	Recipe	Non-Lead Glazes
15.12.1845	11005	Findler, Thomas	Flint Miller	Scotland	Raw Materials	Machinery
25.02.1846	11107	Maddock, John	Earthenware Mfc.	Staffordshire	Process	Firing
25.03.1846	11149	Smith, Charles	Not Listed	Middlesex	Ancillary	Domestic
22.05.1846	11215	Lutwyche, Charles T.	Gold & Silver Smith	Warwickshire	Process	Porcelain
23.07.1846	11313	Fourdriner, George H.	Paper Maker	Staffordshire	Process	Raw Materials
17.11.1846	11453	Masters, Thomas	Confectioner	Middlesex	Ancillary	Cooling liquids
14.12.1846	11488	Ford, Charles	Engineer	Staffordshire	Process	Machinery
29.07.1847	11824	Newton, Alfred Vincent	Mechanical Draughtsman	Middlesex	Process	Firing
04.08.1847	11831	Bourne, Joseph	Potter	Derbyshire	Process	Firing
21.10.1847	11912	Ridgway, John	China Mfc.	Staffordshire	Process	Machinery
20.11.1847	11973	Walker, Thomas	Potter	Staffordshire	Process	Decoration
31.12.1847	12008	Pratt, Felix Edwards	Earthenware Mfc.	Staffordshire	Process	Machinery
08.03.1848	12079	Whishaw, Francis	Civil Engineer	Middlesex	Product	Pipes
14.03.1848	12097	Collins, Frederick	Engraver & Printer	Middlesex	Process	Decoration
10.04.1848	12115	Spencer, Thomas	Earthenware Mfc.	Lancashire	Process	Machinery
08.02.1849	12465	Tooth, William	Engineer	Surrey	Process	Machinery
03.05.1849	12599	Buller, Thomas	Esquire	Middlesex	Process	Machinery
22.05.1849	12616	Da Costa, Solomon Israel	Civil Engineer	London	Process	Machinery
24.05.1849	12619	Goodfellow, Thomas	Earthenware Mfc.	Staffordshire	Raw Materials	Preparation
27.09.1849	12789	Browne, William	Mine Agent	Cornwall	Raw Materials	Preparation
17.10.1850	13288	Baddeley, James Henry	Eng. and Designer	Staffordshire	Process	Machinery
17.03.1851	13558	Minton, Herbert	Earthenware Mfc.	Staffordshire	Ancillary	Clocks/Watches
26.04.1851	13608	Nasmyth, James	Engineer	Lancashire	Process	Machinery
02.10.1851	13763	Hodge, William	Printer	Cornwall	Recipe	Earthenware
29.10.1851	13791	Biddell, William	Founder	Middlesex	Process	Moulded Ware
04.11.1851	13803	Beswick, Robert	Builder & Architect	Staffordshire	Process	Bricks
08.12.1851	13850	William, Pidding	Gentleman	Middlesex	Ancillary	Bricks

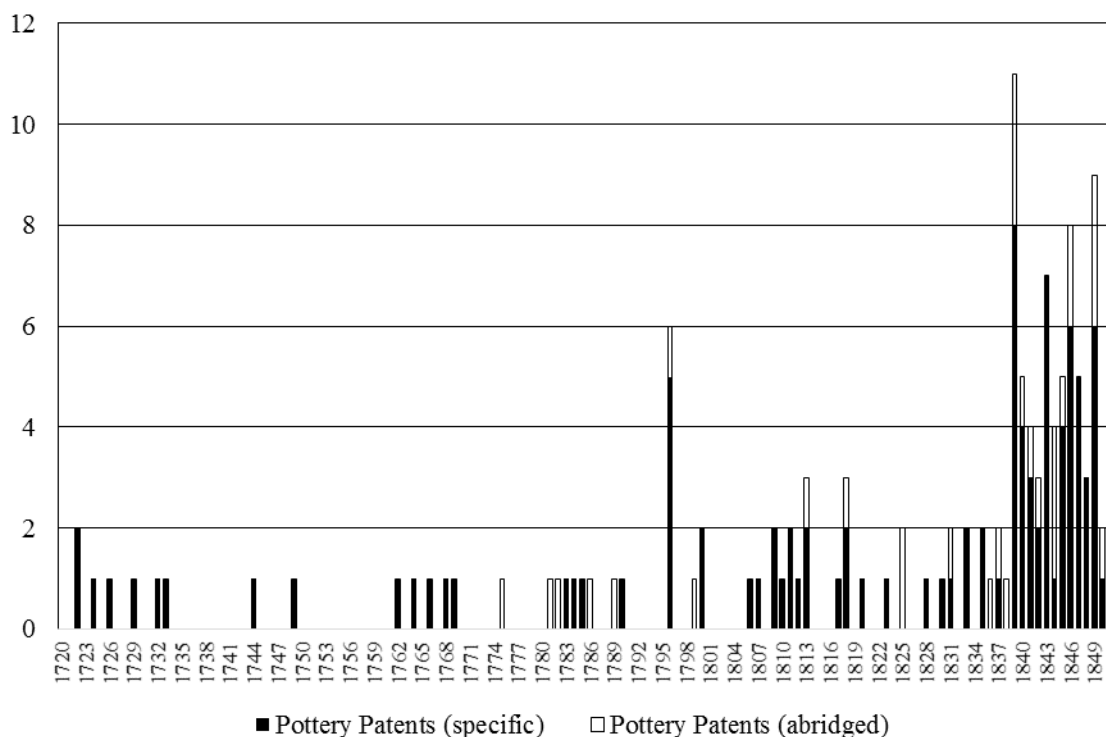
At the industry level, pottery did not experience such a strong trend in patenting and the volume of patents granted was extremely low as shown in Figure 7.2. Patenting in the industry was minimal until 1839 when there was an increase in patents for machinery of various descriptions. Before this, there was only one year, 1796, in which more than two patents were granted. Of the five patents granted in this year, coincidentally the year after Josiah Wedgwood's death, three were held by one man, his cousin and business partner Ralph Wedgwood.<sup>7</sup> To provide a relative measure, Table 7.2 shows both the Patent Office's abridged patents and the author's own 'specific' pottery patents as a share of total patents granted in England. Even during the period 1701-1750, which saw considerable attempts outside of Staffordshire to imitate Chinese porcelain and produce English porcelain, pottery patents accounted for only 3.08 per cent of all patents.<sup>8</sup> Even with the inclusion of Woodcroft's abridged patents, pottery accounted for less than 1 per cent of the total granted 1617-1851.

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<sup>7</sup> It seems at this stage more than a coincidence that Ralph Wedgwood, cousin and partner of Josiah Wedgwood, would patent three innovations in the year immediately following the master potter's death.

<sup>8</sup> The most notable coming from factories at Bow and Chelsea in the 1740s: Holgate, *New Hall*, pp. 1-3.

Figure 7.2: Number of pottery related patents granted in England, 1720-1851



Notes: The period 1617-1719 has been excluded as there were only five patents granted. The solid columns represent patents which were specifically for pottery innovations. The hollow columns represent those additional patents in Woodcroft's 'Abridged' list.

Sources: Woodcroft, *Patents for Inventions: Abridgments*.

Table 7.2: Pottery patents as a share of total patents, 1617-1851

Years	1617-1700	1701-1750	1751-1800	1801-1851	1617-1851
<b>Total Patents</b>	431	292	1,804	11,484	14,011
<b>Pottery Patents (abridged)</b>	5	9	23	106	143
<b>Share of total</b>	1.16%	3.08%	1.27%	0.92%	1.02%
<b>Pottery Patents (specific)</b>	5	9	16	78	108
<b>Share of total</b>	1.16%	3.08%	0.89%	0.68%	0.77%

Notes: see main text for distinction between abridged and specific patents.

Sources: Woodcroft, *Patents for Inventions: Abridgments*

Table 7.3 shows the pottery patent data alongside those compiled by Nuvolari and Sumner for a similarly highly innovative industry, brewing, over roughly the same period which showed a 'remarkably low propensity to patent'.<sup>9</sup> Given this low number of patents the next stage of analysis is to determine who the patentees were, and what was being patented.

<sup>9</sup> Nuvolari and Sumner, 'Inventors', pp. 103-4.

Table 7.3: Brewing and pottery patents, 1751-1850

<b>Years</b>	<b>1751-1800</b>	<b>1801-1850</b>	<b>1751-1850</b>
<b>Total patents</b>	1,804	10,974	12,778
<b>'Genuine' brewing patents</b>	21	62	83
<b>Brewing share of total</b>	1.16%	0.56%	0.65%
<b>Specific pottery patents</b>	16	73	89
<b>Pottery share of total</b>	0.89%	0.67%	0.70%

Sources: Brewing industry data comes from Nuvolari and Sumner, 'Inventors', pp. 103-4. Their 'genuine' brewing patents are comparable to 'specific' patents. Pottery patent data taken from Woodcroft, *Patents for Inventions: Abridgments*.

## 7.2 Occupational distribution of patents

During the second half of the eighteenth century 99 per cent of all patents recorded both the occupation and place of residence of the patentees.<sup>10</sup> Occupational coverage in the pottery patent dataset I have created is 93 per cent for the period 1617-1851, and 96 per cent for 1750-1851; location of the patentee is provided for 99 per cent of patents. The coverage of pottery patents is thus roughly in line with national levels and provides us with an excellent opportunity to conduct an occupational and locational analysis of patentees. The data, therefore, allow for the construction of an occupational dataset.

There are two issues concerning the study of historical occupations which are relevant for this study and must first be discussed. In the newly edited *Cambridge Economic History of Modern Britain*, Shaw-Taylor and Wrigley survey historiographical trends in the study of the occupational structure of Britain during the eighteenth- and nineteenth- centuries. In particular, they provide a synthesis of some of the more current debates surrounding reconstructions and estimates of Britain's occupational structure which centre on the classification of individual occupations and their corresponding sectors (i.e. Primary, Secondary or Tertiary).<sup>11</sup> The first issue concerns by-employment and the potential impact this may have on the recording of occupations and their classification. This criticism is based on the notion that sources such as parish records, which

<sup>10</sup> MacLeod, *Inventing the Industrial Revolution*, p. 116.

<sup>11</sup> Leigh Shaw-Taylor and E. A Wrigley, 'Occupational structure and population change', in R. Floud, J. Humphries and P. Johnson (eds.) *The Cambridge Economic History of Modern Britain, Volume 1: 1700-1870* (Cambridge University Press: Cambridge, 2014), pp. 53-88.

provide information on occupations before the more substantial censuses of the nineteenth-century, record only primary occupation and thus skew or obscure the ‘true’ spread of occupations across Britain.<sup>12</sup> Shaw-Taylor and Wrigley argue, however, that such records do not give a substantially different view of the occupational structure. In fact, Keibek and Shaw-Taylor conducted research into probate inventories (a source on which this first criticism rests upon) and found that by-employment was exaggerated due to the natural tendency of those engaged in by-employment to leave a probate inventory.<sup>13</sup>

Shaw-Taylor and Wrigley also respond to a second issue related to occupation estimates which focuses on the ‘maker/seller problem’.<sup>14</sup> This debate centres on those occupations whose activities fall into two of the three traditional sectors. The example raised is that of a baker, who splits their time between making and selling bread and therefore occupies both the secondary and tertiary sectors.<sup>15</sup> In their most recent reconstruction of the occupational structure of Britain between 1700 and 1871, Shaw-Taylor and Wrigley have privileged the secondary sector in any such cases, such that a baker will be recorded as operating in the secondary sector. Whilst this does have the potential to skew classifications toward the secondary sector, Shaw-Taylor and Wrigley argue that the process also occurs for the tertiary sector (as in brewing) and therefore ‘[i]t is unlikely that overall totals in each of the three sectors would be changed other than marginally even if the maker/seller problem were completely overcome.’<sup>16</sup>

The methodological work conducted by the *Cambridge Group for the History of Population and Social Structure* on occupations in Britain is extremely useful in providing an electronic, open-source, system for classifying and categorising British occupations as recorded in a variety of

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<sup>12</sup> *Ibid.*, p. 60.

<sup>13</sup> Sebastian Keibek and Leigh Shaw-Taylor, ‘Early Modern Rural By-Employments: A Re-Examination of the Probate Inventory Evidence’, *Agricultural History Review*, 61, (2013) pp. 244-81.

<sup>14</sup> Shaw-Taylor and Wrigley, ‘Occupational Structure’, p. 60

<sup>15</sup> *Ibid.*, pp. 60-1.

<sup>16</sup> *Ibid.*, p. 60.

historical sources.<sup>17</sup> The primary, secondary, tertiary (PST) system and additional resources have been made available by the Group and can be used to code both pre-census and post-census occupational data-sets from both Britain and other countries. Numerous recent studies in economic history have employed the PST system with a variety of research agendas with the most notable listed on the web page for the research group.<sup>18</sup> Before the development of the most recent incarnation of the PST system there were other systems of criteria and descriptors used by historians to classify and group occupations. Lorna Weatherill, for example, employed several different classification schemes in order to group her occupations collected from inventories and other probate records. These allowed her to ‘emphasize different social and economic functions’ and grouped occupations by social hierarchy, ‘contemporary perceptions’ and sector of the economy.<sup>19</sup> The present analysis uses the most recent version (April 2010) of the PST system and classification available for download through the web page of the Cambridge Group.<sup>20</sup>

The first stage in constructing the dataset was to record the occupation of each patentee as given in Woodcroft’s *Titles* index. Due to differences in spelling and descriptors used, each was standardised as accurately as possible to conform to the PST system. Each occupation was then coded using a four-tier system to denote the sector, group, section and occupation. For example, the occupation of ‘Earthenware Manufacturer’, as recorded in the patent data is coded as 2, 45, 1, 1, where 2 signifies the secondary sector, 45 is ‘Earthenware, pottery manufacture’, 1 is ‘Earthenware Manufacture’, and 1 is ‘Earthenware Product Manufacture’. Other occupations outside of the

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<sup>17</sup> The Cambridge Group are engaged with research on the occupational structure of Britain from the late-medieval period to the twentieth century: See <http://www.campop.geog.cam.ac.uk/research/occupations/> ; Research output from the project is detailed in: Shaw-Taylor, Leigh et al, *The Occupational Structure of Nineteenth Century Britain: Full Research Report*, ESRC End of Award Report, RES-000-23-1579. Swindon: ESRC. For an in-depth discussion of this system and comparisons with other occupational systems see: E. A. Wrigley, ‘The PST system of classifying occupations’, *Unpublished paper, Cambridge Group for the History of Population and Social Structure*, University of Cambridge (2011).

<sup>18</sup> For a more complete list, see:

<http://www.geog.cam.ac.uk/research/projects/occupations/britain19c/usage.html>

<sup>19</sup> See ‘Appendix 2’ in Lorna Weatherill, *Consumer Behaviour and Material Culture in Britain, 1660-1760* (Routledge: London, 1988), pp. 208-214.

<sup>20</sup> See: <http://www.geog.cam.ac.uk/research/projects/occupations/britain19c/pstversions.html> .

pottery industry can also be coded with the PST system. William Busk and Robert Harvey, who were granted a patent in 1817 for making porcelain pipes and tubes are listed as victuallers. Their PST code in the dataset is 5, 1, 1, 1, where 5 signifies the tertiary sector, specifically, the service and professional element, 1 is 'Food, drink and accommodation services', 1 is 'Restaurant', and 1 is 'victualler'.

Given the broad scope of the PST system, using accompanying resources it has been possible to classify the occupations of each patentee of pottery related patents. A further reason the PST system has been chosen is because it allows classification of the occupations of pottery patentees is possible at the aggregate level of the primary, secondary and tertiary sectors of the economy. Such a methodology also allows for standardised classification at the individual level and can help disentangle those patentees involved in the acquisition and production of raw materials required for producing earthenware, those engaged in the manufacturing of products, and those engaged in the dealing and selling of such products.<sup>21</sup>

An issue which is common in studies of patenting during this period concerns the number of patentees listed for each patent.<sup>22</sup> This is particularly problematic when dealing with a small sub-sample such as pottery patents; despite the proportion of all English patents taken out in more than one name accounting for just seven per cent for the period 1750-1799, there were twenty-five specific pottery patents (23 per cent of the total) for the period 1617-1851 which listed two or more patentees.<sup>23</sup> At present there are two possible methods of dealing with this as a methodological issue.

The first, and the one which the author has employed here, is to use the preference system described by MacLeod whereby each patent was ascribed to a single person (usually the first name listed). In

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<sup>21</sup> Wrigley states that this two tier system of analysis is what sets the PST system apart from other classification systems: Wrigley, 'The PST system', p. 22.

<sup>22</sup> MacLeod, *Inventing the Industrial Revolution*, p. 116.

<sup>23</sup> *Ibid.*, p. 250.

cases where the patentees held different occupations, the individual with an identified occupation (a trade rather than a title or mercantile descriptor such as ‘gentleman’ or ‘merchant’) was preferred, and the individual with the trade most closely connected to the invention itself was preferred. In the event of a London-Provincial split of patentees with similar occupations, location was biased toward the provinces based on the assumption that ‘a provincial inventor was more likely to seek a London partner than vice versa.’<sup>24</sup> Care has been taken not to distort the original occupations given and each case taken individually in order to give the most accurate representation.

The second possible solution, and the one which is rejected, is closely related to the methodology used by Wrigley and his colleagues at the Cambridge Group in the development of the PST system. This would involve choosing only the first name and occupation listed in the patent specification, essentially ignoring the existence of partners in such endeavours. Whilst this may be a suitable methodology to employ in order to help mitigate the existence of by-employment or multiple occupations listed in censuses and other documents, it is not suitable for such a small sample of patents. Indeed, Wrigley has stated that such a methodology is adequate in the short term although later stages of research intend to employ a weighting system in order to incorporate multiple occupations.<sup>25</sup>

The majority of patentees listed in the newly constructed database as earthenware or pottery manufacturers were highly skilled master potters who ran their own businesses and were highly skilled.<sup>26</sup> Division of labour in the industry was extensive and it is not possible at this stage to discern exactly which branch or stage of manufacturing all the potters were involved in. The extent of the division of labour in each manufactory could vary and can be neatly illustrated through three sources. The first is the list of employees drawn up by Josiah Wedgwood and detailed in Table 3.1

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<sup>24</sup> *Ibid.*, p. 116.

<sup>25</sup> Wrigley, ‘The PST system’, p. 18.

<sup>26</sup> The majority of them are identifiable through the database of pottery firms compiled from trade directories in an earlier paper.

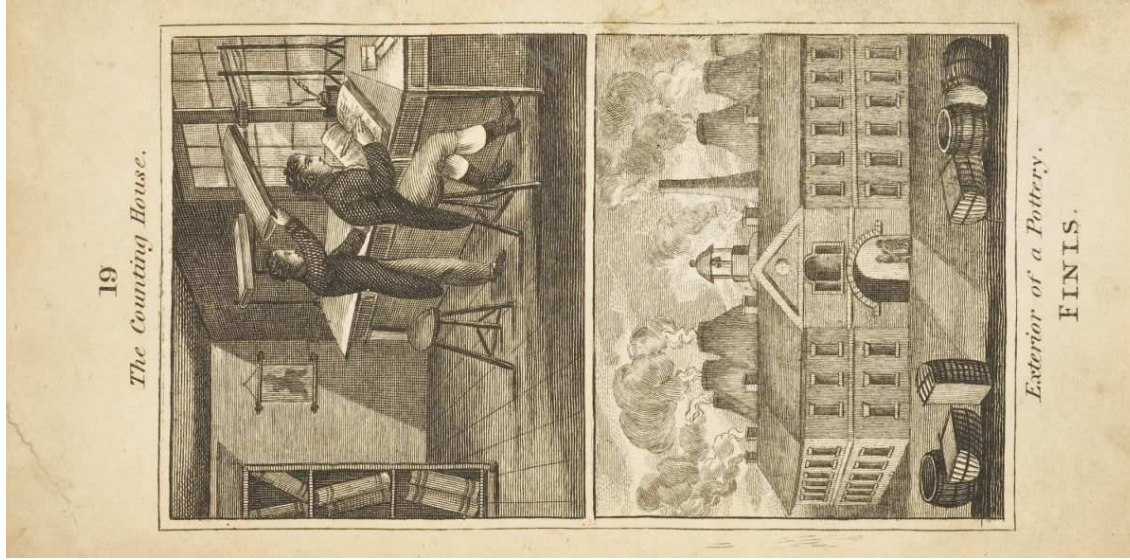
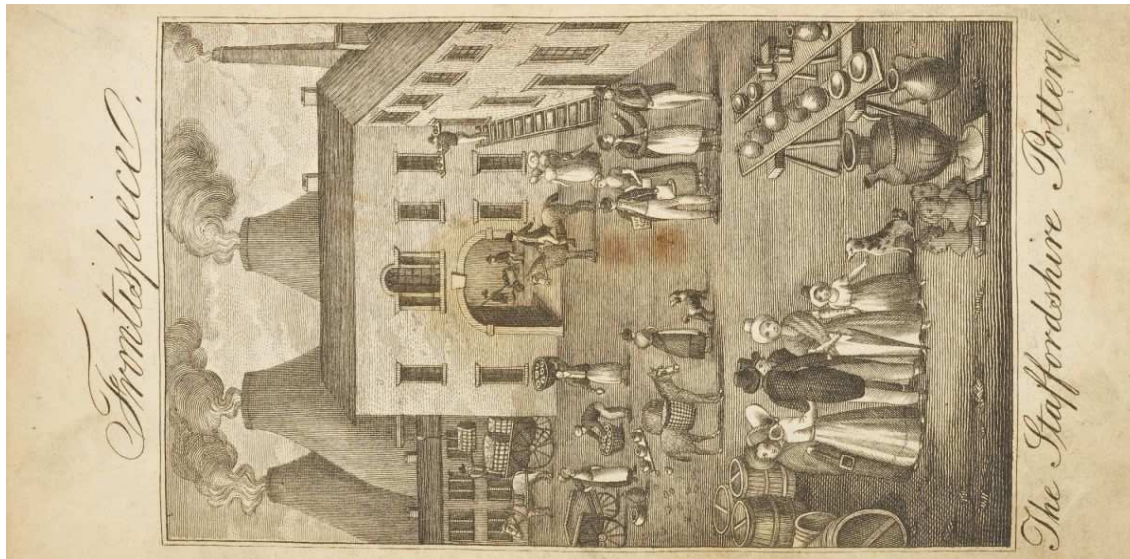


which lists over forty different jobs within his useful and ornamental works in 1790. The second source is a set of engravings showing production at Enoch Wood's manufactory in Staffordshire in around 1826 which depicts eighteen separate stages of production (Figure 7.3).<sup>27</sup> Whilst these engravings do not detail the job descriptions themselves, they do show that producers separated stages of production, and these each had their own designated space in the factory. The engravings also provide strong evidence of the low level of mechanisation and automation in the industry and the persistence of the 'craft' of pottery production into the nineteenth century. The frontispiece and the exterior view of the pottery are particularly striking images. They proudly convey 'The Staffordshire Pottery' in all its glory, neatly capturing and representing different sides of the industry. The first side is that of the successful industrial district: the size of the factory and the scale of production is clear, numerous smoking kilns and chimneys depict a working, productive factory, and the grandeur of the façade and arched entrance suggest power, wealth and prosperity. The second, rather more genteel side to the industry is represented by the family visiting the factory in the frontispiece. Well dressed, accompanied by children and pet dogs, the visitors are pictured next to fine statuary and ornamental wares. The glamorous and fashionable appeal of Staffordshire pottery is clear; separate, but closely linked to the smoke and toil required to produce the wares.

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<sup>27</sup> Appendix Three contains all the images from this series of copperplate engravings.

Figure 7.3: Representations of earthenware production. engravings. 1827



Source: A Representation of the manufacturing of earthenware: with twenty-one highly finished copperplate engravings, and a short explanation of each, showing the whole process of the pottery, (Ambrose Cuddon: London, 1827)

A third source allows a far more detailed break-down of the division of labour for the 1840s, and complements that provided by Wedgwood's list for the eighteenth century. Samuel Scriven's report to Parliament on the conditions of child labour in the trades and industries of Britain during the 1840s provides a great level of detail concerning the processes performed in the pottery industry. The report is a useful source for a social history of industrialisation, with interviews recorded and commentary on working conditions and attitudes of workers in general. It is also useful for this thesis as it contains detailed notes on the factories that Scriven visited in order to speak to workers. In Minton and Boyle's manufactory, for example, Scriven notes that there were 24 separate rooms relating to various stages of production.<sup>28</sup>

Pottery patents were held by individuals from a broad range of occupations. Figure 7.4 shows the occupations of pottery patentees for 1750-1851 and highlights the diverse origins, or appropriation, of innovation. Clearly, the few patents that were granted were not restricted to potters. Whilst the largest group of patentees were those directly involved in earthenware manufacture although they only held just under a third of patents. The second largest group were 'outsiders' to the industry. This group are individuals whose occupation was significantly outside of pottery production and consists of the following job titles: architects, builder and architect, civil engineer, confectioner, doctor in philosophy, doctor in physics, engineer, engineer and designer, gas engineer, gold and silver smith, mechanical draughtsman, paper maker, and victualler.

The third largest group of patentees were the upper societal elite who held almost 15 per cent of pottery patents. We also see the involvement of related industries such as printing, engraving and chemical industries although the number of patents held is relatively small. Whilst this is a new finding and an addition to the empirical evidence relating to patenting in the Industrial Revolution

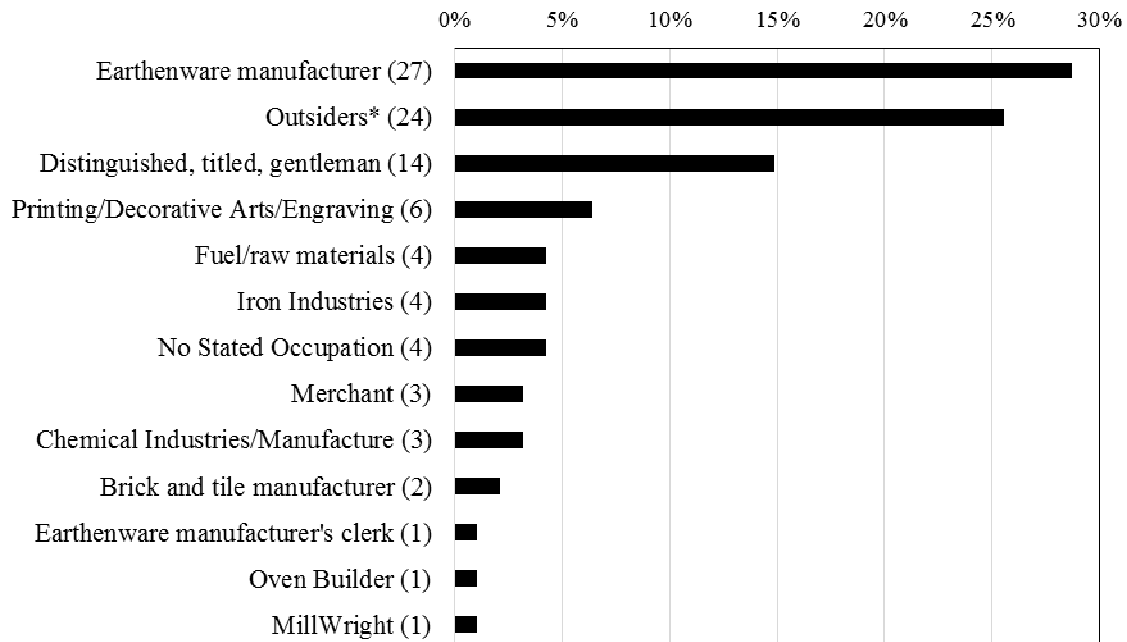
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<sup>28</sup>

See Table 3.2 and accompanying text in chapter 3 for a discussion of this evidence: PP, [431]: *Children's Employment Commission. Appendix to the Second Report of the Commissioners. Trades and Manufactures. Part 1* (1842), pp. C1-C124.

period, it is not a phenomenon unique to the pottery industry by any means. To continue an earlier comparison, a quarter of all brewing patents for the same period were also held by ‘outsiders’.<sup>29</sup>

Figure 7.4: Occupations of pottery patentees, 1750-1851



Notes: Absolute numbers in parentheses

The group of individuals under the classification ‘Distinguished, titled, gentleman’ is somewhat problematic for this and other studies of patenting. Whilst the title of ‘Gentleman’ or ‘Esquire’ was likely to accurately portray social status until the early eighteenth century, as we progress through to the nineteenth century it becomes more likely that such titles may obscure other occupations or connections to industry.<sup>30</sup> This is challenging as further identifiable characteristics for these individuals have been difficult to obtain; none appear in the *Oxford Dictionary of National Biography*, the author’s own database of pottery producers, or Allen’s list of inventors of the Industrial Revolution.<sup>31</sup> Nevertheless, for the purposes of this research, the focus will remain on the potters themselves.

<sup>29</sup> Nuvolari and Sumner, ‘Inventors’, p. 104.

<sup>30</sup> *Ibid.*; MacLeod, *Inventing the Industrial Revolution*, p. 116.

<sup>31</sup> Allen, *The British Industrial Revolution*, pp. 269-271.

### 7.3 The geography of pottery patenting

Having established that more pottery patents in England were held by those outside of the industry, we turn now to the geographical location of pottery patentees. Figure 2.5 shows the geographical distribution of patentees for the whole period 1617-1851. The map on the left shows the location of potters who held patents, and the map on the right shows the location of patentees who were not potters. The concentration of potters with patents in Staffordshire reflects the geographical concentration of the industry and contrasts with the more scattered distribution of non-potters with patents. Staffordshire, Middlesex (including London), and Surrey remained the dominant sources of pottery patenting. Staffordshire itself accounted for a third of all patents with a peak of 37.9 per cent during the 'boom' period of 1839-1851. The only pottery patent located in Staffordshire that was not held by a resident of the Potteries district was that granted to George Thorneycroft, an iron founder from Wolverhampton whose machine for 'rolling, squeezing, or compressing puddle balls of iron', could also be used for grinding raw materials for the production of pottery.<sup>32</sup> The mining districts of Cornwall and Devon and Newcastle accounted for a small share of patents with northern counties neighbouring Staffordshire accounting for a considerable number. The geography of patenting activity in the pottery industry changed as the 19<sup>th</sup> century progressed with more patents being granted outside of the region than inside. This suggests that there was a district effect impacting on the practice of patenting. Within North Staffordshire all patentees bar one were potters, and the spread of potters who held patents was extremely limited. Outside of the district, and outside of the industry itself, the distribution of pottery patents was far broader.

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<sup>32</sup> Woodcroft, *Patents for Invention: Abridgments*, p. 46.

Figure 7.5: Distribution of patents held by potters and non-potters, 1617-1851

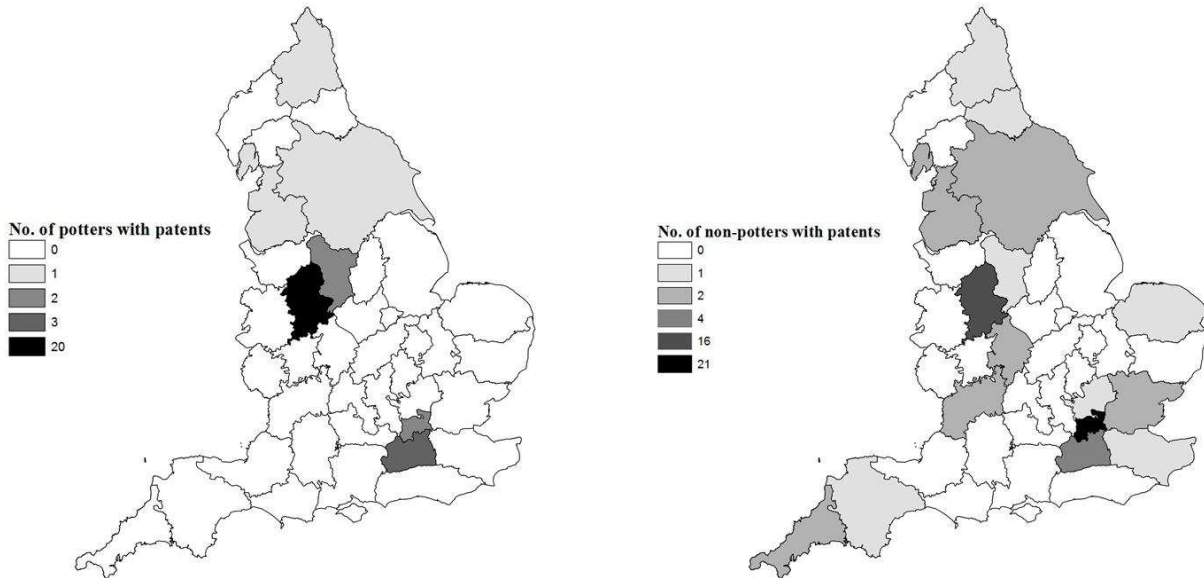


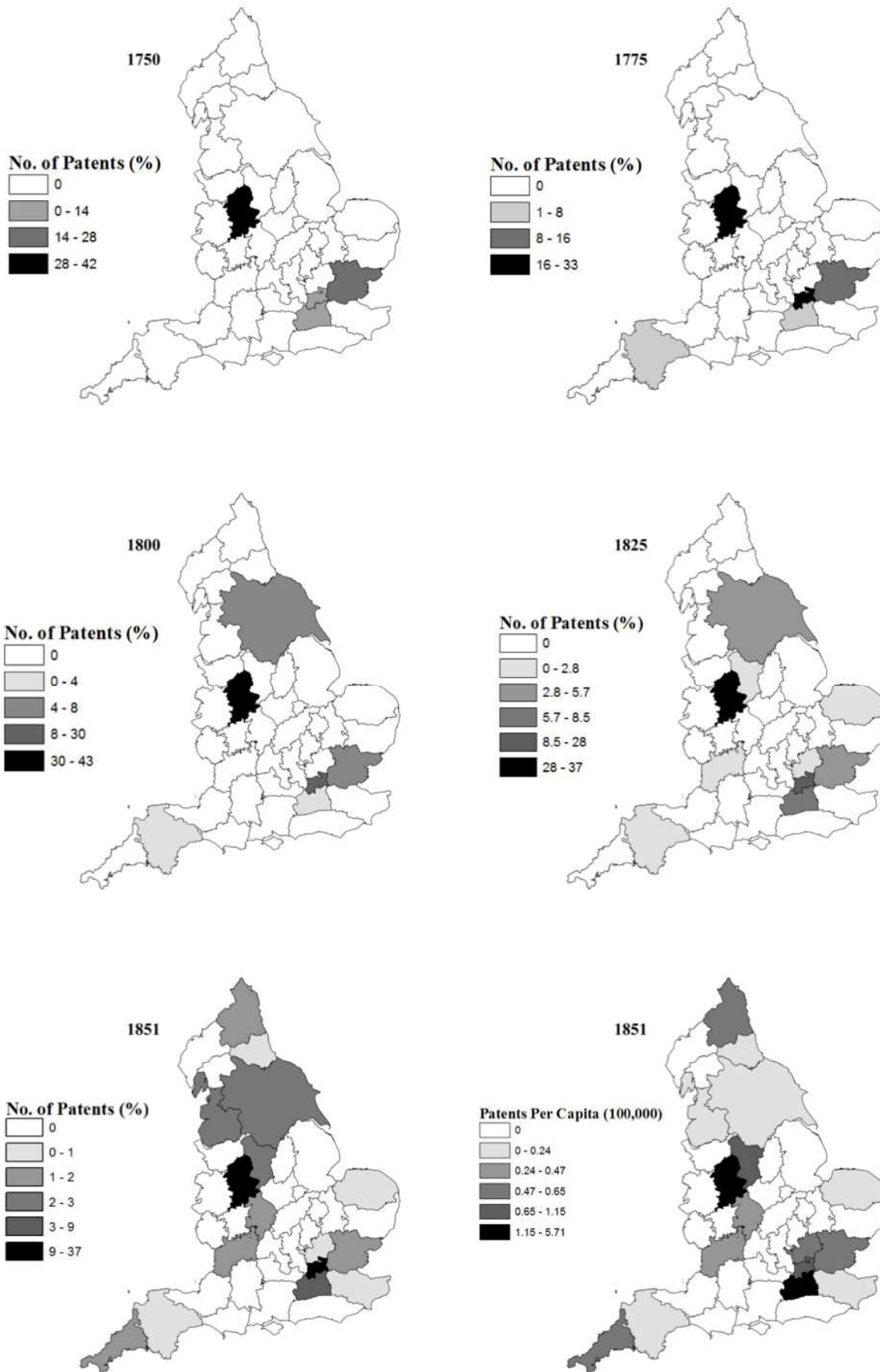
Figure 7.6 shows the cumulative number of patents registered in each county in England as a percentage share of total pottery patents in the country for benchmark years between 1750 and 1851. The map at the bottom right shows the number of patents per capita at the end of the period in 1851. The predominance of London, Middlesex and Surrey as well as Staffordshire is not surprising when we consider national trends in patenting overall. MacLeod estimates that London and the metropolitan parts of Middlesex and Surrey accounted for over half of England’s patents, and Inkster suggests a figure of 47 per cent for London during the 1790s.<sup>33</sup> Inkster has also noted that for patenting in general, it is not clear whether this dominance was ‘a mere function of the location of the patent system’, or a ‘genuine reflection of the skill-character of the major London districts.’<sup>34</sup> Closer analysis of the pottery patents reveals that only six of the thirty-four patentees from London, Middlesex and Surrey were potters; the majority were listed as gentlemen or engineers. The combination of this, along with the low number of earthenware manufacturers in London suggests that the latter of Inkster’s explanations is not true for the pottery industry. For the most part, London was not a hotbed of skilled potters. The shift of the industry into North Staffordshire during the

<sup>33</sup> MacLeod, *Inventing the Industrial Revolution*, p. 119; Ian Inkster, *Science and Technology in History, An Approach to Industrial Development* (Macmillan: Basingstoke, 1991), p. 85.

<sup>34</sup> Inkster, *Science and Technology*, p. 323.

seventeenth and eighteenth centuries concentrated much of the innovative activity into the district. The higher propensity of outsiders to take out pottery patents than Staffordshire potters themselves also explains the shift in the geography of patenting activity.

Figure 7.6: Geographical distribution of patents in England for benchmark years





In his study of collective invention in the Cornish mining industry Nuvolari also finds that London, Middlesex and Surrey accounted for over 40 per cent of steam engine patents between 1698 and 1852. He attributes this to the first of Inkster's propositions, the urbanisation and growth of London alongside the geographical location of the patent office.<sup>35</sup> This is interesting when we compare Nuvolari's findings to the ones presented here as there are both parallels and differences between the two. Firstly, steam engine patents were relatively spread out across the country and very few were issued to residents of Cornwall, perhaps a result of the increased usage of steam power for numerous purposes in industrialising areas. Pottery patents, on the other hand, were concentrated in Staffordshire and London's surrounding area which between them accounted for two thirds of patents. Secondly, Cornwall had an extremely low number of patents for steam engines relative to the 'major contribution' of the region to steam power.<sup>36</sup> This shows that the geography of patenting activity in the pottery industry was somewhat more complex. Whilst Staffordshire did command the largest share of pottery patents for a single county, the absolute number was relatively low given the extreme concentration of the industry, and the majority of patents were located outside of the county. Moreover, when we look away from the producer side, outsiders to the industry, shown in Figure 7.4, who held patents were spread far more widely across England and located in regions heavily involved in other industries such as Yorkshire, Lancashire, Cornwall and Devon. This shows, therefore, that the low propensity to patent a pottery innovation was exhibited within the industry rather than at the regional level, and did not extend to outsiders. This reinforces the notion that the types of innovations being awarded patents in each of these industries were very different. This is of course a somewhat obvious distinction to make but it is an important one nevertheless as it will lead us to an examination of the patent specifications themselves. Was there something specific about the pottery industry in England which made it difficult or precluded the need for innovations to be patented? The short answer to this question is yes. The long answer will become

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<sup>35</sup> Nuvolari, 'Collective Invention', pp. 357-8.

<sup>36</sup> *Ibid.*, p. 358.

clearer through further analysis and can be explained by examining the different types of knowledge in the pottery industry and considering the strategies of producers. These findings provide some support for Moser's assertion that the variation in the propensity to patent across industries can be explained as a function of the kind of reliable scientific or technical knowledge in each industry.<sup>37</sup>

The key points to take from this analysis so far are firstly, patenting was *not* widespread in the pottery industry and was extremely scarce until the 1840s. Patenting an innovation was not a strategy employed in the industry. Secondly, although earthenware manufacturers themselves were the largest single group of patentees, 71 per cent of patents came from outsiders, most of whom were not resident in Staffordshire. We may therefore confidently draw a similar conclusion from this analysis as has been found in other industries; much of the innovation and inventive activity, and the appropriation of knowledge, was conducted outside the patent system. Such evidence provides a much-needed addition to the body of knowledge on patenting and inventive activity in individual industries to complement the broader studies by Nuvolari, Moser and their co-authors. The question remains as to *what* was being patented and what types of knowledge underpinned those innovations that *were* being patented.

Having presented the quantitative empirical evidence and available data for patenting activity in the pottery industry, this discussion will move to the patent specifications themselves and what types of innovations and knowledge were being patented. The new empirical research presented above means we now know who was patenting, where they were, and how many patents were granted. Such evidence provides a much-needed addition to the body of knowledge on patenting and inventive activity in individual industries to complement the broader studies of types of knowledge by Nuvolari, Moser and their co-authors.<sup>38</sup> The information presented in Table 7.1 includes the

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<sup>37</sup> Moser, 'Why don't inventors patent?', p. 3.

<sup>38</sup> See footnotes referenced in this chapter for examples.

category and sub category of each patent. These have been determined by reading the specifications and information available for each patent individually.

Patents granted in the pottery industry can be grouped into five main categories: products, processes, recipes, raw materials and ancillary products. Product innovations resulted in an entirely new type of ware, such as Wedgwood's black basalt ware (patent 939).<sup>39</sup> Process innovations increased efficiency of production by altering a stage in the production process, either through mechanical or chemical means. Recipes were new compositions for glazes or bodies which detailed the combination of materials being used. Raw materials innovations mostly dealt with the grinding and preparation of flints, clays and other ingredients. Ancillary innovations, whilst not completely removed from the manufacture of earthenware products, were mainly composed of broader applications of methods and techniques. For example, a patent for earthenware clock faces was granted in March 1851 to the potter Herbert Minton and a London based merchant Augustus Hoffstaedt (patent 13558).<sup>40</sup> Hoffstaedt was an interesting choice in partner for Minton, having spent at least three years in prison between 1842-5 as a result of a bankruptcy in October 1841.<sup>41</sup> The shares of each of these categories for the period 1617-1851 are shown in Figure 7.7. This is as a total of all specific pottery patents (total 108).

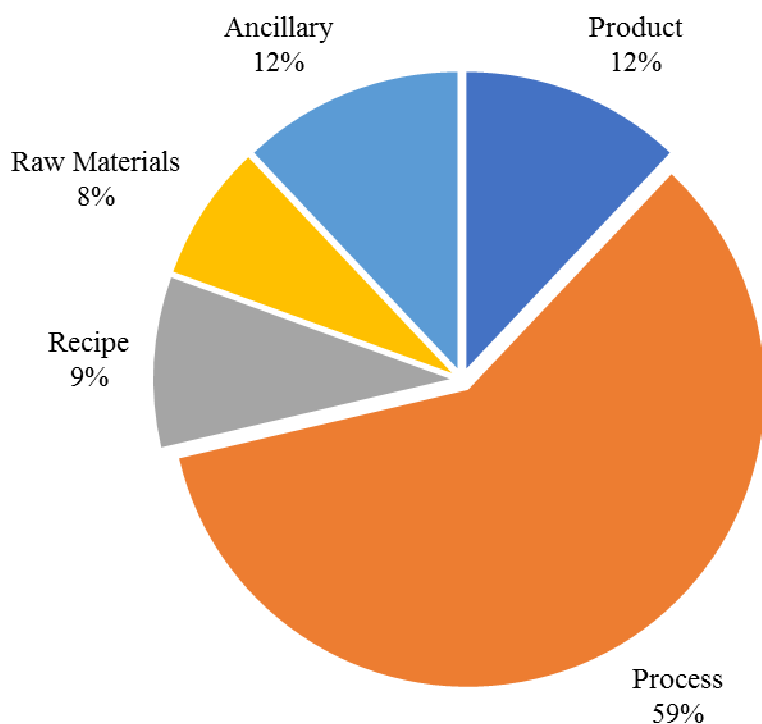
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<sup>39</sup> Woodcroft, *Patents for Inventions: Abridgments*, p. 9.

<sup>40</sup> *Ibid.*, p. 67.

<sup>41</sup> *The Jurist*, Vol. VI, Part II (1843) p. 93; *The Law Journal, New Series, Bankrupts, Certificates, and Dividends, Advertised in the London Gazette During the Year 1841* (1841), p. 64; *Appendix to the Reports of the Select Committee of the House of Commons on Public Petitions. Session 1845* (1845), p. 471.

Figure 7.7: Categories of all pottery patents granted in England, 1617-1851



Notes: Shares shown here are as a total of the 108 specific pottery patents

Pottery patents were dominated by process innovations such as John Pepper's improved kiln construction to reduce fuel consumption, or John Ridgway and George Wall's repeated attempts to mechanise flat-ware production in the 1840s.<sup>42</sup> Just 12 per cent of patents were for product innovations such as Cookworthy's English porcelain, or the garden pots of Cutten and Brown.<sup>43</sup> It is also interesting to note that only one of these product patents was held by a resident of the potteries, Josiah Wedgwood. The remainder of these patents were held outside of the district. Of the patents issued between 1750 and 1851, over 40 per cent of these related to process innovations which were easily observable and reverse-engineered. For example, there were three different kiln designs awarded patents in 1796. John Pepper designed a new firing oven. The design plans submitted with his patent specification show that the kiln had to be a square of at least twenty feet across, had a height of at least four feet, and included foundations three feet deep to house

<sup>42</sup> Woodcroft, *Patents for Inventions: Abridgements*, Patents 2140, 8338, 8339, 8340, 9901, 11912.

<sup>43</sup> *Ibid.*, Patents 898, 8254, 9518.

ventilation shafts to regulate temperature and burning.<sup>44</sup> Ralph Wedgwood was also granted a patent for a new kiln design, and Valentine Close and James Keeling were jointly granted a patent for a new close-mouthed oven.<sup>45</sup> Wedgwood's patent in particular was visually striking, as it moved some of the fireplaces into the exterior walls of the kiln, rather than having them adjoining the outside as was previously the case.<sup>46</sup> These kilns were not small structures, and indeed, required considerable construction and ground preparation before installation. Keeping the installation of a new kiln secret from competitors, given the spatial proximity of manufactories, must have been virtually impossible. The innovations in these patents and others such as machinery and grinding tools were largely based on explicit practical or mechanical knowledge rather than tacit scientific knowledge. This type of knowledge was visible, had been embedded and articulated clearly in an object, and was therefore more easily defensible using a patent. Figure 7.8 shows the frequency of each of the five categories of patents across different groups of patentees. The distributions are fairly similar across all groups although there is considerable variation between patentee's resident in Staffordshire, and those outside of the county. Only fifty per cent of those patents granted to patentees outside of the county were for process innovations, whereas this figure is over seventy per cent for those resident in Staffordshire. There is also considerable difference in the proportion of ancillary and product patents held by these two groups of patentees. Both product and ancillary patents each accounted for fifteen per cent of patents issued to patentees outside of Staffordshire, whereas for patentees within the county this share dropped to just five per cent. The geographical or regional effect only becomes apparent when we examine the types of innovations being patented. The larger share of product and ancillary patents inside the county reflects the sheer volume and variety of production of wares.

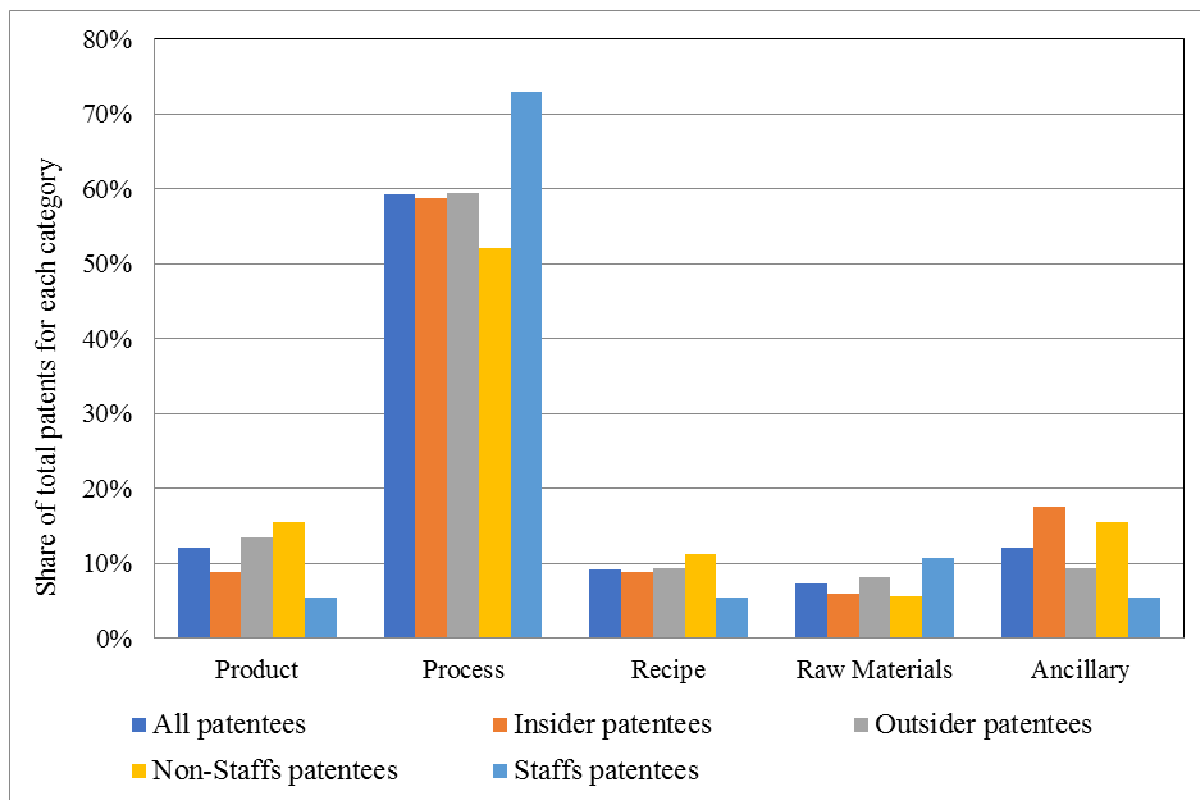
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<sup>44</sup> *The Repertory of Arts and Manufactures*, (Vol. 5, 1796), Plates 16-17, pp. 289-292.

<sup>45</sup> *Patents for Inventions: Abridgments*, pp. 14-16.

<sup>46</sup> *Ibid*, p. 15.

Figure 7.8: Comparison of patentees and patent categories in England, 1617-1851



#### 7.4 Knowledge in patent specifications

Patent specifications exist for our entire sample of patents and provide a great deal of information on a given innovation, the novel components, and the use for which it was intended. The following specifications are representative of the entire sample and are particularly revealing. They have been compiled from (a) Woodcroft's *Titles of Patents for Invention, Chronologically Arranged*, and (b) *Patents for Inventions, Abridgments of the Specifications Relating to Pottery*. The first patent, number 649, is from the beginning of our period and was granted in 1749 to Thomas Frye, a pottery painter from Essex who worked at the Bow porcelain factory and developed 'a new method of making a certain ware'. Emphasis has been added to several vague terms and phrases.

Patent 649: Thomas Frye – a new method of making a certain ware

- (a) FRYE. 17<sup>th</sup> Nov. 1749 **649.** A grant unto Thomas Frye, of the parish of West Ham, in the county of Essex, painter, of his new invented method of making a certain ware.

(b)

*FRYE, THOMAS.- “New method of making a certain ware, which is not inferior in beauty and fineness, and is rather superior in strength, than the earthenware that is brought from the East Indies, and is commonly known by the name of china, japan, or porcelain ware. Animals, vegetables, and fossils, by calcining, grinding, and washing, are said to produce an insoluble matter named virgin earth, but come, in greater quantities than others, as all animal substances, all fossils of the calcareous kind, such as chalk, limestone, &c.; take, therefore, any of these classes, calcine it, grind and wash it in many waters, and reiterate the process twice more, when the ashes or virgin earth will be fit for use. These ashes are mixed in certain proportions with flint, white pebble, or clear sand, and with water made into balls or bricks, highly burned, & ground fine, and mixed with a certain proportion of pipe clay; it is thrown on the wheel, & when finished, dried, burned, and painted with smalt or zaffre, when it is ready to be glazed with a glaze made first by making a glass with salt petre, red lead and sand flint or other white stones in certain proportions, grinding it up well, and mixing it with a certain proportion of white lead, adding a small proportion of smalt to clear the colour. After dipping and drying the articles are put in cases, and burned with wood, till the surface of the ware is clear and shining.<sup>47</sup>*

This patent specification, which was the second patent held by Frye for porcelain ware, is particularly interesting as it is rather vague in its detail, almost to the point of absurdity.<sup>48</sup> Upon reading the specification it seems almost any combination of a large number of ingredients will render ‘a certain ware’ purported to be English porcelain. No amount of tacit understanding or experience in pottery production would enable anyone to accurately decipher the recipe. There are so many instances of ‘certain proportions’ or ‘quantities’ that it is unclear exactly what the innovation is. This was most likely a deliberate attempt to obscure any detail of the process on the part of Bow porcelain factory, with the true purpose of the patent to grant protection over the use of and experimentation with the numerous materials listed.<sup>49</sup> This is a far cry from the ‘reliable,

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<sup>47</sup> Woodcroft, *Patents for Inventions: Abridgments*, p. 7; *Titles of Patents*, p. 121.

<sup>48</sup> The first patent was held jointly with a Merchant at Bow, Edward Henlyn and was similarly obscure and vague.

<sup>49</sup> *A History of the County of Middlesex: Volume 2 (Victoria County History: London, 1911)*, p. 146.

transparent and definitive statements' specifications were officially required to provide.<sup>50</sup> Here we have an interesting example of a patent being used to appropriate knowledge which had in all likelihood not been articulated fully even in the head of Frye himself.

The second patent was granted to Josiah Wedgwood in 1769 for his famous black basalt ware and was the only patent held by the Master Potter.

Patent 939: Josiah Wedgwood (I) – his invention for the purpose of ornamenting

- (a) WEDGWOOD. 939. A grant unto Josiah Wedgwood, of Burslem, in the county of Stafford, potter, of his invention for the purpose of ornamenting of earthen and porcelaine ware an encaustic gold bronze, together with the peculiar species of encaustic painting in various colours.  
16<sup>th</sup> Nov. 1769
- (b)

*WEDGWOOD, JOSIAH.- "The purpose of ornamenting earthen and porcelaine ware with an encaustic gold bronze, together with a peculiar species of encaustic painting in various colours in imitation of the antient Etruscan and Roman earthenware. In carrying out this invention, the patentee first prepares ten ingredients, among which is bronze powder, some of these are one chemical substance, whilst others are composed mostly of several chemical substances in certain proportions, and generally calcined together. The substances are Ayoree, a white earth in North America, gold, aqua regia, copper, oxide of antimony, tin ashes (oxide of tin), white and red lead, smalts, borax, nitre, copperas, flint, manganese and zaffre. By mixing these ingredients with the exception of the bronze power, in different proportions, he obtains seven colours, which he names as follows: - Red, orange, dry black, white, green, blue, yellow, and he produces another colour, which he names shineing black, by mixing some of these ingredients and one of the colours, namely, the green.*

*In applying the bronze powder, grind some of it in oil of turpentine, and apply this by sponge or pencil to the vessels finished, ready for burning, but not quite dry, polish it; heat the ware as high as is necessary for it; afterwards burnish the bronze. Applying the bronze after the ware is fired basket, make a mixture in certain proportions of white lead and calcined ground flint, grind them well together; apply this thin with a sponge or brush, flux it, then apply upon it the bronze as before directed.*

*Shining black (and other colours) upon red vessels, antique Etruscan vases. These colors are ground with oil of turpentine before applying them to the vessels, and are proceeded with as in the first application of the bronze powder.<sup>51</sup>*

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<sup>50</sup> Bottomley, *The British Patent System*, p. 181.

<sup>51</sup> Woodcroft, *Titles of Patents*, p. 169; *Patents for Inventions: Abridgments*, p. 9.



This abridged specification was published in Woodcroft's Index during the second half of the nineteenth century.<sup>52</sup> A full and complete specification was printed in the *Repertory of patent inventions* in 1797, although this almost thirty years after the initial patent was granted, and the term had expired.<sup>53</sup> The original specification contained weights and measurements and a relatively detailed description of the process required although it is still far from a 'how-to' guide to re-creating the encaustic decoration. Aside from being an extremely complex process, and one which was very difficult to get to work, the patent reveals the extent of Wedgwood's knowledge of minerals and chemical processes. The knowledge underpinning this patent was complex scientifically derived knowledge combined with experiential knowledge gained through extensive experimentation. As will become clear through later discussion, Wedgwood was extremely careful not to reveal too much information about his innovation.

The third patent examined is for a decorative gold lustre recipe and was granted to Godwin Embrey, a North Staffordshire potter, in April 1835.<sup>54</sup>

Patent 6817: Godwin Embrey – Certain improvements in ornamenting of china

- (a)            EMBREY.        **6817.** A grant unto Godwin Embrey, of Lane Delph, in the  
14<sup>TH</sup> April 1835    parish of Stoke-upon-Trent, in the county of Stafford, potter,  
for his invention of 'Certain Improvements in ornamenting  
china, glass, and earthenware'.
- (b)

*EMBREY, GODWIN.*—"Certain improvements in ornamenting of china, glass, and earthenware. This consists, first, in making a composition differing from the composition known to potters as gold lustre, made with the following ingredients, and in certain proportions, namely, gold, grain tin, nitromuriatic acid, and balsam of sulphur, and spirit of turpentine, and boiled oil, and gum, and applying the same as follows:- Spread upon a plate engraved with the design to be transferred some of the composition, wipe off what is superfluous, cover the plate with a sheet of paper, &c., and pass them between rollers or otherwise, separate the paper from the plate, cut away all from the design, and spread the design on the surface of the china, &c.; apply pressure, afterwards remove the design, and dust the china with gold precipitated or

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<sup>52</sup> Woodcroft, *Patents for Inventions: Abridgments*, p. 9.

<sup>53</sup> *The Repertory of Arts*, (Vol. 7, 1797) pp. 309-14.

<sup>54</sup> Woodcroft, *Patents for Inventions: Abridgments*, pp. 29-30; *Titles of Patents*, p. 971

*pulverized with the aid of mercury, added to a preparation of borax, lead, and other substances known as flux, and gently rub it; then fire and afterwards burnish it. Second, to the above composition, adding nitrate of mercury. Third a composition of precipitated gold, or gold pulverized by mercury, or gold used by gilders of china, &c., oils, gum and turpentine. Fourth, to the last position, adding nitrate of mercury. These two are applied as the first two.*

There was considerable scepticism at the time concerning the degree of novelty in this innovation, and indeed whether the specification provided any new information or knowledge.<sup>55</sup> The *London Journal* provides an account of the specification which is useful here:

*This invention appears to us to possess but a very slight degree of novelty, the whole of the invention consisting in adding a little gum to the ordinary composition in use among potters, and known by the name of gold lustre [...] but for what purpose this ingredient is added, the specification does not inform us.*<sup>56</sup>

Embrey's patent specification, whilst including some details of weights and measures, does not contain any new information or knowledge, and these form the basis of the confusion noted in the *London Journal*. This may have been an attempt on Embrey's part to capitalise on an existing set of techniques and knowledge which were already 'commonly used' in the industry. In this instance, Embrey used the patent as a way of appropriating existing rather than newly created knowledge.

The final two patent specifications to be examined highlight the differences between patents pertaining to or containing valuable scientific knowledge, typically difficult to reverse-engineer, and those later patents granted during the 1830s and 1840s for mechanical innovations in which component pieces and mechanisms were more easily discernible. These patents were accompanied by annotated diagrams which were referred to in the specifications. The first was held by John Ridgway, a celebrated North Staffordshire potter who, along with George Wall, was involved in early attempts to mechanise pottery production during the 1840s. Between them, the pair took out five patents in the decade including one for a flatware machine known as a *Jolly* which was installed at Mason's manufactory in North Staffordshire in November 1844. Early attempts by the

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<sup>55</sup> *The London Journal of Arts*, Vol. 13, Conjoined Series, (W. Newton: London, 1839), pp. 22-3.

<sup>56</sup> *Ibid.*, p. 22.

pair were largely unsuccessful and it was not until the 1870s that this type of machine was in general usage.<sup>57</sup> Ridgway's patent was relatively simple to understand and was clearly designed to be as detailed as possible with some passages accompanied with qualifications such as 'this term being well understood by potters and persons conversant with such manufacture'.<sup>58</sup> The potter was extremely clear in what invention he claimed and clearly lay out his contributions, namely, the use of two different substances to form the moulds for shaping wares.

Patent 8338: John Ridgway– improvement in the moulds used

- (a)            Ridgway.            **8338.** A grant unto John Ridgway, of Cauldon place, in the  
11<sup>th</sup> Jan 1840            county of Stafford, china manufacturer, for his invention of  
   an improvement in the moulds used in the manufacture of  
   earthenware, porcelain, and other similar substances,  
   whereby such moulds are rendered more durable.
- (b)

*To all to whom these present shall come, &c., &c.- My improvements in the moulds used in the manufacture of earthenware, porcelain and other similar substances whereby such moulds are rendered more durable, consists in the union or combination of two suitable substances to form the mould for shaping or working earthenware or porcelain, instead of making the mould of one substance or material throughout. The face of the mould which gives the shape or form to the article to be moulded is to be composed of a thin layer of the substance usually denominated "pitcher" (this term being well understood by potters and persons conversant with such manufacture), and is to consist of a mixture of, say eight pounds, of flint, two-and-a-half pounds of blue clay, and one pound of china clay, more or less, as may be found most desirable, and baked, which is then to be backed and strengthened by a composition-back, consisting of, say three parts, of sane, two of Roman cement, and one of plaster of Paris, the whole mixed with water, whereby, after standing, it becomes hard and durable. The union of these two substance to form the mould will allow it to receive and form or size most convenient for use.*

*Description of the Drawings*

*Fig. 1, is a face view.*

*Fig. 2, an edge view; and,*

*Fig. 3, a section of the mould. The "pitcher" face being represented at a, a, a, and the composition-back, b, b, b.*

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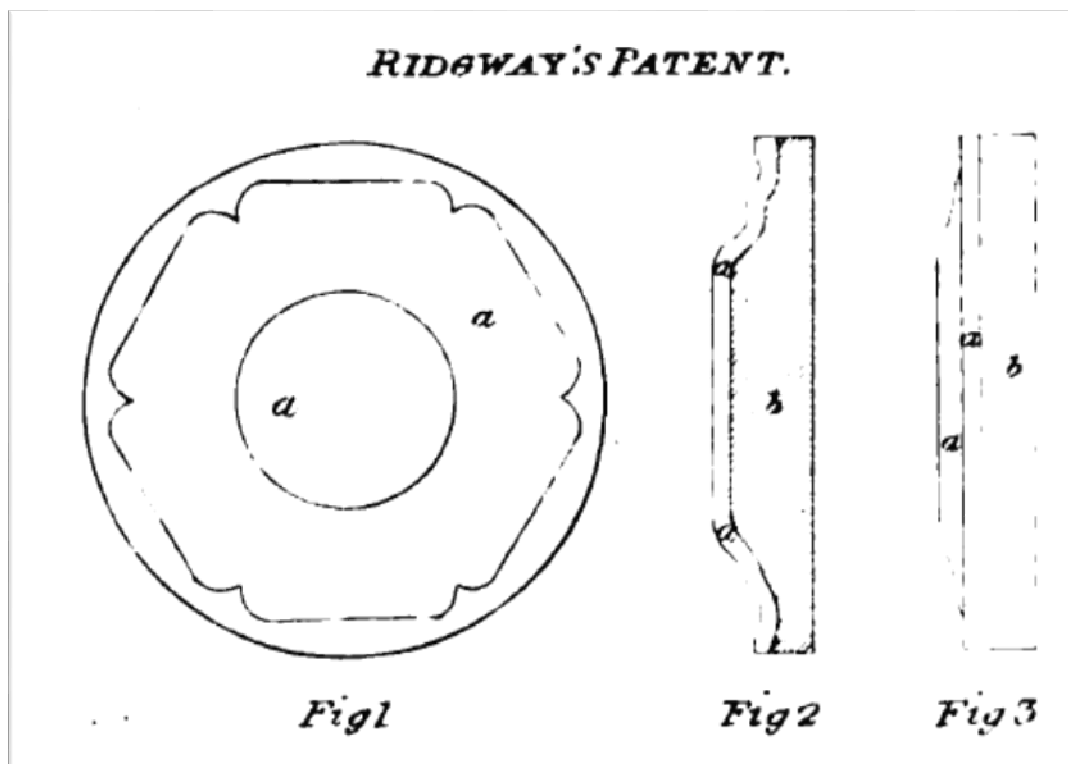
<sup>57</sup> Lamb, 'The Press', p. 1; Warburton, *The History of Trade Union Organisation*, pp. 191-2; Burchill and Ross, *A History of the Potters' Union*, p. 154.

<sup>58</sup> *The Repertory of Patent Inventions*, (Vol. 17, 1842) pp. 280-281; *Titles of patents*, p. 1099.

*Having now particularly described the nature of my said invention, and the manner in which the same is to be performed, I desire it to be particularly understood that I do not intend to confine myself to the exact proportion or materials, either of the “pitcher” face, or of the composition-back, for moulds, as it may be necessary to vary the same in order to suit convenience; but I include all or any materials whatever, which, being baked, come under the general denomination of “pitcher” for the face of the moulds, and also any materials, metals, or modification whatever to form the back of the moulds; but I claim as my invention the union or combination of the two parts constituting the “pitcher” face, and a composition mixed, or metal back, to form moulds used in the manufacture of earthenware, porcelain, and other similar substances.*

The patent was filed with an annotated diagram which is shown in Figure 7.9.

Figure 7.9: Annotated drawing submitted with Ridgway's patent application: granted 11 January, 1840



Source: PLATE XIV, *The Repertory of Patent Inventions*, (Vol. 17, 1842)

Ridgway's innovation was simple to articulate. In the closing paragraph of his specification, the potter made his intentions to continue innovating around this theme, with the use of alternative materials and proportions; an attempt, no doubt, to protect him against similar innovations from rival potters

The difference in approach to this type of specification is even more pronounced when we examine the patent of Henry Trewhitt, a Gentleman from Newcastle-on-Tyne which was granted in December 1839.<sup>59</sup> The full specification is extremely detailed and accompanied by numerous diagrams, such as those shown in Figure 7.10. Each component part was referred to in the specification including the material they should ideally be formed of (copper, iron etc.). The process of each mechanism was described along with the function of each part. From a technical perspective, there is no reason to believe that someone with experience of machine making would not be able to reproduce the machine to a reasonable degree of accuracy thus allowing for tinkering and improvement. Whilst this patent undoubtedly revealed a great deal about the machine, the specification itself is purely technical and does not contain any additional insight or information which could not be gleaned by viewing the machine in person.<sup>60</sup>

Patent8295: Henry Trewhitt – a mode of fabricating china and earthenware

- (a) Trewhitt. **8295.** A grant unto Henry Trewhitt, of Newcastle-on-Tyne, I  
4<sup>th</sup> Dec 1839 the county of Northumberland, esquire, for ‘Certain improvements in the fabrication of china and earthenware, and in the apparatus or machinery applicable thereto’
- (b)

*This invention consists of a mode of fabricating china and earthenware by means of moulds or dies, and pressure. In Plate XII, fig. 1, represents an elevation of a press, and dies or moulds; the details are shewn at fig. 2. 1, is the framing of the press; 2, metal plate; 3, represents other metal plates, which have grooves, from the centre outwards, in which the parts of the die or mould slide from and to the centre; 4, shews the three portions of the concave die or mould, which are opened outwards by means of the cords passing under the frame of the press, and they are moved by the roller, -they are pushed towards the centre by the springs pressing on the lever seen at fig. 1.- These moulds should be of copper. -5, is the pallet of the mould, part of which is raised, as the mould opens, to remove the vessel made, and facilitates its removal from the mould; 6, tube containing the springs; 7, the pulley and frame; 8, coupling swivels; 9, shews one half of the zinc cover of the table; 10, iron shaft or axis, acting as the conductor to the die or mould, which forms the hollow of the vessel; 11, the inner die or mould, turning on the end of the shaft 10; and there are two handles affixed to this mould or die, by turning which, when the act of moulding by pressure is complete, the die will be detached, and*

<sup>59</sup> Patent no. 8295, Dec. 4 1839: *Titles of Patents*, p. 1095.

<sup>60</sup> *The London Journal of Arts*, Vol. 18, (1841), pp. 297-300.

will at the same time, polish the interior of the vessel; 12, is a section of the dies or moulds, and also the exterior frame which encloses the mould 4, and keeps them secure during the act of moulding; and there is a small rod, which, passing up through the lower part or bottom of the mould, raises the vessel when complete; 13 is a rod, around which the spring 14, used for forcing in the parts of the mould 4, is wound; 15, copper tube, in which the spring is contained; 16, is the bearing, in which the parts 13, 14, and 15, are carried; 17, shews the three parts, 13, 14, and 15, together; 18, the joining pieces 8, shewn separately, to be affixed to the rod 13, and to the cord; 19, guide pullies and their frames, separately shewn in the plan at 7; 20, is an external frame or case, which is placed over the moulds 4, to hold them secure, when moulding by pressure; 21, plan of fig. 20; 22, shews the vessel separated from the moulds; 23, the inner face of part of the mould 4; 24, one third of the plate 2.

*It will be seen, that the arrangement of the moulds is such, that the various vessels made in the same dies or moulds will necessarily have the same uniformity and appearance; and by this mode, articles may be made at a much less expense than by the ordinary mode; an greater numbers may be produced, in the same time, without increasing the number of workmen. Although copper dies and moulds are preferable, yet they may be made of other suitable material.*

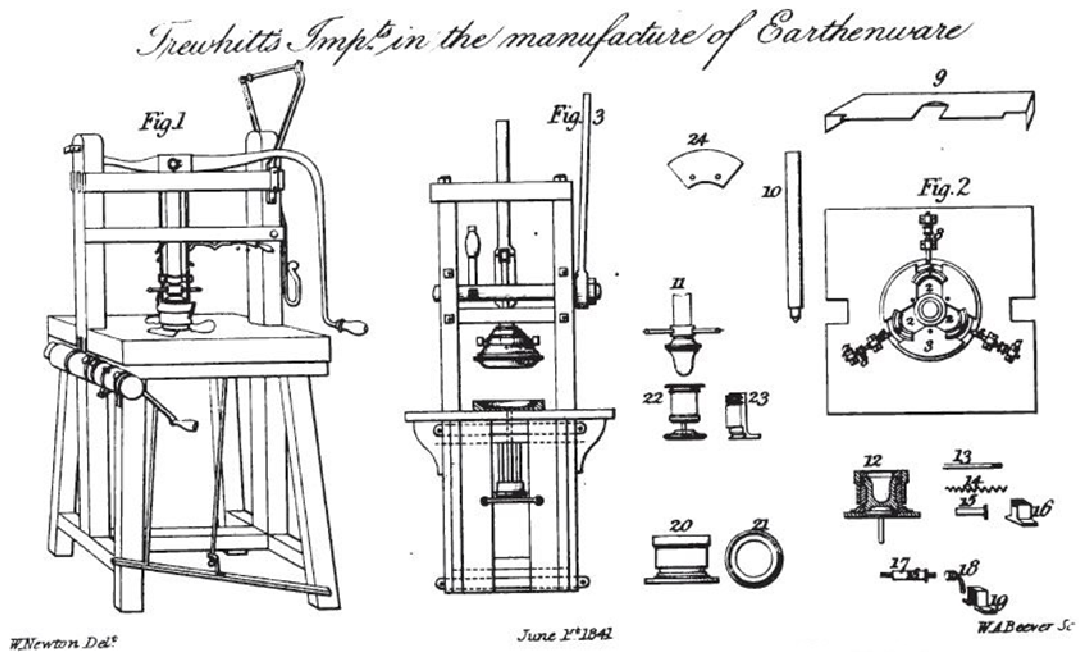
*Fig. 3, is a press of somewhat different description to that before shewn, but it is not necessary to describe the mode of working this or the former press, as they are not new, with the exception of the dies applied thereto.*

*Although only two constructions of moulds or dies are shewn,- one for plates and the other for small jars,- it will be evident, that in making other vessels of china or earthenware, convex moulds or dies, of the figure of the interior will be employed and concave moulds or dies, having the figure of the exterior of the vessel to be made therein, will be necessary; and when the vessel to be made is deep, then the concave die is to be of several pieces, capable of separating, to deliver the articles moulded.*

*The patentee claims the mode of making vessels in china and earthenware, by means of dies or moulds, and pressure; one of such dies or moulds being of the figure of the interior of the vessel, and the other of such moulds being of the figure of the exterior of the vessel, as above described.*

This innovation claimed to provide solutions to two key concerns of manufacturers: increasing output whilst reducing the wage bill, and creating large numbers of identical wares rapidly.

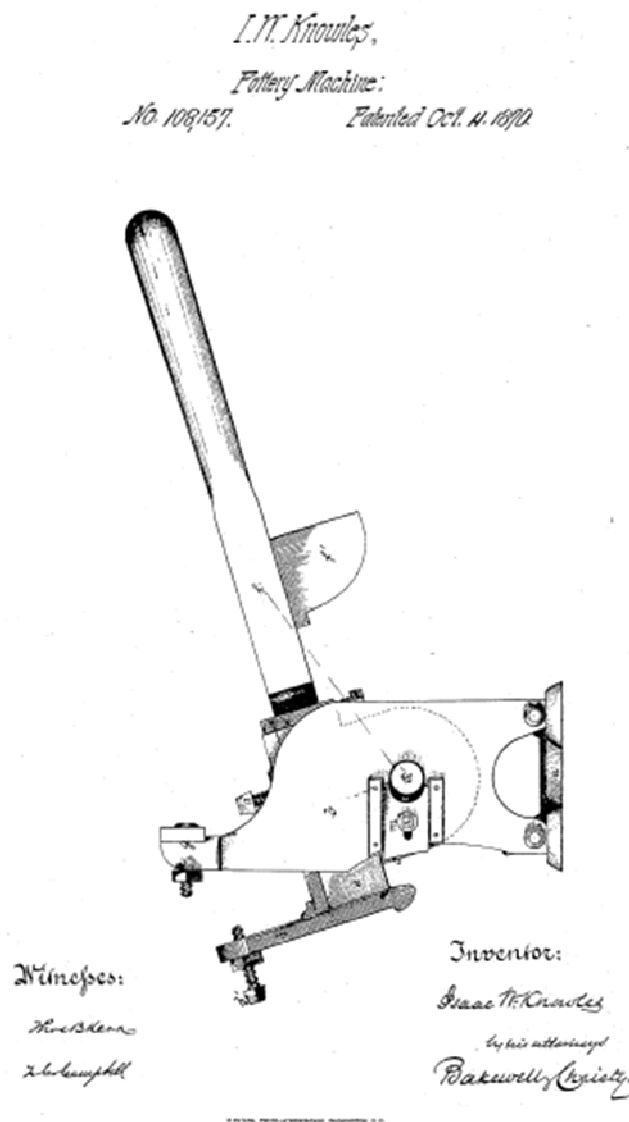
Figure 7.10: Technical Drawings for Henry Trewhitt's Patent: granted 4 December, 1839



Source: Plate 12, *The London Journal of Arts* (Vol. 18, 1841).

The level of detail provided by English mechanical patents in the 1840s is comparable to those provided for US pottery patents of the 1870s, the period of experimentation with machinery, which were also accompanied by lengthy descriptions and technical drawings. This is shown in Figure 7.11, Isaac Knowles' diagram accompanying his patent of 1870 for a new machine that allowed the regulation of the thickness of wares when using a pull-down mechanism commonly known in the industry as a *jigger*. The basic mechanism in Knowles' machine employed the same principles as those invented in England during the 1840s; a mould was pulled down or pressed into onto a bat of clay that rotated on the wheel. The lever arm formed one side of the ware, and the mould on the wheel formed the other side. Knowles' innovation was to introduce pegs and screws (seen at the bottom of Figure 7.11) that prevented the lever from travelling beyond a given point, thus limiting the depth that the mould or tool pressed into the clay on the wheel. The tool fixed to the lever arm shown in Knowles' patent was for the production of hollow ware. The blade tool on the arm formed the inside of a ware, with the curve forming the interior profile of a bowl.

Figure 7.11 Technical Drawing for Isaac Knowles' Patent: granted 11 October, 1870



Source: 'Patent 108,157', 'Patents Full Text Database', United States Patent and Trademark Office (USPTO), online at: <http://patft.uspto.gov/netacgi/nph-Parser?Sect2=PTO1&Sect2=HITOFF&p=1&u=/netacgi/PTO/search-bool.html&r=1&f=G&l=50&d=PALL&RefSrch=yes&Query=PN/108157>, [accessed 12 August 2012]

Patent specifications in the English pottery industry can thus be divided into two types based on their knowledge components. The first type, the detailed patent specification, offered potential readers a large amount of information and, in the case of those such as Trewhitt's, almost certainly offered enough for a reader with a limited degree of experience or knowledge to reconstruct or replicate the invention. The knowledge disseminated here was mechanical knowledge, and to return



to Collins' conception, articulable and explicated by virtue of its embodiment in a tangible object.<sup>61</sup> The fact that it was fully articulable and embodied in a clearly visible mechanical lever or arm, rendered it more easily defensible through the patent system.

The second type of patent, the vague, abstract and sometimes incomprehensible patent, offered little valuable information to a reader and often, though not always, only signified that some sort of innovation had occurred. The knowledge behind those patents which did support an innovation was clearly extremely valuable and specifications appeared to reveal as little as possible to pass the scrutiny of the patent office without offering too much information to competitors. A degree of the scientific and chemical knowledge hinted at in these patent specifications was explicable, in the sense that quantities and procedures for recipes *could* be written down in considerable detail (as in Wedgwood's patent and the discussion below). This was largely not the case however, and much of the valuable and useful knowledge that could be articulated was kept secret, either in the head or experiment books of the Master Potter. The other component of this second type of knowledge was the tacit element that could not be articulated easily and is best captured by Polanyi's dictum that 'we know more than we can tell'.<sup>62</sup> No amount of detail or written text could disseminate the skills and experience required to develop and make a new design, shape, pattern or style.

Registered designs or copyright protection did not exist in England until the 1840s. Whilst other trades such as printmakers, artists, and cotton textile printers were early beneficiaries of the 1735 *Hogarth's Act*, and the Copyright Act of 1787, earthenware goods had no such institutional protection until the introduction of the Copyright of Designs Act in 1839.<sup>63</sup> There was not much agitation for such protection from England's potters before this; much of the push for legislative protection for design came from textile manufacturers and calico-printers.<sup>64</sup> The second Copyright

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<sup>61</sup> Collins, *Tacit and Explicit*.

<sup>62</sup> Polanyi, *The Tacit Dimension*, pp. 4, 10.

<sup>63</sup> MacLeod, *Inventing the Industrial Revolution*, p. 67.

<sup>64</sup> Alexander Carter-Silk and Michelle Lewiston, 'The Development of Design Law, Past and Future, From History to Policy', *Intellectual Property Office Report*, No. 2012/15, (IPO: 2012), pp. 27-31.

of Designs Act issued in 1839 extended protection to the design and shape of manufactured goods including earthenware. This was later repealed and replaced by The Ornamental Designs Act of 1842 and the Utility Designs Act of 1843. The acts are of crucial importance to the pottery industry because they created and reinforced a legal distinction between *form* and *function* and granted through patents, intellectual property protection for design, ornamentation, shape and utility of manufactured goods.<sup>65</sup> MacLeod argues that because this legal framework was absent before the middle of the nineteenth century, the tension around what constituted a novel invention ‘was at its most acute’, thus, the majority of potters refrained from patenting in acknowledgement of this issue.<sup>66</sup> This could help to explain the consistently low level of patenting in the pottery industry until the 1840s.

However, given the importance of tacit and uncodified knowledge in pottery production, the difficulty in reverse engineering such knowledge, and the lack of widespread mechanical penetration into the industry, any explanation based solely on the legislative environment is not sufficient. If we accept the argument put forward by Moser that the level and type of knowledge in an industry largely determines the propensity to patent and the degree of innovation outside of the patent system, we must engage further with the innovations themselves and evidence other than patents.<sup>67</sup>

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<sup>65</sup> *Ibid.*, pp. 30-31.

<sup>66</sup> MacLeod, *Inventing the Industrial Revolution*, pp. 66-7.

<sup>67</sup> Moser, ‘Why don’t inventors patent?’, p. 3.

## 8 Knowledge and innovation outside the patent system

Exhibition records offer an indicator of innovation in an industry regardless of whether they were patented or not. As Moser notes, a crucial weakness in exhibition data in general is that innovations which were easy to replicate or copy may be underreported if we assume that innovators may not wish to divulge their secrets.<sup>1</sup> With earthenware exhibits this is not as serious an issue as the innovation or key component of potters' wares, the composition of the body, was inherently difficult if not impossible to determine once at the fired stage. The fact that most the pottery exhibits displayed at the Crystal Palace were finished wares and were freely open to examination by any paying visitor suggests that potters were not concerned that their trade secrets would be revealed or discovered in this way.<sup>2</sup> In our case, official reports of exhibitions and fairs are useful as they reveal the perception of novelty, innovation and success in the pottery industry. We have already noted in the introduction to this thesis that Staffordshire potters dominated the exhibits on display at the Crystal Palace. Official reports relating to the Great Exhibition of 1851 contain detailed and remarkably balanced accounts for each of the thirty exhibition classes, in addition to strict industry-specific criteria upon which international prize juries must base their decisions.<sup>3</sup>

Pottery prizes and awards at the Crystal Palace were given for 'Important inventions and discoveries, or regularity combined with excellence of design; novel application of known discoveries; great utility combined with economy and beauty; excellence of workmanship and quality.'<sup>4</sup> The eight members of the jury for this class comprised of china and earthenware manufacturers from Staffordshire, London, Sèvres, the German Confederation, Russia and Portugal.

Non-practitioners on the panel were the Duke of Argyll and Charles Wall, a merchant and MP; two

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<sup>1</sup> Moser, 'How do patent laws influence innovation?', p. 1219.

<sup>2</sup> *Great Exhibition of the Works of Industry*, pp. 709-728.

<sup>3</sup> *First Report of the Commissioners for the Exhibition of 1851*, (Spicer Brothers: London, 1852); *Reports by the juries on the subjects in the thirty classes into which the exhibition was divided, in four volumes, Great Exhibition 1851* (Spicer Brothers: London, 1852).

<sup>4</sup> *First Report of the Commissioners*, p. 202.

associates, one MP and Thomas Henry, an analytical chemist and Fellow of the Royal Society. The group appear to have been particularly strict with regards to their interpretation of the criteria and what constituted ‘Novelty of invention’, even going so far as to make slight alterations replacing ‘regularity’ with ‘originality’ and emphasising design and aesthetic qualities (which was within their mandate).<sup>5</sup> Decorative features of the wares were not the primary concern of the exhibition jury who favoured utility and practical innovations over style. For example, Table 8.1 contains the full list of British earthenware producers who received an award from the jury for their exhibits. *J. Rose & Co* were awarded a prize medal for the ‘hardness and transparency’ of their glazes, J. Bourne received a medal for his stone bottles in a new body which resisted tainting.<sup>6</sup> Style was noted by the jury, although it was superseded by innovation as shown in the case of W. T. Copeland’s prize medal. The citation for Copeland noted that while the ‘novel style [of the wares] may be a question of taste’, the skill and required to produce them, and the new colours created were key.<sup>7</sup>

The jury were also particular in their report which goes to great lengths to justify the exclusion of Parian or Statuary Porcelain as a new invention. Whilst this body was an ‘important advance’ for the industry in Britain, ‘the amount of novelty in the material’ was difficult to determine and it was ‘hardly entitled to rank as an entirely new invention’ given that similar results could be attained through different compositions. A similar example is described at length in the report and refers to a process of making earthenware buttons, which, despite outperforming existing processes in terms of commercial success, was identical ‘in principle’ to an existing methods, and thus, not eligible for an award on the grounds of novelty of invention.<sup>8</sup> This emphasis on novelty and the improvement of design and process is indicative of concerns on the part of some of the exhibition organisers that Britain was stagnating; the exhibition should function as a ‘celebration of British ingenuity’ and an

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<sup>5</sup> *Reports by the Juries*, pp. 1183-1184.

<sup>6</sup> *Ibid.*, pp. 1189-1191.

<sup>7</sup> *Ibid.*, pp. 1188-1189.

<sup>8</sup> *Ibid.*, p. 1185

incentive and stimulus for further innovation and progress.<sup>9</sup> The criteria for novelty, invention and innovation were exacting and, overall, applied relatively evenly. Given this, the awarding of a prize may be taken as a proxy, albeit a very rough one, for international conceptions of what constituted leading quality, invention and innovation in the pottery industry by the middle of the nineteenth century.

Based on the accounts of each exhibit in the reports, at the general level the key reasons for the granting of each prize indicate that novelty, unsurprisingly, played a key role; novelty in design and patterns, style and modelling, in the production process and in the creation of new colours.<sup>10</sup> Much of the novelty rewarded at the exhibition was the result of innovation in design and creativity but which was nevertheless knowledge intensive. Utility and practicality were also important with several potters rewarded for modifying existing products through the addition of particular qualities and properties that enabled them to be more useful for a wider range of tasks, especially those involving chemicals.<sup>11</sup> Again, many of these innovations were the result of progress in knowledge-intensive research into glazes and compositions. The jury often commented on the ‘first-rate quality’ or the ‘delicate execution’ of the wares, thus fulfilling the obligation that prize winning entries exhibited ‘excellence of workmanship and quality’.<sup>12</sup> However, quality was almost never the principle or sole reason for an award and should not be a surprise given the prestige of the Great Exhibition and the challenging selection process.<sup>13</sup> Economy of production is mentioned explicitly in only two of the twenty-five citations although six refer to commercial success, target markets and exports which suggest that there was some recognition at least of the commercial nature of innovations. A small number of exhibits were commended for more structural qualities relating to

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<sup>9</sup> Jeffrey Auerbach, *The Great Exhibition of 1851: a nation on display* (Yale University Press: New Haven, 1999), pp. 91-108.

<sup>10</sup> See Table 7.1 for details of the key attributes of each award winning exhibit.

<sup>11</sup> See entries in Table A1 for: T. J. and J. Mayer; J. Bourne; W. S. Kennedy; G. Grainger and Co; S. Green and Co.

<sup>12</sup> *Reports by the Juries*, pp. 1184.

<sup>13</sup> Petra Moser and Tom Nicholas, ‘Prizes, Publicity, and Patents: Non-Monetary Awards as a Mechanism to Encourage Innovation’, *The Journal of Industrial Economics*, Volume 61, No. 3 (September 2013), p. 765.

feats of production; a notable example being the ‘very remarkable size’ of two vases produced by the Staffordshire firm C. Meigh and Sons.<sup>14</sup>

Based on the reports the key reasons for the granting of each prize indicate that novelty, unsurprisingly, played a key role. Utility and practicality were also important with several potters rewarded for modifying existing products through the addition of qualities and properties that enabled them to be more useful for a wider range of tasks, especially those involving chemicals. Quality was almost never the principle or sole reason for an award and should not be a surprise given the prestige of the Great Exhibition and the challenging selection process.<sup>15</sup>

The award citations for the Great Exhibition of 1851 suggest that novelty and innovation in the pottery industry at the end of our period largely relied on knowledge-intensive efforts in the scientific and chemical based processes of glazes, colours and body composition. The knowledge required to succeed in these aspects of production was to a large extent protected by the virtue that the end-products had undergone a series of irreversible chemical reactions during the firing processes. This renders the innovation somewhat elusive to the untrained eye, and very difficult to reverse-engineer even for a practitioner. If Moser’s analysis for the second half of the nineteenth century holds for our period, this may impact on the strategies employed by producers to appropriate the returns to their innovations.<sup>16</sup> The chemical based innovations deemed to be the finest required high levels of scientific knowledge (not necessarily formal knowledge) and could thus be protected outside of the patent system through, for example, secrecy.

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<sup>14</sup> *Reports by the Juries*, p. 1190.

<sup>15</sup> *Reports by the Juries*, 1184; Moser and Nicholas, ‘Prizes’, 765.

<sup>16</sup> Moser argues that the level of scientific knowledge in an industry accounts for the variation in the propensity to patent. Moser, ‘Why don’t inventors patent?’.

Table 8.1: Prizes awarded for earthenware and porcelain exhibits at the Great Exhibition, Crystal Palace, 1851

Exhibitor	Location	Prize Awarded	Key reason
H. Minton & Co.	Stoke-on-Trent, Staffs	Recommendation for Council Medal	'originality and beauty of design'; 'design and modelling of the figures'
W. T. Copeland	Stoke-on-Trent, Staffs	Prize Medal	'novel style' of inlaid pearls and jewels; 'a colour which is claimed as new'
T. Wedgwood & Sons	Etruria, Staffs	Prize Medal	the 'popular taste' of wares 'capable of being applied, and that cheaply, to almost every variety of domestic use'; 'particularly adapted for the export trade'
J. Rose and Co.	Coalbrookdale, Salop.	Prize Medal	'the hardness and transparency of glaze'
J. Ridgway & Co.	Cauldon Place, Staffs	Prize Medal	'ingenuity and success' in new sanitary ware and 'commercial importance'
T. J. & J. Mayer	Burslem, Staffs	Prize Medal	'novel', 'hard and vitreous body', a practical modification of tea-urns and jugs to withstand variations in temperature protect against boiling water
T. Dimmock	Shelton, Staffs	Prize Medal	'first-rate quality'; 'heatness and good taste'
S. Alcock & Co.	Burslem, Staffs	Prize Medal	'most delicate execution'; 'fancy and freshness of effect'
C. Meigh & Sons	Hanley, Staffs	Prize Medal	'specimens of very remarkable size'; 'has an extensive hold on the market'
T. & R. Boote	Burslem, Staffs	Prize Medal	'some new processes in the manufacture of earthenware'; 'inlaying of one clay upon another [...] which it was before impossible or difficult to produce'
J. Bourne	Derby Pottery, Derby	Prize Medal	stoneware bottles 'which have the property of resisting the action of blacking in a manner which had been found extremely difficult'
S. Green & Co.	Lambeth	Prize Medal	'hardness of glaze and other qualities, are of great value in many processes of chemical manufacture'
J. Finch	London	Prize Medal	no specific reason given
W. S. Kennedy	Burslem, Staffs	Hon. Mention	'utility of application is combined with cheapness and agreeable appearance'
Keys & Mounford	Newcastle-under-Lyne	Hon. Mention	'well executed' statuettes in parian
F. & R. Pratt & Co.	Fenton, Staffs	Hon. Mention	'a process which they seem to have greatly improved, viz., that of coloured printing under the glaze'
J. Bell & Co.	Glasgow	Hon. Mention	'good quality and design'
Chamberlain & Co.	Worcester	Hon. Mention	'perforated china of agreeable effect'
J. Edwards & Sons	Dale Hall, Staffs	Hon. Mention	size of replica vase
G. Grainger & Co.	Worcester	Hon. Mention	utility for chemical purposes 'well attested'
W. Southorn & Co.	Brosely, Shropshire	Hon. Mention	no specific reason given
G. Wood	Brentford	Hon. Mention	'remarkable size' of wares
Sharpe Bros. & Co.	Swadlincote,	Hon. Mention	no specific reason given
J. Lee	Rotherham, Yorkshire	Hon. Mention	'a useful and pretty adaptation' of earthenware for signage
E. Challinor	Not listed (Staffs)	Hon. Mention	no details given

There were of course other ways in which producers could achieve recognition and remuneration for their innovations before the proliferation of World Fairs after 1851. In 1822 Job Meigh was awarded a 'Large Gold Medal' by *The Society of Arts* for his production of a new lead-free glaze.<sup>1</sup> The details of this case published in both the *Mechanics' Magazine* and the *Transactions of the Society of Arts* and are particularly interesting as they were the subject of comment and debate in the trade literature of the time. *Mechanics' Magazine* was targeted at the 'autonomous practical artisan', and there is strong evidence to suggest that it had a wide readership among the artisan class outside of London.<sup>2</sup> An anonymous enquirer wrote to *Mechanics' Magazine* in May 1824 referring to an unknown gentleman (Meigh) who had been awarded a Medal for the discovery of a lead-free glaze. He suggested:

*'If that gentleman does not wish to monopolize to himself the advantages which may arise from his discovery, he would do well to give it publicity through the medium of the Mechanics' Magazine.'*<sup>3</sup>

Whilst this is suggestive of the notion that certain ideas and innovations were discovered but not appropriated by their inventors, perhaps in some altruistic manner, the response of a second anonymous contributor, 'G. C.', points toward a more logical explanation:

*'Specimens of the ware [...] and of the glaze itself, as well as of the ingredients of which it is composed, are placed in the Repository of the Society [of Arts]. See Volume 40, of the Transactions of the Society of Arts, in which is detailed the ingredients of the above glaze, and also an improved composition for the ware itself.'*<sup>4</sup>

The knowledge and secrets which could have been appropriated by Meigh himself were published, although in a very rudimentary format, and thus made publicly available.<sup>5</sup> A patent may have allowed Meigh to appropriate some of the gains from this discovery although in the event he was bound by the decree of the Society:

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<sup>1</sup> *Mechanics' Magazine*, 8 May, 1824, p. 142.

<sup>2</sup> Marsden, Ben, 'Carriages, coffee-cups and dynamometers: representing French technical cultures in the London *Mechanics' Magazine*, 1823-1848, Documents pour l'histoire des techniques, Vol. 19, (2nd semester 2010), pp. 243-54.

<sup>3</sup> *Mechanics' Magazine*, 31 Jan, 1824, p. 366.

<sup>4</sup> *Ibid.*, Sat 8th May, 1824, p. 142.

<sup>5</sup> A somewhat vague and simplistic recipe is printed in the source: *Transactions of the Society, Instituted at London, for the Encouragement of Arts, Manufactures, and Commerce*, Vol. 40, (London: 1823), p. 46.



*'no person shall receive any premium, bounty, or encouragement, from the SOCIETY, for any matter for which he has obtained any premium or reward from any other SOCIETY, or for which he has obtained, or purposes to obtain a patent; it being a condition stipulated with every candidate, that all articles rewarded by the SOCIETY, shall be freely given up to the public, to be made or manufactured by any person whatever.'*<sup>6</sup>

Sales catalogues are an excellent supplementary source as they are detailed and often illustrated, although very few from the eighteenth century survive. Wedgwood's innovations in marketing and sales techniques are well known and researched.<sup>7</sup> Examination of a sales catalogues from the 1780s gives us an indication of what one of the most successful and pioneering potters saw as novel and innovative.<sup>8</sup> Similarly to patents, they offer an internal view of knowledge and innovation and can indicate what potters themselves. The meticulously organised catalogue provides commentaries for each class of ware produced at Etruria, the majority of which came with a qualification of excellence: 'no cameos, medallions or bas-reliefs, of equal beauty, magnitude and durability [...] have ever before been offered to the public'; and perhaps the most self-elevating, 'persons of the most refined taste have acknowledged this to be a higher and more perfect species of painting than was known to the world before the date of this invention.'<sup>9</sup> This, of course, is to be expected. Wedgwood went to considerable efforts to illuminate the originality and innovation of a few choice pieces above all others: three pages and an illustration are reserved for Wedgwood's 'Etruscan' wares of a black basalt body and encaustic decoration, a style he pioneered during the late 1760s and had perfected by the 1770s.<sup>10</sup> This represented the pinnacle of experimentation, art, taste and imitation: the 'new species of encaustic colour [was] durable [...], entirely free from the varnished

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<sup>6</sup> *Ibid.*, preface, (vii-ix)

<sup>7</sup> see: McKendrick, 'Josiah Wedgwood: An Eighteenth Century Entrepreneur'; 'Josiah Wedgwood and Thomas Bentley', pp. 1-33; Blaszczyk, *Imagining Consumers*.

<sup>8</sup> *The Wedgwood Catalogue of 1787* (The Wedgwood Society of New York: New York, 1980), reprint of the original with title: [Catalogue of cameos, intaglios, medals, bas-reliefs, busts and small statues; with a general account of tablets, vases, ecritoires and other ornamental and useful articles. The whole formed in different kinds of porcelain and terra cotta, whitefly after the antique and the finest models of modern artists. By Josiah Wedgwood, F. R. S. and A. S. Potter to Her Majesty, and to His Royal Highness the Duke of York and Albany, sold at his rooms in Greek Street, Soho, London, and at his manufactory in Staffordshire]. Sixth Edition, with additions (Etruria, 1787).

<sup>9</sup> *The Wedgwood Catalogue*, pp. 31, 64-66.

<sup>10</sup> This encaustic style of decoration was, incidentally, the only innovation for which the potter held a patent. *Ibid.*, 62-5; Reilly, *Josiah Wedgwood*, pp. 79-81.

or glassy aspect' of previous imitations, and above all, consistent. 'The colours never spread in the fire or run out of drawing.'<sup>11</sup> Consistency should be seen as a relatively loose concept. Although by the time of the publication of the catalogue Wedgwood had attained a degree of efficiency in production of Etruscan wares, the potter was losing around 85 per cent of production in the firing stages in the late 1760s and thus had to charge very high prices.<sup>12</sup> Not only was Wedgwood's black basalt ware a completely new type of ware, but the recipe used for the body solved imperfections and inconsistencies in appearance and durability. The new method for encaustic decoration that Wedgwood introduced also had the compound effect of reducing the skill level required for English potters to imitate objects of classical antiquity. The catalogue claimed that the new method allowed 'moderately skilled painters' to achieve high levels of quality and likeness.<sup>13</sup> Wedgwood was careful not to reveal too much useful information regarding the composition or production process for his Etruscan ware, publicising just enough to signal that this was both extremely difficult and innovative whilst the all-important recipe and specific knowledge remained elusive. In the sources examined so far, the novelty and uniqueness of an innovation was disclosed, often overtly, to signpost an innovation or market a new product. However, barriers were raised around the crucial, specific knowledge that underpinned the new glaze or body recipe that provided the all-important properties of aesthetics, utility and durability.

Wedgwood also diversified into developing new uses for earthenware. He was keen to promote his innovative new black basalt bodied ink-stand which 'is neither corroded by the ink, nor absorbs it, nor injures its colour, as the metals used for these purposes do'. The entry in his sales catalogue of 1787 was accompanied by an annotated technical drawing, shown in Figure 8.1.<sup>14</sup>

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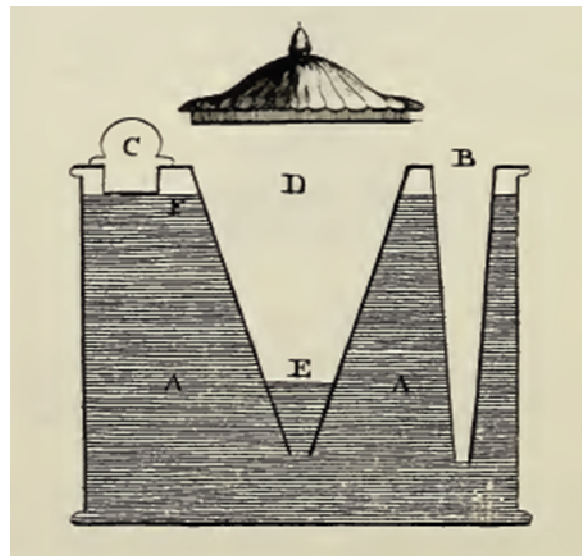
<sup>11</sup> *The Wedgwood Catalogue*, p. 64.

<sup>12</sup> Reilly, *Josiah Wedgwood*, p. 79.

<sup>13</sup> *Ibid.*

<sup>14</sup> *The Wedgwood Catalogue*, p. 67.

Figure 8.1: Wedgwood's black basalt ink-stand, advertised in his product catalogue of 1787



Source: *The Wedgwood Catalogue*, p. 67.

In a similar fashion to the patents of Ridgway and Trewitt, the illustration and description clearly reveal the mechanical and design properties of the ink-stand. Moreover, these features could be examined in detail and 'reverse-engineered' or imitated through purchase. This was not patented however and the chemical secrets of the composition of the black basalt body, the most crucial innovation in this product, remained intangible. Once more, Wedgwood was selective in the knowledge he revealed, publicising only that which could be easily attained by fellow manufacturers.

Wedgwood's sales catalogue reveals different layers to the potter's and the industry's conception of innovation, and some indications as to where the value lay in the market, for both consumers and producers. At the surface level certainly, there was an element of innovation and demand being driven by the 'look' of an object; imitating classical pieces and the styles of ancient Greece and Rome. Underneath this aesthetic veneer, were concerns about the utility of wares, with attention drawn toward functional features that were possible as a result of new recipes for glazes and bodies. In addition to this, there were also allusions to the cost of production, where new knowledge could

reduce the skill premium required to produce sought-after wares, thus benefitting the producer and consumer.

Here then, we have examples of two different types of knowledge related to innovation in the pottery industry. The first is that scientifically derived knowledge which allowed and produced innovations resulting in entirely new product ranges, such as Wedgwood's Etruscan ware. These were obtained through much experimentation, and the knowledge that underpinned them was protected by virtue of its nature and the production process which enabled it to be kept secret. The second type of knowledge relates more to the visual and tangible elements of design and construction and which is not rooted in scientific understanding. Some examples of this type of knowledge, specifically the mechanical features of a machine, could be reverse-engineered. For example, the design knowledge held within the inkstand could be accessed by purchasing the product and dismantling it or cutting it down the middle to reveal the cross-section. This second type of knowledge, as seen in the Crystal Palace exhibits, can be freely publicised, advertised and shared. It was more routinely and easily protected. Clearly there were decisions to be made here between the disclosure of crucial knowledge or secrets, and the advertisement and dissemination of the product or innovation.

An article in *Mechanics' Magazine* from 1825 offered a recipe and instructions for a new lead-free glaze which had been developed by Mr Rochinski, a potter in Berlin. Whilst the recipe was relatively straightforward in terms of quantities, a certain amount of prerequisite knowledge or experience was required to get the consistency right: 'a mixture fit to be readily applied on the earthenware, and to cover it equally all over'.<sup>15</sup> R. Campbell's comments made in 1747 on the skills of a potter were still pertinent almost a century later.<sup>16</sup> In March 1839, a master potter by the name of Mr Cowper gave a 'Lecture on Pottery' at the Royal Institution. A summary of the lecture was

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<sup>15</sup> *Mechanics' Magazine*, 5 November, 1825, p. 46.

<sup>16</sup> See Introduction to this thesis, fn. 7.

published in *Mechanics' Magazine* in the April of that year. The summary is quite detailed despite the apologies of the writer that it was an 'imperfect report [...] from the circumstance of having lost our notes'.<sup>17</sup> The report detailed the proceedings of the lecture, and drew attention to several areas of specific interest regarding the different stages of production. The content and delivery of Cowper's lecture are indicative of the 'cognitive limitations' associated with the communication and transfer of technical and tacit knowledge in the pre- and early-modern period.<sup>18</sup> Although Cowper was a master potter, in order to demonstrate skills and techniques at even the most basic level, he required a live demonstration by a potter working at a wheel.<sup>19</sup> Following Polanyi's dictum once more, the type of skills required for pottery or any other intensive craft based production rely on the craftsman's 'awareness of a combination of muscular acts for attending to the performance of a skill.'<sup>20</sup> By having a potter with him in the lecture, Cowper was able to elucidate and, more importantly demonstrate, the 'minute, and sometimes very delicate points, on which hinge the success or the perfection of the ultimate results.'<sup>21</sup> The lecture thus highlights the problems that can arise in the transfer of certain types of knowledge, especially when we consider that the way in which we try to teach or articulate a skill or piece of knowledge may be in a very different form to when we actually do it ourselves.<sup>22</sup> In this case, Cowper understood that he would be unable to convey orally the intricacies of spinning pots on the wheel. A practical demonstration bridged this gap to a certain extent, although participation and practical experience on the wheel cannot be matched. We have also seen examples of the tensions Collins highlights between knowledge which 'is not' explicated on the one hand, and knowledge which 'cannot' be explicated on the other.<sup>23</sup> This has implications for our understanding of what could and could not be kept secret.

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<sup>17</sup> *Mechanics' Magazine*, 6 April, 1839, pp. 14-15.

<sup>18</sup> Epstein, 'Property Rights', p. 382.

<sup>19</sup> *Mechanics' Magazine*, 6 April, 1839, p. 15.

<sup>20</sup> Polanyi, *The Tacit Dimension*, pp. 4, 10.

<sup>21</sup> *Mechanics' Magazine*, 6 April, 1839, p. 15.

<sup>22</sup> H. M. Collins, *Artificial Experts: Social Knowledge and Intelligent Machines* (MIT Press: Cambridge, Mass, 1990), p. 85.

<sup>23</sup> Collins, *Tacit and Explicit*, p. 1-4.

## 8.1 ‘Spilling the beans’: an insight into secret knowledge

A fascinating exchange in *Mechanics’ Magazine* highlights the importance of secret, scientifically focused knowledge. In March 1833, a contributor writing under the alias of ‘Friar Bacon of Hulton Abbey’ responded to requests from readers for information on pottery glazes.<sup>24</sup> Under the title ‘Secrets in Pottery’, Friar Bacon submitted 108 recipes with ‘reason to believe that they include nearly all of those in any repute’ (Figure 8.2). They included recipes for bodies and glazes used in the manufactories of Meigh, Spode, Davenport, Wedgwood, Clowes, Yates and Moore, to name a few. These were far more detailed than those listed in patent specifications or other literature and were each composed of 100 parts which were then apportioned for each ingredient.

To illustrate the level of disclosure that the publication of these secrets provided, comparisons with patent specifications that referred to recipes can be made. John and William Turner, who operated a pottery in Lane-End, Staffordshire, were granted a patent in 1800 for a new method of manufacturing porcelain and earthenware that involved the introduction of a new substance that was found in Staffordshire coal mines known as ‘Tabburners Mine Rock’ or ‘Little Mine Rock’.<sup>25</sup> The specification is relatively short and is vague when describing the characteristics of the new substance:

*‘This stone, or rock substance [...] between a hard marle and an iron-stone rock [...] is an ash or greyish colour, but, when dry, becomes whiter; and, if bunt in a potter’s oven, with the degree of heat generally used in burning their wares, becomes very white, without any appearance of fusion.’*<sup>26</sup>

The patent then went on to blur the description of the substance even further:

*‘Any stone or substance corresponding with this description, or of a similar quality, wherever found, and whether known by the name or names of the Tabburners Mine Rock, Little Mine Rock, and New Rock, or by any other name or names, is the material*

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<sup>24</sup> *Mechanics’ Magazine*, 31 March, 1833, p. 434.

<sup>25</sup> *The Repertory of Arts and Manufactures* (Vol. 12, 1800), p. 299.

<sup>26</sup> *Ibid.*, p. 300

*for which we have applied for the said letters patent, and which we mean to appropriate to our own use, in the manufacturing of porcelain and earthen ware.*<sup>27</sup>

This suggests the patentees were trying to widen the scope of their patent with this description, and it is clear that they were keen to gain a return on their discovery. When the specification turns to details of the recipe and preparation of the mixture far less is revealed than in Friar Bacon's recipes. John and William Turner referred to breaking the body down into parts although they were far from precise in their description. Again, the proportions are loose and flexible enough to capture a wider range of body compositions.

*'The proportions we think the best, are from six to ten parts of the said new material to one part of the flint or siliceous earth. But, although we have described what we consider as the best proportions using the said new material, in the manufacturing of porcelain and earthen-ware, it is expressly to be understood, that we do not mean absolutely to confine it to these proportions, inasmuch as the proportions must necessarily vary, according to the particular article to be manufactured.'*<sup>28</sup>

A similar style of patenting was continued by William Hodge who was granted a patent for the introduction of a new substance to earthenware production known as hornstone porphyry or 'elvan'. The specification was vague when it came to any details of the recipe that was being employed and the materials being used: 'I find that a large or a small proportion of elvan may be employed, and the effect in the ware produced will be in relation to the relative proportions; and therefore the workman will use his judgment in the quantity he employs, according to the effect he desires to obtain.'<sup>29</sup> Here, then, the onus was placed on the person interpreting the patent to get the correct proportions of materials. Just as the Turner's sought to appropriate the use of 'Tabberners Mine Rock', so too Hodge sought to limit the use of elvan.

There were several other instances of patents for new recipes for bodies and glazes that followed the same pattern; the restricted detail when it came to being able to reproduce the innovation, and

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<sup>27</sup> *Ibid.*

<sup>28</sup> *Ibid.*, pp. 301-2.

<sup>29</sup> *The Repertory of Patent Inventions* (Vol. 19, 1852), p. 353

the loose and flexible definition of the materials used in order to capture a greater range. Patents were granted for John White in 1809, Joseph Gibbs in 1841 and George Skinner and John Whalley in 1845 which all referred to recipes and new compositions for the bodies of wares.<sup>30</sup> All these patents adopted a guarded style and sought to reveal the minimum amount of useful knowledge. The practice of patenting recipes was clear in the pottery industry.

By contrast, the recipes provided by Friar Bacon were far more useful in the details that they revealed. Whereas the patents did not reveal proportions or quantities, Bacon's recipes were broken down into parts and annotated. Many of the recipes were accompanied by notes which included: 'J. Clowes says, this is a much better Glaze' and 'No. 1 is a good body, much approved in the American Market; requires a hard fire'.<sup>31</sup> The fact that the contributor was writing under an alias draws attention to the desire to remain unknown, perhaps due to the fact this is one of the only documented open publications of pottery recipes found which in itself, and along with the title suggests, that these were tightly held 'secrets'.

Friar Bacon's identity remains a mystery, although there are several possible scenarios based on conjecture. The choice of moniker is an interesting one. It could be a reference to Roger Bacon (c.1214-c.1292), the English natural philosopher and Franciscan Friar with an interest and skill in optics and mathematics.<sup>32</sup> It is possible that the individual behind the name was a particularly well-travelled potter who had spent time working at many different workshops across the district. This is entirely plausible given the high turnover of firms and likely exposure to recipes if he worked in the dipping house for example. A less plausible alternative is that Friar Bacon's contributions are the work of a disgruntled employee who felt the need to publicise the secrets of his past employers.

Although for this to be the case he must have held a grudge against a large number of potters. It is,

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<sup>30</sup> The specifications for these patents are printed in the following sources in the same order as in the text: *The Repertory of Arts, Manufactures, and Agriculture* (Vol. 16, 1810), p. 260; *The Inventors' Advocate, and Journal of Industry* (Vol. 1, 1841), p. 309; *The Patent Journal, and Inventors' Magazine* (Vol. 1, 1846), p. 136.

<sup>31</sup> *Mechanics' Magazine*, 31 March, 1833, p. 433.

<sup>32</sup> George Molland, 'Bacon, Roger (c.1214–1292?)', *Oxford Dictionary of National Biography*, (Oxford University Press: Oxford, 2004) online at <http://www.oxforddnb.com/view/article/1008>, [accessed 12 Sept 2017].



also possible that Friar Bacon was an outsider to the district, someone who had managed to procure detailed recipes by means of subterfuge. However, the motives are not clear as one may assume that an outsider to the industry with access to such knowledge may try to sell the information privately, rather than publish it publicly and freely.

Figure 8.2: 'Secrets in Pottery' compiled by Friar Bacon of Hulton Abbey, printed in Mechanics Magazine, 31 March 1833

**SECRETS IN POTTERY.**

*Cream-Colour Glazes.*

Nos. - - - - -	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Glass - - - - -	80	..	..	..	..	..	..	4	5	..	..	5	16	17	8	80	38	10	..	..	
W. Lead - - - - -	..	64	60	66	72	55	66	53	57	60	66	66	47	50	75	10	4	30	71	86	
Cornwall Stone - - - - -	..	24	32	4	..	45	16	16	28	23	22	11	31	25	..	..	..	..	..	..	
China Clay - - - - -	20	..	..	10	..	..	2	..	..	..	..	..	..	..	..	10	..	..	..	..	
Dry Flint - - - - -	..	12	8	20	28	..	16	27	10	8	12	18	6	8	17	..	..	49	9	20	9
Borax - - - - -	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	23	..	..	
Parts - - - - -	100	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	

Nos. - - - - -	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Glass - - - - -	..	5	..	..	..	..	..	6	..	4	5	5	..	..	..	..	..	..	..	..
W. Lead - - - - -	70	55	70	65	62	62	60	60	56	63	58	60	70	70	65	60	63	56	50	54
Cornwall Stone - - - - -	20	30	25	25	20	21	30	35	28	27	20	25	10	8	28	10	18	23	32	25
Dry Flint - - - - -	10	10	5	10	18	10	10	5	10	10	18	10	15	28	7	30	18	20	16	20
Borax - - - - -	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	2	1
Parts - - - - -	100	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

No. 2 is Wedgwood's; 7 is for Brown Ware; 8 and 11, Wilson's; 10, Toft's; 13, Stevenson's 27, Rivers'; 37, Spode's; 14, Mr. St. Amand's. Most of them are excellent on particular Bodies. Mean of the five best:—W. Lead, 65; Stone, 24; Flint, 11.

*Blue Printing Bodies.—Slip State.*

Nos. - - - - -	1	2	3	4	5	6	7	8	9	10	11	12	13
Blue Clay - - - - -	35	60	35	40	27	56	60	55	57	50	50	66	40
Black do. - - - - -	15	—	10	15	11	—	—	—	—	10	20	—	10
Brown do. - - - - -	15	—	15	10	12	—	—	—	—	—	—	—	10
China do. - - - - -	12	20	20	17	25	27	18	22	23	18	10	17	20
Flint - - - - -	20	20	18	15	25	14	20	20	16	20	19	17	20
Cornwall Stone - - - - -	5	—	2	3	—	3	2	3	4	2	1	—	2
Parts - - - - -	100	—	—	—	—	—	—	—	—	—	—	—	—

The Clay slips 24 oz., Flint 32 oz., Stone 28 oz. to pint. No. 12 is Mr. Spode's. (For Glaze, see Blue Printing Glazes, No. 8.)

Source: *Mechanics' Magazine*, 31 March, 1833, p. 434.

In June 1833, several months after the publication of these original recipes, a ‘constant reader’ from Newcastle-under-Lyme in the Potteries raised their concern over the publication of secrets. In a short statement the reader noted that the Friar’s actions had ‘put all in commotion’.<sup>33</sup> Objections to the disclosure were raised although the reader went on to express his pleasure in receiving the information and requested further glaze and body recipes. This objection tells us two things that both point to the reliability of the recipes. Firstly, the fact that an objection was made is an indication that the ‘constant reader’ was concerned about secret knowledge being leaked into the wider community. If the recipes were bogus or ineffective, then it is unlikely that they would have caused such a stir. Secondly, the reader ended the objection on a positive note and placed a more specific request for ‘chalk and china bodies and glazes.’<sup>34</sup> Again, it is safe to assume that if the original recipes were not effective or trusted, further requests would not be made. Clearly, then, whilst there were some moral or ethical issues raised, the pragmatic reader recognised the importance of the knowledge that was published. The *Magazine* obliged the reader and continued the somewhat obvious deception and intrigue but explaining the delay in publication: ‘though [the Friar’s] knowledge is modern, [he] writes in so ancient and crabbed a fashion [...] it takes more time than we have been recently able to command, to furnish the printer with an intelligible transcript of his manuscript.’<sup>35</sup> Dutifully, on 13<sup>th</sup> July the *Magazine* published a further 31 recipes provided by the Friar under the title ‘More Pottery Secrets’. These had the same level of detail and were in turn followed by 36 more recipes a week later.<sup>36</sup> Unfortunately the trail of Friar Bacon runs dry and there are no further references to this episode. The saga ended on 20<sup>th</sup> July 1833, but not without 175 detailed recipes being published. The local newspaper for the region at the time, the *Staffordshire Advertiser*, made no mention of the leak, or of any secrets in the pottery industry save one: the advertisement showed in Figure 8.3.

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<sup>33</sup> *Mechanics’ Magazine*, 29 June, 1833, p. 223.

<sup>34</sup> *Ibid.*

<sup>35</sup> *Ibid.*

<sup>36</sup> *Mechanics’ Magazine*, 20 July, 1833, p. 263.

Figure 8.3: Advertisement for pottery secrets, 1795

**AN ESTABLISHED MANUFACTORY  
TO BE DISPOSED OF.**

To be LET or SOLD, and may be entered upon immediately,

**A** Very convenient and extensive Set of Potworks, with a substantial Dwelling House, in one of the most eligible situations in the STAFFORDSHIRE POTTERIES. The Fixtures and Utensils are in good Condition, and with a great Variety of Blocks and Moulds of modern make, may be had at a fair Valuation.— The Manufactory is in Employ, and the Purchaser will not only be recommended by the Retirer to his Connexions, which are extensive and valuable; but all the important Secrets and Chemical Preparations used in the Trade, and which are the result of expensive Experiment, will be disclosed and fully explained for a reasonable consideration.

For Particulars apply to Mr. TOMLINSON, Attorney, Hanley, Staffordshire, who will give a reference to the Proprietor; and from whom Tickets may be had to view the Premises; but only Principals will be attended to.

May, 1795.

Source: *Staffordshire Advertiser*, Saturday 16 May, 1795

The advertisement for the sale or letting of a pottery manufactory was placed by an anonymous proprietor in the *Staffordshire Advertiser* for several weeks over May and June 1795. It is suggestive of several features of the English pottery industry at the time: networks and connections mattered; ‘important secrets’ of the trade could be acquired either through ‘expensive Experiment’, or purchased for a ‘reasonable consideration’; producers could access an informal market for certain types of useful and reliable knowledge which were seen as providing competitive advantage in the industry.

The vast majority of advertisements relating to earthenware production in printed sources for the eighteenth and early nineteenth centuries tend to be focused on sales of manufactories and job-lot auctions targeted at other producers, wholesalers and dealers rather than the retail or consumer

market.<sup>37</sup> They reveal more about the identity and location of the seller and potential buyers than about novelty, innovation and knowledge. Such advertisements placed in local newspapers followed a standardised style; details of the time and location of the sale or auction were given and this was followed by a basic list of the items for sale which in most cases was extensive and ranged from fixed plant such as ovens to miscellaneous items such as ‘other utensils requisite for the trade’.<sup>38</sup> It would appear, then, that mention of the secrets themselves remained largely absent from print media and advertisements but were, nevertheless, changing hands in some instances.

The first conclusion we can draw from this chapter is that patenting was not a widespread strategy employed by North Staffordshire potters between 1750 and 1851. Innovating potters faced a dilemma in the tensions between the advantages of patenting an invention or idea, and the disclosure of information. In theory, the more precise and detailed a patent specification was, the easier it was for a patentee to legally defend any abuse or contestation; this also offered the potential for an innovator to close-off competition from capitalising on potential opportunities related to the innovation. In practice, this was not the case for many potters.

What may seem striking at first and a point already mentioned is that Josiah Wedgwood, a driver of change and innovation in the pottery industry held only one patent in his lifetime, number 939, granted on 16<sup>th</sup> November 1769 for his development of new encaustic decoration.<sup>39</sup> His aversion to patenting is well documented and his feelings toward the patent system were no secret to his contemporaries. Indeed, Dutton draws attention to Wedgwood’s criticisms of the inefficiency of the system in a letter to Lord Dundonald in 1791 in which he stated:

*‘I am not surprised at your Lordship’s aversion to patents. They are bad, and deficient for the purpose intended in many respects [...] the hands of all British artists and manufacturers are bound during the term of the patent [...] patents are highly*

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<sup>37</sup> The author has examined advertisements for wares placed in two substantial local newspapers: *Staffordshire Advertiser* for the years 1795–1850 and the *Staffordshire Gazette and County Standard*, for the years 1839–1850.

<sup>38</sup> *Staffordshire Advertiser*, 14 February, 1835.

<sup>39</sup> See Woodcroft, *Patents for Inventions: Abridgments*, p. 9.

*pernicious to the community amongst whom the invention originated and a remedy is much wanted in the Patent Office for this evil.*<sup>40</sup>

Josiah Wedgwood's own views on patenting were deep-rooted.<sup>41</sup> He had established himself in a region and industry where patenting was infrequent and his aversion was shared by his local contemporaries. Indeed, between his birth in 1730, and his patent in 1769 there had been just nine pottery related patents granted, only two of which were held by residents of North Staffordshire. His aversion to patenting was shared by his local contemporaries; during Wedgwood's lifetime (1730-1795) he was one of only three Staffordshire potters to be granted a patent, with the other two coming in 1732 and 1733. MacLeod provides further evidence to explain Wedgwood's revilement of the patent system; two years after the granting of his patent, the potter was forced to engage in length and expensive legal disputes in defence against a potter who was violating his patent. In the event, both parties agreed to compromise citing the expense of legal proceedings and 'to uphold the patent against the mass of other potential interlopers'. As a result, Wedgwood 'resolved to have no further truck with patents.'<sup>42</sup> Wedgwood was not alone in his legal battles to defend his patent: Landes argues that many patentees during the eighteenth century spent more time defending their patents than benefitting from them.<sup>43</sup> In North Staffordshire, patents were opposed or encountered resistance and abuse whether they were for successful processes that were commercialised or not.

North Staffordshire potters were even more resolved to make access to their prized innovations and knowledge as difficult as possible for foreign outsiders and competitors. Travel diaries written during tours of industrial regions contain further evidence of cautious potters. S. H. Spiker, on his travels through the region in 1816 wrote the following after being denied access to certain rooms in

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<sup>40</sup> Dutton, *The Patent System*, pp. 26-7

<sup>41</sup> *Ibid.*

<sup>42</sup> MacLeod, *Inventing*, p. 71; evidence based on letters written by Josiah Wedgwood. David Landes also drew attention to the

<sup>43</sup> David Landes, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present* (Cambridge University Press: Cambridge, 1969), p. 64. Bottomley provides details of many of these cases, see: *The British Patent System*.

Spode's workshops: 'Mr Spode, [declared] that he had been frequently deceived by persons, who, under the pretext of seeing the manufactory, merely sought to communicate its arrangements to others'.<sup>44</sup>

There was an air of mistrust in the district that was extended to both insiders and outsiders and was present in the eighteenth century too. In October 1785 Wedgwood wrote to the Secretary of the General Chamber of Manufacturers of Great Britain to voice his and his fellow potters, concerns regarding 'three different sets of spies upon our machines and manufactures now in England'.<sup>45</sup> Wedgwood told of accounts from his contemporaries of foreign spies gaining access to machinery, and the inner workings of manufactories by pretending they themselves had important innovations to share.<sup>46</sup> Clearly there was a high degree of uncertainty and anxiety over keeping trade secrets secret.

Wedgwood was also keen to track down spies and secrecy among his own workforce. In November 1790, he noted in his Commonplace Book that a potter by the name of Mountford, who worked in the ornamental works had 'evidently been acting as a spy. [Had] twice applied to Steel to a receipt for making jasper & has been frequently observed to pry into the ovens & other parts of the business.'<sup>47</sup> It is not clear what action was taken by Wedgwood although this does show that even a philanthropic entrepreneur who provided his workers with low-rent houses and took pride in his factory discipline suffered from espionage within his own ranks.

The evidence suggests that secrecy, where possible, seems a suitable strategy and the natural tendency in the pottery industry was toward holding one's cards close to one's chest. The fewer details and processes unnecessarily revealed, the more ambiguous the actual innovation appeared to competitors, the freer the innovator was. Rather than engaging in what Dutton calls a 'disclosure

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<sup>44</sup> S. H. Spiker, *Travels through England, Wales & Scotland, in the Year 1816* (London, 1820), p 81.

<sup>45</sup> Letter from Josiah Wedgwood to Mr. Nicholson, 25<sup>th</sup> October 1785. Wedgwood MS, E26-18968.

<sup>46</sup> *Ibid.*

<sup>47</sup> British Library Wedgwood Documents, Add MS 71093, 'Wedgwood', ff53.

agreement' whereby 'society and the inventor made a bargain, one offering temporary protection, the other knowledge of new techniques', potters preferred to opt for secrecy wherever possible. This strategy was particularly appropriate in the pottery industry where much of the innovation was of a chemical and scientific nature until well into the nineteenth century. This finding supports MacLeod's more general statement that secrecy as a strategy was more prevalent in scientific rather than mechanical settings.<sup>48</sup>

The evidence discussed above also support Moser's more recent findings for the second half of the nineteenth century regarding secrecy as opposed to formal protection of intellectual property. Moser asserted that for the second half of the nineteenth-century the 'effectiveness of secrecy' was industry specific and the key determinant of the propensity to patent and that this was underpinned by the degree of scientific or technical knowledge required.<sup>49</sup> This discussion has shown that the argument also holds for the pottery industry for 1750-1851, before Moser's period of study. This is the case because of the chemical base of many of the innovations in the pottery industry rendering them difficult to articulate, reverse engineer and make transparent. Much of the valuable knowledge could not easily be reverse-engineered and was therefore granted protection outside of the patent system. Despite Mokyr's assertion that 'any other form of protection worked even less well' than patents, North Staffordshire potters successfully employed secrecy as a strategy for success.<sup>50</sup>

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<sup>48</sup> MacLeod, *Inventing the Industrial Revolution*, p. 63.

<sup>49</sup> Moser, 'Why don't inventors patent?', pp. 3, 25-26.

<sup>50</sup> Mokyr, *The lever of riches*, p. 250.

## 9 Conclusion to Part Two

Part two of the thesis examined North Staffordshire as a knowledge district, a geographically bound agglomeration of producers in which useful and innovative knowledge is created and disseminated. This approach complements the findings of part one, and is influenced by the perspective taken in economic geography and organisational studies in particular.<sup>1</sup> It also speaks directly to a large body of economic history literature which focuses on the patterns of knowledge creation and dissemination.<sup>2</sup>

We have seen that spatial concentration was a characteristic of the region throughout its history. We have also seen evidence that suggests there were considerable tensions between knowledge transfer and spillovers (either intentional or unintentional), and the need to retain competitive advantage. This sits in juxtaposition to Storper and Venables' argument that in creative industries where tacit knowledge looms large spatial concentration and proximity generates face-to-face contact between individuals and facilitates knowledge exchange in a positive manner: 'buzz'. The evidence presented in part two suggests that spatial and social proximity could indeed provide positive externalities, although there were also undesirable implications for the region's potters.

The nature of knowledge in the pottery industry was extremely important in determining the behaviour of producers with regards to articulating and disseminating knowledge, and its appropriation. There is a wide variety of evidence for innovation in the English pottery industry during one of its most dynamic and successful periods of development. Patents offer us much in the way of quantifiable evidence but are also extremely useful in disclosing information about the types of knowledge in the industry and the motivations of the patentees themselves.

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<sup>1</sup> Pinch *et al.*, 'From 'industrial districts' to 'knowledge clusters'.

<sup>2</sup> See literature discussion in chapter six.



The first conclusion we can draw with regard to the patenting practices of North Staffordshire potters is that this was not a widespread strategy employed to protect innovation and appropriate the returns. Rather than extensive patenting it was secrecy, where possible, that was adopted by the industry. It is here that Dutton's work on patent justification theory can be challenged. Dutton suggested that one of the key justifications for the patent system was the 'exchange-for-secrets thesis'. This frames patents as a 'disclosure agreement' between an inventor and society, and is presented as a win-win scenario: the inventor receives the protection offered by the patent system, and society receives the benefit of new knowledge and techniques.<sup>3</sup> We can clearly state that this was not the case in the pottery industry.

We can also now contribute directly to MacLeod's and Moser's work on patents concerning the differences in patenting strategies in scientific and mechanical settings.<sup>4</sup> The findings that secrecy was the preferred strategy for North Staffordshire potters support both these authors' works and this thesis provides significant new empirical evidence in this regard. In particular the evidence on patenting support Moser's findings for the second half of the nineteenth century that the effectiveness of secrecy was dependent on the industry in which it was pursued. Moreover, the key determinant of the propensity to patent in any given industry is the level of scientific or technical knowledge required.<sup>5</sup> Based on the research in part two of this thesis we now know that this argument holds for the pottery industry during the period 1750-1851, the century before Moser's study. It is also important to note that Moser's work focuses predominantly on national innovation systems and, in particular, the British patent system *after* the introduction of the patent amendment act of 1852.<sup>6</sup> This adds further significance to the findings presented here because it raises the question of the impact of the patent amendment act in industries where innovation was predominantly scientifically derived. Therefore, building directly on the research conducted for this

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<sup>3</sup> Dutton, *The patent system*, p. 22.

<sup>4</sup> MacLeod, *Inventing the Industrial Revolution*, p. 63; Moser, 'Why don't inventors patent?'

<sup>5</sup> Moser 'Why don't inventors patent?', pp. 3, 25-26.

<sup>6</sup> Bottomley, *The British patent system*, pp. 64-5.

thesis, the pottery industry could serve as a crucial case to test this theory in the longer term, and in particular, over a temporal scope that incorporates patenting both before and after 1852.<sup>7</sup>

Further connections to the literature are clear when we consider how the types of knowledge being produced in the region influenced patenting practices. It is here that the new typology of knowledge presented in chapter eight. Examination of additional sources reveals that the categorisation of knowledge is more complex than a simple tacit/explicit division. Firstly, there was that knowledge which was articulable and defensible in the formal sense, i.e. through patents. This included mechanical or prescriptive knowledge which was relatively easy to detect and decipher. Secondly, there was that knowledge which did not require this type of protection by virtue of the fact that it was difficult to fully articulate and transfer in the written form. Thirdly, there was knowledge which straddled the tacit and explicit distinctions. In its finished state as embodied in a piece of earthenware it was largely undecipherable except through extensive and expensive experimentation, with no guarantee of success or imitation.<sup>8</sup> However, in its articulable form in a recipe or instruction manual, this knowledge was extremely useful to those with the experience and tacit knowledge to understand and apply it. Thus, it was deemed to be of such value to a potter that it was kept secret, being revealed (somewhat cryptically) only when in its irreparably altered state. Potters thus adopted different strategies toward protecting their knowledge depending on the type of knowledge.

This new typology directly challenges the existing tacit/explicit categorisation that is common among many disciplines, including economic and business history.<sup>9</sup> Certainly, as the discussion in part two shows, there are elements of Collin's knowledge that is embodied in a tangible object, and Polanyi's dictum that 'we know more than we can tell'.<sup>10</sup> However, this thesis argues that we must

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<sup>7</sup> This research question will be developed further as a corollary paper for submission to a journal in the future.

<sup>8</sup> We are reminded here of the lengthy and expensive attempts to successfully imitate Chinese and Japanese porcelain.

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See

Table 6.1 and the surrounding discussion in chapter six for a discussion of this literature.

<sup>10</sup> Collins, *Tacit and Explicit*; Polanyi, *The Tacit Dimension*, pp. 4, 10.

move beyond the tacit/explicit division of knowledge. Whilst this can be a useful introductory term, we know that the knowledge created and in use in the pottery industry did not fit into these homogenous categories. Indeed, much of the nuance, richness and complexity of the knowledge itself and the impact it had on the behaviour of potters is missed by analysing the differences as a dichotomy.

Part two also addresses collective invention and is directly connected to Allen and Nuvolari's work on this concept. Chapter six introduced a hypothesis to test which directly links chapter's seven and eight: a low propensity to patent in an industry is accompanied by open knowledge sharing between producers. This is informed by the discussion of some of the features of collective invention: incremental innovation; wilful open dissemination of useful knowledge; utilisation of knowledge to innovate further; open sharing of technology.<sup>11</sup> In short, part two of this thesis has presented considerable evidence to argue that this hypothesis does not hold for the pottery industry in North Staffordshire 1750-1851. Whilst there was incremental innovation, the evidence presented shows that there was no open sharing of knowledge of technology, the key characteristics of collective invention. Conversely, the opposite was the case and we can draw relatively robust conclusions. The pottery industry exhibited some, but not all, of the core features of collective invention. Innovation *was* incremental and took place largely outside of the patent system. However, the remaining criteria are not satisfied. There is no evidence of open sharing of technology, or the wilful dissemination of useful knowledge. Advances and innovations were highlighted and referenced in trade literature, patent specifications, advertisements and sales catalogues but the details and precise nature of the innovations remained secret; or, indeed, accessible only for a 'reasonable consideration' in one case. In answer to the question: does the assumption hold that a very low propensity to patent in an industry is accompanied by open

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<sup>11</sup> Allen, 'Collective Invention'; Nuvolari, 'Collective Invention'.

knowledge sharing between producers? We can state with confidence that this is not the case in North Staffordshire during the later eighteenth and early nineteenth centuries.

So, North Staffordshire was not a site of conventional collective invention à la Allen or Nuvolari. In the pottery industry, the knowledge being created and used was different to both the pig-iron industry and steam technology; the innovations in the pottery industry were different; and crucially, the ability to keep them secret was fundamentally different due to the production process and the nature of the irreversible chemical reactions and processes that this entailed.

Part two, then, speaks to several different bodies of literature and contributes to them in different ways. In the case of patenting, extensive empirical evidence is offered to test hypotheses concerning the propensity to patent, in addition to mapping out the formal sphere of knowledge appropriation. The discussion of the nature of knowledge furthers our understanding of how and why the behaviour of producers can be influenced significantly by the types of knowledge they are creating and using. In addition to the empirical contributions, the work presented here also poses a robust alternative framework for thinking about knowledge, and challenges the tacit/explicit division that has heretofore been considered the norm.

# 10 Conclusions

The concluding remarks for this thesis are in two sections. The first section provides a summary of the central findings and details the significant empirical and historiographical contributions that the thesis makes. This section also discusses the rationale behind some of the methodological choices made. The second section strengthens the connection between the two parts of the thesis and provides a more holistic perspective on the study as a whole.

## 10.1 Central findings

In the introduction, this thesis began with the premise that the North Staffordshire Pottery Industry deserves to be held up as an example of a ‘classic’ industrial district. Indeed, alongside *Cottonopolis* and textile production in Lancashire, and metalworking in Sheffield and Birmingham, the tightly packed *Potteries* are far less studied despite, arguably, outperforming these regions if not in the value of outputs, then in its sustained dominance and intensity of production. The region built a formidable international reputation during the second half of the eighteenth century; a reputation it would enjoy and capitalise on for more than two hundred and fifty years. As an industry and region that is understudied from an economic and business history perspective, the *Potteries* offers the opportunity to further our understanding of the diversity of experience that characterised the first Industrial Revolution and the several decades preceding and following it. It is this diversity that the thesis has sought to exploit.

The district is distinctive and possibly unique because of several key features and characteristics which, in turn, make it worthy of our sustained attention through academic research. Unlike its more famous industrial cousins, often seen as staple industries of the first Industrial Revolution, pottery production in North Staffordshire experienced a far more elongated life cycle; as an industrial district, it reached the terminal phase of decline only by the turn of the twenty-first

century, a fate which English industrial history shows us is, if not inevitable, then certainly difficult to avoid.

The period of study 1750-1851 is the focal point for this thesis for several reasons. However, firstly, let us remind ourselves of the life-cycle model of industrial district development as identified by Wilson and Popp and discussed in chapter two: *critical mass, take-off, cooperative competition, maturity, saturation, decline* and/or *renaissance*.<sup>1</sup> These six stages of development can roughly be seen to characterise a progression, of sorts, of English industrial districts and clusters during the eighteenth and nineteenth centuries. The author notes here that the 'linear' nature of this model does not imply inevitability; indeed, we should steer clear of any frameworks that assume a path dependence of any sort. There are different interpretations of the historical development of industrial districts and regional clusters, such as the Marshallian model and its Italianate extensions discussed in chapter two.<sup>2</sup> The Marshallian model has its uses in framing the basic characteristics of industrial districts, although the life-cycle model allows the diversity of cases evident in English industrialisation to take centre stage and puts forward a distinctly English concept of the industrial district.

By the middle of the eighteenth century, the English pottery industry had reached its critical mass and begun to experience take-off in a small region in North Staffordshire around seven miles long and three miles wide. After 1750, the number and size of potteries began to rapidly increase and the labour force grew substantially in real terms and as a share of the national level. Production soared and output increased substantially with some of the larger firms such as Minton's seeing output increase threefold in as many years in the late 1790s regularly producing in excess of half a million pieces year on year by 1810.<sup>3</sup> It was also during our period that exports began to assume a far more

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<sup>1</sup> For a discussion of the life-cycle model as applied to English industrial districts, see chapter two of this thesis; Popp and Wilson, 'Life cycles, contingency, and agency'.

<sup>2</sup> See chapter two for discussion of these alternative frameworks.

<sup>3</sup> Weatherill, *The growth of the pottery industry*, p. 393

important role in the development of the region and industry. As in other industries such as textiles and metal production, from the 1780s the pottery industry became more reliant on export trade alongside its already significant domestic market.<sup>4</sup> Although data is not available for the region itself, foreign demand for British earthenware was met, continued to grow and by the second quarter of the nineteenth century exceeded thirty four million pieces.<sup>5</sup> By the Great Exhibition at Crystal Palace in 1851, the *Potteries* had been seen as the national seat of the industry for almost a century and its potter's wares dominated the exhibits on display. The reasons for the initial concentration of the industry in the region, and the early phase of development in the face of national competition until the middle of the eighteenth century, and international competition thereafter, are not the sole focus of this thesis, but were discussed in chapter three.

One of the key empirical and analytical contributions of this thesis is provided in chapter three through the use of trade directories to reconstruct the district at the firm level during its period of most dynamic development, 1780-1851. The benefits of this methodological approach are two-fold. Firstly, it allowed the identification of over 780 individual pottery businesses operating in the region during a period for which we have extremely few surviving records produced by the firms themselves. These range from the larger well-known producers such as the Wedgwood dynasty,<sup>6</sup> to far smaller concerns such as the potshops worked by Thomas Barker in Lane Delft during the 1780s,<sup>7</sup> or John Glass, who, at 84 years of age, was hailed to be the oldest manufacturer in the district in the year of his death, 1840.<sup>8</sup> Trade directories allow us to garner far more information on relatively unknown producers of wares whose marks adorn countless pieces in both public and private collections. Secondly, the large dataset makes it possible to detect and highlight trends at the

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See

Figure 3.13.

<sup>5</sup> See chapter three for discussion of UK exports of earthenware during the nineteenth century; this figure taken from: Table 82, *Tables of the Revenue, Population, Commerce*.

<sup>6</sup> Several generations and numerous firms within the Wedgwood dynasty feature in every single directory published between 1781 and 1851.

<sup>7</sup> Thomas Barker was listed in the trade directories for the following years: 1781, 1783, 1784. See the bibliography for the full references.

<sup>8</sup> *Staffordshire Advertiser*, 2 May 1840.

broader level of the district and allows us to assess the dynamic character of the region in new ways not possible before this study. A more granular perspective of individual producers is also possible and allows us to pick out details and use these to help inform and explain the broader trends and patterns observed at the district level. Previous studies of industrial districts in economic and business history have not provided such detailed firm-level analysis.

The construction of the trade directory database in chapter three provided the empirical foundations for the analysis that followed and also allowed for relationships and connections in the network analysis of chapter four to be cross-referenced. However, the database is not only relevant for the first part of the thesis; the findings from the resulting analysis also have implications for part two of the thesis.

For example, the chapter offers some interesting findings regarding the vibrant and complex dynamics of the organisation and evolution of an industrial district. These not only guided some of the research questions in later chapters, but also provided a rich narrative and context within which to understand the behaviour of potters identified in part two. We know now that, in general, Staffordshire potters developed their business models and organisational preference in favour of short-term partnerships. Indeed, by the 1820s the stereotypical Staffordshire potter could be said to be a 'serial partner' who sought cooperation from a growing pool of competitors. This model turned out to be remarkably flexible. For example, we can see distinct phases in the growth of the region with a period of relative stagnation in the total number of firms operating from the mid-1790s until the end of the Napoleonic wars. In a region which exhibited an overwhelming preference for short-term partnerships as the preferred business model, firms adapted their strategy to cope with increased competition and external constraints by increasing the average life-span of partnerships during this period. These partnerships were drawn from a pool of potential partners that was relatively static as the number of new firms entering the market had reduced considerably. The flexibility of the region can be seen again as the dynamic turnover of firms and short-term



partnerships returned almost immediately in 1816 as the number of producers entering the market began to increase again. Here, then, we have producers in a competitive industry organising themselves and pursuing strategies that allowed them to respond to up- and down-turns in the wider economic climate. Moreover, this seems to have been done as a district, suggesting a strong sense of local identity and cooperation.

This evidence of competitive cooperation is shown not only in chapter three, but more strongly in chapter four which concludes the first part of the thesis by examining social networks, identity and cooperation. However, the findings of part two of the thesis seem to challenge this notion of cooperation and present an alternative narrative of secrecy and isolation. These issues will be addressed in the second section of this conclusion.

The ego-centric network of Josiah Wedgwood in chapter four was used to demonstrate the presence and importance of social and business networks in the English pottery industry during a period of rapid growth and innovation. It demonstrated that the importance of the Master Potter in several key developments in terms of business ventures and collective action. Wedgwood's social network was also instrumental in industry wide technological and scientific developments. In particular, we see the importance of James Keir to the development of scientific knowledge to produce glazes, and also a clear example of network failure when knowledge transfer is not reciprocated.

Perhaps most importantly, visual representation of these connections through network graphs highlights the crucial, and often unseen, roles occupied not only by Wedgwood, but also by other 'knowledge brokers' such as the chemical assistant Alexander Chisholm. Such individuals bridged structural holes where knowledge existed in one network, but not in another; in this case, the networks of Dr William Lewis and Josiah Wedgwood respectively.

The social network analysis in chapter four has added another rich layer of detail and complexity to the region during the second half of the eighteenth century. The analysis has shown that social and business relationships were neither static or binary, and Wedgwood in particular was able to utilise

his societal memberships and standing in the community to exploit these with great effect. In particular, Wedgwood was instrumental in creating rich opportunities to gather Staffordshire potters together and provide the foundations for substantial lease agreements with Cornish clay mines to the benefit of the district, for example, or indeed one of the most pioneering hard-paste porcelain factories, New Hall Pottery. The potter utilised both his effective and extended networks with great effect, providing him and the district with much needed access and information in addition to commercial opportunities.

A further historiographical contribution of chapter four is in the close examination of the research and development company proposed by Wedgwood and others in 1775. Close readings of the documents, whose existence were known, but had hitherto not been analysed in any great detail, proved extremely beneficial. The analysis presents important insights into trust, regulation and cooperative competition in a region and industry which, as shown in chapter four, was undergoing significant dynamic organisational change and development. Although not much information is known about the vast majority of the short-term partnerships identified through trade directory analysis, these documents enable us to provide a somewhat candid account of the motivations and considerations of the leading innovative producers of the day.

As an early example of proposals for sophisticated and considerable collective action, the episode set a benchmark for further investigation through the eighteenth and into the nineteenth centuries. Take trust, for example. On the surface, the documents suggest evidence of a group of producers who have strong enough connections and enough trust in one another to jointly enter a business venture to produce that most precious of commodities, knowledge. With the sole purpose of pooling innovative activity, at first thought it may be comparable to notions of collective invention put forward by Allen and Nuvolari.<sup>9</sup> However, upon closer reading of the draft agreement a more nuanced perspective becomes clear. Despite a shared common interest and goal, trust and openness

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<sup>9</sup> Allen, 'Collective Invention'; Nuvolari, 'Collective Invention'.

was not endemic. The proposal of such a joint-venture involving a large number of competing potters required a detailed and considered set of memoranda and rules designed to protect members and their knowledge, and keep outsiders from benefiting from the fruits of their exertions. Even so, these drafted arrangements were not enough to counter the apprehension and concerns of interested parties. This, therefore, was not an example of willing and open dissemination of a collective pool of knowledge as in the case of the Cleveland iron industry, or the Cornish mining industry.<sup>10</sup>

This research has shown that trust did exist in the region, to a certain degree. However, in this case it was not assumed between Staffordshire Potters, but required careful construction through regulation and the threat of sanctions for breach of the agreement. These sanctions and regulations would serve to control the behaviour of members of the company. Through a process of self-identification and othering, they would also serve to reinforce the characterisation of members of the company as elite producers and innovators who, unlike non-members, were capable of producing the knowledge needed to fuel progress in the industry. This is extremely important for our understanding of trust and cooperative competition in the eighteenth century. Even though the company was never formed, the potential for collective action was clearly present and the chapter goes into considerable detail regarding successful collective ventures. Alongside the short-term partnerships clearly favoured at the firm level, the existence of cohesion and communal identity (at more than one level) fostered meta-level collaboration for the requisition of raw materials, the pursuit of key innovations such as hard-paste porcelain at New Hall, or, in this case, the pursuit of knowledge.

The fact that such a company was suggested at all, the considerable detail found in the proposal documents, and the genuine disappointment shown by Wedgwood at its failure, is indicative of a complex group of potters. Entrepreneurial, innovation seeking potters who were fierce competitors in the production of earthenware and who were acutely aware of the advantages of cooperation and the need to overcome obstacles such as potential lack of trust, and experiment with new

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<sup>10</sup> *Ibid.*

organisational forms to achieve this. Overcoming these obstacles was not always desired or achieved, although the evidence presented in part one and part two suggests that potters were acutely aware of them.

The geo-locating of all pottery workshops and manufactories listed in the trade directory of 1802 used modern GIS software and techniques to consolidate and capitalise on the original map produced by Allbut.<sup>11</sup> Whilst the original map gave some indication of the number of firms operating in each part of the district, the new maps created in this thesis highlight and show far more accurately the intense proximity in which these potters were operating. This analysis provides a new layer of complexity to the content in which business networks and collaborative efforts were sought. It also provides the final layer in the analytical characterisation of the region that constitutes the first part of the thesis. We now have a much fuller understanding of what the region looked like from multiple levels and perspectives over the period 1750-1851. From a firm level perspective, we know how the industry and district was organised. From the geographical perspective, we know the proximity and clustering of these firms in various parts of the district. From a social and business network perspective, we know far more about how networks were used and the key role they played in significant events in the history of the district.

Perhaps most importantly, the analysis in part one of the thesis allows us to capture historical change over time. It is important to remember, and this analysis shows, that industrial districts were not static constructs that exhibited a set of characteristics consistently over a set period of time. Rather, this analysis has shown that change occurs often, progress along a development path was not inevitable, and underneath the macro-level data on rising output and the growth in the number and size of firms was a vibrant group of producers acting on and reacting to the ever-changing economic climate of the eighteenth and nineteenth centuries.

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<sup>11</sup> Allbut, *The Staffordshire Pottery Directory*, map insert.

The second part of the thesis provided a close case study of one particular aspect of pottery production. Whilst it continued the characterisation of the Potteries as a distinct district, it shifted the perspective from the *industrial* to the *knowledge* district. It considered the nature of knowledge in the industry and region given the findings of the first part of the thesis. It builds on, for example, the identification of short term partnerships in an industry where knowledge was difficult to control outside of the boundaries of the firm. By conducting research into the strategies employed by producers to create, use and share knowledge, and how the characteristics of different types of knowledge drove these strategies and behaviours. As an example of a heavily craft-based, highly skilled industry without a legacy of formal institutions such as guilds to govern and protect access to knowledge, understanding regimes of knowledge in the pottery industry requires significant investigation. Part two of the thesis provides important findings that not only help us understand these processes in far more detail than previously, but also situates the pottery industry as a subject of research at the forefront of ongoing debates around collective invention, national patent systems and innovation during the industrial revolution more broadly. It does this through collecting and analysing a considerable amount of new data and evidence on knowledge and innovation in the industry over the period 1700-1851.

The chapter on patenting in the pottery industry presents findings relating the tensions that existed between partnership, collaboration and knowledge transfer on the one hand, and the need to retain competitive advantage on the other. Presentation and examination of new patent data for the period 1700-1851 show that formal protection of knowledge and intellectual property through the patent system was not widespread. Indeed, patenting in the pottery industry was extremely scarce until the 1840s with the advent of serious attempts to mechanise various parts of production. Of those that did patent, the majority were from outside the industry *and* the region. This analysis of patenting draws similar conclusions as those found in some other industries: much of the innovation and inventive activity was conducted informally outside of the patent system.

Close analysis of the specifications of patents that *were* issued allowed me to identify several different categories of knowledge that were crucial to the production of pottery. Firstly, there was mechanical knowledge that was articulable and embodied in a particular lever or arm, and therefore easily codified and protected through the patent system. Secondly, there was knowledge which was scientific or chemical in nature and was capable of being articulated and codified in the form of recipes for glazes for example, although this type of knowledge was largely absent from the patent system. The third type of knowledge was that knowledge that could not be articulated: tacit and scientific knowledge, the codification of which was limited by Polanyi's dictum that 'we know more than we can tell',<sup>12</sup> and the fact that irreversible chemical reactions in the production process rendered that knowledge nigh on impossible to reverse-engineer. This knowledge was kept far outside of the patent system.

Examination of Exhibition reports, sales catalogues and trade literature allowed this classification of knowledge to be taken further and revealed the behaviour of producers in a much more detailed way. Evidence of secrecy was presented through the context of an advertisement placed in 1795. The discussion in the second part of the thesis shows strong support for Moser's assertion that the effectiveness of secrecy was industry specific and, alongside patenting, was a practice underpinned and determined by the degree of scientific and technical knowledge required. This thesis has shown that the types of knowledge in the pottery industry influenced the behaviour of producers substantially. This typology of knowledge was far more complex than established tacit/explicit divisions favoured in historical study and the social sciences more broadly.

## **10.2 Bridging the gap: multiple perspectives on a district**

The key findings of this thesis answer numerous questions concerning the development of the North Staffordshire Potteries during the eighteenth and nineteenth centuries. The thesis is organised in

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<sup>12</sup> Polanyi, *The Tacit Dimension*, pp. 4, 10.

two parts, which can be seen as distinct perspectives on a district ('industrial' and 'knowledge'). This was done in order to allow careful and considered approaches to both the industrial organisation of the region and the nature of knowledge and innovation distinctly and comprehensively. However, as stated in the introduction to the thesis, these are not isolated topics and the connections between the findings run far deeper than the mere fact that both parts use North Staffordshire as their empirical context. Many of these connections have been highlighted in the conclusions to each part of the thesis and the discussion in the first part of this conclusion. There are however several points which acutely illustrate the need for the approach taken in this thesis, whereby different perspectives are studied and analysed and brought together into a holistic whole.

For instance, the findings of part two of the thesis concerning the behaviours surrounding knowledge production and dissemination broadly support those presented in part one, and in some instances explicit links can be made. For example, questions of trust which were raised in part one concerning the proposal of a research a development company can be found again in part two concerning efforts to maintain absolute secrecy. The air of mistrust, or more accurately, the selective allocation of trust, was extended to both insiders and outsiders when it came to knowledge. Just as we saw with the research company seeking to protect knowledge from outsider non-members, we see potters raising concerns of industrial espionage from within the region, and without, in part two of the thesis. Moreover, in light of the discussions of trust raised in both parts, the short-term partnerships seem far more pragmatic in their nature rather than openly collaborative in the 'collective' sense; potters still competed intensely and closely guarded their secrets by choosing not to patent or reveal the tricks of their trade.

Moreover, the analysis in part two of the thesis also allows us to present robust conclusions regarding collective invention that confirm the findings of part one. The pottery industry exhibited some, but not all, of the core features of collective invention à la Allen and Nuvolari. The thesis has shown that innovation was frequent and incremental, and largely took place outside of the patent

system. It has also shown that there was considerable collaboration between potters in the form of business partnerships (although these were pragmatic and commercially driven) and some concerted collective action throughout the eighteenth and nineteenth century through the existence of committees and meetings on major local topics such as transport and infrastructure. However, perhaps the most important feature of collective invention cannot be found in the pottery industry. There is no evidence of open sharing of technology, or the wilful dissemination of knowledge. In fact, rather the opposite has been found suggesting potters drew the line at knowledge and secrets when it came to collective action.

When brought together in such a way, the complimentary strands of research and findings presented in each part and chapter of the thesis offer a coherent narrative of an extremely complex and dynamic cluster of production that both challenges and confirms traditional historiographical tradition concerning industrial districts. Whilst North Staffordshire should be viewed as an exceptional case, it was in many ways remarkable that the industry and region enjoyed such a dynamic and extensive reign as the seat of English pottery production. The thesis places into perspective the validity of close case studies in allowing us to speak to broader concerns in economic and business history. In particular, the rigidity of the Marshallian paradigm of Industrial District Theory has been challenged, and in its place, a multi-faceted perspective is offered which brings the social and behavioural elements to the foreground.

An underlying theme of this thesis has been a question of human behaviour, and trying to explain why, at certain times in history and in certain types of places, human beings have acted in the way they have; a way that has, ultimately, contributed in some way to economic growth and industrial development. Focussing on a very small region over a carefully chosen period of time from a variety of perspectives has allowed for some of this behaviour to be explained for the first time in the context of the North Staffordshire Potteries. Of course, whilst robust conclusions and findings have been presented, the process of conducting academic research offers up far more questions than



can be answered adequately or given the space they deserve in the present piece of work. Questions could be raised concerning how North Staffordshire compared to other pottery producing regions in the world at similar stages in their development. For example, the ceramic industry in Arita and the Mashiko pottery district are perhaps some of the best known Japanese examples of traditional consumer goods industries which developed in a highly localised cluster.<sup>13</sup> Both these regions experienced continued growth in international exports of distinctly local products during their development in the twentieth century. Whilst outside of the scope and aims of this study, comparative analysis with these and other regions could help answer fundamental questions regarding how industries enjoyed economies of both scale and scope, producing vast quantities of extremely diverse useful and ornamental wares. For instance, Song China developed an elegant solution using remarkable ‘dragon kilns’, some capable of accommodating over fifty thousand pieces at varying temperatures; a technology and technique we know was not used in Europe.<sup>14</sup> We do not know, however, if there was a general solution to the problem of creating both mass and variety, which at some point all historical pottery clusters across the globe have implemented in some way.

The conclusions concerning patenting and intellectual property have raised several key questions that must be answered. Further research could be conducted to extend the coverage of patent data collection and analysis to determine how patenting behaviour changed in the industry over the second half of the nineteenth century; the industry developed more mechanical and technological capabilities and the patent system underwent massive change with the Patent Amendment Act in 1852. It seems logical, then, that this should be one of the first avenues of research to extend

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<sup>13</sup> Steven Tolliday and Yasushi Yonemitsu, ‘Microfirms and Industrial Districts in Japan: The Dynamics of the Arita Ceramic-ware Industry in the Twentieth Century’, *Journal of Japanese Studies*, Vol. 33, No. 1 (2007), pp. 29-66; Kazuhiro Ōmori, ‘How Local Trade Associations and Manufacturers’ Associations Worked in Pre-war Japan’ in Masayuki Tanimoto (ed.) *The Role of Tradition in Japan’s Industrialization: Another Path to Industrialization, Volume 2* (Oxford University Press: Oxford, 2006), pp. 157-180.

<sup>14</sup> Maxine Berg, ‘In Pursuit of Luxury’, p. 116.

further, which would also allow for a continued engagement with current historiography concerning national patent systems and their impact on innovative activity.

This thesis represents a considerable step in keeping the study of industrial clusters and pottery production at the forefront of economic and business history. It has potentially changed the way that we should think about early industrial districts. When taking the finding of this thesis together, we see a remarkable industrial district developing over the course of a century or more. The analysis and arguments presented here provide a far more complex perspective of an industrial district than we are used to seeing in previous studies of other regions and industries in England. The multifaceted approach of the thesis occupies a happy position between close case studies and micro-histories of specific features in an industry, and broader studies of industrial districts and clusters. As the concluding remarks here will emphasise, the North Staffordshire Potteries adopted and fostered different characteristics to suit different needs and contexts. It was both reactive and proactive. It is difficult to determine precisely whether the district behaved in a chameleon-like manner, responding and adapting predominantly to external changes in its environment; such as international competition and economic shocks such as the Napoleonic Wars. However, given the dynamism of the district, and the positive functional characteristics discussed in chapter three, it could be more appropriate to think of the district as engendering change and growth from within. Certain characteristics, such as the organisation of firms and the high turnover rates, suggest that this was the case.

The evidence and analysis presents the district as a multifaceted one that took on different identities, with a narrative of simultaneous inclusion and exclusion. On the one hand, it fostered cooperation, collaboration and cohesion. A strong sense of local identity set the boundaries of competition at the district level and excluded outsiders. Staffordshire Potters engaged in repeat transactions and partnerships with other local potters and collective action was taken for the benefit of the district. In this context, to be a Staffordshire potter during the eighteenth and early nineteenth

centuries meant flexibility, a relative degree of openness and an inclusive attitude. On the other hand, however, and at the same time, the district prompted isolationism on the part of some of its most successful and innovative potters, as well as more generally in the unnamed or lesser known masses of producers. Secrecy and exclusion were strategies employed to keep competitors at arm's length and well clear of the most important asset in a potter's inventory, knowledge. In this context, being a potter relied on individual enterprise within a concentrated and crowded working environment, in the shadow of caution, suspicion and secrecy. Here, the nature of knowledge in the pottery industry had a significant impact on the organisation and behaviour of potters.

The North Staffordshire Potteries, as a multifaceted industrial district, represents a critical intersection between knowledge, innovation and industrial organisation and development. This was a complex, dynamic and ever-changing district that evolved and adapted to change, but also drove change itself. It is worthy of sustained academic research and should prove a fruitful ground for further theoretical and empirical contributions to economic and business history.

# Appendix One

## Joint Stock Research & Development Partnership Proposal, 1775

Source: Schofield, 'Josiah Wedgwood and a Proposed', pp. 17-19.

*We do mutually agree to establish an Experimental Work for the purpose of trying the materials lately brought from Cornwall, as well as those which may in future come from that County as any other place in order to improve our present manufacture and make an Useful White Porcelain Body, with a colorless glaze for the same and a blue paint under the glaze; and that the Experiments be for the present confined to those objects to prevent being lost in too wide a field at first setting out.*

- 1. That the Company be established and carried on in all respects as a partner-ship and that there be a joint stock.*
- 2. That ..... be appointed Cashier or Treasurer to the Co.*
- 3. That a Deposit of Twenty Five Pounds be paid down by each of us, on the signing of these articles, into the hands of the Company; but if this Joint Stock shod. not be immediately wanted for the purpose of carrying into execution the plan of an Experimental Work, it shall be placed out to interest in such manner as shall be directed by a majority of the Company.*
- 4. That there shall not be any transferring of Shares; nor shall any Heirs (except the Son or Heir of a deceased member and who continues the business of such member) any Executors, Administrators or Assignees become partners without the consent of a majority of the Company; but the property of a deceased member, leaving no Son nor Heir who continues the business, shall be valued and satisfaction made.*
- 5. If any member withdraw himself and the Co. be in debt, he shall first pay his share of that debt; but if the Co. be not in debt, he shall forfeit his share as a punishment for deserting the Company.*
- 6. If any member refuse or neglect to pay into the hands of the Treasurer his proportion of such calls as may from time to time be made on the Company, such member shall forfeit, if he pay not within 10 days after the call becomes due, and of which notice be given him, 10 P. Ct. of his respective Share in the joint Stock; and if he refuse or neglect to pay within 20 days after another notice given, he shall then forfeit his whole share.*
- 7. No member shall disclose the experiments made by this Company or the knowledge obtained by them to any person or persons not in the Company, on pain of forfeiting his share in the joint Stock, and of incurring a penalty of One Thousand Pounds.*
- 8. That no one of us shall take advantage of the knowledge acquired by the experiments of this Society, by adopting any of the improvements made thereby in our own private manufactories or otherwise, until the plan and time of generally adopting and removing such improvements into the manufactory at large be agreed upon by the Society under the penalty of One Thousand Pounds.*
- 9. That the time and manner of adopting and removing such improvements shall be determined by a number of the Proprietors not less than Two Thirds of the Whole; but if Two Thirds of them shod. not attend the meeting for this purpose, that then a General Meeting shall be called and Two Thirds of this meeting shall be sufficient for this purpose.*

10. *That after the first signing of this agreement and the company being formed, no person shall be admitted into the Co. without the consent of all the members.*
11. *That the business of the Co. shall be done by General Meetings of the Proprietors or a Commee of them, to meet Weekly and in a morning at a room in the works.*
12. *That Five or more in number shall constitute a meeting or Committee for making orders and Calls for money, and for doing all other the business of the Company, subject however to the following provisoes.*
  1. *That more than £5 shall not be called for at one time, and that such call shall not be demanded within 10 days after notice given.*
  2. *That a new call shall not be made within one month after a former one.*
  3. *That notice be given of an intention to make a call at a meeting preceding That in which the Call shall be made.*
  4. *That no order made at a former meeting shall be reversed at a subsequent one, unless there be as great or greater number of partners at the latter.*
  5. *That if any questions cannot be determined without taking the opinions of the Co. severally, that shall be done by a Ballot with black balls and white ones.*
13. *That the expense of carrying the plan into execution shall not exceed £50 for each share, and that when the expense shall amount to that Sum the Partnership shall be dissolved, but not before.*
14. *That the first meeting for the purpose of proceeding to carry the plan into effectual execution, be held on the First Friday after Lady Day next at the house of John Moreton, Queen's Arms, Man's Hill, 10 o'clock in the morning.*

*On a Dissolution, the effects of the Company to be disposed of. -Three or Five Persons to be chosen by ballot to allot and value the effects (the Experiment Books and Results excepted) - The Proprietors severally to have the option of purchasing the effects, balloting for the first and the subsequent lots in order; but if any articles should afterwards be left on hand, they shall be sold to the best advantage and the whole placed to the joint stock as in other partnerships. The Experiment Books and the Results to which [illeg.] refer, should be put up by auction to the Company only and sold to the best bidder - Any Member having first had the liberty to copy the Experiments from the book. The Acnts. closed and general releases given by the respective parties as at the expiration of any other partnership.*

# Appendix Two

## Examples of exhibits by Staffordshire potters at the Great Exhibition, 1851

Source: *Great Exhibition of the Works of Industry of all Nations, 1851. Official Descriptive and Illustrated Catalogue, Vol. 2*, (London, 1851), pp. 715, 717, 722.

Ridgway & Co.'s Porcelain Fountain



Meigh & Son's Ornamental



Clock

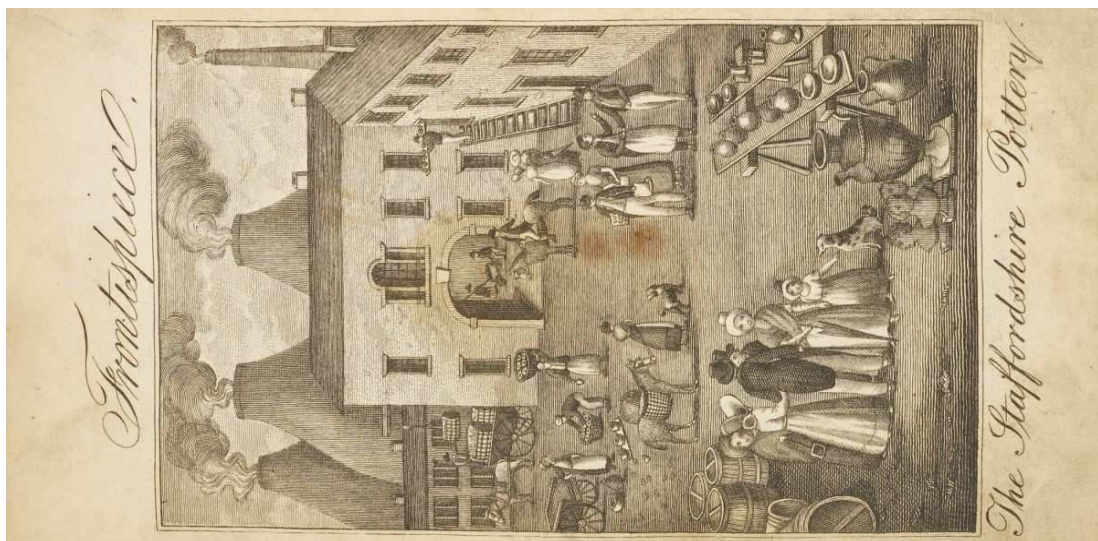
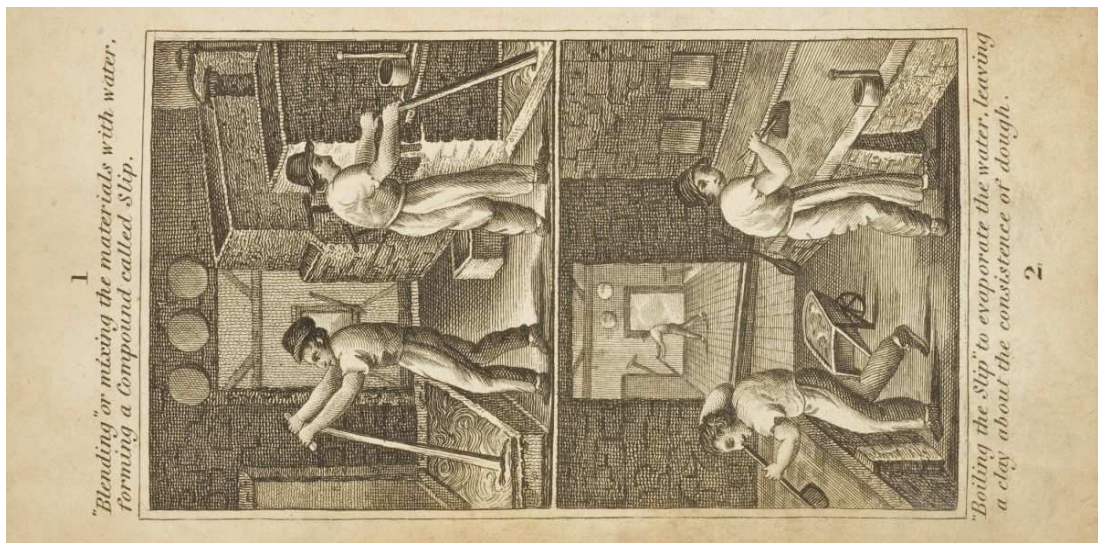
Ridgway & Co.'s Tea and Coffee Service:



# Appendix Three

## Engravings of the stages of pottery production.

Source: *A Representation of the manufacturing of earthenware: with twenty-one highly finished copperplate engravings, and a short explanation of each, showing the whole process of the pottery,* (Ambrose Cuddon: London, 1827)



5

The Turner turning in a lathe and regulating the clay ware which the thrower has formed.

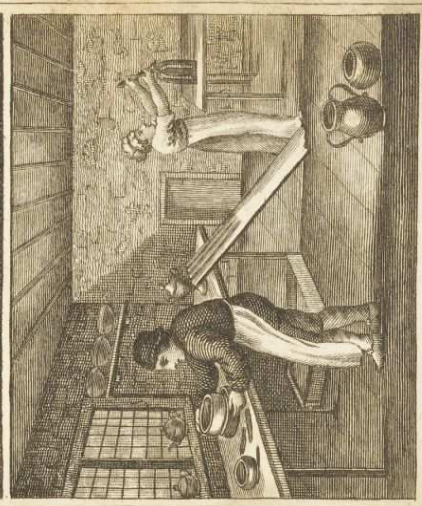


The Handler fixing handles &c. to what has been turned &c. ready for being baked or fired.

6

7

The Moddler or sculptor, from whose productions are taken casts or moulds for the potter.



"Prekking" or "Squeezing," which is making jugs turenes &c. of the clay, ready for being fired.

8

9

Making of the clay, dishes, plates, &c. upon moulds or casts of various forms and patterns.



Engraving designs on Copper Plates, for producing the much admired "blue printed pots," &c.

10



11

*Printing on thin paper, impressions transferred to the fired ware, and paper washed off.*



*Grinding and preparing the various colours for the Enameller or Painter.*

12

13

*Painting and Gilding China or Earthenware.*



*Glazing or dipping the ware in a prepared liquid, which produces the glossy surface.*

14

15

*Placing the "dipped" ware ready for its being fired or baked in the "Glazing" Oven.*

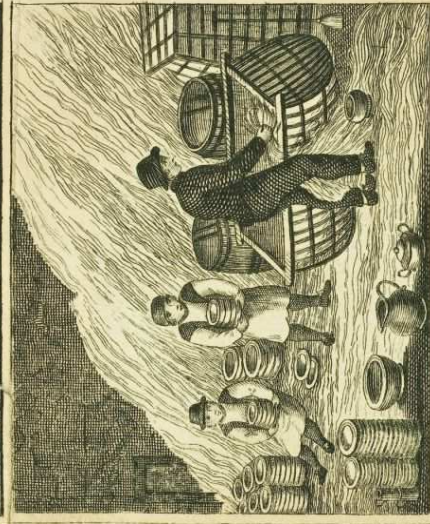


*A Pottery Oven when firing or baking, the ware being therein placed in "Safeguards, or 'Saggers'."*

16

17

*Examining and dreising the ware after its coming from the potters' and glazing ovens.*

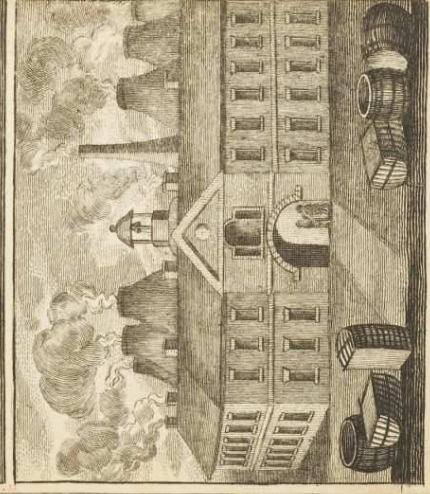


*Packing China and Earthenware in "Crates."*

18

19

*The Counting House.*



*Exterior of a Pottery.*

FINIS.

## Appendix Four

### Average weekly wages in Staffordshire pottery workshops and factories, c. 1840

Job Description	Weekly Wages		
	£	s.	d.
Slip Makers	1	19	0
Throwers	2	0	0
Turners	1	12	0
Plate, Dish, and Saucer Makers	1	18	0
Pressers	1	10	0
Moulders and Modellers	1	10	0
Dippers	1	12	0
Oven Man (per Oven)	3	0	0
Printers	1	10	0
Painters, Landscape and Flower	2	0	0
Gilders	1	4	0
Warehousemen	1	4	0
Ground-layers	1	4	0
Scourers	0	10	0
Slip Assistants	0	18	0
Throwers' Women	0	9	0
Turner's Treader	0	10	0
Oven Assistants	0	18	0
Transferrers	0	10	0
Sorters	0	9	0
Jiggers	0	2	0.5
Mould-runners	0	2	0.5
Oven-boys	0	2	0.5
Dipper's-boys	0	2	0.5
Cutters	0	2	0.5
Handlers	0	2	0.5
Apprentice Painters	0	2	0.5
Figure Makers	0	2	0.5

Notes: Scriven's estimates based on his observation of Potteries; assuming 12 hour working day and 72 hour working week.

Sources: PP [431], *Children's Employment Commission. Appendix to the Second Report of the Commissioners. Trades and Manufactures. Part 1* (1842), p. C4

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