



This work is protected by copyright and other intellectual property rights and duplication or sale of all or part is not permitted, except that material may be duplicated by you for research, private study, criticism/review or educational purposes. Electronic or print copies are for your own personal, non-commercial use and shall not be passed to any other individual. No quotation may be published without proper acknowledgement. For any other use, or to quote extensively from the work, permission must be obtained from the copyright holder/s.

GROWTH, DECLINE AND LOCATIONAL CHANGE IN THE
ENGLISH SILK INDUSTRY OF THE NINETEENTH CENTURY:
A STUDY IN HISTORICAL GEOGRAPHY.

by Peter D. Wilde.

A thesis presented for the degree of
Doctor of Philosophy

Geography Department
University of Keele

July, 1970.

ABSTRACT

The English silk industry, by its extreme fluctuations in profitability and its widespread distribution makes an interesting geographical case study of some of the forces which affected the location of industry during the Industrial Revolution. This thesis sets out to analyse the industry's changing location in times of expansion and contraction, particularly in its mechanised branches, during the nineteenth century.

The broad locational pattern of the silk industry was established during the eighteenth century when a considerable increase in the size of the industry was accompanied by spatial expansion: the old concentrations of manufacturing in London declined in importance and new centres, particularly in the Pennine province, but also in parts of southern England assumed greater significance. The first four chapters examine the factors, for example power supplies and competition for labour, which influenced its location. Because of its uncertain profitability, there were few districts in which silk could dominate the local labour force and so secure a measure of protection from stronger industries. Its labour force was

thus liable to be eroded during the industry's frequent recessions and was only rebuilt with difficulty in subsequent booms. The supply of labour is therefore seen as a major factor affecting the changing location of silk manufacture, though competition for other resources, such as power and factory space were also significant, particularly in the Pennine province.

The broad pattern of the industry's distribution had been established by the mid-nineteenth century and from this time there is a wealth of statistical information available for the size and distribution of the industry in the Factory Inspectors' Returns and the Census. Chapter 5 uses these sources to give a systematic account of the distribution and structure of the industry in about 1850. Despite its widespread distribution it is evident that there existed compact localities in which silk manufacturing was concentrated and that here the domestic, as well as the factory workers were found. Moreover, there were four districts, London, Lancashire the South West Pennines and Coventry which were the dominant centres of the trade and together accounted for most of the industry's employment.

From an analysis of the technical data contained in the Factory Inspectors' Returns it is possible to distinguish some regional contrasts in the technical advancement and organisation of the industry. Chapter 6 concludes that in general silk manufacturing in the south was labour intensive and technically backward while in the Pennines contact and competition with the other textile trades made for a more advanced industry.

Chapters 7 and 8 analyse the reaction in the various regions to one of the most extreme fluctuations in fortune that the industry experienced, in terms both of changing techniques and organisation and of the size and distribution of the labour force. Differences between the throwing and weaving branches in their response to boom and slump were apparent and the greater strength of the Pennine industry was again demonstrated.

Finally Chapter 9 examines the long term decline of the industry after the Free Trade Treaty of 1860. Competition exposed the weaknesses of the industry and at a national level contraction was inevitable. But some of the regional specialisms had the ability to persist despite the general malaise, and it was not until the twentieth century that silk

manufacturing was located almost entirely in one region, the South West Pennines.

CONTENTS.

PAGE

List of maps and diagrams	v
List of tables	viii
Preface	xv
Note on references.	xix
CHAPTER I	
The early growth of the silk industry.	1
A) The beginnings of silk manufacture in England.	1
B) Protection, profitability and spatial instability in the industry.	3
C) The spread of the industry in the eighteenth century.	12
D) Mechanisation and the growth of the industry in the Pennines.	17
References for Chapter I.	25
CHAPTER II	
The Pennine silk industry and its power supplies.	28
A) The south west Pennines in the eighteenth century.	28
B) The south west Pennines in the boom of the early nineteenth century.	34
C) The supply of coal in the south west Pennines	41
D) Power Supplies elsewhere in the Pennines.	45
E) General conclusions	48
References for Chapter II	50

	PAGE
CHAPTER III	
Locational factors in the Pennine industry.	54
A) "Integration" in Yorkshire.	54
B) "Subservience" in Lancashire.	59
C) "Competition" in the East Midlands	67
D) "Domination" in the south west Pennines	72
References for Chapter III	84
CHAPTER IV	
The distribution of the silk industry outside the Pennine province.	88
A) The dispersal of the industry in the south east.	90
B) The development of the industry in Norfolk and south west England.	99
C) Specialisation in Coventry.	106
D) General Conclusions.	109
References for Chapter IV.	113
CHAPTER V	
The location of the silk industry in the mid-nineteenth century: a regional synopsis.	116
A) The distribution and structure of the mechanised silk industry.	117
i) Deficiencies in the data.	117
ii) Mapping the Factory Inspectors' Returns.	122
iii) Regional analysis	127
B) The distribution of non-factory employment in the silk industry.	138
i) Interpreting and mapping the Census data.	138
ii) Regional Analysis	143
References for Chapter V.	154

	PAGE
CHAPTER VI	
Regional contrasts in the structure and organisation of the mechanised industry in the 1840s.	156
A) Problems of analysis.	156
B) Regional contrasts in power sources.	158
C) Regional contrasts in the structure of the labour force.	162
D) Regional contrasts in the size of establishments.	166
E) Regional contrasts in the combination of inputs.	169
F) Conclusion: the strength of the regions.	176
References for Chapter VI.	182
CHAPTER VII	
Technical adjustment to a changing economic climate: 1850-1870.	184
A) The Factory Inspectors' Returns in a period of change.	186
B) Technical adjustments in the throwing branch	191
C) Technical adjustments in the weaving branch.	195
D) Regional contrasts in the organisation of powered weaving.	201
E) Conclusion.	211
References for Chapter VII.	213
CHAPTER VIII	
Expansion and crisis: changing employment in the industry, 1850-1870.	215
A) Regional fortunes in the boom of the 1850s: the geography of expansion.	216
B) Reaction to the 1860 treaty: the geography of decline.	227
C) Concentration or dispersal?	234
References for Chapter VIII	238

	PAGE
CHAPTER IX	
Contraction, specialisation and rationalisation: the shaping of the modern industry.	240
A) The problems of the contracting silk industry.	242
B) Adjustment to new conditions: the national picture.	255
C) Adjustment to new conditions: a regional analysis.	262
D) Conclusion.	299
References for Chapter IX	301
CONCLUSION	304
APPENDIX 1	
Sources for maps, diagrams and tables.	312
APPENDIX 2	
Notes on some tables and figures.	316
APPENDIX 3	
Dates and details of the Factory Inspectors' Returns of silk mills: 1835 - 1907.	320
APPENDIX 4	
Technology, structure and the pattern of linkages in the silk industry.	322
A) Techniques of production.	322
B) The distribution of production and pattern of linkages.	346
References for Appendix 4.	362
APPENDIX 5	
Tariffs, costs and international competitiveness.	365
A) Tariffs and the English silk industry.	367
B) Costs of production.	376
C) International competitiveness of the English industry.	385
References for Appendix 5.	392

LIST OF MAPS AND DIAGRAMS

FIGURE NUMBER		FOLLOWING PAGE
2.1.	The early silk industry and water power in Stockport.	30
2.2.	Water power and mill location in Macclesfield.	36
2.3.	Water power and mill location in Congleton.	36
2.4.	Coal and water in the South West Pennines.	37
2.5.	Leek - development of communications in the eighteenth century.	39
2.6.	Silk mills in Derby - early sites.	45
2.7.	Silk mills in Derby - later sites.	45
2.8.	Power utilisation in the Pennine silk industry in the 1830s.	46
3.1.	The silk industry in the Manchester area in the 1830s.	65
3.2.	The mechanised textile industries in the 1830s - the Pennine fringes.	75
4.1.	The mechanised textile industries in the 1830s - the South West.	105
5.1.	The distribution of employment and power in silk mills in 1838 - the Pennine province.	122
5.2.	The distribution of employment and power in silk mills in 1838.	122

FIGURE NUMBER		FOLLOWING PAGE
5.3.	Change in employment in silk mills - 1838 - 1850.	124
5.4.	The expansion of powered silk weaving - 1835 - 1850.	124
5.5.	The structure of the mechanised silk industry - 1850.	125
5.6.	The regional distribution of employment, power and equipment in silk mills - 1850.	126
5.7.	Total employment in silk manufacture - 1851.	142
6.1.	Power utilisation in the silk industry of England in the 1830s.	158
6.2.	The structure of the silk industry's labour force in the mid-nineteenth century.	162
6.3.	Unit employment in silk mills related to power source - 1838 and 1850.	166
6.4.	Unit employment in silk mills - 1838 and 1850.	167
6.5.	The ratios between employment and power in silk mills - 1850.	171
6.6.	The relation of spindles to power and labour throwing mills - 1850.	174
8.1.	The change in factory employment - 1850 to the "Peak".	216
8.2.	The change in factory employment - "Peak" to "Nadir".	227

FIGURE NUMBER		FOLLOWING PAGE
8.3.	Factory employment at the "Peak" and "Nadir".	235
9.1.	Re-exports of foreign-made raw silk and silk yarn: 1855 - 1910.	252
9.2.	Employment in silk manufacturing: 1850 - 1911.	256.
9.3.	Raw and waste silk imports retained in Britain: 1855 - 1910.	257
9.4.	Imports and exports of manufactured silk goods: 1855 - 1910.	260
9.5.	Structure of the silk industry - 1901 and Change in total employment - 1851 - 1901.	262

LIST OF TABLES

TABLE NUMBER		FOLLOWING PAGE
2.1.	Expansion of the number of mills in Macclesfield and Congleton: 1800 - 1838.	35
2.2.	Steam engines known to have been installed in Macclesfield and Congleton: 1800 - 1817	36
2.3.	Steam engines and water wheels at use in silk mills in Macclesfield and Congleton: 1838.	37
2.4.	Average power requirements of the textile industries in England and Wales: 1838.	44
2.5.	The use of water in the textile mills of some parishes in the West Riding of Yorkshire: 1838.	48
2.6.	Changes in the power source of Pennine silk mills: 1838 - 1870.	49
3.1.	Hand looms using silk in the Manchester area: 1819 - 1832.	60
3.2.	The distribution of power looms weaving silk in south east Lancashire: 1835.	65
3.3.	The growth of the hosiery industry in England: 1660 - 1884.	68
3.4.	The hosiery industry in the East Midlands: 1844.	69
3.5.	The silk hosiery industry in the East Midlands: 1844.	69

TABLE NUMBER		FOLLOWING PAGE
3.6.	The textile industries of the South West Pennines: 1838.	73
3.7A.	Silk establishments in Macclesfield: 1790 - 1834.	78
B.	Silk establishments in Congleton: 1790 - 1834.	78
C.	Silk establishments in Leek: 1784 - 1834.	78
4.1.	Ribbon looms of all types in use in the major centres: 1838.	107
4.2.	Ribbon looms in Coventry and district: 1818 and 1838.	108
5.1.	A regional division of the silk manufacturing counties.	123
5.2.	The regional distribution of the powered silk industry: 1838.	123
5.3.	The estimated division of labour between throwing and weaving in combined mills: 1850.	126
5.4.	A comparison of the various measures of the regional distribution of the powered silk industry: 1850.	126
5.5.	Total and factory employment in the silk industry of the early 1850s.	142
5.6.	The areal concentration of the manufact- uring localities in the major silk manufacturing regions: 1851.	144
6.1.	Changes in the source of power in silk mills: 1838 - 1850.	158

TABLE NUMBER		FOLLOWING PAGE
6.2.	Power sources of the silk mills south of the Pennine province: 1838.	159
6.3.	Summary of changes in power utilisation: 1838 - 1850.	161
7.1.	The changes in the number of workers and amount of equipment used in silk mills in England: 1838 - 1878.	188
7.2.	The estimated division of labour between throwing and weaving in combined mills: 1867.	188
7.3.A)	Rates of change of labour and equipment in specialised silk throwing mills: 1850 - 1867.	
B)	Rates of change of labour and equipment in the combined mills of southern England. 1850 - 1867.	191
7.4.	Spindles installed in combined silk mills in England: 1850 - 1878.	194
7.5.	Regional variations in the size of the specialised silk throwing and spinning mills: 1850 - 1874.	194
7.6.	Total employment in the factory and domestic silk industries in England.: 1850 - 1871.	196
7.7.	The decline of non-factory employment in the silk industry: 1851 - 1871.	196
7.8.	The application of power to looms in the specialised silk weaving mills in England: 1850 - 1861.	198

TABLE NUMBER		FOLLOWING PAGE
7.9.	Average ratio of power to looms and employment in England's mills weaving broad silk: 1850 - 1867.	199
7.10.	The number of looms installed in England's silk mills: 1850 - 1870.	199
7.11.	The application of labour and power to looms in the specialised silk weaving mills in England: 1861 - 1870.	199
7.12.	The scale of operation in Warwickshire's ribbon weaving mills: 1850 - 1861.	201
7.13.	Powered looms in the silk mills of southern England: 1850 - 1870.	203
7.14.	The scale of operation in the combined mills of Southern England: 1850 - 1870.	203
7.15.	Weaving in the silk mills of the East Midlands 1850 - 1870.	204
7.16.	Weaving in the silk mills of Lancashire: 1850 - 1870.	205
7.17.	Weaving in the silk mills of Cheshire: 1850 - 1870.	209
7.18.	Unit employment in Cheshire's silk mills: 1850 - 1870.	209
7.19.	Combined silk mills in Staffordshire: 1850 - 1870.	209
7.20.	Silk weaving and the combined mills of Cheshire: 1850 - 1889.	210
8.1.	The population of the South West Pennine silk towns: 1801 - 1851.	217

TABLE NUMBER		FOLLOWING PAGE
8.2.	Employment and equipment in Lancashire's silk mills: 1850 - 1861.	218
8.3.	Employment and equipment in Derbyshire's silk mills: 1850 - 1861.	219
8.4.	Population and silk workers in the South West Pennines: 1851 and 1861.	220
8.5.	Employment and equipment in Yorkshire's silk mills: 1850 - 1861.	221
8.6.	The decline of employment in the 1860s in the silk industry's dominant centres.	227
8.7.	The change in employment in the silk mills of the Pennine province: 1856 - 1867.	228
8.8.	The change in employment in the specialised silk throwing areas of southern England: 1856 - 1870.	229
8.9.	The decline of specialised throwing mills in the South West and Hampshire: 1856 - 1867.	230
8.10.	Employment and equipment in the combined mills of South West England: 1856 - 1867.	230
8.11.	Employment and equipment in the combined mills of Norfolk: 1856 - 1867.	232
8.12.	Employment and equipment in Norfolk's silk industry as a proportion of the national totals.	232.
8.13.	Employment and equipment in the combined mill of Essex: 1856 - 1867.	232.

TABLE NUMBER		FOLLOWING PAGE
8.14.	Employment and equipment in the specialised throwing mills in Essex and Suffolk: 1850 - 1867.	233
8.15.	The distribution of employment in the silk industry of the Pennine province: 1850 - 1867.	236
8.16.	The proportion of employment in England's silk industry found in the Pennine province: 1850 - 1867.	236
9.1.	Waste silk spinning in England: 1792 - 1913.	258
9.2.	Production and trade of silk and silk goods in the United Kingdom: 1907.	259
9.3.	Value of the output of the various sections of the silk weaving trade in the United Kingdom: 1907.	262
9.4.	The distribution of the various branches of the English silk industry: 1904.	263
9.5.	Persons employed in crape manufacture: 1881 and 1891.	265
9.6.	Employment in spinning and combined mills in Yorkshire: 1867 - 1889.	282
9.7.	Employment and equipment in Lancashire's silk mills: 1878 - 1889.	285
9.8.	Distribution of power looms: 1870 - 1889	289
9.9.	The population of the South West Pennine silk towns: 1851 - 1911.	296

TABLE NUMBER		FOLLOWING PAGE
9.10A	The structure of employment in Macclesfield: 1861-1911.	297
9.10B	The structure of employment in Congleton: 1861-1911.	297
9.10C	The structure of employment in Leek: 1861-1911.	297
A5.1	Duty on raw and thrown silk imported into England: 1660-1824.	371
A5.2	Duty on silk imported into England: 1824-1860.	374
A5.3	Cost structures of sample silk manufacturing firms in 1905.	378

PREFACE

There is a surprising dearth of geographical case-studies of the location and regional development of industries in England in the Industrial Revolution, a period in which the foundations of the present day distribution of industry and population were laid. The gap in the literature extends even to the textile industries, in which rapid growth in the Pennine border counties and decline elsewhere initiated radical changes in the regional distribution of population and wealth but these changes remain an incompletely understood phenomenon. The textile manufacturers in Lancashire and the East Midlands have received adequate treatment but, for the rest, not even the growth of the wool-worsted industry in Yorkshire has been subjected to detailed locational analysis.

This deficiency of case-study treatment, in the textile trades at least, is not due to any lack of source material for, as Professor Rodgers showed ten years ago, the Factory Inspectors' Returns yield much valuable information about variations in the size of the labour force and the distribution of employment. It is hoped that this study of the silk

industry will further illustrate the usefulness of this source and help to fill a gap in the study of the geography of the Industrial Revolution.

Although one of England's minor textile trades, the silk industry in the nineteenth century displayed a number of characteristics which make its study particularly rewarding. It was commercially and organisationally a relatively weak industry and its establishment and growth in England were due almost entirely to the imposition of protective tariffs. It was consequently liable to react violently to any changes in government policy and to any increase or diminution in foreign competition. Moreover, the silk industry catered largely for a fashion market and so for this reason, too, was subject to sudden and extreme variations in profitability. There was an important geographical dimension to these fluctuating fortunes, for the industry retained an exceptionally widespread, but also a remarkably unstable distribution. The silk industry's reaction to changing circumstances in a variety of economic environments is the central theme of this analysis.

The Factory Inspectors' Returns, by their spatial detail and frequency of compilation, permit the short term changes in the size and distribution of the industry's labour force to be traced, particularly during one of its most extreme periods of fluctuation in the mid-nineteenth century. But, in addition to details of employment, the Returns also give a wealth of technical data on the equipment installed in the mills and the power applied to production. Such information, which is so often lacking in both modern and historical sources, gives an invaluable insight into regional contrasts in the productivity of labour and the technical progressiveness of the industry.

Although the Factory Inspectors' Returns form the statistical base of this study, the establishment and spread of the industry occurred in the early nineteenth century before this source was available. There were, however, a number of government reports which investigated the industry in this period. These together with many other sources have been used to analyse the early distribution of the industry in what is essentially a non-quantitative manner.

The first four chapters of this thesis consider the silk industry during the eighteenth and early nineteenth centuries when expansion was the keynote, and they examine the factors, for example the power and labour supplies which influenced its locational spread. This is followed in Chapter 5 by a systematic account of the distribution and structure of the industry which had emerged by the mid-nineteenth century, emphasising especially the regional specialisms which had evolved, and showing that, though widespread, silk manufacturing took place in compact localities.

The technical data in the Factory Inspectors' Returns is used in Chapter 6 to distinguish some regional contrasts in the technical advancement of the industry in the relatively stable period around 1850 and Chapter 7 analyses the regional contrasts in the changes in the techniques and organisation of the industry in response to its increasing prosperity in the 1850s and its sudden decline following the Free Trade Treaty in 1860. The changing distribution of the industry during these twenty years of rapid change after 1850 is then considered using the labour statistics of the Factory Inspectors' Returns as a base. Finally Chapter 9 traces the industry's long term decline in the second half of the nineteenth century

at both a national and a regional level in order to account for the collapse of silk manufacturing in some regions and its survival in others.

NOTES ON REFERENCES

Notes and abbreviated references are given in footnotes on each page, except that evidence which clearly originates from the most used statistical sources, the Factory Inspectors' Returns and the Census, is not usually detailed. A bibliography of material referred to is given at the end of each chapter. There is no massed bibliography for the whole work, but a full list of the Factory Inspectors' Returns, with notes, is given in Appendix 3.

The sources for all maps and tables are given in full in Appendix 1. It was considered better to state sources systematically in this way as some of the maps and tables were synthesised from several sources which require a somewhat lengthy statement.

ERRATA

For C.S. DAVIS read C.S. DAVIES.

CHAPTER 1THE EARLY GROWTH OF THE SILK INDUSTRYA) THE BEGINNINGS OF SILK MANUFACTURE IN ENGLAND.

It was in the mid-fourteenth century that silk manufacture became sufficiently important in England to be mentioned by name in the statute book;⁽¹⁾ and at about the same time that the silk workers in London were organised and numerous enough to be able to petition the mayor as a body. A century later their political influence was sufficient to gain tariff protection and by 1482 numbers employed were great enough for assistance to be given when competition threw many people out of work.⁽²⁾ Despite these early origins the establishment of silk manufacture on a large scale dated from the sixteenth and seventeenth centuries when many refugees settled in England as a result of persecution of Protestants in the Netherlands and France. Among the refugees were many silk weavers from Lyons, Antwerp and Mons, all towns with established silk industries and bastions of Protestantism.

(1) 37 ED III Cap VI (1363). (2) Dale (1933) p.324

Weavers of silk, as well as of other fabrics are reputed to have been invited to Norwich in the early sixteenth century;⁽³⁾ Sandwich received Flemish refugees in 1561, and a large settlement was established at Canterbury for Flemish and Walloon weavers in the early 1560's.⁽⁴⁾ Many of the immigrants naturally gravitated toward the eastern quarters of London where the early indigenous industry was chiefly found and by 1621 there were twelve foreign throwsters and hundreds of foreign weavers to be found in Spitalfields and Bethnal Green.⁽⁵⁾ The influence of the early refugees led to the incorporation of the Fellowship of Throwsters in 1629⁽⁶⁾ and in a variety of ways they were important in firmly establishing the silk industry in England and in creating a favourable environment for the later immigrants. However they were numerically very small when compared with the huge influx of Huguenots consequent upon the Revocation of the Edict of Nantes in 1685. Maitland gives the numbers of Huguenots being relieved in 1687 as 15,500, of whom 13,500 were in London.⁽⁷⁾ Many of these were silk weavers from the Protestant stronghold of Lyons, who were attracted in such numbers to the established weaving quarter in east London that an extensive network of streets was built to house them.⁽⁸⁾

(3) Warner (1921) pp.29-30.

(4) Warner (1921) p.51

(5) Smiles (1895) p.103

(6) Hertz (1909) p.710

(7) Maitland (1775) vol.1 p.485. (8) Warner (1921) p.56

From the closing decades of the seventeenth century the industry grew to be of considerable importance in England: it employed in 1851 over 130,000 workers compared to perhaps 1,000 looms at work in 1700,⁽⁹⁾ and increasingly it became not only the concern of the weavers, but also of politicians, financiers and wholesalers. It is from this latter tendency that much of the material for this study of the early geography of the industry derives.

B) PROTECTION, PROFITABILITY and SPATIAL INSTABILITY in the
INDUSTRY.

The action of politicians was essential for the prosperity of the silk industry since without protection from foreign competition it could neither have been established nor maintained.⁽¹⁰⁾ In fact the Royal Lustring Company, incorporated in 1693, was able to secure either high tariffs against, or absolute prohibition of, the import of manufactured silk for the next 150 years. Between 1713 and 1765 tariffs were extremely high and from 1765 to 1826 fully manufactured silk imports were prohibited and duty on other silk goods was punitive. In 1826

(9) Census (1851); Hertz (1909) pp.710-711.

(10) "Foreign Trade" H.C.(1821) vol. VII p.421.

a tariff system was re-introduced and rates were lowered in 1828 and 1845 and removed completely in 1860.⁽¹¹⁾ Although the English silk industry was thus, to a degree supported by the state by these tariffs, it nevertheless had financial problems to face: the duty on raw silk, as well as on manufactured goods, was extremely high, which tied up large amounts of the manufacturers' capital and reduced the effect of any economies or innovations adopted by the industry.⁽¹²⁾ Parliament also intervened in the industry's affairs in 1714 by passing the Spitalfields Act, the effect of which will be considered later.

Despite considerable protection from foreign competition the English silk industry experienced violent fluctuations in output, employment and profitability in the eighteenth and nineteenth centuries, much of it caused by variations in illicit competition from France. French silks were so prized, even in the time of absolute prohibition in their import, that manufacturers in England tried to pass off their goods as smuggled, and the trade from France was so large and well organised that it was possible to insure the shipments of smuggled goods.⁽¹³⁾

(11) See Hertz (1909) p.711

(12) Hertz (1909) p.720; Prout (1829) p.39

(13) Edinburgh Review (1826) p.82-3; Porter (1831) p.84

Consequently the weaker English industry was in a continual inverse relationship with the French, prospering only when French goods were unfashionable or restricted in output. When France was at war the English industry expanded, when a peace treaty was signed a number of English firms would fail, and the industry would clamour for greater or more efficient protection. Thus in 1714 and 1765 import restrictions were imposed and in 1818 it was necessary for a Select Committee to enquire into the grievances of the weavers. The reduction in the protection given to the industry in the 1820s led to further fluctuation. The duty on raw silk was reduced to a negligible amount in 1824, and though the duty on foreign thrown silk, was also reduced there was a boom in silk throwing which led to many mills being built throughout the country. A reversal occurred after 1826 when manufactured goods were admitted to England and many mills were closed and spindles left idle. In short, the changing fortune and distribution of the silk industry both show the influence of government policy far more clearly than in the case of the stronger textile industries, such as cotton or the wool-worsted trade. Frequently in the pages that follow, locational change in silk manufacturing will be seen to stem from the influence of political action.

Even without reference to foreign competition the silk industry was liable to fluctuating fortunes. In the long term silk was gradually replaced by cotton for many uses and the advancing technology of the cotton industry enabled fine cottons and muslins to be produced, especially after 1781.⁽¹⁴⁾ Now dependent on the luxury market, silk was liable to the vagaries of fashion, and changes in demand frequently affected thousands of looms, in both the broad silk and ribbon trades.⁽¹⁵⁾

The speculative nature of many of the silk throwing and weaving ventures itself intensified these fluctuations. French wars, short lived changes in fashion and, best documented of all, the tariff charges in 1824, led to an excessive number of mills being built or occupied by silk manufacturers, the installation of new capacity frequently never used, and overproduction of goods, leading to extreme competition and an intensification of the subsequent slumps. Macclesfield, for example, was appealing for 4-5,000 young persons to be employed in silk in 1825, yet as recently as 1818, the town had been feeling the strain of French competition following the cessation of the Napoleonic wars, and by 1829, the new, lower tariff on manu-

(14) Daniels (1920) pp.128-9; Unwin (1924) p.2

(15) Hertz (1909) p.721; Prest (1960) p.44.

factured goods reduced output and there were alleged to be 200,000 spindles idle in the town, though many of these had never actually been in use.⁽¹⁶⁾ In England as a whole the fluctuations were proportionally greater: between 1824 and 1828 the number of mills increased from 175 to 266 and the number of spindles from 780,000 to 1,180,000.⁽¹⁷⁾ The capital for this particularly extreme boom had been made available by the reduction in duty on raw silk.⁽¹⁸⁾

A final factor causing variations in employment and profitability was the technological advance of the industry which in the 1820's was considered as significant as the extreme speculation in causing instability in the industry.⁽¹⁹⁾ In particular, additional power applied to the industry in the booms increased the output of existing equipment, which in the slump added to the total of installed excess capacity. For example, it was estimated that between 1815 and 1833 technical advances (almost certainly through the application of extra power) made possible a twenty per cent rise in the output of a typical throwing mill without increasing either the number of spindles or the labour force.⁽²⁰⁾

(16) Prout (1829) p.46: Badnall (1828) p.84-87.

(17) Porter (1831) p.80. (18) Vict. County Hist. Staffs. Vol.2. (1967) p.209. (19) Badnall (1828) p.92

(20) "Manufacturing, Commerce and Shipping." H.C. (1833) vol. VI Q5202

In considering silk manufacture in England we are thus studying an industry which could never have been firmly established on purely economic grounds, and one which inevitably reacted violently to variations in competition or the demands of fashion. Nevertheless the general trend of the industry was toward growth while it enjoyed a protected environment, and even after the Free Trade Treaty of 1860 some branches remained strong in England. In addition to being violent, fluctuations in the prosperity of the industry were usually concentrated into brief periods, and were general to the whole country. These features make the silk industry particularly appropriate for a study of the influence upon it of external factors, especially government policy, which created radical changes in the commercial environment. From a study of its reactions to the rapidly changing conditions of operation in which it was placed, light may be shed on the significant forces affecting more slowly changing industries. The fluctuations also lead to difficulties in interpreting data. There is naturally a great wealth of data and comment during the periods of recession, particularly as these frequently attracted a government enquiry. Comparisons are usually between the zenith of the previous boom and the current nadir, both exaggerated for maximum effect; and so it is difficult to obtain any idea of "normal" conditions or to

(9)

establish a general trend.⁽²¹⁾

The violent fluctuations had two marked effects on the distribution of the silk industry in England. Firstly, the ownership of the mills changed frequently. In many cases silk continued to be produced under the new owners,⁽²²⁾ but in some mills silk production was only a shortlived phase in the history of a particular mill. In Sheffield and Stockport, for example, mills are known to have been converted from corn-milling to silk production and then to cotton manufacture within a short space of time.⁽²³⁾ In the regions where silk and other textiles were manufactured side by side, notably in the south west and in Lancashire and Yorkshire, the production of some mills changed from fibre to fibre as business dictated. Thus not all closures of silk manufacturing establishments were equally significant in terms of the local economy or were likely to cause social distress among mill workers and weavers. Some closures merely meant a transfer (by the same firm) to another textile; others resulted from new owners moving into cotton or wool after the former silk manufacturer retired, perhaps with a fortune.

(21) See for example "Silk Manufacture" C.J. XXX (1765) p.219. and compare Prout (1829) a protectionist with Badnall (1828) who advocated free trade.

(22) See for example Vict. County Hist. Essex Vol.2 (1907) pp.463-4.

(23) Unwin (1924) pp23 and 119. Warner (1921) p. 258

Comprehensive evidence of such changes in any industry is slight, though in calico printing where a census does exist the turnover was "staggeringly high" in the 1840's.⁽²⁴⁾ In an industry so beset with recessions as silk it must have been phenomenal.

Closely linked with this constant change of ownership was the second major effect of the violent fluctuations in the fortunes of the industry, namely silk's weak position compared particularly with other textile industries. As it was frequently near the margin of profitability, the silk industry was in almost constant competition with other textile industries for mills, power supplies, and to a lesser extent for labour. At times when the prospects of profit in silk dwindled, the industry was ousted from many of its best locations by more reliably profitable industries. Locations maintained through the slumps were thus often those which suffered least competition from other textile interests rather than those from which silk manufacture could gain a positive advantage. It will be seen later that this was true even in the Pennine province where a large proportion of the industry was established.

At the boom periods when silk manufacture was an exceptionally profitable enterprise, there was, of course, an expansion of its domain at the expense of other textile

(24) Wallwork (1969) p.148; Turnbull (1951) appx.2 pp.423-6.

industries. There is occasional evidence of the movement of producers, capitalists, speculators or workers to regions showing most profit. However, since any boom was national in its influence, there tended to be a crisis in the supply of both labour and equipment, and expansion took place at many centres. An entrepreneur was prepared to operate widely scattered concerns to benefit fully from the opportunities presented by the brief boom. In the subsequent slump many less favoured locations would be abandoned (perhaps to other textile interests), but a remnant of production would continue, awaiting the next boom. Such practices were not rare in the nineteenth century textile trades generally but the silk industry provides an example of the effects of particularly short term and extreme changes.

The locational history of the silk industry is thus one of successive spatial expansions followed by contractions, in which the industry was concentrated into a number of core regions, which were in the long term the chief centres of manufacture. It is impossible to interpret the locational patterns in the industry in terms of any simple "environmentalist" principle. Silk manufacture seldom took place at "least cost" locations: in the booms profits were so high that cost was of little relevance, and in the slumps manufacture was located not where

conventional costs were at a minimum but rather where silk's comparative advantage, in terms of reduced competition for labour, power, and factory space from stronger industries, was greatest.

C) THE SPREAD OF THE INDUSTRY IN THE EIGHTEENTH CENTURY

Although London was by far the most important centre of silk production in the early eighteenth century there is evidence for the establishment of silk manufacturing at a variety of towns in the seventeenth and early eighteenth centuries. A Winchester weaver is noted as having an apprentice in 1671; a Worcester silk worker as carrying arms in 1692.⁽²⁵⁾ For other towns the evidence is more substantial: Wokingham, Reading and Oxford were manufacturing silk stockings in the mid-seventeenth century; Gloucester was engaged in weaving from 1637, and Malmsbury, Warminster and Bishopscanning commenced weaving during the century.⁽²⁶⁾

Huguenots are credited with bringing the industry to some of these towns in the south west, and there is more evidence of their importance at Chipping Campden, Blockley and Kidderminster,

(25) Warner (1921) pp.329-330. (26) Warner (1921) pp.325-6: Vict. County Hist. Wiltshire vol.4 (1959) p.176

where silk manufacture was established in the early eighteenth century.⁽²⁷⁾ However as the silk industry expanded it was frequently adopted by towns with no previous connection with any trade, encouraged either by an enterprising native or by the towns' overseers looking for some profitable occupation for the poor. Mills using workhouse labour were established in Marlborough in 1792, in Aylesbury in 1824, and in the Chilterns in the early nineteenth century.⁽²⁸⁾ Doubtlessly many other places took up silk production as it was less tied to traditional regions than many other labour intensive industries at that time. In the south-east of England the industry became less widespread as many weavers moved to London, from Canterbury and the smaller centres, in times of distress in the early eighteenth century;⁽²⁹⁾ but in Norfolk an important centre of silk weaving grew up at Norwich, one of the first towns to receive refugees.

There are fewer centres of silk manufacture mentioned further north in England in the early seventeenth century, though it is these which were to have most effect on the industry in its later development. In Coventry the weaving of broadsilks

(27) Warner (1921) p.327.

(28) Vict. County Hist. Wiltshire vol.4 (1959) p.177;
Warner (1921) p.322

(29) Hertz(1909) p.721

was on a sufficient scale to warrant a distinct company being formed in 1627.⁽³⁰⁾ This industry lapsed however and wool production was the major concern of the town until ribbon manufacture was introduced in about 1700. Huguenots may have been responsible for the establishment of this industry,⁽³¹⁾ but more significant is the propitious timing of the venture. In the early eighteenth century ribbons were extremely fashionable and the Coventry industry rapidly grew to dominate this specialised branch of the silk industry, a position it maintained until its collapse in 1860.⁽³²⁾

In Macclesfield, the other crucially important silk manufacturing centre outside the south, the industry originated in button making which was introduced to the town in the sixteenth century. There is evidence of silk buttons being made from at least 1649,⁽³³⁾ and London silk merchants were mentioned in Corporation regulations in 1664.⁽³⁴⁾ By the end of the century silk twisting and button making had developed into a considerable domestic industry. In 1698 it was strong enough for the

(30) Warner (1921) p.107. (31) See Warner (1921) p.108; Vict. County Hist. Warwickshire vol.2. (1908) p.258.

(32) Vict. County Hist. Warwickshire vol.2 (1908) p.257.

(33) Davis (1961) p.122. (34) Davis (1961) p.70.

Corporation to direct that poor children should be instructed in button making and by the start of the eighteenth century the industry had spread into many neighbouring villages. Congleton also shared this early button making industry, but in the early eighteenth century the trade was largely replaced by leather lace making, and it was not until a mechanised silk industry was attracted by the power potential of the River Dane that silk was reintroduced into the town fifty years later.

In Macclesfield, however, industries subsidiary to domestic button making had been introduced by the start of the eighteenth century. Silk throwing, as well as twisting, was begun and the resulting waste silk was made up into "ferrets, stockings, knee garters, fringes and sewing silks".⁽³⁵⁾ Commercial links were established both with the producers of raw silk and with home and overseas users of the twist and buttons. In particular the Macclesfield throwsters met some of the demand for yarn from the increasing numbers of Spitalfields weavers, certainly in the eighteenth century and perhaps from 1685.⁽³⁶⁾

Button making also spread to Leek in the late seventeenth century, and there is evidence of a small silk weaving concern even earlier.⁽³⁷⁾ Although the silk industries of Leek and

(35) Davis (1961) p.125. (36) Davis (1961) p.123-4.

(37) Vict. County Hist. Staffordshire vol.2 (1967) p.206

Macclesfield later developed in different directions, it is probable that in this early period the industry in Leek was little more than an outlier of the larger Cheshire centre.⁽³⁸⁾

By 1731, however, the silk manufacturers of Leek were important enough to join with those of Macclesfield and with the principal traders of Stockport and Manchester to petition Parliament against the extension of Lombe's patent.⁽³⁹⁾

Clearly the chief foci in what was to become the south-west Pennine silk producing region, and the dominant centre of the industry in Britain, had acquired their interest in the trade at an early date, and long before mechanisation gave the area its advantages of power supply.

The above account of the early spread of silk manufacture in England is by no means exhaustive. Although the contribution of immigrant weavers has been considered, no attempt has been made to assess their importance in disseminating the knowledge and practice of silk working. The significant feature for the ensuing study was the growth of a widespread, largely handicraft industry in the eighteenth century organised by many small masters. By 1800 the industry was among England's greatest undertakings and Spitalfields was beginning to lose its control

(38) "Technical Instruction" H.C. XXXI (2) (1884) p. xxxii

(39) "Petition" C.J. XXI (1731) p. 840.

over it.⁽⁴⁰⁾ In the early nineteenth century a series of booms, coupled with the acceleration of technical and organisational changes introduced in the eighteenth century, completely transformed the industry as will be seen in subsequent chapters.

D) MECHANISATION AND THE GROWTH OF THE SILK INDUSTRY IN THE PENNINES.

The first powered mill for throwing silk which was commercially successful was built by John and Thomas Lombe between 1717 and 1721 at Derby. As well as being the first example of power being successfully applied to the preparation of a textile yarn, the venture was significant because it was the first time that organzine had been produced in Britain. Organzine is the high quality silk yarn required for warp threads and framework knitting, and the necessity of importing it from Italy had hitherto placed great restraint on the English silk industry.⁽⁴¹⁾

Thomas Lombe was a silk merchant in London and came from a family which for generations had been settled in the textile town of Norwich.⁽⁴²⁾ Many reasons have been put forward to explain why he chose Derby rather than either of the towns with

(40) See Hertz (1909) p.721. (41) Chaloner (1953) p.778.

(42) Chaloner (1953) p.781

which he was connected as the location for the mill. Sorocold under whom John Lombe had learnt much of his engineering, and who in fact built the mill, was in business there, and an earlier attempt had been made to throw silk by water power in the town. Crotchett a local barrister (also with Sorocold as engineer), had built this mill on an island in the Derwent in 1702.⁽⁴³⁾ The project soon failed though Lombe's mill, on the same island, incorporated the "Old Shop".⁽⁴⁴⁾ Hutton suggests the secrecy afforded by the island was a significant locational factor.⁽⁴⁵⁾

The search for labour, both cheaper and more plentiful than could be found in London, has been put forward as a major factor in the widespread migration of industry from the metropolis at this period.⁽⁴⁶⁾ The silk industry was a part of this migration and potential mill workers, chiefly from among the many pauper children in the town,⁽⁴⁷⁾ were available in Derby and this may have constituted an important attraction. There can be little doubt, however, that the decisions to locate both Crotchett's and Lombe's mills in the east Midlands were primarily in response to the increasing and potentially large demand for silk yarn in the region from the framework knitters.⁽⁴⁸⁾

(43) Williamson (1936) pp.55-64 gives a detailed account of both mills. (44) Nixon (1969) p.181

(45) Hutton (1795) pp.197-198. (46) Labour supply is considered in detail below: see pp.91 and 98

(47) Henson (1831) p.153. (48) See below pp. 67-8.

Although Nottingham was the chief centre of framework knitting in the early eighteenth century, the greater water power potential of the Derwent than the Trent governed the decisions to locate the mills at Derby rather than Nottingham.

Despite the importance which had been attached to a home supply of organzine, the adoption of the process and the development of mechanical throwing was slow. In 1731 it was estimated that Lombe had succeeded in reducing the cost of yarn by twenty per cent,⁽⁴⁹⁾ though thirty years later only one-ninth of the 360,000 lbs. of organzine used in England was produced at home because in general it was cheaper to import the yarn.

However the monopoly control exercised by the King of Sardinia gave rise to uncertainties which justified a home supply.⁽⁵⁰⁾

By 1765 there were seven mills throwing organzine in England working on Lombe's principle, although tram, the lower quality weft, was produced in about sixty powered mills by that date.⁽⁵¹⁾

Of the seven organzine mills there were certainly two at Macclesfield, at least one at Stockport, one in each of Derby

(49) C.J. XXI (1731) p.795. "Lombe's Engine."

(50) "Silk Manufacture" C.J. XXX (1765) p.213: "Raw Silk in America": H.C. (1749-50) vol.59 of general collection 1731-1800.

(51) "Silk Manufacture" C.J. XXX (1765) pp.213-217.

and Congleton and perhaps one in Sheffield.⁽⁵²⁾ It seems that only one mill, thought to be in Hertfordshire, was producing organzine outside the Pennine province in 1765 though a further mill was opened in Watford in 1768.⁽⁵³⁾ Since the Spitalfields weavers were the major consumers of thrown silk in the eighteenth century, the concentration of organzine mills in Pennine England requires explanation.

It is true that Stockport and Macclesfield, the first towns to follow Derby in developing powered organzine throwing, both had established domestic silk throwing industries in the early eighteenth century. However, button making, the mainstay of the industry in both towns was beginning to decline in the face of cheaper metal buttons made in the Birmingham area.⁽⁵⁴⁾ Stockport throwsters supplemented the button trade with small-ware and bands for the local hat manufacturers and it is likely that the weavers of silk and mixed goods in Manchester were supplied with yarn from Stockport.⁽⁵⁵⁾ The Macclesfield

(52) "Silk Manufacture" C.J. XXX (1765) pp.213-7 for Macclesfield and Congleton: "Raw Silk in America H.C. (1749-50) vol.59 of general collection 1731-1800 refers to "three large machines" at Stockport (see also Unwin (1924) p.23) Warner (1921) p.257 for Sheffield. This mill was "said to be on Lombe's pattern".

(53) Wadsworth and Mann (1931) p.305. for Hertfordshire: Manchester Mercury (August 2nd. 1768) for Watford.

(54) Timmins (1866) p.35.

(55) See "Petition" C.J. XXI (1731) p.840.

hand twisting industry had already developed strong commercial links with the market for yarn in Spitalfields by the mid-eighteenth century, and the growing London market was replacing the local button trade as a major outlet for yarn.

In addition to the decline in button manufacture, innovations in that trade were causing unemployment so serious that the women of Macclesfield rioted in 1737.⁽⁵⁶⁾ It is probably true to deduce that, in part, the cheap labour made available by these changes was responsible for attracting the silk throwing industry away from London.⁽⁵⁷⁾ Not only was the immediate factory labour cheaper but there was also the prospect of lower paid country outworkers as the industry, expanding nationally, took a hold in the Pennine provinces.

A recurrent feature in the establishment of these early mills was their dependence on the Spitalfields trade. In common with other industries which were spreading into the provinces at that time, the establishment of silk manufacture in the south west Pennines depended to a large degree on the direct involvement of London merchants both as customers and as suppliers of capital. Not one of the early ventures was without a London silk merchant among the partners and for

(56) C.J. XXIII (1737) pp.50,76 and 162.

(57) See Wadsworth and Mann (1931) pp.304-5.

many years Spitalfields provided the major market for the yarn produced. A London merchant was in the partnership of six which established the Stockport mill in 1732, as soon as Lombe's patent had expired.⁽⁵⁸⁾ In 1769 Spitalfields was referred to as the major outlet for the much expanded silk industry of the town.⁽⁵⁹⁾ In Macclesfield, Roe, a button merchant, built what was almost certainly the first powered throwing mill in the town in 1743.⁽⁶⁰⁾ No partner was mentioned at that time but by 1750 he was in partnership with Samuel Lankford, a silk merchant,⁽⁶¹⁾ and Spitalfields was the major market for the yarn. Congleton soon followed Macclesfield in developing a mechanised throwing industry, though at the time the town had no strong links with the silk industry. However given the economies possible by proximity to Macclesfield and the excellent water power resources with which the town was endowed, Congleton was well placed to participate in the expanding silk industry. John Clayton, from Stockport opened the first throwing mill in 1752 with Pattison, a London silk merchant who wished to control his own supplies of organzine, as partner.⁽⁶²⁾

(58) Unwin (1924) p.23 and Heginbotham (1892) vol.2. p.318.

(59) Defoe (1769) vol.2 p.397.

(60) See Chaloner (1951) pp.135-7 for confirmation of the date.

(61) Chaloner (1951) p.137: Royal Depot Mill MSS.

(62) "Silk Manufacture" C.J. XXX (1765) p.213

Despite the concentration of the early throwing mills in the south west Pennines, the powered branch of the industry was extended very little during the eighteenth century, compared with the rapid growth it would undergo after 1800. In Stockport the entire industry increased briefly but had collapsed by 1780. In Macclesfield and Congleton and to a lesser extent in Leek however, the domestic industry expanded rapidly as the button makers turned increasingly to other branches of the silk industry, and the throwsters devoted an increasing amount of their output to satisfy the demand from the local manufacturers. By 1800 the silk industry was consequently so strongly established in the south west Pennines that both domestic and powered branches could grow with a greater degree of independence from the London market that had once dominated them.

The reasons behind the choice of the Pennine province for these major developments (by which four of the seven organzine mills working in 1765 were concentrated in Cheshire) are obviously problematical. Only in Derby was a local outlet for yarn a significant factor when operations commenced. At Stockport and Macclesfield the fortuitous decline of the button industry coincident with the introduction of mechanised throwing provided cheap labour, though the nature of the earlier industry, providing both a labour force used to handling silk and a marketing

organisation, perhaps exerted a stronger attraction than the mere availability of labour.

The water power potential of the region was clearly an important factor in encouraging the expansion of the industry in the south west Pennines; though this cannot explain the establishment of the earliest mills so far from the London base of the industry. The improvement in communications between the north west of England and London was a vital consideration in an industry which depended on London both as the port of entry for raw silk and as the chief market for the thrown yarn. From 1730 there would have been little difficulty in the journey between the silk producing towns and London, and by 1762 Stockport, Macclesfield, Congleton and Leek were all on direct and improved roads to the south. (63) These developments may have brought the region to the attention of the London merchants for the first time, and as conditions became less favourable for the extension of the silk industry in London, the region may have appeared as one ripe for development. The next three chapters consider the importance of power and labour resources, among other factors, in the spread of the silk industry in the late eighteenth and early nineteenth centuries with particular emphasis on the Pennine province.

(63) See Harrison (1886) p.87. and map.

REFERENCES FOR CHAPTER 1

- R. BADNALL (1828) "A View of the Silk Trade: with remarks on the recent measures of government in regard to that branch of manufacture."
- W.H. CHALONER (1951) "Charles Roe of Macclesfield (1715-81): an eighteenth century industrialist." Trans. Lancs. and Cheshire Antiq. Soc. (vol.62) pp.133-156.
- W.H. CHALONER (1953) "Sir Thomas Lombe (1685-1739) and the British Silk Industry." History Today (vol.3) pp.778-785.
- M.K. DALE (1933) "The London Silk Women in the Fifteenth Century." Econ. Hist. Rev. (Ser.1. vol.4) pp.324-335.
- G.W. DANIELS (1920) "The Early English Cotton Industry."
- C.S. DAVIS (1961) "A History of Macclesfield."
- D. DEFOE (1769) "A Tour Through Great Britain"(7th. edition 4 vols.)
- W. HARRISON (1886) "The Development of the Turnpike system in Lancashire and Cheshire." Trans. Lancs. and Cheshire Antiq. Soc. (vol.4) pp.80-92.
- H. HEGINBOTHAM (1892) "Stockport: Ancient and Modern."
- G. HENSON (1831) "The Civil, Political and Mechanical History of the Framework Knitters and Europe and North America."
- G.B. HERTZ (1909) "The English Silk Industry in the Eighteenth Century." Eng. Hist. Rev. (vol.24) pp.710-727.
- W. HUTTON (1795) "A History of Derby."
- W. MAITLAND (1775) "The History of London"(New edition 2vols.)

- F. NIXON (1969) "Industrial Archaeology of Derbyshire."
- G.R. PORTER (1831) "A Treatise on the origin, progressive improvement and present state of the silk manufacture."
- J. PREST (1960) "The Industrial Revolution in Coventry."
- J. PROUT (1829) "Practical View of the Silk Trade."
- S. SMILES (1895) "The Huguenots: their settlements etc." (4th Ed.).
- S. TIMMINS (ed.) (1866) "The Resources, Products and Industrial History of Birmingham and the Midland Hardware District."
- G. TURNBULL (ed. J.G. Turnbull) (1951) "A History of Calico Printing."
- G. UNWIN, A. HULME, and G. TAYLOR (1924) "Samuel Oldknow and Arkwrights."
- VICTORIA COUNTY HISTORIES.
- STAFFORDSHIRE (vol.2) (1967) "Silk" pp.206-223.
- WARWICKSHIRE (vol.2) (1908) "The Ribbon Trade of Coventry." pp.257-263.
- WILTSHIRE (vol.4) (1959) "Silk" pp.176-177.
- A.P. WADSWORTH and J. de L. Mann (1931) "The Cotton Industry and Industrial Lancashire (1600-1780)."
- K.L. WALLWORK (1968) "The Calico Printing Industry of Lancashire in the 1840's." Trans. Inst. Br. Geogr. (No.45) pp.143-156.
- SIR. F. WARNER (1921) "The Silk Industry of the United Kingdom."
- F. WILLIAMSON (1936) "Sir George Sorocold of Derby: a pioneer of Water supply." J. of Derby Archaeology and Nat. Hist. Soc. pp.43-94.
- EDINBURGH REVIEW (1826) (vol. xliii)

MANCHESTER MERCURY (August 2nd 1768)

GOVERNMENT PAPERS

37 Ed III Cap VI (1363) "Handicraftsmen shall not use but one mysterie but werkwomen may work as they did."

COMMONS JOURNAL

- Vol. XXI (1731) "Petition of Silk Manufacturers." p.840
- Vol. XXI (1731) "Lombe's Engine." p.795
- Vol. XXIII (1737) "The Protection of silk button makers." pp. 50,76 and 162.
- Vol. XXX (1765) "Silk Manufacture" pp.208-219.

"Raw Silk in America" H.C. (1749-50) vol.59 of general collection 1731-1800.

"Second Report from the Select Committee of the House of Lords ... into Foreign Trade (Silk and Wine)" H.C. (1821 vol.VII) pp.421-464.

"Report from the Select Committee appointed to enquire into the Present State of Manufacture, Commerce and Shipping." H.C. (1833 vol.VI) pp.1-801.

"Report on the English Silk Industry" by Sir T. Wardle in:
"Second Report of the Royal Commission on Technical Instruction"
(Vol.III pp.xxix-cv) Vol.15 of Reports from Commissioners etc.
H.C. (1884) vol.XXXI) appx.

CENSUS VOLUMES: 1851

CHAPTER IITHE PENNINE SILK INDUSTRY AND ITS POWER SUPPLIES

The availability of water - and later of coal - as power sources was of considerable importance to the Pennine silk industry from its inception and more particularly in the period of rapid development during the first quarter of the nineteenth century. Despite the availability of Newcomen and Watt steam engines converted to rotary motion from about 1780,⁽¹⁾ and though the developments in mining and transport lowered the price of coal, the use of water power survived late and strongly. In 1838 eighteen per cent of power in the Pennine silk industry was derived from water.⁽²⁾

A) THE SOUTH WEST PENNINES IN THE EIGHTEENTH CENTURY

In the silk towns on the margins of the south west Pennines there were marked contrasts at all stages in the exploitation of power; and it would be quite wrong to suggest that any of the towns were ideally endowed with either source of power.

(1) See Chaloner (1949) p.122; and Musson and Robinson (1959) p.424.

(2) "Fact Insp. Ret." (1838). This is a general reference for details of the powered industry in 1838 throughout this chapter. When the Returns are obviously the source of information details are not footnoted.

STOCKPORT

Stockport was the first town in England to develop a large powered silk industry, and was a significant producer even before the industry had been established at Macclesfield. The excellent water power potential available in the town was the major attraction, without which the profitable use of the labour supply or market links referred to above could not have occurred. The availability of water power was largely governed by the glacial history of the rivers. In general, the major rivers in the south west Pennines were too well-graded to provide exceptional power supplies. But at intervals they have been diverted from their preglacial courses by drift masses which plug the old valleys. Here the rivers flow turbulently through narrow gorges where they have been incised into the sandstone flanks of the old valley. The Mersey gorge at Stockport was formed in this way and was perhaps one of the finest water power sites in Pennine England.⁽³⁾ Oddly enough the water power potential was the cause of both the establishment and the collapse of the silk industry at Stockport. After 1770 the cotton industry, in its most expansionist phase, totally replaced silk in its use of the power resources of the Mersey gorge. However the silk industry was able to benefit from its earlier mechanisation and enjoyed an unhindered period of rapid growth from 1732 until the

(3) Rodgers (1962) pp.7-10; Rice (1957) esp. pp.223-4.

cotton industry ousted it from the power sites.⁽⁴⁾

Until the coming of the silk industry the manorial corn mills were the major users of water power in Stockport. However a mill near the castle had already been used for other purposes and the "logwood mill" had been built specifically for industrial tenants. The water power supplying these mills had been improved by the construction of a reservoir and a tunnel cutting off the loop in the river (see Figure 2.1.)⁽⁵⁾ These mills were taken over for silk throwing as soon as Lombe's patent expired in 1732 and Park Mill was added specifically for silk manufacture. This mill was operational by 1736, and only eight years later competition had to be faced when Parliamentary approval was given to the damming of the Tin Brook. The Carr Dams and silk mills were soon built, using the steep fall of the brook where it dropped to the Mersey between the Castle Hill and High Street. A third silk mill has been identified as being in Adlington Square, near the confluence of Tin Brook and the Mersey.⁽⁶⁾

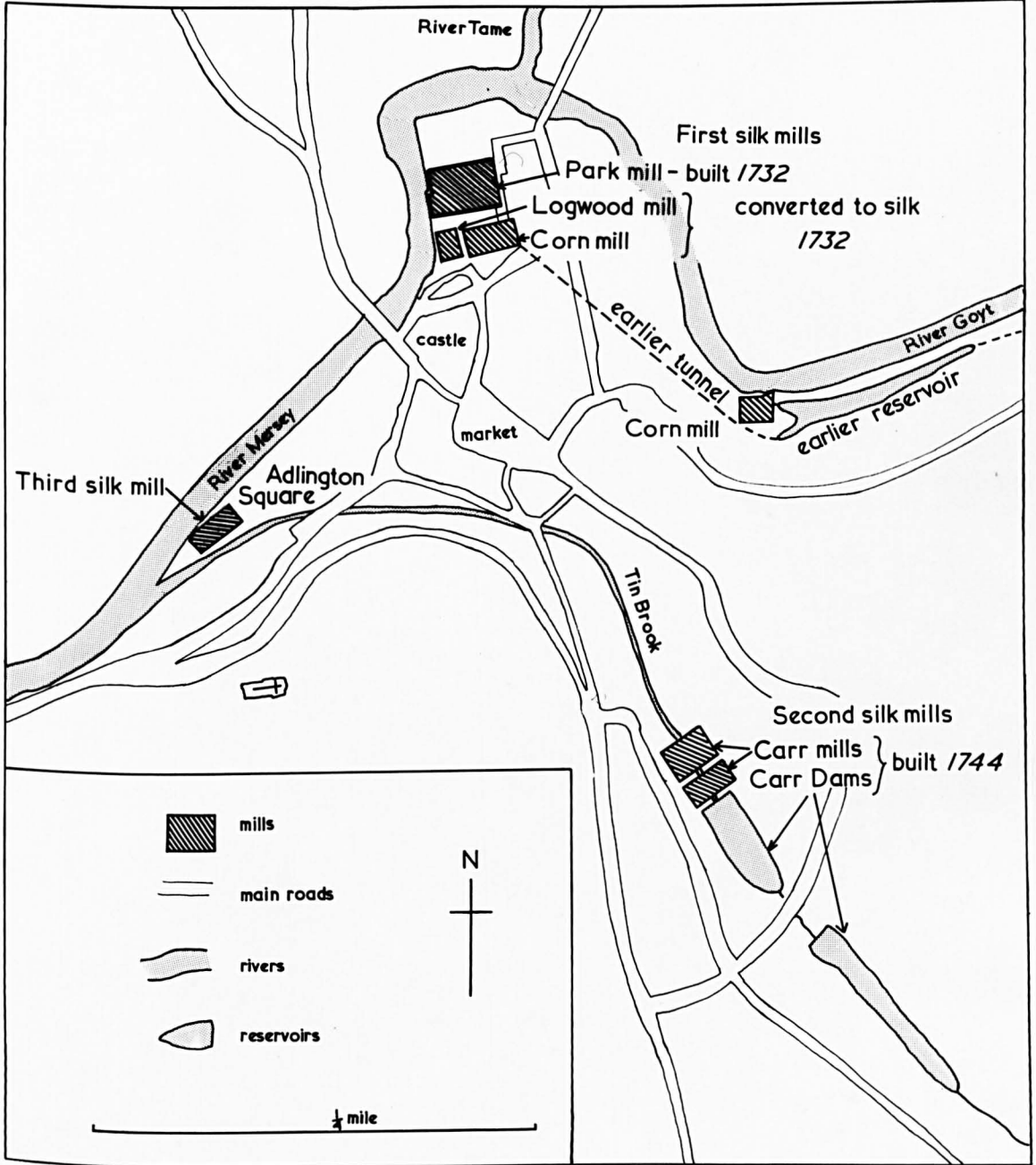
(4) See below pp. 62-3.

(5) Unwin (1924) pp.21-26.

(6) Unwin (1924) p.119.

FIGURE 2.1.

THE EARLY SILK INDUSTRY AND WATER POWER IN STOCKPORT



By 1770 there were at least 4 silk mills in the town employing over 1000 persons,⁽⁷⁾ though the 1769 edition of Defoe's tour suggests a rather larger industry with six "mills or engines" in use employing nearly 2,000 persons.⁽⁸⁾ This represented the height of the silk industry in Stockport, though the water power resources were by no means exhausted. In its later development the cotton industry built numerous weirs and long, elaborate tunnel systems were cut into the soft Permian sandstone later than those shown on Figure 2.1. and considerably more expensive.⁽⁹⁾

MACCLESFIELD.

Although Stockport was the first major producer of silk yarn by power, its position was soon challenged by Macclesfield. Here Roe's original water powered mill, built on Park Green and powered from Dam Brook, was considerably enlarged in the 1750s. The cornmills at Sutton were leased and water obtained from the Bollin, though it appears to have been diverted into the Dam Brook on which a reservoir was built.⁽¹⁰⁾ Roe withdrew his capital from the silk mill in the early 1760s, in order to finance the copper works he built on Macclesfield Common, and the remaining partners were declared bankrupts in 1773. This left Daintry, a long established throwster in Macclesfield, and

(7) C.J. XXXIV (1770) p.240.

(8) Defoe (1769) vol.2 p.397. and vol. 3 p.74.

(9) See Unwin (1924) pp.115-123.

(10) Chaloner (1951) p.136-7; details from Royal Depot Mill MSS.

his partner Ryle, free to use practically the same power sources. Their mill was built in 1775 on Park Green and the reservoir "Ryle's Pool" constructed in Macclesfield Park. About thirty years later, in 1803, the water power available to the mill was increased when the Sutton corn mills were sold to Daintry and Ryle, and the mill stream diverted to power their mill.⁽¹¹⁾ The development of these two mills, the only ones for which considerable detail is available, illustrates particularly the piecemeal nature of growth general to the industry. In later developments especially, this unplanned expansion gave a chaotic siting pattern to the industry in Macclesfield, and in other centres of silk production.

Evidence of the development of the industry at Macclesfield is slight. In the early 1760's there were seven major firms of throwsters and twelve lesser ones presumably not using power. Fluctuations in profitability were already affecting the industry. Employment fell from about 3,500 in 1761 to under 1,000 in 1764 and all of the lesser firms and three of the larger were on the point of collapse.⁽¹²⁾ The changing management or failure of firms makes comparisons between different sources difficult, though

(11) Misc. Doc. DOX 113 Chester Record Office.

(12) "Silk Manufacture" C.J. XXX (1765) p.219

the industry clearly comprised, as it did in 1765, a few throwsters using water power and a larger and more variable number of domestic throwsters. Corry lists twelve throwsters "as soon following Roe", to at least six of whom water power was not available. Aikin refers to twenty to thirty silk mills in 1795, though few could have been powered. Dyehouses and mills are noted on Macclesfield Common before 1800 which may have been powered, though the space for bleaching and sufficient unpolluted and soft water for dyeing was the major consideration of these joint concerns. (13)

By 1800 there were certainly four mills using the Bollin and perhaps another four in Dam Brook, headed by the Chester Road "Card Factory" using water power, and a large number of domestic throwsters. (14) At this date there was almost certainly no steam power used in the town, though it is just possible that some mills used steam engines to return water

(13) Corry (1817) p.65; Aikin (1795) p.438: "Enclosure Award Commission" (1796): c.f. Wallwork (1968) pp.146-7.

(14) Davis (1961) pp.125-130; An inventory of 1804 referred to by Davis (1961) p.129; Aikin (1795) p.439 refers to a steam engine only in a Bollington Coal mine.

above the wheels when faced with supply difficulties.⁽¹⁵⁾

CONGLETON AND LEEK.

In Congleton, Clayton's mill, largely built by Brindley in 1752 and incorporating "the most modern improvements", appears to be the only powered silk mill in the town until late in the final decade of the century.⁽¹⁶⁾ However an important domestic industry grew up and workers at both Congleton, and Leek were "weaving ribbons on account of the Coventry merchants"⁽¹⁷⁾ from about the date of the mill, perhaps influenced by the local source of yarn.

B) THE SOUTH WEST PENNINES IN THE BOOM OF THE EARLY NINETEENTH CENTURY.

MACCLESFIELD AND CONGLETON

The slow expansion of the powered silk industry in the south west Pennines during the eighteenth century was followed by a period of very rapid growth during the boom period of the first

(15) The Evidence in favour of steam engines is slight; Harris (1967) has revised the figures upward for steam engines installed in the eighteenth century. In 1766 Roe stated that "large silk mills and other manufactories....by means of this canal will be supplied with coal and other necessaries at a cheaper rate". "Canal Scheme" C.J. XXX (1766) p.523. See also Davis (1961) p.129.

(16) Aikin (1795) refers to "a silk mill" (p.433) and Barfoot and Wilkes (1790) list only one throwster. The directories and guides for the early nineteenth century omit Congleton altogether.

(17) Yates (1820) p.100.

quarter of the nineteenth century.⁽¹⁸⁾ Large amounts of capital, much of it speculative, were put into buildings and machinery, and power, both from steam and water, was adopted by many formerly domestic throwsters. During this period the mechanised concerns developed alongside a manual, and largely domestic, industry which was always large and which was in the hands of relatively few master throwsters. It had become customary to safeguard against the pilfering of the valuable raw material by building throwing houses where a number of hand operators would work together under supervision. Much of the "domestic" industry had in fact become concentrated in non-powered "mills" and it is difficult to isolate powered concerns in sources referring to "mills" or "throwsters". This has been attempted, however, in Table 2.1. which shows the expansion which occurred in the Macclesfield powered industry, with further amendment to give only silk mills which were fitted out and used for silk production.⁽¹⁹⁾

The rapidity of development in this period, as well as the paucity of source material, precludes any detailed examination of the growth of production, or of the use of power. However, it

(18) See above p.5-7 & 17. (19) See above pp.6-9.

TABLE 2.1.

EXPANSION OF THE NUMBER OF MILLS IN MACCLESFIELD
AND CONGLETON: 1800 - 1838

Date	MACCLESFIELD No. of mills	CONGLETON No. of mills
1800	c.8	c.2
1814	32	17 ⁽¹⁾
1824	58	31
1826	62	39
1830	63	39
1832	41	21
1835	40	37
1838	48	35

Note: (1) in 1817.

is apparent that the water potential of the streams in both Macclesfield and Congleton was heavily exploited by 1830, suggesting particularly that only limited use was made of steam power while the cheaper source was available. The distribution of all mills was strongly influenced by the water power sites: steam mills were either converted from water powered precursors or were built on the periphery of the existing development. Figures 2.2. and 2.3. show the extent of water engineering on the Bollin and the Dane, and of greater importance, on their more easily controlled tributaries. In Congleton the flat ground near the confluence of the Howty and the Dane was the major centre for water powered and for most subsequent developments, though Timbersbrook and the Dane itself provided sites for a considerable industry founded on water power. In Macclesfield the Dam Brook was soon strung with mills and the better sites on the Bollin were taken.

Rotative steam engines were used in silk mills in the south west Pennines from early in the nineteenth century (see Table 2.2.) though they were not widespread until the later stages of the boom when the water power potential of the towns was fully developed. However it is impossible to give more than the roughest estimate of the division between steam and water power before 1838 when the Factory Inspector's Returns give a detailed analysis. By this

FIGURE 2.2.

WATER POWER AND MILL LOCATION IN MACCLESFIELD

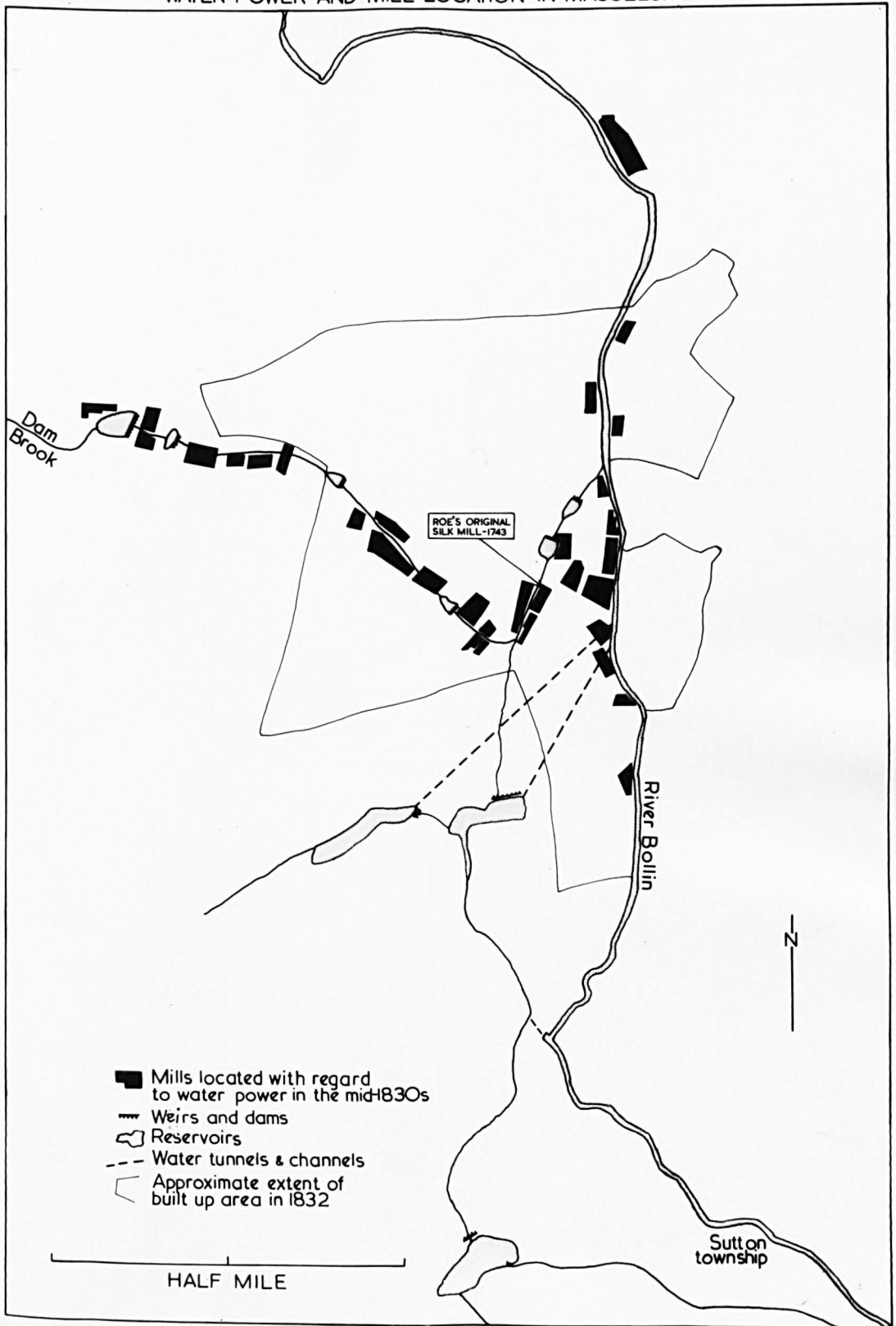


FIGURE 2.3.

WATER POWER AND MILL LOCATION IN CONGLETON

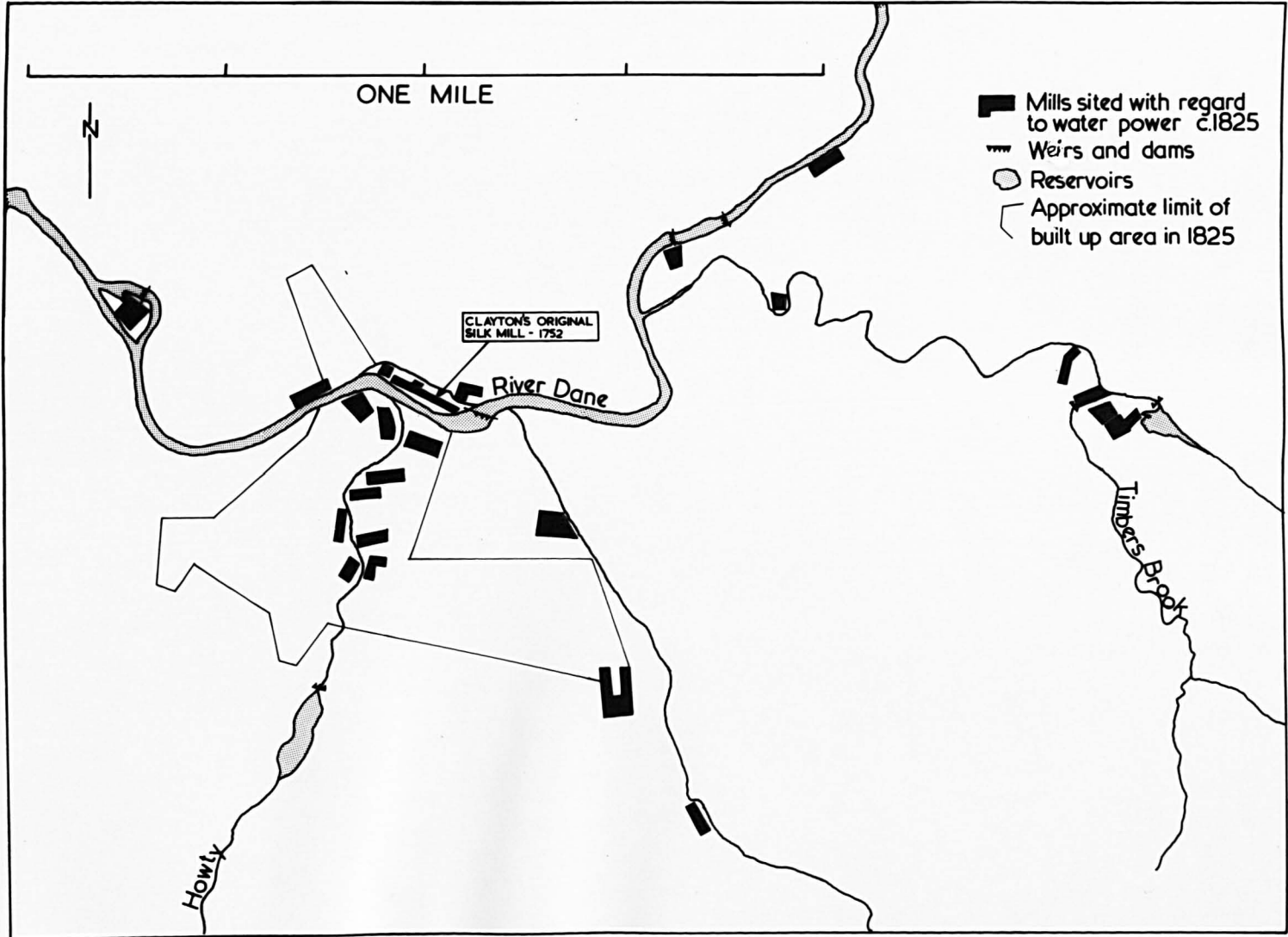


TABLE 2.2.

STEAM ENGINES KNOWN TO HAVE BEEN INSTALLED
IN MACCLESFIELD AND CONGLETON: 1800 - 1817

MACCLESFIELD

Date.	Firm	Type of Mill
March 1801	Daintry and Ryle	Cotton
July 1802	Daintry and Ryle	Cotton
Oct. 1804	J. & G. Pearson	Silk
Feb. 1805	Daintry, Wood and Daintry	Cotton
1811	Daintry & Ryle	Silk

CONGLETON

July 1800	Thomas Slate	Silk
1801-9	Jesse Drakeford	Silk

date it is apparent that the silk industry in both towns was largely dependent on steam power, Macclesfield deriving 85% of its power from this source and Congleton 63% (see Table 2.3.).

The greater exploitation of water power in Congleton, in both absolute and relative terms, can be explained in terms of the available water power. At Macclesfield the Bollin is merely a small misfit river, beheaded by glacial action and flowing in an overdeepened and well-graded valley. The river drops less than forty feet per mile through the town and the broad valley does not lend itself to damming. The Dam Brook offered a greater head of water and was more easily dammed but its catchment area is tiny and its flow small and variable. The Dane, by contrast, has a source deep in the Pennines and a large and reliable flow, so that weirs are all that are required to maintain the water level. The Howty and Timbersbrook are also much more considerable in length and flow than the Dam Brook at Macclesfield (see Figure 2.4.). Table 2.3. shows the greater dependence in Macclesfield on steam power and the inability of its rivers to support large water wheels. The excess of engines over the number of mills suggests also that here steam engines may have been used to return water above the wheels, a practice common in the smaller cotton mills in Lancashire and

FIGURE 2.4.

COAL AND WATER IN THE SOUTH WEST PENNINES

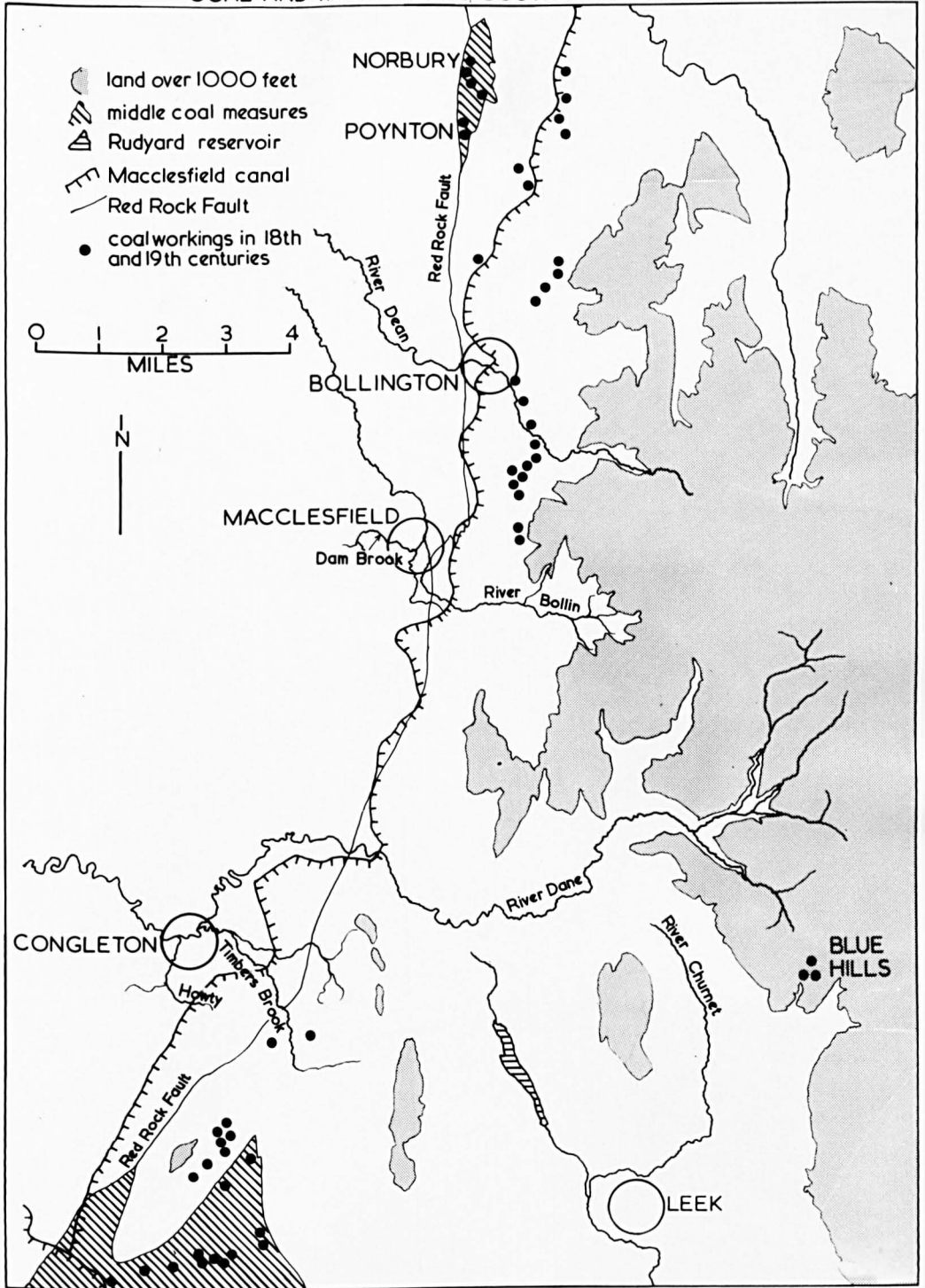


TABLE 2.3.

STEAM ENGINES AND WATER WHEELS AT USE IN SILK MILLS
IN MACCLESFIELD AND CONGLETON: 1838

	No. of Mills	No. of Steam Engines	No. of Water Wheels	Total Engines and Wheels	Excess of Engines and Wheels over Mills	Total Steam Power		Total Water Power		Total H.P.
						H.P.	%	H.P.	%	
Macclesfield	48	46	13	59	11	492	85	87	15	579
Congleton	35	27	12	39	4	228	63	133	37	361

	STEAM						WATER			
	over 20 H.P. ave.		10-20 H.P. ave.		under 10H.P. ave.		over 10H.P. ave.		under 10H.P. ave.	
	No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.
Macclesfield	7	25.5	18	11.5	21	5	3	14	10	4.5
Congleton	2	30	6	10.5	19	5.5	6	17	6	5

certainly found in silk mills in the south west of England.⁽²⁰⁾
 Saverian or Newcomen engines of about four horse power were often used for this, which though they were much more expensive and less efficient to run, needed considerably less capital outlay than comparable rotative engines.⁽²¹⁾

In Congleton, the cotton mills derived almost exactly the same proportion of their power from water as did silk.⁽²²⁾ The entire textile industry of the town was thus dependent on water to a degree found among few towns with comparable employment in textiles, and rare among even small centres of the silk industry. Since water power was only slowly given up in silk, as in other textile industries, the rivers permanently guided the development of the industry and the form of the town.

LEEK.

In Leek the development of the powered branch of the silk industry occurred later than at Macclesfield and Congleton, due largely to the isolation of the town and the small scale of the

(20) Musson and Robinson (1959) pp.423-4: "Fact. Insp. Ret". (1838) and see below p.104

(21) Musson and Robinson (1959) p.420.

(22) Comparable figures cannot be derived for Macclesfield where the cotton industry in the neighbouring village of Bollington was included with the Macclesfield mills in the Returns for Prestbury parish.

earlier domestic industry. The communications network of the area was greatly improved after the turnpikes linking Manchester to London and Newcastle to Bakewell were built in the 1760's,⁽²³⁾ and the building of the canals reduced the isolation of the town still more. The Caldon Canal (initially built to reach the limestone deposits at Caldon Low) passed close to the town and the Leek branch of the canal was added in 1797. This branch was not built because the trade of the town warranted it, but to act as a feeder between the newly built Rudyard Reservoir and the main line of the Trent and Mersey Canal it was designed to supply.⁽²⁴⁾ The glacial history of the area was critical in these developments. The Rudyard gap and the over-deepened Churnet valley eased the north-south communications and the mature pre-glacial valley of the upper Trent linking Leek to Stoke-on-Trent was vital for the Caldon Canal (see Figure 2.5.)⁽²⁵⁾

The town of Leek was clearly an insignificant factor in influencing the development of the roads and canals - and later the railways - in its vicinity. But once it was adequately linked to its raw materials and markets, the silk industry in Leek

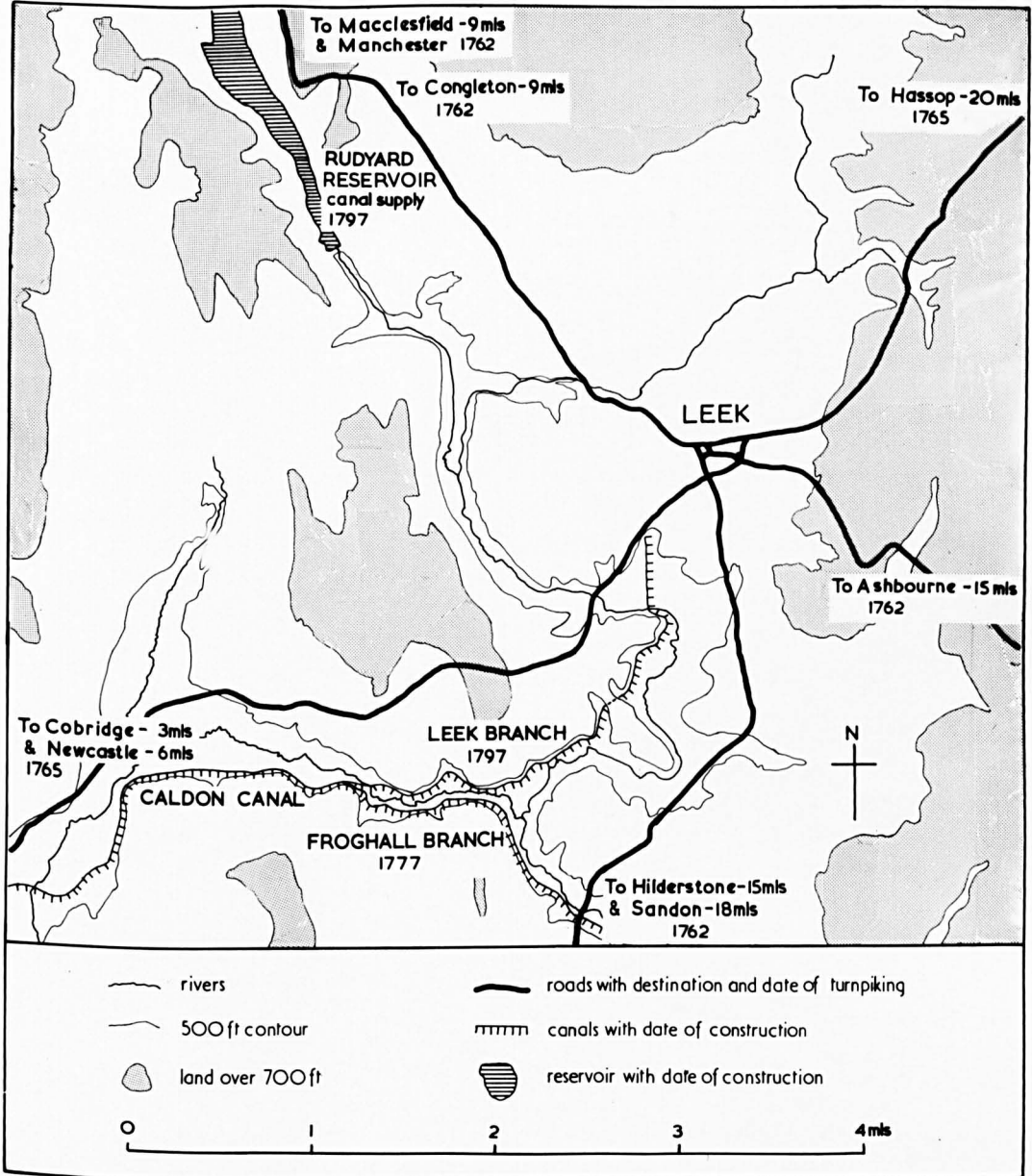
(23) Vict. County Hist. Staffordshire vol.2 (1967) p.281

(24) Hadfield (1966) pp.198-200.

(25) See King (1960) p.36; Johnson (1965) p.97

FIGURE 2.5.

LEEK - DEVELOPMENT OF COMMUNICATIONS IN THE EIGHTEENTH CENTURY



prospered. By the late eighteenth century there were about 2,000 silk workers employed in the town and a further 1,000 in the surrounding countryside, and the products - "sewing silks, twist, buttons, silk ferrets, shawls and silk handkerchiefs" ⁽²⁶⁾ suggest the small scale domestic industry was already developing its own specialisms, and was to a degree independent of the Macclesfield masters. Power was not added to the industry until the height of the boom. In 1817 there were ten silk "mills" ⁽²⁷⁾ but few, if any, were powered. By 1825 several large throwing mills employing power had been built and powered weaving was introduced in 1831. ⁽²⁸⁾ By 1835 there were seven powered establishments in the town, one of which contained 119 looms. ⁽²⁹⁾

The Leek industry was always dependent on steam to power its mills. This dominance of steam was largely associated with the later growth of the powered industry here, in a period when textile mills everywhere were beginning to turn from water to steam. Coal was readily available ⁽³⁰⁾ in the town and in any case the large dyeing industry was already established at the most accessible points along the river and had rights over the

(26) Aikin (1795) p.538 (27) Corry (1817) p.258.

(28) Langford (1884) vol.1 Appx. p. lxxxvi

(29) "Fact. Insp. Ret". (1835) (30) See below p. 42

water which reduced the possibility of water power development. By using steam the throwsters and manufacturers could retain their old premises in the town centre, at some distance from the river. The greater freedom of location given by steam power has resulted in the Leek industry being less highly concentrated in any one part of the town than was the case in Macclesfield and Congleton. Mills in the town are scattered among rows of terraced houses, strongly reminiscent of the mill towns of the south east Lancashire coalfield.

C) THE SUPPLY OF COAL IN THE SOUTHWEST PENNINES.

The supply of coal - at a price - was never a great problem in the steam powered silk industry of the south west Pennines, though it was not until the middle of the nineteenth century that mining techniques and communications had developed sufficiently to provide the region with a supply of coal both cheap and plentiful. Early in the nineteenth century local pits, which later became worked out or uneconomic as techniques improved, were able to supply the towns. Many small coal seams are caught into the tight folding of the south west flanks of the Pennine system and these were extensively worked where they were accessible - usually in restricted synclines or as discontinuous outcrops along the hillside. Thus a chain of small workings

virtually joined the South Lancashire and the North Staffordshire coalfields along the flanks of the Pennines.⁽³¹⁾ The crisis in Macclesfield's coal supply which Roe had stressed when proposing a canal in 1766⁽³²⁾ appears to have passed, and by the end of the century there was a colliery near Macclesfield with four seams, and pits at Bollington and Rainow with sufficient coal to supply not only the local demand but also the Buxton lime kilns.⁽³³⁾ Congleton had a sufficient supply both from local pockets and from the extreme north of the North Staffordshire coalfield, and in the neighbourhood of Leek "the Blue Hills abounded with mines of coal".⁽³⁴⁾ Leek was able to receive additional coal cheaply from the Potteries coalfield from the start of mechanisation, using the Caldon Canal, built over twenty years previously. As late as 1930 twenty-five per cent of Staffordshire coal used in Leek still travelled by canal.⁽³⁵⁾

By 1811 there were forty collieries in the area around Macclesfield and Congleton,⁽³⁶⁾ the supply being supplemented

(31) See Hull and Green (1866) esp. pp.23 and 27.

(32) "Canal Scheme" C.J. XXX (1766) p.523; Chaloner (1951) p.151. The price of coal in Macclesfield was alleged to have increased by one third in the ten years before 1766 owing to the approaching exhaustion of local coal pits.

(33) Aikin (1795) pp.438-9. (34) Dugdale (1848) vol. VI p.1054.

(35) Mellows (1933) p.41

(36) Wallis (1917) p.17.

by coal from Poynton and Adlington, as well as from Staffordshire.⁽³⁷⁾
 From 1831 when the Macclesfield Canal was finally built the coal from Poynton became much cheaper in both Macclesfield and Congleton and the price of transporting it to Macclesfield was halved again in 1845 when the railway to Manchester was completed.⁽³⁸⁾ In 1860 coal from local sources was still significant, though the majority of the supply came from the more distant coalfields. Nineteen local pits supplied the towns, supplemented in Congleton mainly by coal from Biddulph and elsewhere in Staffordshire, and in Macclesfield by Poynton coal which accounted for rather over sixty per cent of the town's consumption of 80,000 tons.⁽³⁹⁾

Although coal was thus always available in the towns of the south west Pennines the distances over which it was carried by the middle of the century would apparently have made its price prohibitive to other textile concerns. In the cotton industry, "power seems to have been emphatically the most important" factor influencing location and Preston was the only important centre of the steam powered industry beyond the margins of the coalfield.⁽⁴⁰⁾ In the calico printing industry too, the cost

(37) Varley (1825) p.13. (38) Davis (1961) p.166

(39) Mellows (1934) p.384. Wallis (1917) p.47.

(40) Rodgers (1960) pp.138 and 140.

of transporting coal "made location on or near the productive coal measures critically important", and there was consequently a peripheral contraction in the distribution of the industry as steam was introduced.⁽⁴¹⁾ The cotton industry in Bollington and Macclesfield was clearly at a considerable disadvantage when competing with better placed firms, yet the silk industry was able to thrive in similar conditions. There were two factors operating in favour of silk. Firstly, the more valuable product could absorb some extra costs of transport, both of fuel and of the actual products. Secondly, and more important, the mechanised silk industry used proportionately less power than any other textile industry. Table 2.4. showing the power requirements of the various textile industries suggests that fuel costs were proportionately much less important than in cotton, for example, where they are estimated to equal one-fifth of the wages bill.⁽⁴²⁾

The distribution of mills in Macclesfield and Congleton was affected very little by the change in the major power sources or by the construction of the canal and railway at some distance from the towns. The period of most vigorous growth had passed before the canal was built, and the steeply sloping land

(41) Wallwork (1968) p.147. (42) Rodgers (1960) p.140

TABLE 2.4.

AVERAGE POWER REQUIREMENTS OF THE TEXTILE INDUSTRIES
IN ENGLAND AND WALES: 1838

	Silk	Cotton	Wool	Worsted	Flax
Horse Power per Mill	12.3	31.4	15.4	17.3	25.2
Employees per Horse Power	10.4	4.4	2.7	4.4	3.9

close to the canal, some seventy-five feet above the rivers in both towns, offered very few suitable sites for mills. Moreover the canal could only exert any influence on the industry for a limited period, for within fifteen years the railway was built, in Macclesfield much nearer the town. Sites near the town centres, with easy access for workers were preferred throughout development and the industrial areas in both towns changed little from those imposed by water power requirements.

D) POWER SUPPLIES ELSEWHERE IN THE PENNINES

DERBY

In Derby, the mechanised silk industry was influenced to a greater degree by the change from water to steam power than was the case elsewhere in the Pennines. In the water powered phase of development mills were generally sited to the west of the town on the Markeaton Brook, though a number were found with Lombe's mill on the less easily controlled and better graded Derwent (see Figure 2.6.). Rapid expansion of the silk industry occurred in Derby in the 1820's, rather later than the boom began to affect Macclesfield and Congleton. This late development encouraged the use of steam power (as it did in Leek) particularly as it was coupled with extremely cheap coal, available from the dissected margins of the Nottinghamshire - Derbyshire coalfield.

FIGURE 2.6.

SILK MILLS IN DERBY - EARLY SITES

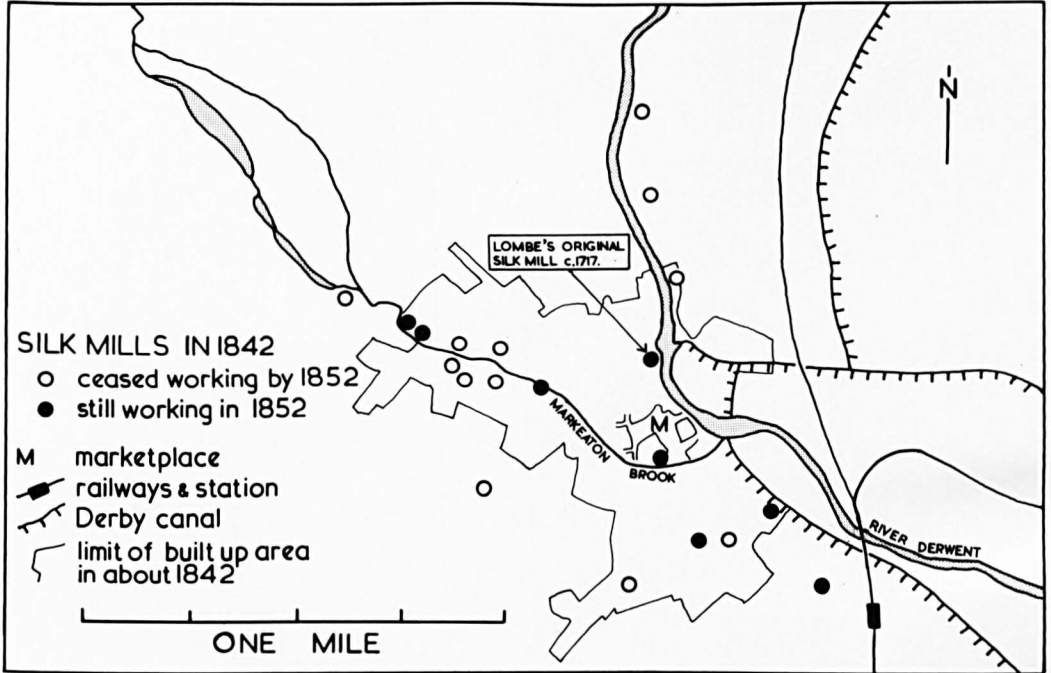
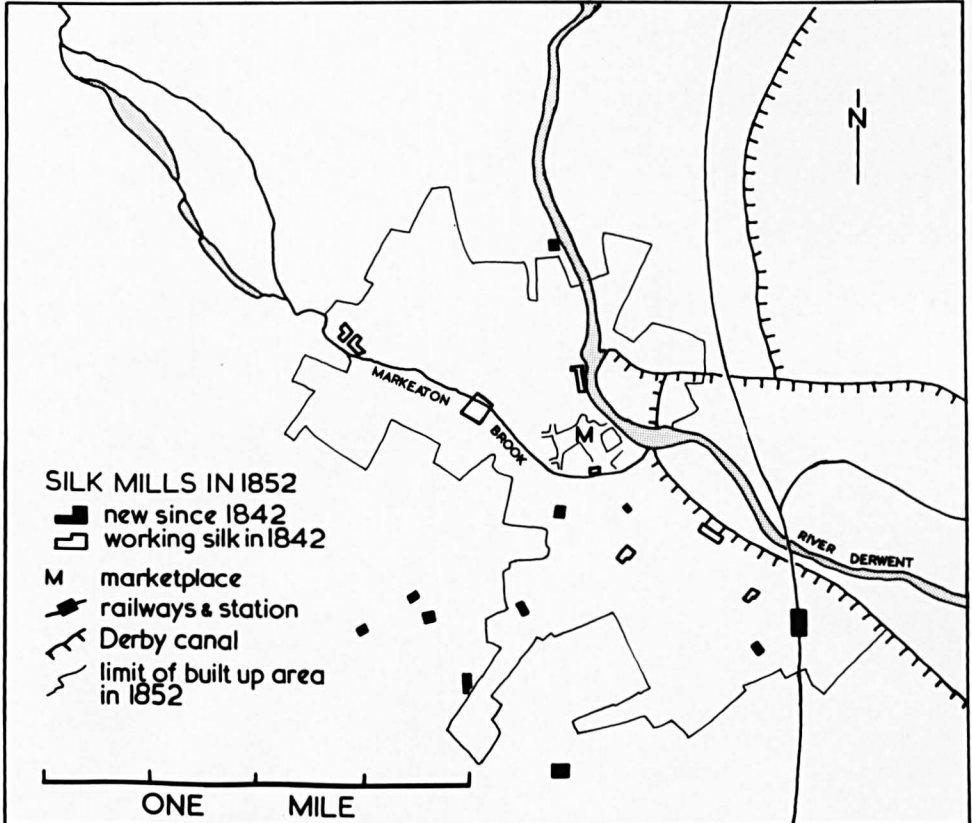


FIGURE 2.7.

SILK MILLS IN DERBY - LATER SITES



By 1838 only two per cent of the power for the silk industry in the town was derived from water.

The change in the source of power moved the centre of gravity of the industry within the town. Sites along the Mark-eaton Brook was abandoned and new developments took place to the south where access to the Derby canal, and later to the railway station, eased the distribution of coal (compare Figures 2.6. and 2.7.).⁽⁴³⁾ It was in this new district rapidly developing under the influence of the locomotive works⁽⁴⁴⁾ that Derby's silk industry reached its peak in the late 1850's and remained through its subsequent decline.

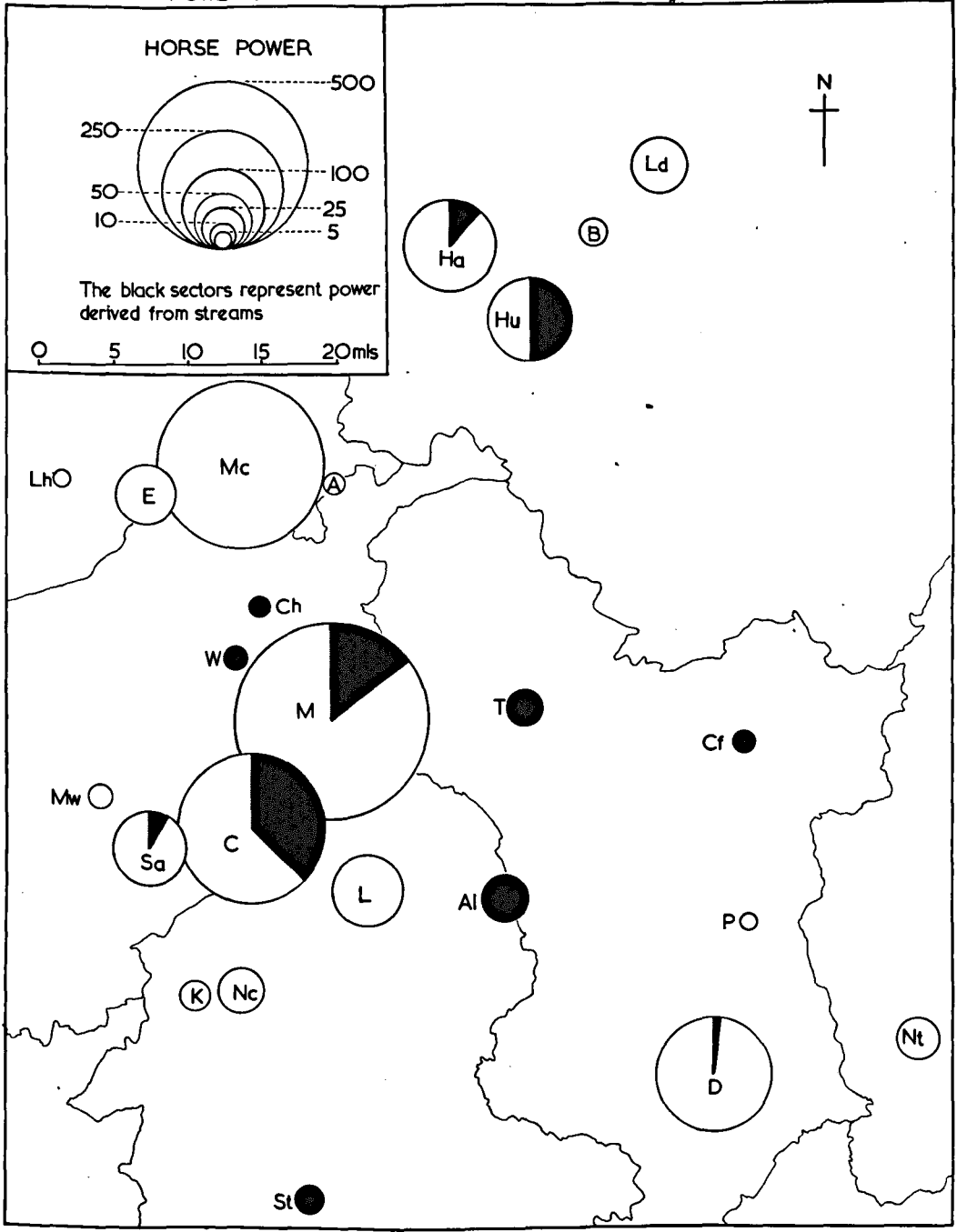
THE SOUTHERN PENNINES

The boom periods of the early nineteenth century brought the powered silk industry to a number of towns and villages which had previously had no links, or only very limited ones, with this textile trade. (see Figure 2.8.) Four centres to the south west of the Pennine margins, Middlewich and Sandbach, (formerly small outliers of the Macclesfield domestic trade) Silverdale, in Keele parish, and Newcastle, (where a small hat industry using silk was found) all added silk throwing to existing silk using concerns. The industry in all these places was dependent on steam power, using local or canal-borne coal from north Staffordshire.

(43) See Nixon (1969) pp.184-5. (44) See Turton (1960) vol.1 pp.273-80

FIGURE 2.8.

POWER UTILISATION IN THE PENNINE SILK INDUSTRY IN THE 1830s^R



Southeast of the Pennines a few secondary centres developed, chiefly to serve local frame-work knitters. The largest of these, outside Derby, was Nottingham where early development had been hampered by the lack of water power potential. Horse driven silk mills were built late in the eighteenth century, (45) but most new enterprises were attracted to Derby and by 1838 there were only three mills in Nottingham, all steam powered but employing under 400 persons. The remaining centres of activity in the southern Pennines were all very small, with employment ranging from under thirty at Pentrich and Cheadle, to 135 at Tideswell. Most were short-lived, speculative ventures, taking advantage of easily available water power, or, as in the case of the Tideswell mill, excess capacity in another textile concern. (46)

LANCASHIRE AND YORKSHIRE

In Lancashire and Yorkshire more substantial silk industries developed between 1815 and 1840. In the Manchester area water power sites had long been occupied, and often abandoned, by cotton mills. In the progressive environment of the south east Lancashire textile industry steam engines quickly replaced water power, for coal was easily and cheaply obtained, and in 1838 the silk industry here was entirely steam powered. In Yorkshire, silk was usually added to businesses already concerned with a mixture of fibres. Silk throwing therefore took place in mills already

(45) Lowe (1798) p.139

(46) See "Fact. Insp. Ret".(1838)

occupied and these were frequently water powered. A marked contrast is seen in 1838 between the upper Aire and Calder valleys, on the one hand, where much of the excellent water power potential was utilized and the Leeds area, on the other, where the more mature valley of the Aire provided much less water power potential, so that most textile mills, and all silk mills, were steam powered (see Table 2.5.).

E) GENERAL CONCLUSIONS

This analysis of power exploitation in the Pennine silk industry shows, firstly, that the availability of power was seldom the dominant factor leading to the establishment of a mill, nor was the industry in general hindered by insufficient power resources. It appears that only the small and isolated mills were established predominantly for reasons of power. A number of the towns which developed into major centres of the industry had excellent water power resources or easily available coal, but this seems to have been a secondary factor, and in the case of Stockport, a definite liability. Conversely Nottingham provides the only example of a town which failed to develop a large silk industry, despite having suitable resources apart from power, and here other factors were probably more influential.⁽⁴⁷⁾ The relative unimportance of power supply

(47) See below p.71.

TABLE 2.5.

THE USE OF WATER POWER IN THE TEXTILE MILLS OF SOME PARISHES IN THE WEST RIDING OF YORKSHIRE: 1838

Parish	<u>Cotton</u>		<u>Wool</u>		<u>Worsted</u>		<u>Silk</u>		<u>Flax</u>		<u>Total</u>	
	H.P. from water	% of total power	H.P. from water	% of total power	H.P. from water	% of total power	H.P. from water	% of total power	H.P. from water	% of total power	H.P. from water	% of total power
UPPER AIRE VALLEY												
Bingley	118	79	-	-	24	9	-	-	-	-	142	35
Keighley	61	58	207	49	19	54	-	-	-	-	287	51
Kildwick	-	-	-	-	50	54	-	-	-	-	50	54
UPPER CALDER VALLEY												
Dewsbury	0	0	105	15	11	24	-	-	-	-	126	16
Halifax	478	56	407	44	209	19	109	14	-	-	1,094	30
Mirfield	-	-	45	70	-	-	-	-	-	-	45	70
COLNE VALLEY												
Huddersfield	21	51	208	25	-	-	52	54	-	-	281	29
Almondbury	24	15	711	52	-	-	0	0	-	-	735	48
OTHER												
Leeds	-	-	115	4	80	17	0	0	0	0	195	4
Bradford	22	61	12	5	113	5	-	-	-	-	147	6

arose from the fact that all of the larger centres were adequately supplied with power. Techniques of mining, transport and the application of steam power were advancing rapidly under pressure from more prosperous and progressive industries, and were able to keep abreast of the modest demands of the silk manufacturers.

Secondly, the analysis shows that the nature of the power source, whether steam or water, is not a useful indicator of the state of technical advancement of centres. Steam power was seldom utilised on a large scale until the water power potential of a town was exhausted, unless coal was particularly easy to obtain. Moreover water power, once installed, was only slowly abandoned and new sites were occasionally exploited even in the areas most dependent on steam and as late as 1870 as Table 2.6. shows. It has been shown that a period of prosperous and rapid growth; the proximity of a progressive textile industry; the late development of a silk centre, or its good communications all tended to encourage the installation of steam engines. In fact these circumstances merely accentuated the ease or the need of obtaining coal and cannot be considered as identifying an advanced industry.

The greatest effect of power requirements on the silk

TABLE 2.6.

CHANGES IN THE POWER SOURCE OF PENNINE SILK MILLS: 1838 - 1870

	<u>CHESHIRE</u>			<u>YORKSHIRE</u>			<u>LANCS. NOTTS. & DERBYS.</u>		
	% change in H.P. from:		% of power from water at end of period	% change in H.P. from:		% of power from water at end of period	% change in H.P. from:		% of power from water at end of period
	Water	Steam		Water	Steam		Water	Steam	
1838 - 50	-9	-15	24	+30	+1	29	+1	+20	6
1850 - 56	-5	+35	19	+7	+70	20	-45	+81	2
1856 - 61	-5	+35	14	+70	+209	12	+3	+20	2
1861 - 67	-23	+9	10	+75	+5	18	+22	-5	2
1867 - 70	+16	+11	11	+49	+65	17	+149	+38	4

industry was within the major towns. In Macclesfield and Congleton the industry's power sources had a strong and lasting effect on the morphology of the entire town. In Derby they influenced the urban pattern at two periods in its development, and elsewhere silk mills briefly dominated many smaller settlements where power was available. In general, however, the supply of power to the silk industry was not a factor which influenced the location of the industry, or the growth of its centres, to any great degree. This was in marked contrast to other textile industries, for example cotton, where the demand for power dominated the development of the industry.

REFERENCES FOR CHAPTER II

- J. AIKIN (1795) "A Description of the Country for thirty to forty miles round Manchester".
- P. BARFOOT and J. WILKES (1790-1798) "Universal British Directory". (3 vols.)
- W.H. CHALONER (1949) "The Cheshire Activities of Mathew Boulton and James Watt, of Soho near Birmingham. 1776-1817." Lancs. and Cheshire Antiq. Soc. (vol.61) pp.121-136.
- W.H. CHALONER (1951) "Charles Roe of Macclesfield (1715-81): an eighteenth century industrialist. (Part I)" Lancs. and Cheshire Antiq. Soc. (Vol.62) pp.133-156.
- J. CORRY (1817) "A History of Macclesfield, Congleton, Knutsford, Stockport and Leek".

- C.S. DAVIS (1961) "A History of Macclesfield".
- D. DEFOE (1769) "A tour through Great Britain". (7th. ed. 4 vols.)
- T. DUGDALE (1848) "Curiosities of Great Britain". (9 vols. 3rd Ed)
- C. HADFIELD (1966) "The Canals of the West Midlands."
- J.R. HARRIS (1967) "The Employment of Steam in the Eighteenth Century". History (vol.52) pp.133-148.
- E. HULL and A.H. GREEN (1866) "Geology of the country around Stockport, Macclesfield, Congleton and Leek". Memoirs of the Geological Survey.
- R.H. JOHNSON (1965) "The Origin of the Rudyard and Churnet Valleys". N. Staffs J. of Field Studies (vol.5) pp.95-105.
- C.A.M. KING (1960) "The Churnet Valley" E. Midld. Geogr. (No.14 vol.2.) pp.33-40.
- J.A. LANGFORD et. al. (1884) "Staffordshire and Warwickshire, past and present". (2 vols.)
- R. LOWE (1798) "General View of the agriculture of the County of Nottingham".
- C.L. MELLOWES (1933) "The Geographical Basis of the Natural Silk Industry of the West Pennines" Unpubl. M.A. Thesis: University of London.
- C.L. MELLOWES (1934) "The Geographical Basis of the West Pennine Silk Industry" J. of the Textile Institute (Proceedings) pp.376-388.
- A.E. MUSSON and E. ROBINSON (1959) "The Early growth of Steam Power". Econ. Hist. Rev. (second series vol.11) pp.418-39.
- F. NIXON (1969) "Industrial Archaeology of Derbyshire".

- R.J. RICE (1957) "Some Aspects of the Glacial and Post-Glacial History of the Lower Goyt Valley, Cheshire".
Proc. Geol. Ass. (vol.68) pp.217-227.
- H.B. RODGERS (1960) "The Lancashire Cotton Industry in 1840".
Trans. Inst. Br. Geogr. (No.28) pp.135-153.
- H.B. RODGERS (1962) "The Landscape of Eastern Lancastria".
Pages 1-16 in "Manchester and its Region"
(British Association Handbook).
- B.J. TURTON (1960) "Geographical Aspects of the Railway Industry".
Unpubl. Ph.D. Thesis: University of Nottingham.
- G. UNWIN, A. HULME, and G. TAYLOR (1924) "Samuel Oldknow and the Arkwrights".
- W.D. VARLEY (1825) "A History and Directory of Macclesfield".

VICTORIA COUNTY HISTORIES.

STAFFORDSHIRE. (Vol.2) (1967) "Roads" pp.275-284.

- K.L. WALLWORK (1968) "The Calico Printing Industry of Lancastria in the 1840s" Trans. Inst. Br. Geogr. (No.45)
pp.143-156.
- B.C. WALLIS (1917) "Central England During the Nineteenth Century: The Breakdown of Industrial Isolation" Geogr. Rev. (vol.3) pp.28-52.
- S. YATES (1820) "An History of the Ancient Town and Borough of Congleton".

GOVERNMENT PAPERS AND OTHER DOCUMENTS

Misc. Doc. DDX 113 (Chester Record Office) - on the sale of the Sutton Corn Mills.

Enclosure Award Commissioners: Maps of Macclesfield Awards (1796) (Chester Record Office).

Royal Depot Mill, Macclesfield: Manuscripts (lodged with
Barclay's Bank, Macclesfield).

FACTORY INSPECTORS' RETURNS.

"A Return of the Numbers of Power Looms used in Factories
(1835)" H.C. (1836 vol. XLV) p.195.

"Return of All Mills and Factories...June 1838" H.C. (1839
vol XLVII) pp.1-

COMMONS JOURNAL

Vol. XXX (1766) "Macclesfield Canal Scheme" p.523

CHAPTER IIILOCATIONAL FACTORS IN THE PENNINE INDUSTRY

It is argued above that the violent fluctuations in output and profitability to which the silk industry was liable placed it in a weak position in relation to the major textile industries and made it unable to compete for labour or other resources with any continuity.⁽¹⁾ The relationship between silk and other textile industries was therefore crucial, particularly in the Pennine province with its diversity of textile manufactures. Competition was avoided either where silk was closely integrated with other textile concerns or where it dominated the industry of a town completely. If neither of these conditions was fulfilled the silk industry was subservient and became a poor relation among the textile interests of a town, largely dependent for its fortunes on trends external to itself. The silk industry can be seen in these three situations of integration, domination and subservience in different parts of the Pennine province.

A) "INTEGRATION" IN YORKSHIRE

In Yorkshire silk production was added to the manufacture of other textiles from about 1820. By the beginning of the nineteenth century mechanised worsted spinning was rapidly developing

(1) See above pp.10-12.

in the middle courses of the Aire and Calder valleys and by 1825 some firms were also engaged in powered weaving.⁽²⁾ One of these, Ackroyd's of Halifax successfully copied a worsted design from the Norwich hand loom weavers in 1811 and, after again practicing industrial espionage in Norwich, began producing mixed goods using a silk warp.⁽³⁾ From this introduction of mixed fabrics in 1819, the silk industry developed rapidly in Halifax. Throwing was commenced in 1822 and all-silk goods were produced from 1827. Other towns in Yorkshire developed a silk industry from about the same period. There was a large factory at Leeds in 1836, which may have dated from 1812; mixed fabrics using silk were made in Bradford from about 1835, and in Huddersfield both pure silk and mixed goods were made from about 1830 to combat a decline in the demand for plain worsteds. Finally spun silk was produced in Brighouse from 1843.⁽⁴⁾

The Yorkshire silk industry can be seen as following the worsted trade in its migration from the traditional and backward weaving industry of Norwich into the progressive commercial environment and more appropriate physical setting of the West Riding. In fact, the worsted region of Yorkshire was already

(2) Forbes (1853) p.310. (3) Warner (1921) p.237
(4) Warner (1921) pp.253-260.; Forbes (1853) p.311

manufacturing a variety of fibres to which silk was a natural addition. Cotton, flax, silk, alpaca and mohair as well as wool and worsted were all manufactured in the region by the 1830's,⁽⁵⁾ making Yorkshire unique among the major textile regions for the variety and intermixing of fabrics produced. Not only were the towns concerned with more than one fibre, in itself an unusual feature at this period,⁽⁶⁾ but individual firms and mills themselves manufactured a variety of products with different or mixed fibres. The support that the weaker branches of the textile industry, particularly silk, received in this highly integrated organisation was of great benefit to them. Output and marketing of minor fibres was more easily geared to the needs of the region; labour and machinery were available as soon as demand increased in any particular branch of production; a lower threshold of output and profitability was sufficient to encourage production, and losses in recessions could more easily be absorbed than in a concern dependent solely upon silk. In the protective environment of the integrated Yorkshire industry, the precarious silk industry could grow. Although silk manufacture in Yorkshire was only a small part of the total textile industry in the country, it was a

(5) See Forbes (1833) pp.311-314.

(6) Compare with Lancashire (Figure 3.2.) and S.W. England (Figure 4.1.)

major section of the English silk industry and was more easily able to survive and develop here than anywhere else in England, the specialist region of the south west Pennines not excluded.

One unfortunate result, for the researcher, of the integrated Yorkshire industry is the difficulty of assessing employment and other statistics for silk production. Figures relating to silk were often included with the more important branches of textile manufacture and mill statistics were almost invariably allocated to the mill's most important branch of operation. In 1912 Warner considered the consumption of silk "too general and occasional" to allow any statistics to reflect its importance and thought it "a long established truism" that more silk was manufactured outside the silk industry proper than within it.⁽⁷⁾ In Yorkshire, therefore, more than elsewhere, statistics for the silk industry must be treated as a minimum and not as an accurate representation of the state of the industry.

The character of the Yorkshire textile region not only led to the success and resilience of both the throwing and the pure and mixed weaving branches of the silk industry, but was also responsible for the development of Yorkshire as the main silk spinning (as distinct from throwing) region in England. Silk throwing

(7) Warner (1921) pp.218 and 234.

consists of drawing a long continuous thread from the "raw silk" wound from the cocoon of the silk worm. The silk "waste" generated by this process and short lengths of silk from damaged cocoons can be used as "staple" and spun in the same manner as other textile fibres. The growth of this industry will be considered later,⁽⁸⁾ but links with the existing Yorkshire industry can be noted here. Technologically "waste silk spinning" was closely allied to flax spinning, since both are dealing with a longer staple than other textiles. A specialised engineering industry for the silk spinning trade grew out of the declining flax industry at Leeds, and Yorkshire became the centre of this progressive and expanding branch of the industry. Spun silk was much cheaper to produce and was of adequate quality for the mixed goods on which the Yorkshire industry was based. Elsewhere in England there was neither the technological ability, nor such well established production and marketing links between other textile industries and silk spinning, for the latter to flourish: and in only a limited number of centres did any silk spinning develop.

(8) see below pp. 257 - 259 and 278 - 281.

B) "SUBSERVIENCE" IN LANCASHIRE

The contrast between the place of silk within the Lancashire and Yorkshire textile industries is extreme. In Yorkshire silk grew up as an integrated part of a diverse industry. In Lancashire it was very much a minor trade, subservient to the vigorous and wholly dominant cotton industry.

Some silk had been manufactured in Lancashire from about 1648 and employment increased through the eighteenth century.⁽⁹⁾ Until the last quarter of the century, silk and the infant cotton industry developed parallel to each other. By that time, however, cotton production was becoming technically advanced and the industry was beginning its period of rapid mechanisation and vigorous growth. In 1773 the first all cotton goods were woven in Manchester (previously cotton had been insufficiently strong and linen was used in the warp); in 1769 Arkwright's frame was patented; in 1781 the first cotton mill in Manchester was built; and in about 1793 the perfection of Crompton's mule made possible the explosive early growth of the industry and the development of its finer branches.⁽¹⁰⁾ As a result of these developments the market for silk was to some extent being

(9) Aikin (1795) p.160; Warner (1921) p.149

(10) Baines (1835) pp.147-220 esp. pp.151-202.

encroached upon by cotton, and in Lancashire silk manufacturers could neither hold their own against the better wages and higher profits to be found in the cotton industry nor compete with the cheaper products in the market. Consequently many manufacturers changed their line of business, and many mills were converted from silk to cotton production.⁽¹¹⁾ Nevertheless at the heart of the region, in Manchester itself, the silk industry showed a progressive increase from about 1786 to 1810,⁽¹²⁾ though at a much slower rate than cotton, and many developments, particularly in silk smallware manufacture and finishing took place in Manchester.⁽¹³⁾ In Middleton, however, and in other outlying areas, silk weaving was giving way to the more profitable production of fine cotton goods, muslin and nankeen.⁽¹⁴⁾

The decline in silk weaving was reversed from about 1816 and a great increase in hand loom weaving took place throughout south east Lancashire over the next fifteen years. (see Table 3.1.) The origins of this rapid rise in silk manufacture - and of the drastic decline thirty or forty years later - lie almost entirely in the trends within the cotton industry. From about 1815 the power loom was rapidly being introduced to the

(11) See above pp.9-10 (12) "Silk Report" H.C. (1831-2) vol. XIX p.820.

(13) Aikin (1795) p.161. (14) Aikin (1795) p.245.

TABLE 3.1.

HANDLOOMS USING SILK IN THE
MANCHESTER AREA: 1819 - 1832

	PURE SILK	MIXED GOODS	TOTAL
1819	50	1,000	1,050
1823	2,500	3,000	5,500
1828	8,000	4,000	12,000
1832	N.A.	N.A.	15,000

cotton industry and many domestic weavers were unemployed. The silk industry was still dependent on hand looms - chiefly because the nature and delicacy of the fibre created technical difficulties when attempts were made to adopt the power loom - and demand for silk goods was running high. Manufacturers both from the Cheshire towns and native to Manchester were consequently quick to use this source of skilled and cheap labour among the redundant cotton weavers.⁽¹⁵⁾ By 1851 over 20,000 persons in Lancashire were employed in hand loom silk weaving.⁽¹⁶⁾ This was the largest concentration of the trade anywhere in England, and for a time Lancashire was the major producer of many kinds of broadsilk cloth.

Despite its size the Lancashire silk industry was not established on a firm foundation and its growth was largely opportunist. Weavers alternated between mixed silk-and-cotton fabrics and pure silk weaving, though the latter soon became dominant (see Table 3.1. above). Unlike its Yorkshire counterpart, the Lancashire industry lacked any integration with a stronger textile industry, and was particularly liable to decline when conditions changed in the cotton industry. The Lancashire

(15) "Silk Report" (1832) pp.819-820

(16) See below p. 143.

silk industry employed only one-tenth the numbers of cotton manufacture (31,700 workers compared with over 300,000 in cotton in 1851),⁽¹⁷⁾ and was unable to withstand competition from the more vigorous and rapidly expanding industry, especially when its own profitability was in doubt. Thus the cotton industry was able to displace silk from the best power sites and in times of labour scarcity it could attract workers away from silk with relative ease.

The transfer of small water powered mills from silk to cotton occurred in many villages throughout the Pennines in the late eighteenth century, as the greater profitability of cotton became apparent. On an unprecedented scale cotton replaced silk in almost every mill in Stockport. Here there had been at least four mills and between 1,000 and 2,000 people engaged in the silk industry at its height in 1770. By 1789 only two persons connected with silk are mentioned in Tunnicliffe's directory, compared with thirty-three connected with cotton, and in 1792 no silk manufacturers were recorded.⁽¹⁸⁾ The details of the decline of silk in Stockport are obscure: it is known that the original silk enterprise, Park Mill, was taken over for cotton manufacture in 1783 after an unsuccessful attempt to

(17) Census (1851).

(18) Tunnicliffe (1789): Mellows (1933) p.16

stave off bankruptcy, but no records of the other mills remain.⁽¹⁹⁾

So complete was this adoption of cotton in Stockport that even in the 1830's, at the height of the silk revival in the cotton province, Stockport remained preoccupied with cotton. Most of the employment in the cotton industry was in the mechanised branches where full employment was maintained. Thus, faced with competition for labour from its stronger rival, the silk industry failed to boost its low employment in Stockport. In the 1830's there were only two hundred and seventy handlooms and no power looms at work in silk, and the one silk throwing mill recorded in 1835 had closed by 1838.⁽²⁰⁾

The far greater profitability and potential for growth of the cotton industry in the late eighteenth century thus enabled it to displace silk from excellent water powered sites. Buildings, equipment and labour could also easily be transferred from silk to cotton and the presence of all four factors in Stockport, close to the heart of the cotton manufacturing region, made the transfer inevitable. Cotton could doubtlessly use the available resources more profitably and pay the workers higher wages, and yet the silk industry was not generally

(19) Unwin (1924) p.27

(20) "Silk Report" (1832) p.816. "Fact. Insp. Ret."
(1835-1838)

unprofitable but merely incapable of competing with the more vigorous cotton industry in this location.

Technological advances in the cotton industry weakened the more slowly developing silk industry in south east Lancashire some seventy years later. The capital equipment employed by the cotton industry became increasingly productive from about 1850, following the introduction of the self acting mule and other innovations. There was great prosperity in the industry: both output and employment expanded and wages increased. Hand loom silk weaving in Lancashire was unable to match these wages,⁽²¹⁾ particularly as power looms, by now sufficiently advanced to be used with silk, were adopted by silk manufacturers in Lancashire and elsewhere. In fact the introduction of mechanisation to silk weaving was the major factor reducing the labour force of the industry between 1850 and 1860,⁽²²⁾ but the booming cotton industry also exerted a positive attraction of its own. The trend of thirty years earlier was reversed. Productive resources, chiefly labour, were transferred from silk to cotton working, where there was demand for labour and high wages to be earned. Between 1851 and 1861 employment in silk fell by 5,000 persons, almost entirely in the hand loom sector, and after 1861 the rate of decline accelerated.

(21) Warner (1921) p.157

(22) See below p.195-196.

The major area in Lancashire where the silk industry suffered this decline was in the townships east of Manchester. It was here where most redundant hand loom cotton weavers were to be found in the 1820s and where most employment in silk weaving was given in the 1830s (see Figure 3.1.). After 1850 decline was rapid and only Middleton retained a significant silk weaving industry. However, where the industry was based on powered throwing and weaving it stood on a much firmer foundation. Not only was it technically more competent and so able to withstand competition, it was also more closely integrated with cotton manufacture. This highly mechanised industry was located close to the centre of Manchester: in 1835 fifteen of the twenty-one powered concerns and five-sixths of Lancashire's power looms in silk were within three miles of the city centre (see Figure 3.1. and Table 3.2.). Two features of the cotton industry in Manchester encouraged these developments in silk and enabled the industry to remain in the city until after 1900. Most important was the concentration of the town on fine spinning⁽²³⁾ to which silk throwing was a natural addition. Moreover weaving was of increasing importance in Manchester,⁽²⁴⁾ and silk was widely used in high quality mixed goods. Secondly

(23) Rodgers (1960) p.148

(24) Rodgers (1960) p.148

FIGURE 3.1.

THE SILK INDUSTRY IN THE MANCHESTER AREA IN THE 1830s.

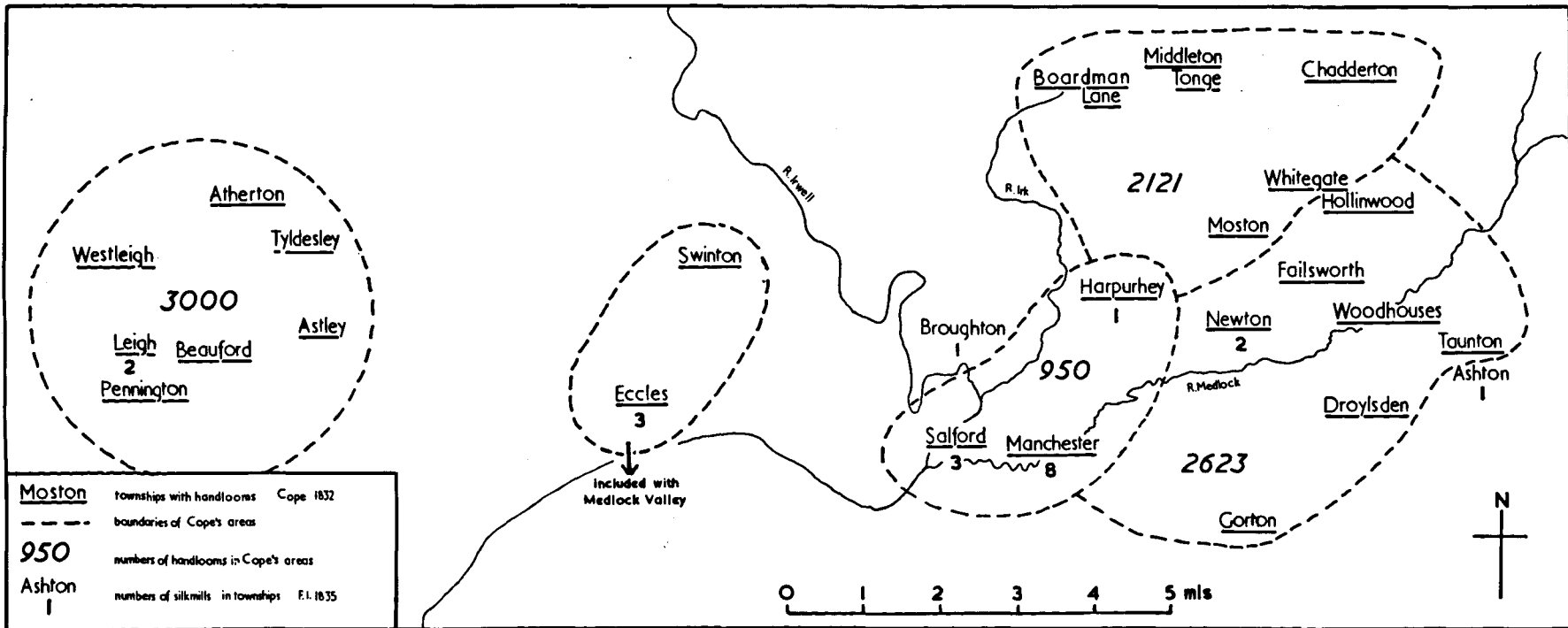


TABLE 3.2.

THE DISTRIBUTION OF POWER LOOMS WEAVING
SILK IN SOUTH EAST LANCASHIRE: 1835

TOWNSHIP	DISTANCE FROM MANCHESTER (miles)	No. of FIRMS	No. of POWER LOOMS IN SILK
Hulme	1	1	40
Salford	2	2	244
Broughton	2½	1	22
Eccles (Pendlebury)	4	1	60
TOTAL	-	5	366

Manchester has a wider range of textile industries than any other town in Lancashire. Although of declining importance there were four mills spinning wool or worsted in 1838 and some small remnants of the old smallware industry. Doubling had recently been introduced and was beginning to grow.⁽²⁵⁾ The silk industry took second place in this diverse and high quality textile industry and for a time employment in the mechanised silk industry in Manchester was second only to Macclesfield, with 4,200 persons employed as against 7,800 in 1838. The place of silk in Manchester is thus reminiscent of its "integrated" role in Yorkshire; but this is clearly not the case elsewhere in Lancashire.

To the west of Manchester townships around Leigh and Eccles also turned to silk weaving in the 1820's. The number of looms in the Eccles district is not known, but in 1832 over one-third of the total hand looms in south east Lancashire were in Leigh and the neighbouring townships. Mechanised throwing was also introduced to Leigh and Eccles, and the latter town was the most distant centre from Manchester to have any power looms in 1838. In both towns cotton manufacture employed a considerably greater proportion of the labour force than did silk and yet

(25) Rodgers (1960) p.148: "Fact. Insp. Ret." (1838)

silk remained a major interest long after it had disappeared from the cotton producing towns. The lesser exposure of the silk industry here to the capture of its mills and labour force by the cotton industry was perhaps due to its situation on the margin of the cotton manufacturing province. Unlike at Stockport in an earlier era, or in the major cotton towns east of Manchester in the 1850s, extreme competition for labour and other resources seems to have been avoided. Whatever the reasons - which remain somewhat obscure - the silk industry grew relatively undisturbed by the advances of the cotton industry in these predominantly mining settlements.

C) "COMPETITION" IN THE EAST MIDLANDS.

In most of south east Lancashire the silk industry was thus in a position of subservience to cotton and at the mercy of external influences for its success or failure. In Yorkshire an integrated textile industry aided the survival of the silk industry. In the East Midlands the relations of silk with the region's major textile industry, hosiery of framework knitting, illustrate conditions of competition.

The demand for silk yarn from the framework knitters has been cited as a major factor encouraging Lombe's enterprise to this region. Lombe broke the monopoly of the London importers

and Sardinian exporters of thrown organzine (though now the East India Company became monopoly suppliers of the raw silk) and perhaps had thereby hastened the growth of the East Midlands rather than London as the dominant centre of framework knitting. For this and other reasons the hosiery industry continued to grow and to become more concentrated in the East Midlands during the eighteenth and the first half of the nineteenth centuries (see Table 3.3.)⁽²⁶⁾ Without the demand from the framework knitters in the eighteenth century the silk throwsters would almost certainly have failed. Even in this market competition from imported organzine was extreme and the industry grew only slowly. Lombe's first known rival was Jedediah Strutt who established a mill around 1760. By 1789 there were twelve "machines or mills" in the town, though Lombe's mill was still the only one producing organzine.⁽²⁷⁾

A number of developments took place in the hosiery industry which had far reaching effects on silk in the district. Firstly silk lost its dominating position in the industry after 1775 when Arkwright's frame was perfected and cotton yarn was produced of an adequate quality for widespread use in hosiery. The use of cotton and other yarns developed rapidly and by 1884

(26) See Wells (1935) for a detailed account of the industry.
 (27) Pilkington (1789) vol.2. p.171; Nixon (1969) p.184

TABLE 3.3.

THE GROWTH OF THE HOSIERY INDUSTRY IN ENGLAND: 1660 - 1884. (1)

Date	England	London		The Midlands (Derbys.Notts.Leics.)		Derby	Derbyshire		Notting- ham	Nottinghamshire	
	No. of frames	No. of frames	% of total	No. of frames	% of total	No. of frames	No. of frames	% of total	No. of frames	No. of frames	% of total
1660	660	400	61	156	24	0	0	0	-	100	15
1695	-	1,500	-	-	-	-	-	-	-	-	-
1714	8,000	2,500	31	3,400	43	50	-	0.6	400	-	5
1727	-	3,350	-	4,650	-	-	-	-	400	-	-
1739	-	-	-	-	-	-	-	-	-	3,000	-
1753	14,000	1,000	7	7,300	52	200	-	1	1,500	-	11
1782	20,000	500	3	17,350	87						
1812	27,165	267	1	15,163	56	400		2	2,600		10
		(2)						4,700		17	
1832	30,500	-	-	28,500	93	-	6,800	22	-	10,500	34
1844	45,612	60	0.1	44,040	97	-	6,797	15	-	16,382	36

Notes (1) The table shows all frames, using any yarn and unused
 (2) The counties of Middlesex and Surrey

under ten per cent of the frames in use made silk goods.

Secondly a strong sub-regional specialisation by type of yarn developed: Nottinghamshire accounted for over half the frames using cotton, and Leicestershire practically monopolised the wool and worsted frames (see Table 3.4.). Nottinghamshire, with fifty-seven per cent of the silk frames, was the chief producer of silk goods but Derbyshire, with almost twenty-five per cent of its frames devoted to silk had the more concentrated industry.

A third feature of the industry was that Derbyshire depended to a great extent on the traditional and less rapidly advancing silk hose industry, while most innovations and developments in the use of silk in knitwear took place in Nottingham. Thus silk-glove manufacture, introduced in the mid-eighteenth century was centred in Nottingham (see Table 3.5.). Nottingham's specialisation on a varied hosiery industry rather than on any particular textile can be seen in the establishment in the town of mills supplying a variety of yarns. Cotton was produced from 1769 when Arkwright's mill was built and worsted from 1803. By 1838 there were three cotton, three silk and two worsted mills in the town.

Fourthly, in contrast to Nottingham, the Derbyshire hosiery industry was predominantly located in the countryside rather

TABLE 3.4.

THE HOSIERY INDUSTRY IN THE EAST MIDLANDS: 1884

	<u>Silk</u>		<u>Worsted</u>		<u>Cotton</u>		<u>Merino</u>		<u>Total</u>	
	No. of frames	% of total	No. of frames	% of total	No. of frames	% of total	No. of frames	% of total	No. of frames	% of total
Derbyshire	1,454	40	2	. .	4,380	18	0	0	6,005	15
Notts.	2,094	57	15	. .	12,440	52	46	3	14,879	38
Leics.	105	3	9,875	99.8	6,933	29	1,582	97	18,558	47
TOTAL	3,653	100	9,892	100	23,753	100	1,628	100	39,442	100

Notes (1) The table refers to frames in use.

(2) The totals given for each county slightly exceed the sum of those given by yarn.

TABLE 3.5.

THE SILK HOSIERY INDUSTRY IN THE EAST MIDLANDS:1844

PRODUCT	NUMBER OF FRAMES IN USE			
	Derbyshire	Nottinghamshire	Leicestershire	Total
Silk Gloves	698	1,407	102	2,206
Fashioned Silk Hose	650	346	0	996
Other Silk Goods (unfashioned & fancy)	106	341	3	450
TOTAL FRAMES in silk	1,454	2,094	105	3,652
Frames in silk as % of all frames	24	14	0.6	9

than the town. Thus in 1812 Derby accounted for under one-tenth of the county's frames, Nottingham for over one-third (see Table 3.3. above). Finally, the hosiery industry in Derbyshire had always been much smaller than in Nottinghamshire or Leicestershire, and in the early nineteenth century its growth was slow. Consequently between 1812 and 1844 the percentage of the total frames in the region found in Derbyshire declined from thirty-one per cent to fifteen per cent. (Compare with Table 3.3. above).

The combination of these adverse factors in Derbyshire's hosiery industry stunted its growth and so allowed the silk industry to develop more strongly, and largely independently. The relatively small numbers employed in hosiery, especially in Derby itself, was of prime importance. The paucity of innovation and progressive hosiery firms in the town, and the slow decline in the use of silk yarn in hosiery were also significant. Thus the silk industry moved from a position of dependence on the hosiery market as a mere service trade (as it was in the eighteenth century), to a new status as an independent industry and so a rival to the hosiery trade for labour and other resources by the middle of the nineteenth century. Had framework knitting been as firmly established in Derby as it was in

Nottingham, and had it been as large a consumer of labour, it is likely that the silk industry would have fared no better than it did in Nottingham where by 1838 there were only three silk mills employing under 400 persons.

In fact the Derby silk industry grew to be very important in the nineteenth century. Silk tapes were produced from early in the century, factory made lace (both silk and cotton) was manufactured in 1820, broad woven silk goods were added early in the 1820s and from 1823 ribbons were woven. In 1827 hand loom weaving employed about 700 persons compared to 2,000 to 3,000 in the throwing industry.⁽²⁸⁾ By 1838 there were seventeen silk mills in Derby and four elsewhere in the county employing a total of 3,200 persons, a figure exceeded only in Cheshire and Lancashire.

Thus the fate of the silk industry on the south east borders of the Pennines perfectly illustrates the principle stated earlier: where silk was in direct competition with a strong, vigorous and technically progressive textile industry (as at Nottingham) it failed: where it competed only against a small, weak, technically backward rival (as at Derby) it was able to achieve dominance and a stability threatened only by

(28) Robinson and Pike (1891) p.26: Felkin (1867) p.252: Glover (1829) p.13.

market factors or the caprice of tariff policy.

D) "DOMINATION" IN THE SOUTH WEST PENNINES

In both Lancashire and Yorkshire, and, except at Derby, in the East Midlands, the fate and fortune of the silk industry was essentially at the mercy of trends in other manufactures. On a major scale it was only in the south west Pennines that an entirely independent silk industry grew to a significant size. Here yet another set of factors must be considered to explain its success. A fundamental consideration is the early date at which silk throwing was established in the region. Through the latter part of the eighteenth century both throwing and the kindred waste using trades developed in a relatively undisturbed environment. There were no great technical changes within the industry nor any developments in other industries which challenged silk's hold on the area. Setbacks occurred in the industry,⁽²⁹⁾ but in general profitability was sufficient to permit a gradual extension of the domestic branch of the industry and the introduction of the new activity of broadweaving from 1787.⁽³⁰⁾

(29) e.g. in the 1760s: see above p.32.

(30) "Handloom weavers" H.C. (1840) vol.XXIV p.340

Thus by 1800 the silk industry was strongly established in the area, though the bulk of employment was not in the mechanised concerns but in the much more important domestic activities of smallware manufacturing and weaving. There was, by 1800, sufficient entrepreneurial ability and a sufficient level of employment already committed to silk in the region to ensure that it would grow and be a centre of innovation in the boom conditions that lay ahead. The south west Pennine region, alone among the silk producing areas so far considered, had reached what may be described as "a take off point" in silk manufacture before the rapid developments of the nineteenth century occurred.

But silk by no means monopolised employment in the textile industries of these towns in the south west Pennines. A possible source of competition was always present in the cotton industry, possessed by all three silk towns. In fact the cotton industry never penetrated southeastwards into the region more than feebly: this area lay some twenty miles from the Manchester market and remained one of the more distant outliers of the cotton province. Table 3.6. shows the weak hold that the cotton industry had, compared with silk, on the labour force of the region.⁽³¹⁾ The first cotton mill in Macclesfield,

(31) See also Table 3.7. below.

TABLE 3.6.

THE TEXTILE INDUSTRIES OF THE SOUTH WESTPENNINES: 1838

PARISH	TOWN	NUMBER OF MILLS		EMPLOYMENT	
		Silk	Cotton	Silk	Cotton
Leek	Leek	7	1	784	60
Astbury	Congleton	35	4	3,279	367
Prestbury	Bollington	0	11	0	2,120
	Macclesfield	48	5	7,779	964

Note. Data for Prestbury parish ^{are} ~~is~~ divided between Macclesfield and Bollington townships using Williams Directory (1846). However the Census figures for 1841 (showing 7,357 silk workers and 368 cotton workers in Macclesfield) suggests that this may exaggerate the numbers employed in cotton in Macclesfield.

established in 1785, soon failed,⁽³²⁾ though subsequent mills were built and it appeared that "here as elsewhere in Lancashire and Cheshire cotton was gaining at the expense of silk."⁽³³⁾ However silk was established strongly enough to recover the lost ground. In the silk slump of 1817 there were nine cotton mills in the town, by the boom of 1825 only three.⁽³⁴⁾ In Congleton the situation was similar, though the firms involved in cotton manufacture appear to have been more stable, with the same four names mentioned in the 1780s and the 1820s.⁽³⁵⁾ In Leek cotton was insignificant: only one small mill was recorded in 1838 and earlier manufacture was negligible. The silk industry was thus in a position of total dominance in the region, recruiting labour from the towns and the surrounding countryside and employing most of the industrial capital available in the area.

It is probable that the silk industry in Cheshire could not have been maintained, despite its strong hold over the region, but for its being beyond the sphere of intense competition of its chief potential rival for labour and capital, the cotton industry. Figure 3.2 shows that there is a clear tendency

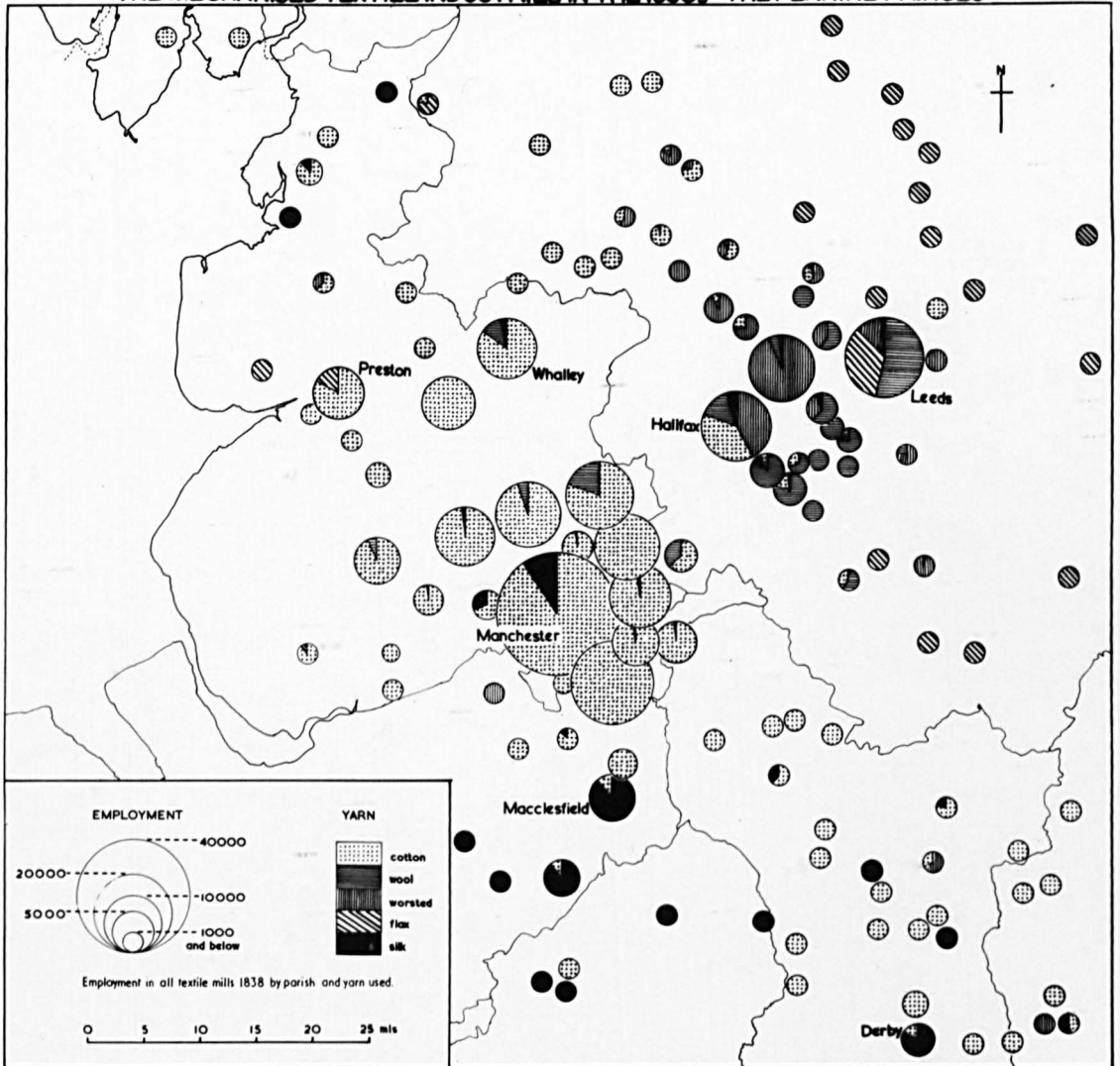
{32} Warner (1921) p.133. {33} Aikin (1795) p.438
 {34} Corry (1817) p.281; Varley (1825) p.2.
 {35} Corry (1817) p.197; Yates (1820) p.100.

for the lesser textile industries of Pennine England to take up a marginal distribution. This is true of the silk industry (not only in the south west Pennines but also around Lancaster and seen to some extent in the East Midlands); and the pattern is repeated in the case of flax. Though Leeds was the strongest single centre, most of the flax industry was in small scattered mills north of Yorkshire's major textile region, and a minor flax district existed on the western margins of the Lancashire cotton region. The speculative silk and the declining flax industries could both be maintained only on the fringes of the textile province, although each had a strong local hold on the employment in its domain, indicated on the map by the absence of much other textile employment.

Nevertheless the location on the margins of the textile province of Pennine England almost certainly conferred great advantages on the silk industry compared with the industry elsewhere. The transport system throughout the province was complex and well-developed. The manufacturers had access - admittedly at some distance - to the commercial and financial facilities of Manchester. The marketing organisation for part-manufactured and finished products in the city was well established by 1830, and later the clothing industry centred on Manchester was an important consumer of silk. It was also

FIGURE 3.2.

THE MECHANISED TEXTILE INDUSTRIES IN THE 1830s - THE PENNINE FRINGES



from the cotton manufacturers that much of the technical innovation stemmed. The position of the Pennine silk industry, especially in the south west Pennines, can almost be described in optimum terms. Where it was not integrated with other textile pursuits, the silk industry took up a sufficiently marginal position to the concentrations of the major textile industries, cotton, wool and worsted, to be relatively free from competition from them for mills, power sites, or labour; but sufficiently close to the focal cities of the textile province to derive great benefits from this proximity, vis-a-vis the distant southern centres of the silk trade.

Certainly Pennine England dominated the silk industry by 1840. The mechanised silk industry in the south west Pennines employed over 13,000 persons in 1838. The next largest agglomeration was in south east Lancashire, where just over 5,000 factory workers were employed. The remainder of the Pennine province employed a further 5,000 persons of whom nearly 3,500 were concentrated on the south east margins around Derby and Nottingham. Thus over seventy per cent of the total employment in England's silk mills was concentrated in the Pennine province and forty per cent was in the south west Pennine manufacturing region.

The concentration of the industry in the south west Pennines suggests that there must have been advantages of agglomeration, expressed in close industrial linkages, quite apart from benefits accruing from being on the margins of the textile province. The industrial linkage system within the silk industry, both backward and forward, was formed over considerable distances.⁽³⁶⁾ When throwing was first established in the south west Pennines, the raw silk was imported through London, and the chief outlets to the weaving or clothing trades were also in London. Thus both supply and market links were chiefly southwards. But another set of linkages developed with the Lancashire cotton district: Lancashire's technical inventiveness was a primary source of innovation in the silk industry, and Manchester was a considerable commercial, financial and market centre for silk, and Lancashire hand loom weavers were major consumers of thrown silk. These ties northwards to Manchester were undoubtedly strong, but not until silk was firmly established in Macclesfield.

Even though linkages in these basic needs of the industry

(36) For a general consideration of industrial linkage see Florence (1948) esp: pp.52-78; Townroe (1970) and Keeble (1969) pp.163-4.

were over some distance, considerable specific economies⁽³⁷⁾ accrued to firms located in the south west Pennines, and particularly in Macclesfield, from more local industrial linkages. Silk dyeing in particular, developed on a large scale in Macclesfield and Leek (in Congleton the town water on which the dyers would have to depend was from boreholes and too hard);⁽³⁸⁾ ancillary occupations grew up, particularly machine making and loom repairing, and the region's trade was sufficient to support a number of merchants, whose chief centre was Macclesfield. Table 3.7. summarises the growth of the major branches of the silk industry, and of the ancillary and associated industries in the south west Pennine towns in the early nineteenth century. It emphasises particularly the overwhelming importance of Macclesfield both for silk manufacture and ancillary activities and indicates the varying activities of the different towns.

(37) "Specific" economies are those accruing from the agglomeration of firms in the same industry. "General" economies from the agglomeration of firms in different industries. See "Industrial Population" (1940) pp.33-4. Hall (1963) p.56 and Keeble (1969) p.185.

(38) See Mellowes (1934) pp.387-8.

TABLE 3.7.A

SILK ESTABLISHMENTS IN MACCLESFIELD: 1790 - 1834

	1790	1818	1825	1828	1834
Button Maker	11	4	-	2	2
Twister	6	5	10	15	8
Throwster	4	49	66	63	47
Manufacturer	24	34	65	41	39
Ribbon and Smallware	2	9	-	7	12
TOTAL MANUFACTURERS	<u>47</u>	<u>101</u>	<u>141</u>	<u>128</u>	<u>108</u>
Dyers	7	5	8	9	11
Merchants	-	2	-	11	14
Ancillary	2	6	5	12	8
TOTAL SILK ESTABLISHMENTS	<u>56</u>	<u>114</u>	<u>154</u>	<u>160</u>	<u>141</u>
Associated Occupations	8	13	-	-	13
Cotton Manufacturers	2	7	3	4	9
Silk & Cotton Manufacturers	2	1	-	-	-

- Notes: (1) Silk and Cotton Manufacturers are also included under "Silk Manufacturer."
- (2) "Ancillary Occupations" which occur are Machine Maker, Power Loom Maker, Mill Wright, Silk Cutter, (Wooden) Button Mould Turner, Reed Maker, Harness Maker, Pattern Designer, Card Cutter (The last four are connected with working the Jacquard Loom).
- (3) "Associated Occupations" which occur are Hatter, Hosier, Tape Maker, Lace Maker.

TABLE 3.7.B

SILK ESTABLISHMENTS IN CONGLETON: 1790 - 1834

	1790	1818	1828	1834
Ribbon Manufacturer	7	4	4	3
Throwster and Manufacturer	4	-	19	13
Throwster and Silkman	-	32	44	40
TOTAL MANUFACTURERS	<u>11</u>	<u>36</u>	<u>67</u>	<u>56</u>
Smallware Dealer	-	-	-	3
Ancillary	-	2	7	4
TOTAL SILK ESTABLISHMENTS	<u>11</u>	<u>38</u>	<u>74</u>	<u>63</u>
Associated Occupations	1	2	2	2
Cotton Manufacturer	3	4	3	-
Silk & Cotton Manufacturer	-	-	2	1

TABLE 3.7C.

SILK ESTABLISHMENTS IN LEEK: 1784 - 1834

	1784	1809	1818	1828	1834
Button, Twist and Sewing Silk	6				8
Ribbon Manufacturer	3	8	-	-	1
Manufacturer (N.O.S.)	-	1	15	15	22
TOTAL MANUFACTURERS	<u>9</u>	<u>9</u>	<u>15</u>	<u>15</u>	<u>31</u>
Dyer	2	2	2	2	2
Ancillary	-	-	-	-	2
TOTAL SILK ESTABLISHMENTS	<u>11</u>	<u>11</u>	<u>17</u>	<u>17</u>	<u>35</u>
Associated Occupations	-	-	1	1	-
Cotton Manufacturer	-	1	-	-	-

Note: N.O.S. - not otherwise specified.

In addition to these subsidiary industries less easily identifiable economies of concentration can be deduced. Most significant, and most referred to by contemporary writers, was the skilled labour force of the district. Economies in organisation and management, typical of many concentrated industries were also evident. In the words of Marshall:

"Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organisation of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own: and thus it becomes the source of further new ideas."⁽³⁹⁾

During periods of increasing production and technical advance contact and discussion between manufacturers helped maintain the south west Pennine industry in a more advanced position than most of its competitors, and in the frequent slumps overall decline was less.

Whether awareness of these economies was significant when locational decisions were made or whether a less rational "behavioural force"⁽⁴⁰⁾ governed location is debatable.

(39) Marshall (1920) p.271 (40) Taylor (1969) p.7.

Certainly Taylor's concept of seedbed growth has little relevance to the nineteenth century silk industry, where considerable financial resources were essential and where the techniques employed did not allow spontaneous genesis of small firms developing new ideas.⁽⁴¹⁾ The big London merchants certainly considered alternative locations, perhaps with more economic rationality in the laissez faire environment than is possible to-day, and they considered that a merchant should be able to employ "in what part of the country he thought most advantageous any portion of his capital".⁽⁴²⁾

Although agglomeration of the industry resulted in substantial economies in the south west Pennine region, the concentration of producers did not bring about such compelling advantages as in many other industries. For example, agglomeration appears to have counted far more in the cotton or wool and worsted trades, in the Coventry ribbon industry⁽⁴³⁾ and among the London clothing manufacturers.⁽⁴⁴⁾ Thus although the south west Pennines remained the most stable and permanent concentration of silk manufacturing, this region frequently

(41) See Taylor (1969) pp.7-16.

(42) "Foreign Trade" (1821) p.4. (43) See below p.106-8.

(44) See Hall (1960) esp. pp. 175.

faced competition from other, sometimes temporarily larger, agglomerations of the industry elsewhere in England.

At a general level, the concentration on silk manufacture which occurred in the south west Pennines lends support to Rawstron's thesis of "specialisation of area." In his study of hosiery and lace Rawstron suggests that in the nineteenth century concentrations of industrial groups were desirable to obtain the economies referred to above, and as a corollary that the growth of non-associated industries in the same areas was generally restricted.⁽⁴⁵⁾ The sharpness of the pattern of specialisation among the south west Pennine towns was marked. Local specialisations in silk manufacture developed in the different towns (shown in Table 3.7.) and these were emphasised by the different terminology used in the various centres. "Manufacturer" appears to have indicated a throwster in Leek and a weaver in Macclesfield. In Congleton "throwster" was generally coupled with "silkman" or "manufacturer" but not used alone. The contrast between Macclesfield and the neighbouring village of Bollington is even more marked. The latter concentrated heavily on cotton manufacture (see Table 3.6. above): it was the most south easterly of the major concentration of the cotton industry and was linked to Manchester by

(45) Rawstron (1958) p.26.

a ribbon of cotton manufacturing towns and villages (see Figure 3.2.). Though it was close to the silk region it apparently had only one silk mill, built in the boom of 1824 but which had failed by 1828.⁽⁴⁶⁾ Conversely Macclesfield only four miles away, never developed a significant cotton industry, and the two towns were separated by a relatively sharp and stable industrial boundary. The factors which caused the establishment of the different industries in these towns, perhaps originally largely chance, were progressively reinforced by the advantages of industrial specialisation, and hence these are important considerations in any attempt to explain the distribution of the industry which occurred.

Thus the specialisation of the south west Pennines on silk production may be seen as a part of a logical regional pattern of comparative advantage over the country as a whole; a specialism reinforced by the "mutual exclusiveness" among industries which was the rule in the nineteenth century.⁽⁴⁷⁾ The near-monopoly hold that silk had over the physical, human and financial resources of the region, due largely to its early specialisation, made the permanent superimposition of

(47) Rawstron (1958) pp.26-28.

(46) Prout (1829) p.56.

another industry, even cotton, impossible. The industry did not flourish in the south west Pennines directly for reasons of labour or other resources but primarily because here, as a nationally weak and unstable industry, it was afforded the greatest protection from the competition of stronger industries. A contemporary writer, as well as those looking back from the twentieth century, considered this to be a major general feature: "there shall be... no preoccupying industry or more important business or one more convenient to be carried on in that locality".⁽⁴⁸⁾

Outside the south west Pennines the fluctuating fortunes of silk placed it in a constantly changing relationship with other industries and the battle for dominance was fought anew with each successive boom and slump: within the region the fortunes of silk and the towns were one.

(48) Buxton (1855) p.206.

REFERENCES FOR CHAPTER III

- J. AIKIN (1795) "A Description of the country for thirty to forty miles round Manchester."
- E. BAINES (1835) "History of the Cotton Manufacture in Great Britain."
- D. BUXTON (1855) "On the Rise of the Manufacturing Towns of Lancashire and Cheshire." Hist. Soc. of Lancs. and Cheshire. (vol.8.) pp.199-211.
- J. CORRY (1817) "History of Macclesfield, Congleton, Knutsford, Stockport and Leek."
- W. FELKIN (1867) "A History of the Machine Wrought Hosiery and Lace Manufacturers."
- P.S. FLORENCE (1948) "Investment, Location and Size of Plant." N.I.E.S.R., Economic and Social Studies. No. VII
- H. FORBES (1853) "Rise, Progress and Present State of the Worsted Manufacturers of England" in "Lectures on the result of the Great Exhibition of 1851 - second series". (Society of Arts, Manufactures and Commerce).
- S. GLOVER (1829) "The History, Gazetteer and Directory of the County of Derby."
- P.G. HALL (1960) "The Location of the Clothing Trade in London 1861-1951." Trans. Inst. Br. Geogr. (No.28) pp.158-178.
- P.G. HALL (1963) "London 2000".

- D.E. KEEBLE (1969) "Local Industrial Linkage and Manufacturing Growth in Outer London." Town Planning Review (vol.40) pp.163-188.
- A. MARSHALL (1920) "Principles of Economics." (8th. ed.)
- C.L. MELLOWES (1933) "The Geographical Basis of the Natural Silk Industry of the West Pennines." Unpubl. M.A. Thesis - University of London.
- C.L. MELLOWES (1934) "The Geographical Basis of the west Pennine Silk Industry." J. of the Text. Inst. (Proceedings) pp.376-88.
- F. NIXON (1969) "Industrial Archaeology of Derbyshire."
- G. ORMEROD (1819) "The History of the County Palatine and City of Chester."
- J. PILKINGTON (1789) "A view of the Present State of Derbyshire." (2 vols.)
- J. PROUT (1829) "Practical View of the Silk Trade".
- E.M. RAWSTRON (1958) "Some Aspects of the Location of Hosiery and Lace Manufacture in Great Britain." East Midd. Geogr. (No.9 vol.2) pp.16-28.
- ROBINSON and PIKE (1891) "Derby - its Art Trade and Commerce."
- H.B. RODGERS (1960) "The Lancashire Cotton Industry in 1840" Trans. Inst. Br. Geogr. (No.28) pp.135-153.
- M.J. TAYLOR (1969) "Industrial Linkage, seedbed growth and the Location of Firms." Occasional Paper No.3 Dept. of Geogr. University College London.
- P.M. TOWNROE (1970) "Industrial Linkage, Agglomeration and External Economies" J. of the Town Planning Institute (vol.56) pp.18-20.
- W. TUNNICLIFFE (1798) "A Topological Survey of the Counties of Stafford, Chester and Lancaster."

G. UNWIN, A. HULME and G. TAYLOR (1924) "Samuel Oldknow and the Arkwrights."

W.D. VARLEY (1825) "A History and Directory of Macclesfield."

SIR. F. WARNER (1912) "The British Silk Industry: Development since 1902." Paper to the Royal Society of Arts.

SIR. F. WARNER (1921) "The Silk Industry of the United Kingdom."

B.G. WARRINGTON (1932) "Historical Geography of the Silk Industry in Macclesfield, Congleton and Leek." Unpubl. B.A. Thesis: University of Liverpool.

F.A. WELLS (1935) "The British Hosiery Trade."

S. YATES (1820) "An History of the Ancient Town and Borough of Congleton."

GOVERNMENT PAPERS

CENSUS VOLUMES: 1851, 1861, 1871.

FACTORY INSPECTORS' RETURNS

"Persons engaged in the Mills and Factories...(1835)
H.C. (1836 vol.XLV) pp.51-

"Returns of all Mills and Factories...June, 1838"
H.C. (1839 vol.XLII) pp.1-

"Second Report from the Select Committee of the House of Lords .. into Foreign Trade (Silk and Wine)" H.C. (1821 vol.VII) pp.421.464.

"Report of the Select Committee to enquire into the Present State of the Silk Trade and the Effects of a Change in Tariffs" H.C. (1831-32 vol.XIX) pp.1-

"Report of the Commissioners...into the Condition of
Unemployed Hand Loom Weavers." Assistant Commissioners
Reports H.C. (1839 vol.XLII) pp.511- (1840 vol.XXIII)
pp.49- and pp.367- : (1840 vol. XXIV) pp.1- and
pp.373 -

"Royal Commission on the Distribution of Industrial Population:
Report" Cmnd. 6153 (1940).

CHAPTER IVTHE DISTRIBUTION OF THE SILK INDUSTRY OUTSIDE THE PENNINE PROVINCE

In 1700 the Spitalfields district of London was the only major silk producing area in England. Throwing, as well as weaving, was probably concentrated here during the early period of the domestic industry,⁽¹⁾ although the former was never an important activity in London as all the organzine and much of the tram was imported ready thrown.⁽²⁾ Moreover, throwing was already becoming dispersed in England even before the process was mechanised; Macclesfield, Sherborne and probably other centres were supplying London with yarn, thrown by hand, in the early eighteenth century and possibly before.⁽³⁾ Soon after mechanisation was introduced to the industry Stockport and Macclesfield in turn became important suppliers to Spitalfields, as seen above, and by 1765 there were over sixty mills widely dispersed in England producing silk yarn, much of it for London weavers.⁽⁴⁾

(1) Smiles (1867) p.113; Huguenot Soc. (1900-1908) Vol.X "Return of Aliens Dwelling in London."

(2) Hertz (1909) pp.711-12.

(3) C.J. vol.XVIII (1717) p.693. Clapham (1916) pp.459-60

(4) C.J. XXX (1765) p.213

Evidence for the location of these mills is scanty, though it is apparent that, already, throwing and weaving were becoming sited in quite separate localities. During the century when throwing was mechanised but weaving was still a hand craft (roughly 1730-1830), the requirements of the two processes were quite different. The south west Pennines and, it will be seen, the Chilterns and the Cotswolds were the major throwing region, while weaving was carried on chiefly in London, East Anglia and Coventry. Silk was clearly a sufficiently valuable commodity to be able to bear the transport costs involved - over much greater distances than were the case in the Lancashire cotton industry at that period⁽⁵⁾ - and each branch of the industry was located without regard for proximity to the other. Only toward the end of the period, with the widespread use of power looms and the evolution of the combined mill, did the two branches of silk production show a strong tendency to become geographically integrated in broadly identical areas. There is an interesting contrast here with the spatial evolution of the cotton industry, in which the opposite tendency was apparent, with spinning and weaving becoming locationally dissociated in growth.

(5) Rodgers (1960) pp.145-151.

A) THE DISPERSAL OF THE INDUSTRY IN THE SOUTH-EAST

By 1800 both throwing and weaving had spread from the Spitalfields nucleus into a number of towns to the north and east of London, as well as further afield. The throwing industry was the first to migrate since London was quite unsuitable as a location for this increasingly mechanised industry. Power, necessarily from water in the early years, was available only at a few sites in the city, and these were already pre-empted for other uses.⁽⁶⁾ Moreover, the use of power led to an increase in the size of mills, but factory development was impossible in the overcrowded city, where the costs of land and building were prohibitive. Consequently only specialised hand throwing continued in London, while large scale, powered throwing was conducted elsewhere.

In the south east the water power potential some distance from London was used successfully from the 1720s when a large mills built at Waltham Abbey and at Little Hallingbury in Essex.⁽⁷⁾ In the 1760s there were mills at Bishops Stortford and Watford throwing organzine,⁽⁸⁾ and by the 1820s mills

(6) Spate (1938) p.425.

(7) Warner (1921) p.298; Vict. County Hist. Essex vol.2 (1907) pp.462.

(8) See above p.20

using the water power potential of the Chilterns, were supplying a large quantity of yarn to the London merchants. In addition to being close to the London market, and having the water power potential and room for expansion which London lacked, there was an easily tapped labour supply in the area. The women and workhouse children who made up most of the workforce were an ample labour supply in a dominantly rural society.⁽⁹⁾ By the 1830s the throwing mills of the Chilterns, in Hertfordshire and Buckinghamshire, employed over 1,000 workers, among whom there were very few men, and more mills were found just over the county boundary, in Essex.

In the traditional weaving area of Essex and Suffolk there were slighter surplus labour resources available for the growth of the throwing industry, and the sluggish rivers were less able to provide water power. Nevertheless throwing mills were built here, chiefly in the boom of the 1820s, and by 1838 there were ten mills using power, almost exclusively for throwing.⁽¹⁰⁾ A total of over 1,900 workers were employed in the mills of Essex and Suffolk in 1838, suggesting that

(9) See below p.163 : Warner (1921) p.322.

(10) The first throwing mills was built at Braintree in 1810 ("Handloom Weavers" H.C. (1840 vol.XXIII) p.288. In 1838 one mill had power looms installed (ibid p.293). The remainder were presumably engaged in throwing.

here the industry was rather larger than in the Chilterns.

These substantial powered throwing concerns were the first expression of a new scale of organisation in the south-eastern silk industry as a whole. The new breed of London wholesalers and merchants, whose influence was shown to be crucial in the management of mills in the Pennines and the Chilterns, was already beginning to dominate the weaving industry. Even though weaving still depended on the hand loom, the scale of operation was increasing and the organisation of the industry was rapidly changing. As a result London was becoming increasingly unsuitable as a location for the weaving branch that now needed larger sites and a greater labour supply.

Moreover, both the restrictive practices of an old trade and even legislative constraints hampered the evolution of the silk industry in London. In the eighteenth century the Spitalfields industry was characterised by wage earning weavers, working for masters who often had only small businesses and who frequently had been recruited from among the successful weavers. They were commercially unadventurous and engaged almost entirely in the staple trade, weaving the plainer cloths. Stability was maintained by the strong guilds which secured almost continual tariff protection for the industry, enforced various conditions

of employment (particularly concerning apprentices) and maintained "The Book" of piece work rates. In 1773 the first Spitalfields Act was passed, which was designed to prevent a recurrence of the rioting which occurred when the system of payment based on The Book broke down. This Act gave the magistrates, rather than the masters and weavers themselves, the task of fixing legally enforceable wage rates, and other conditions of work, on the weavers.⁽¹¹⁾ The operation of this and later Acts was beneficial only while the industry kept its traditional form. In the changing conditions of the nineteenth century the Acts became a strait-jacket by imposing a system of traditional restrictive practices that virtually prohibited experiment, technical progress and the evolution of larger scale units.

These restrictions that so hampered the evolution of the trade in London gave commercial advantages to provincial masters both in the fashionable market, where changes occurred especially rapidly after the French peace of 1815, and also in the staple lines, for which it was the practice outside London to pay only two-thirds the Spitalfields wage.⁽¹²⁾

(11) See Clapham (1916) pp.459-471 for a detailed account of the Acts.

(12) "Foreign Trade" (1821) p.6.

Moreover since the London system used piece rates based on output the costs of production remained the same whether labour saving devices were used or not, and there was little hope of recouping investment in more productive machinery. Consequently any experiments in new techniques were conducted outside London, and any improvements in methods applied there.⁽¹³⁾ Some of the minor clauses of the Acts also encouraged masters to settle in Essex and Suffolk: for example, the prohibition on London employers from giving work outside the City,⁽¹⁴⁾ and the restriction on the number of apprentices (who were in fact little more than low cost workers).⁽¹⁵⁾ In practice, however, these rules were usually evaded.

In the changed conditions of the nineteenth century the operation of the Acts made business increasingly difficult for the Spitalfields master-weavers. For the new merchant-capitalist they were intolerable. These City (as distinct from Spitalfields) men were in the silk business on a large scale, and more willing to experiment and speculate. From

(13) "Foreign Trade" (1831) p.6.

(14) "Spitalfields Acts" (1823) p.124.

(15) "Foreign Trade" (1821) p.21

their central warehouses they managed large vertically integrated businesses and controlled many of the processes from the importation of the raw silk to the distribution of the finished goods. In order to benefit from the new conditions, which they had in part created, these new capitalists had to look beyond the confines of London with its outdated practices, imposed both by tradition and the Spitalfields Acts. Thus progressively they turned their backs on their Spitalfields neighbours and became a dominant force in the growth of a newer, freer and more flexible silk manufacturing industry elsewhere in England.

In this flight from London the silk industry was not alone. Other industries entering a similar capitalistic stage in development were also leaving their traditional centres.⁽¹⁶⁾ The lesser regulation of trade in the developing centres in the north of England is considered the major factor in the dispersion of other textiles, as of silk, from both London and from the long established wool and worsted areas of East Anglia and the West Country;⁽¹⁷⁾ though soon, of course, the economies

(16) Spate (1938) p.422.

(17) Wells (1954) p.54; Spate (1938) p.431; Stamp and Beaver (1962) p.469.

of agglomeration on the coal fields exerted a positive attraction on the factory industries. The increased demand for the mass-production of plain goods also reduced the attraction of London for many industries.⁽¹⁸⁾ But as a centre of fashion, and the largest concentration of wealthy purchasers, London was able to retain, and even to strengthen, its grip on the luxury crafts. Thus clothing, the hat industry, leather and shoes all employed increasing numbers in the city,⁽¹⁹⁾ while obtaining their raw materials from further afield.

The place of silk in these changes was anomalous: in fact this industry became divided. Many of its products were sold as luxury goods directly to the final consumer, and production of these needed to be located near to the centre of fashion.⁽²⁰⁾ The Spitalfields weavers consequently turned their attention increasingly to the finer goods, in which they held the lead for some time to come.⁽²¹⁾ In contrast, Macclesfield and the other centres distant from London dominated the trade in plain cloth, much of it destined to become a raw material of the

(18) Wells (1954) p.54.

(19) Hall (1960) p.155-6; Spate (1938) p.425.

(20) "Foreign Trade" (1921) p.12. See below pp.107-8. for the exception of ribbon manufacture.

(21) Spate (1938) p.425.

clothing industry. However, many of the new firms established in Suffolk and Essex were sufficiently close to the London market to engage in the luxury trade, while benefitting from a freedom from London's restrictive environment. Thus, while other industries leaving London tended to move a considerable distance and to settle in a single concentrated area,⁽²²⁾ part of the silk industry remained tied to locations within easy range of London and the remainder became widely dispersed rather than concentrated into a single area. One of the forces bringing about this result was clearly the power of the London market, which remained much stronger in the silk trade than in most other textile industries.

In part, the dispersal of silk manufacturing in south east England was related to powerful decentralising forces rooted in London's increasing disadvantages as a site. But other, more positive, attracting influences were at work in the new areas of growth. In Suffolk and Essex the newly established silk weaving industry was able, to some extent, to fill the vacuum left by the collapse of worsted manufacture. The weavers, though organised to resist changes in the worsted industry, could not stop the introduction of new methods in silk, which,

(22) See Rawstron (1958) pp.17 and 23 for the examples of hosiery and lace.

in any case, offered the only alternative employment. In fact, even at two-thirds the Spitalfields rate, weavers were better paid than they had been in wool. Thus London merchants found here a ready source of labour, free from the restrictions of London and skilled in weaving, if not used to silk. Many of the towns formerly famous for worsted were weaving silk by the 1820s: Sudbury, the most important, Colchester, Halstead, Haverhill, Braintree and others.⁽²³⁾ In 1838 there were almost 2,000 hand looms at work in these counties and twenty years earlier there had probably been considerably more.

Although throwing had migrated to the Chilterns and weaving to East Anglia, there was still a considerable silk industry in London. During the life of the Acts employment in silk weaving increased in London, though at a slower rate than elsewhere, and in 1822 trade had never been better.⁽²⁴⁾ When the Acts were abolished in 1824, largely as a result of pressure from the big merchants,⁽²⁵⁾ the effect of the levelling of the minimum wage ironically encouraged the migration to the provinces.⁽²⁶⁾ In the slump at the end of the 1820s there were signs of a

(23) See "Handloom weavers" H.C. (1840) vol.XXIII p.285 for a full list.

(24) "Spitalfields Acts" (1823) p.25

(25) Clapham (1916) pp.467-471

(26) Brentano (1870) p.127; Dowell (1888) vol.2 p.201.

renewed concentration on the capital, as in some of the smaller outlying centres (for example Reading, Wokingham and Andover) the trade collapsed and weavers migrated to Spitalfields. (27)

In the long term, however, the trade was not strongly competitive and from about 1850, when powered weaving was widespread, the Spitalfields industry declined rapidly, and about 8,000 of the 20,000 silk weavers in London were lost to the trade in a single decade. (28)

B) THE DEVELOPMENT OF THE INDUSTRY IN NORFOLK AND SOUTH WEST ENGLAND.

The dispersal of silk manufacturing from London into parts of the home counties must be interpreted against the background of change in the Spitalfields industry. But the silk industry also grew up much further away from London in other parts of southern England, and here it was influenced by different factors, which must be treated separately.

NORFOLK

In Norfolk silk throwing and weaving increased during the

(27) "Handloom Weavers" H.C. (1840) vol. XXIII pp. 298-301
 (28) See below p. 196 and Table 7.7.

early nineteenth century, though the industry had always been quite separate from that in Suffolk and Essex and had no direct links with London. Flemish silk weavers are reputed to have been invited to Norwich in the early sixteenth century,⁽²⁹⁾ and throughout the next three centuries Norwich prospered as a major textile centre, in which silk played a minor role in relation to worsted weaving. In the last quarter of the eighteenth century the worsted trade declined in Norwich, as it did throughout East Anglia when faced with competition from the mechanised Yorkshire industry.⁽³⁰⁾ Silk weaving increased in importance, absolutely as well as relatively, as worsted manufacture declined, but from a wider and more indigenous base than in Suffolk and Essex. In particular the weaving of bombazines, which had a worsted warp, expanded easily in Norwich, an established centre for such fabrics, as it declined in Spitalfields.⁽³¹⁾

The growth of a modern and mechanised silk industry in Norfolk illustrates the enormous importance of the vigorous entrepreneur in the industrial geography of the nineteenth

(29) See Warner (1921) pp.29-30 and above p.2.

(30) Lloyd-Prichard (1950) pp.375-376.

(31) "Spitalfields Acts" (1823) p.170; Clapham (1916) p.463.

century. Silk throwing was introduced to the area in the early nineteenth century by the Grouts, a large firm which appears to have been the only producer using power in the county in the 1830s. They also introduced powered weaving to Norfolk and by 1840 they were a fully integrated firm, combining all stages from importing raw silk to distributing the finished goods.⁽³²⁾ In 1832, the firm had six mills or workshops in Norfolk as well as two in Essex and one in Warwick,⁽³³⁾ and in 1838 they employed over 2,500 workers in Norfolk,⁽³⁴⁾ accounting for over one-quarter of the total employment in silk in the country, whether in factory or domestic production.

Such enterprise was exceptional in Norfolk, or indeed elsewhere in Southern England, and much more typical of the industry were the twenty-five or so other manufacturers who continued to put out work to hand loom weavers in the traditional manner.⁽³⁵⁾ This branch of the trade in 1838 was as important in the Norwich area as it was in the south west

(32) "Hand loom Weavers" H.C. (1840) vol.23 p.310

(33) "Silk Report" (1832) p.691

(34) "Hand loom Weavers" H.C. (1840) Vol. XXIII p.317

(35) Warner (1921) p.294.

Pennines, each having just over 5,000 looms, and was much more important than silk hand loom weaving in Essex and Suffolk where there was a total of under 2,000 looms.⁽³⁶⁾

THE SOUTH WEST

Although not of the antiquity of the Norwich trade, silk weaving was carried on at many centres in the south west of England from Blockley to Sherborne and Taunton, in the seventeenth and eighteenth centuries.⁽³⁷⁾ As in Norfolk the industry appears to have been controlled by local manufacturers and not by highly capitalised merchant firms based in other areas. But, unlike in any other silk producing region, manufacturers in the south west were scattered over a wide area, and until after 1820 there was no concentration of the industry into a predominant centre. Small scale concerns appear to have predominated in both the domestic and factory industries, and women and children made up a greater part of the labour force than was general elsewhere.⁽³⁸⁾ Taken together these characteristics suggest an industry based upon the female labour reserves of a predominantly farming

(36) "Hand loom Weavers" H.C. (1840) vol.XXIII
pp.285-310 and 490-493.

{37} See above pp.12-13.

{38} See below p.163

region. Nevertheless the south west had a long tradition of textile weaving and substantial water power resources which enhanced its attraction to manufacturers and maintained its importance.

In the south west counties the industry expanded in the late eighteenth century and a number of throwing mills were established at widely scattered centres. The earliest were at Blockley (Worcestershire), which threw yarn for the Coventry ribbon weavers from 1718, and at Chipping Campden; in Dorset a mill was built at Sherborne in 1740, and at Gillingham in 1776; Bruton and Wells in Somerset both contained mills by 1773; mills were built at Taunton in 1778 and 1781 and at Winchester in 1792.⁽³⁹⁾ Except at Blockley demand for yarn from local weavers appears to have been a major locating factor. Throwing and weaving were closely integrated and it is probable that throwing concerns were operated by local weaving firms. Not only were throwing mills situated in towns where weaving was already important, but also inferior power silks were apparently preferred to others more distant from the weavers. Thus the Winchester mill, and the second mill at Taunton were initially man powered, and at Sherborne horses were used in the drought

(39) Warner (1921) p.327 "Silk Report" (1832) p.758:
Vict. County Hist. Somerset vol.2 (1911) pp.422-23.

of 1781, subsequent to which extensive improvements to the water supply were made; and a number of mills used steam engines to supplement their water wheels.⁽⁴⁰⁾

This expansion of silk manufacture during the late eighteenth century occurred as other textile industries declined and became spatially more concentrated: the woollen industry, in particular, retreated into a compact area on the Mendip flank and more importantly in the Stroud valley. Elsewhere both domestic manufacturers and mill operators were reported to be turning from other textiles to silk.⁽⁴¹⁾ Somerset was growing in importance from 1775 and by 1821 contained the greater part of the employment in the south western silk industry, and thereafter Somerset firms began to control units in the neighbouring counties.⁽⁴²⁾ The expansion of domestic silk weaving in the south west, at its greatest in the 1820s, appears to have been short lived. By 1850 over three-quarters of the labour force of 4,000 were mill operatives and of these only 450 are estimated to have been power loom weavers.⁽⁴³⁾

(40) "Silk Report" (1832) p.758; Warner (1921) pp.334 and 339.

(41) "Foreign Trade" (1821) p.7; "Hand Loom Weavers" H.C. (1840) vol.XXIII p.412.

(42) "Foreign Trade" (1821) p.21. Vict. County Hist. Somerset vol.2 (1911) pp.422-3; Wiltshire vol.4 (1959) pp.176-7.

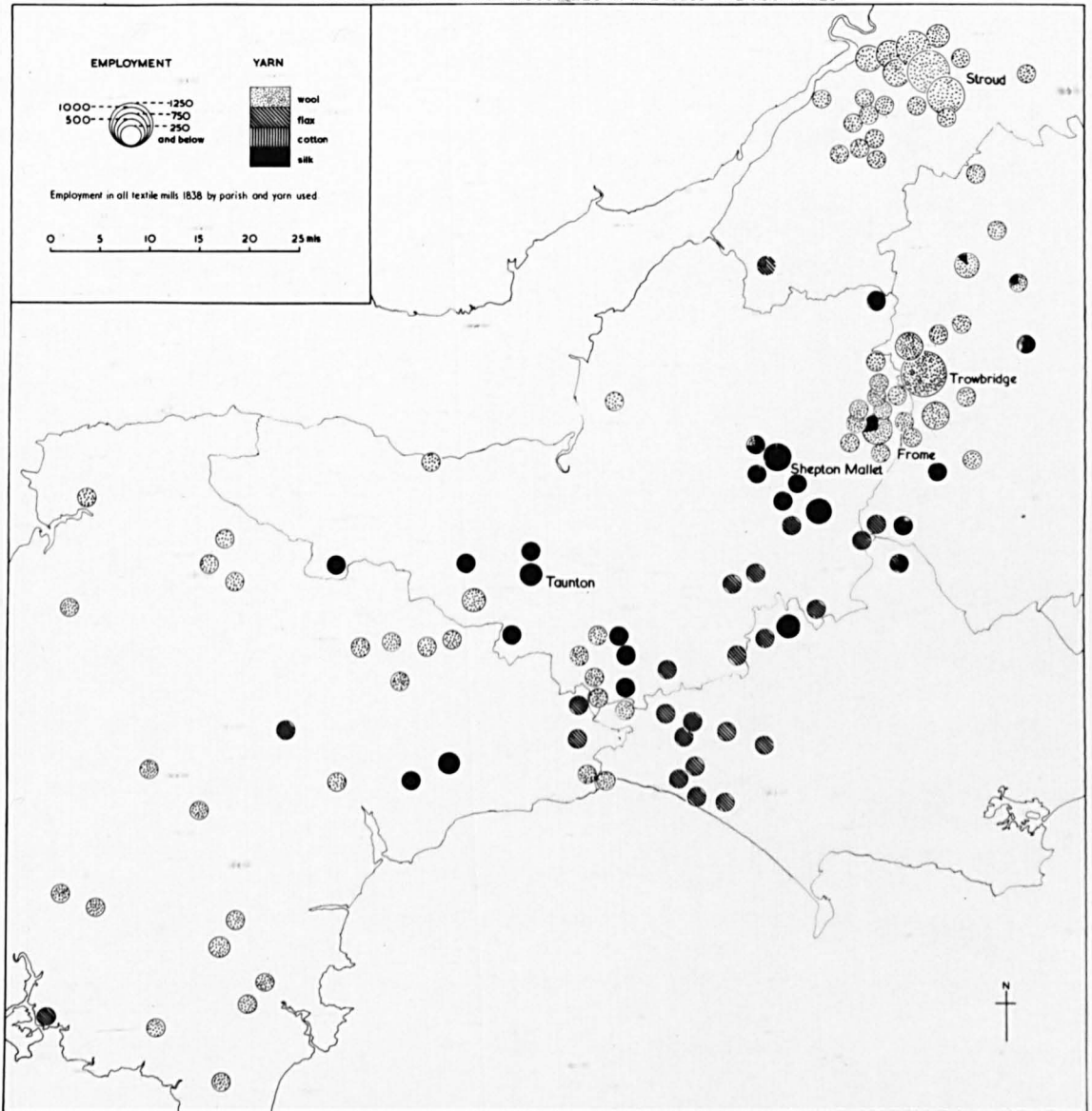
(43) See below pp. 149-150.

Clearly, by that date the industry was less self-contained and was exporting yarn on a large scale.

Despite the frequent changes both in the ownership of mills and of the textiles produced in them, the broad pattern of textile production appears to have been relatively stable in the early nineteenth century. Figure 4.1. shows that with few exceptions only one textile was produced in any one parish in 1838. This is to be expected since 73 of the 124 parishes concerned had only one mill, but is clearly evident even among the larger centres, particularly among those manufacturing wool. More significant was the regional specialisation within the region. The wool manufacturers were now grouped around Stroud and Trowbridge and almost monopolised the production in the dispersed mills of Devon, while the silk and flax industries dominated south Somerset and Dorset in parishes which had no interest in wool. In this area each of the two minor textiles was concentrated into a sub-region in which it faced little competition from the other. The origins of this specialisation are obscure and probably go back into the early hand weaving period, but the textile industry here supports the thesis of specialisation of manufacturing areas discussed in Chapter III. The boundaries of producing regions may

FIGURE 4.1.

THE MECHANISED TEXTILE INDUSTRIES IN THE 1830s - THE SOUTH-WEST



advance and retreat over time as mill uses change, but the overall pattern appears to have been static over a considerable period. Certainly the principle that the silk industry could prosper only outside - or on the margins of - regions dominated by stronger textile trades is illustrated here: silk manufacturing was wholly excluded from the major traditional centres of wool production in the Stroud, Mendip and South Devon area.

C) SPECIALISATION IN COVENTRY.

The silk trade of Coventry was quite different from that of any other part of England, and its products hardly even competed in the same markets. Ribbon weaving was introduced to the town in about 1700⁽⁴⁴⁾ and remained the staple trade for about the next 150 years. Until 1830 competition for labour from other industries was negligible, but after that date, when the ribbon trade was in increasing difficulties, watch-making became important.⁽⁴⁵⁾ By 1850, however, the latter employed only one-tenth the number found in silk.⁽⁴⁶⁾ The

(44) See above p.14 (45) See Prest (1960) p.80-88.

(46) Census 1851. (Approximately 2,000 workers compared with 20,000 in silk).

extreme specialisation of the town even excluded other branches of silk manufacture. Both broad weaving and silk throwing were insignificant and supplies of yarn were obtained from the Cotswold throwsters: in 1850 there were only 5,400 spindles .. installed in Warwickshire compared with almost 40,000 in Worcestershire and Gloucestershire together. Here the physical separation of throwing and weaving persisted longest - from the inception of the industry until its collapse after the treaty of 1860.⁽⁴⁷⁾

Not only was Coventry's industry remarkably specialised, but ribbon weaving was also strongly and stably localised to the town. Attempts were made to introduce the trade to Leek and Congleton in the 1760s but there the output of ribbons declined during the early nineteenth century. Derby made plain ribbons from the 1820s, and challenged that branch of the trade by introducing mechanisation before Coventry, and a number of other towns had small short-lived ribbon industries: but the entirely dominant position of Coventry was never in doubt as can be seen from Table 4.1. Coventry had no obvious environmental advantages to explain this domination, which appears to have been one of the accidents of traditional

(47) See above p.103 and below p.224 and 229.

TABLE 4.1.

RIBBON LOOMS OF ALL TYPES IN USE IN THEMAJOR CENTRES: 1838.

	HAND LOOMS	POWER LOOMS	TOTAL
Coventry	13,232	53	13,285
Derby	-	233	233
Congleton	100	254	354
Leek	60	100	160

specialisation found so often in the early textile industries. Its development in the late eighteenth and early nineteenth centuries can only be explained in terms of its early establishment here, the town's reputation in the ribbon trade, and the control of the channels of trade by the merchants. Not even was London able to attract the ribbon trade from Coventry, though the product depended so much on fashion.

In successive periods of prosperity, the production of ribbons had spread beyond the city to the north and north east, where it became established in small towns and villages which were beginning to grow as mining communities on the East Warwickshire coalfield. The women of these villages provided a pool of casual labour, a necessary feature in an industry so subject to severe seasonal as well as longer term fluctuations. Women were prevented by trade restrictions from using the more efficient ribbon looms developed in the late eighteenth century, and used only archaic single width looms which seem to have been moved from the city to the villages. Thus, although there were more looms in the country areas by 1838 they were less productive than those in the city (see Table 4.2.).⁽⁴⁸⁾

(48) Hand loom Weavers H.C. (1840) vol.XXIV p.54

TABLE 4.2.

RIBBON LOOMS IN COVENTRY AND DISTRICT: 1818 and 1838

	<u>1818</u>		<u>1838</u>	
	Coventry	County	Coventry	County
Single Hand Looms	2,630	2,853	130	7,000
Dutch Engine Looms	2,370	638	3,504	-
Jacquard Looms	-	-	1,678	520
TOTAL	<u>5,000</u>	<u>3,491</u>	<u>5,312</u>	<u>7,520</u>

Notes: (1) Coventry includes Foleshill.

(2) The various looms were capable of the following:-
Single Hand Loom: hand loom weaving only a single ribbon at a time.

Dutch Engine Loom: hand looms able to weave six or ten plain ribbons at a time.

Jacquard Loom: hand (or powered) loom able to weave several fancy ribbons at a time.

By the 1830s the country areas of ribbon weaving had extended to form a frontier with the hosiery trade of Leicestershire - another domestic industry conducted in similar conditions. As in the Pennine province and the south west of England, there is evidence of long term stability in the boundary between the different industries. Attempts by the temporarily more prosperous trade to advance its frontier did not survive a return to normal conditions, and throughout the early nineteenth century the frontier between hosiery and ribbon manufacture corresponded closely to the boundary of the two counties. (49)

Thus the Coventry ribbon trade gives one of the best illustrations in England of the stability of a traditional trade specialism in a town, and of the rigidity of the frontier between the zones of influence of different manufactures.

D) GENERAL CONCLUSIONS

This account has so far been concerned with describing, and where possible accounting for, the early spread of silk manufacturing in its domestic and powered branches. Some of the themes which were apparent in the industry's development

may now be briefly stated.

It is clear that the English silk industry was weak and could not have survived but for tariff protection. Even with protection it suffered extreme competition, on the one hand from overseas silk producers, and on the other from manufacturers of other textiles in England who could frequently make more profitable use of the resources of labour, power and factory space employed by the silk industry. The fluctuations in silk's fortunes which resulted from this competition had a considerable effect on the distribution of the industry. Unlike the case in other textile industries, the mechanisation of silk production did not lead to its spatial contraction into a compact region. A major factor causing the dispersed distribution of the industry was the sudden and nation-wide booms to which silk was subject, which led to its rapid growth over a wide area. Moreover its slumps, and its consequent inability to compete for any lengths of time with other textile manufactures, prevented silk from dominating a major region and restricted its development almost entirely to the fringes of the provinces of the stronger textiles, or to traditional textile regions where a major textile industry was declining.

This tendency to a scattered location was reinforced by other features of its development. In its early growth both the throwing and weaving of silk became widespread and, without the forces of contraction which affected other textile industries, this pattern was largely retained. In particular, specialised pursuits were established at an early date in Macclesfield, Coventry and Spitalfields, and silk weaving became important in Norfolk and the south west, all of which remained significant until well into the mechanised era. Even in the dispersal of the industry from London in the eighteenth century the dual nature of silk manufacture - in part producing luxury goods for the London fashion market and in part manufacturing broadcloth for the clothing trade - led to an accentuation of its scattered location. In the era of steam power the high value of its products and the lesser power requirements of silk manufacture gave power sources a slighter significance than in many textile industries, so that silk remained dispersed while other manufactures became concentrated on the coalfields.

Despite its scattered distribution over many parts of England, the silk industry was almost everywhere strongly concentrated into small producing districts, for, as was general in nineteenth century industrial developments, great

economies could result from the agglomeration of similar activities, with the consequent growth of ancillary industries and lower transport costs. Thus the silk industry illustrated the general principle of comparative advantage in industry which applied over the country as a whole and which led to a specialisation of industry in any particular area.

A secondary, but important, feature of the dispersed distribution of silk manufacturing was that strong regional specialisms developed, which remained strong throughout the industry's history. The most evident distinction between regions was a specialisation on either throwing or weaving, one result of which was the dependence of throwing regions on the strength of the industry elsewhere for their success. In the weaving branch, the product remained varied between regions. Ribbon weaving, located almost exclusively in Coventry, was the most concentrated, and in the broadcloth trade high quality and fashionable articles were produced chiefly in the south east and the plainer cloths elsewhere. Demand for the different products could vary considerably, particularly in the industry's later history, and in consequence the regions did not always share a common fortune.

Thus although silk was a small, weak industry which was not affected by many of the forces which shaped the distribution

of the major textile trades, it is clear that strong influences were at work which shaped its industrial geography and fitted it into a general pattern of industrial location, rational at a national level.

REFERENCES FOR CHAPTER IV

- L. BRENTANO (1870) "On the History and Development of Gilds and the Origin of Trade Unions."
- J.H. CLAPHAM (1916) "The Spitalfields Acts, 1773-1824" *Economic Journal* (vol.26) pp.459-71.
- S. DOWELL (1888) "A History of Taxation and Taxes in England." (2nd. Ed. 4 vols.).
- P.G. HALL (1960) "The Location of the Clothing Trade in London 1861-1951." *Trans. Inst. Br. Geogr.* (no.28) pp.158-78.
- G.B. HERTZ (1909) "The English Silk Industry in the Eighteenth Century." *Eng. Hist. Rev.* (vol.24) pp.710-27.
- HUGUENOT SOCIETY (1900-1908) vol.X.
- M.F. LLOYD-PRICHARD (1950) "The Decline of Norwich" *Econ. Hist. Rev.* (2nd. series vol.3) pp.371-77.
- J. PREST (1960) "The Industrial Revolution in Coventry."
- E.M. RAWSTRON (1958) "Some Aspects of the Location of Hosiery and Lace Manufacture in Great Britain." *East. Middl. Geogr.* (No.9. vol.2) pp.16-28.

- H.B. RODGERS (1960) "The Lancashire Cotton Industry in 1840."
Trans. Inst. Br. Geogr. (No.28) pp.135-53.
- S. SMILES (1867) "The Huguenots: Their Settlements, Churches and
Industries in England and Ireland."
(1st. Ed.).
- O.H.K. SPATE (1938) "Geographical Aspects of the Industrial
Development of London Till 1850."
Geogr. Journal (vol.92) pp.422-32.
- L.D. STAMP and S.H. BEAVER (1962) "The British Isles:
A Geographical and Economical Survey."
(4th Ed.).

VICTORIA COUNTY HISTORIES

- ESSEX (vol.2) (1907) "Silk" pp.462-3.
SOMERSET (vol.2) (1911) "Silk" pp.422-3.
WILTSHIRE (vol.4) (1959) "Silk" pp.176-77.
- SIR. F. WARNER (1921) "The Silk Industry of the United Kingdom."
- F.A. WELLS (1935) "The British Hosiery Trade."

GOVERNMENT PAPERS

FACTORY INSPECTORS' RETURNS

"Returns of all Mills and Factories ... June 1838"
H.C. (1839 vol.XLII) pp.1-

COMMONS JOURNAL

- Vol. XVIII (1717) p.693. "Petition of Silk Throwsters etc."
Vol.XXX (1765) "Silk Manufacture". pp.208-219.
- "Second Report from the Select Committee of the House of Lords ..
into Foreign Trade. (Silk and Wine)." H.C. (1821 vol.VII)
pp.421-464.

"Lords Committee on the Bill to Repeal four Acts relating to the Wages of Persons employed in the Manufacture of Silk." Lords Sessional Papers (1823 vol. CLVI) p.20.

"Report of the Select Committee to enquire into the Present State of the Silk Trade and the Effects of a Change in Tariffs." H.C. (1831-32 vol.XIX) pp.1-

"Report of the Commissioners...into the Condition of Unemployed Hand Loom Weavers." Assistant Commissioners Reports H.C. (1839 vol. XLII) pp.511- (1840 vol. XXIII) pp.49- and pp.367- (1840 vol.XXIV) pp.1- and pp.373-

CHAPTER VTHE LOCATION OF THE SILK INDUSTRY IN THE MID-NINETEENTH CENTURY: A REGIONAL SYNOPSIS.

Chapters I to IV above are intended to give a general review of the rise of the English silk industry and its spatial spread to the middle decades of the nineteenth century. No attempt has so far been made at a systematic and quantitative treatment, since the evidence used is varied in nature and quality. From the late 1830s, however, comprehensive industrial surveys of a high quality became available in the Factory Inspectors' Returns. In addition, the Population Census was much more useful for occupational analysis from 1851, when the classification employed was considerably improved. This chapter therefore provides an essentially quantitative analysis of the industry's distribution in the mid-nineteenth century, using the Factory Inspectors' Returns and the Census as data bases.

A) THE DISTRIBUTION AND STRUCTURE OF THE MECHANISED SILK INDUSTRY.

1) DEFICIENCIES IN THE DATA.

Following the upheavals and rapid expansion of silk production in the first three decades of the nineteenth century, the silk industry went through a relatively stable phase when gradual expansion was the keynote and violent fluctuations were rare. In such a climate little attention was given to the industry either by Parliament or other commentators and it is fortunate that, following the Factory Act of 1833, a quite frequent census of the silk industry (and of all the other textile manufactures) was made by the Factory Inspectors. Their Returns of 1838 are the most useful for plotting location since only at that date was a comprehensive survey made of the whole country at a parish level. They are invaluable in a study of the silk industry as they review the industry in a position of average prosperity. Around 1840 the industry was stable and maturely developed after its earlier expansion, but had not yet felt the effect of the boom of the 1850s or the catastrophic decline following the 1860 treaty. The locational pattern revealed by the

1838 Returns can thus be treated as "normal": it shows neither the influence of intense speculative pressures, encouraging the use of marginal locations with insufficient power or an inadequate labour supply, nor the effects of conditions of depression, when many normally profitable mills would be idle, or producing some other textile.

The data for 1838 give the number of mills, their total employment and the amount of power developed from both steam and water, for each branch of textile manufacture in each individual parish of the country. Information is also given concerning the structure of the labour force and the number of steam engines and water wheels of different sizes. Unfortunately the 1838 Returns do not distinguish between the several processes in the industry or its different branches. Data at this scale of detail are very rare: a Superintending Inspector of Factories, Leonard Horner, made a most detailed survey of the textile industries of Lancashire in 1841,⁽¹⁾ but unfortunately this full analysis did not extend to the major silk producing region of Cheshire, and it is not until

(1) See Rodgers (1960) pp.135-36.

1850 that there are any comprehensive data distinguishing between the various processes in silk manufacture. The Returns of 1850, and of subsequent years, indicate the number of mills engaged solely in throwing (including waste silk spinning) or in weaving, and give also the number of "combined" mills, where both processes were carried on. There is data also, for each type of mill, on the total number of spindles and looms installed. Although useful for these technical and organisational details, the Returns of 1850 and later are less satisfactory for locational analysis as information is aggregated at a county and not at a parish level.

The reliability of the Factory Inspectors' Returns appears to be high throughout the nineteenth century. The mills to which the 1833 and subsequent Acts applied and the data to be collected were clearly laid down by Parliament, and little variation is apparent between the districts for which different Inspectors were responsible or between the amount of detail recorded in different years. The Returns for the south west of England have a number of identifiable errors, but in general

the Returns are consistent both internally and over time.⁽²⁾

This is not to say that the Returns are ideal for the purposes of this analysis. In particular, the result of aggregation, whether by parish or county is that the least detail is available in the large centres of the industry, where it would be most useful. There are other shortcomings of the data which are of relatively minor importance when the industry was stable, but become critical in the analysis of the rapidly changing situation after 1850. The total of installed capacity, whether spindles, looms or horse power, is given rather than the total of equipment actually in use, which may lead to an overestimate of the size of the industry particularly in times of recession. Employment is, in this respect, a more sensitive indicator of economic activity, though estimates of the number of employees could vary considerably between different mill owners and district inspectors. Moreover the relative importance of labour and

(2) In 1850 Somerset's combined mills were credited with 144,000 spindles: 14,400 appears to be a more likely total. In 1867 Wiltshire was credited with 4,085 looms. Data for employment and power suggest about 100 looms and so the total has been modified to 125 (40 + 85). In 1867 Devon had no entry under employment (estimated at 300 persons) and Norfolk's weaving mills were credited with a huge amount of power (which has generally been omitted from any analysis). In subsequent analysis the estimates given above have always been used.

other inputs differed considerably in the various regions and branches of manufacture.⁽³⁾

A more serious disadvantage is that some enterprises may have been totally omitted from the Inspectors' Returns, for where premises were shared with another textile concern, data was often entered only for the major concern, a defect seen to be serious in Yorkshire,⁽⁴⁾ and at a number of locations rough and ready estimates, involving for example one-third of a water wheel, occur. At least one important silk throwster, John Heathcote of Tiverton, is omitted from all the Returns because his major pursuit, lace making, was not subject to the Factory Acts, although his mill employed over 300 persons and had both a large water wheel and a steam engine.⁽⁵⁾ Throwing concerns in the East Midlands working in hosiery or lace factories may similarly have been overlooked, though here such integrated production was uncommon.⁽⁶⁾ At the other extreme the development of the cottage factory in Coventry is laboriously recorded, although an average of barely one horse power was

(3) See Chapter VI below (4) See above p.57

(5) Gore-Allen (1958) p.142. quoting the Dumfries Courier of the 1850s.

(6) Compare with Wells (1935) pp.207-8.

applied to each of the 350 "mills".

The most serious deficiency of the Factory Inspectors' Returns arises from the fact that in 1850 less than one-third of the 130,000 workers employed in the silk industry were factory operatives. The Returns give a clear picture of the distribution of the throwing industry, as this was almost entirely mechanised, but they account for only a small portion of the total weaving which took place. An attempt will be made later to estimate the number of hand loom weavers but first the distribution of the mechanised industry, as presented by the Returns will be considered.

ii) MAPPING THE FACTORY INSPECTORS' RETURNS.

Figures 5.1. and 5.2. show the distribution of the mechanised silk industry in 1838, by individual parishes, for the Pennine province and the rest of the country respectively, based on the employment of both labour and power, the two measures of relative importance available. The industry was clearly concentrated into a number of regions which had little regard for county boundaries. Any impression of this concentration is consequently lost in the data available after

FIGURE 5.1.

THE DISTRIBUTION OF EMPLOYMENT & POWER IN SILK MILLS IN 1838 - THE PENNINE PROVINCE

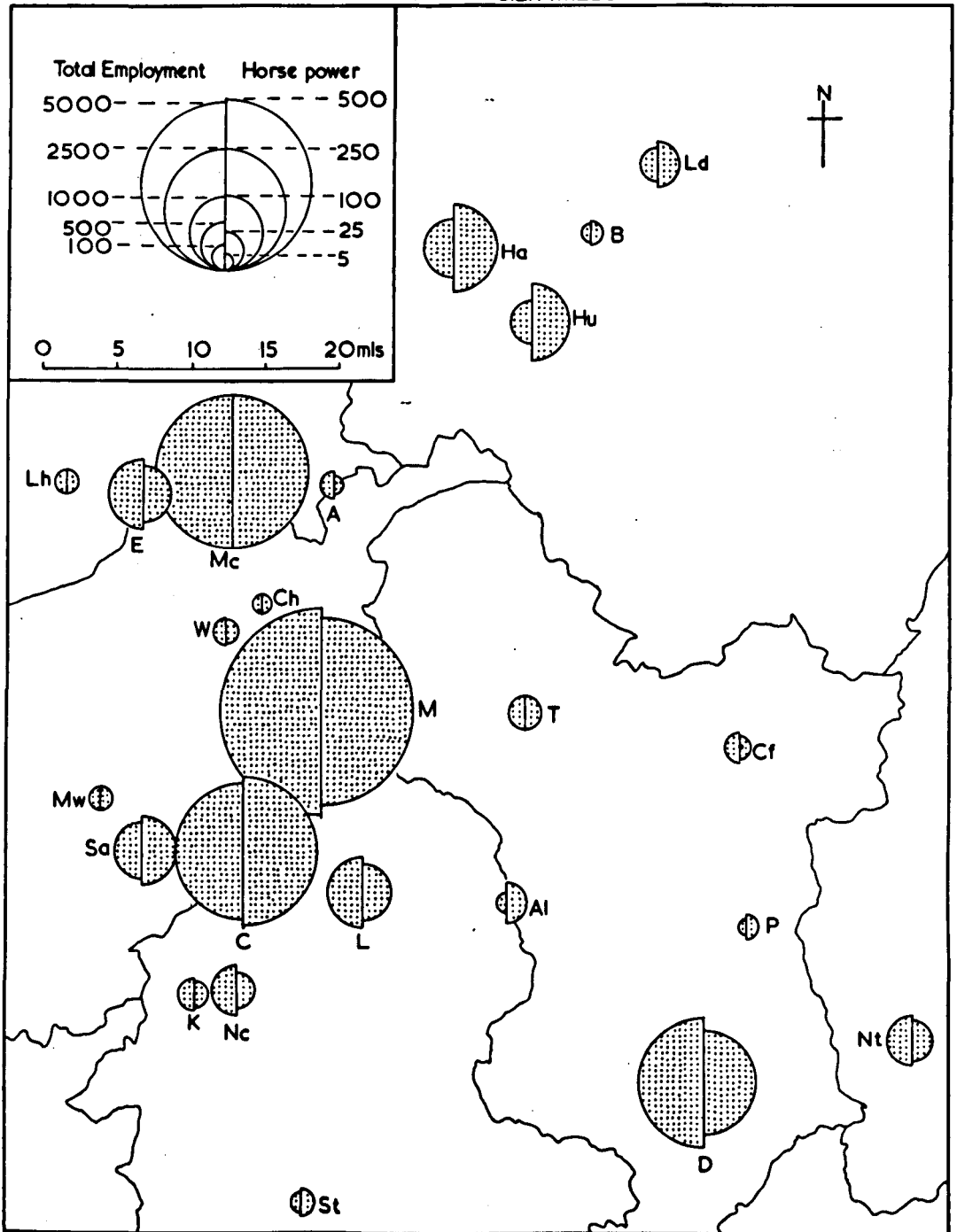
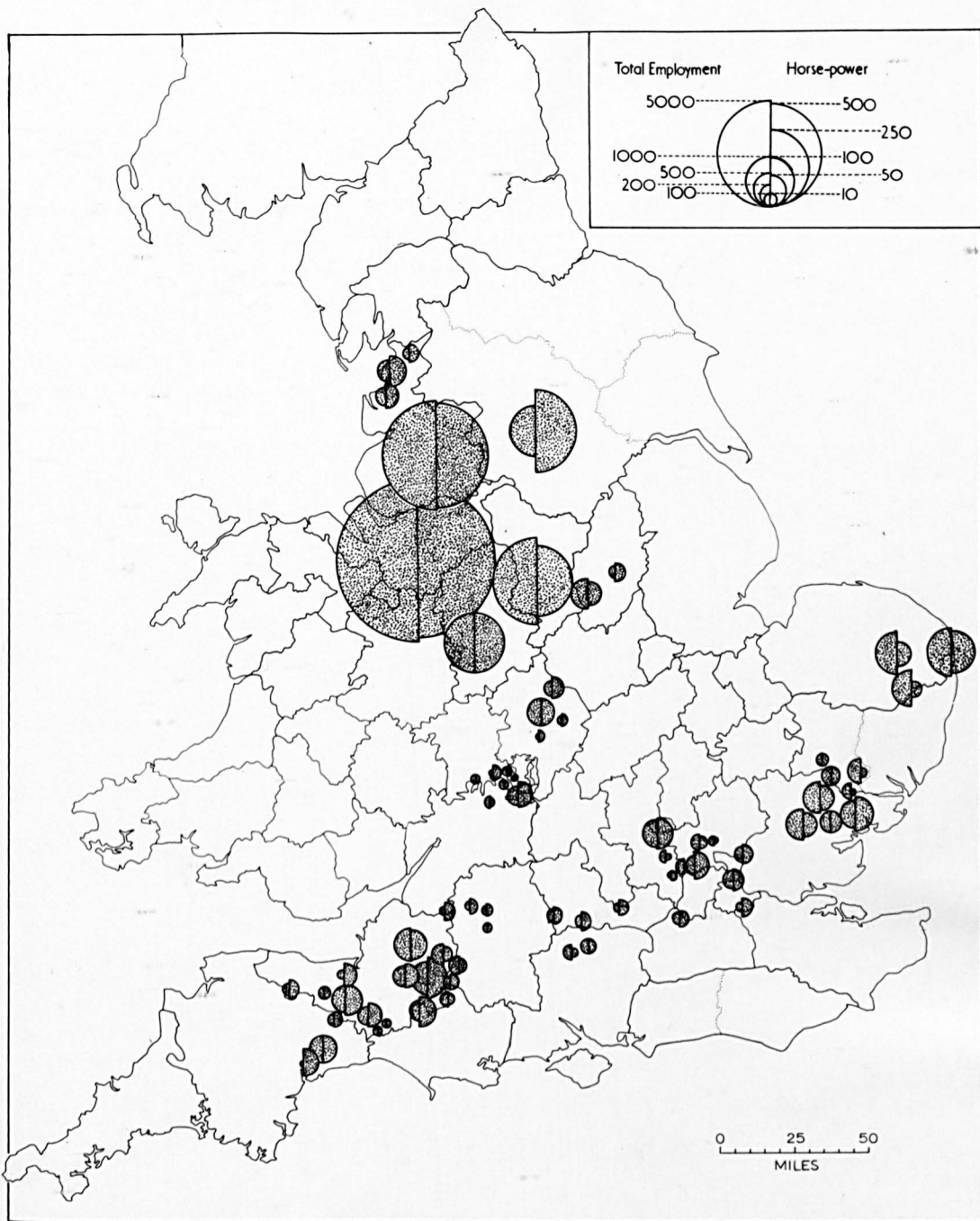


FIGURE 5.2. THE DISTRIBUTION OF EMPLOYMENT AND POWER IN SILK MILLS IN 1838.



1838 which is aggregated at county level. However other evidence, particularly the Census, suggests that little change occurred in the more detailed distribution of the industry. An analysis of the Census by Registration Districts indicates a distribution in 1851 very similar in areal extent to that of factory employment in 1838, except where large domestic industries are reflected in the Census data. Moreover only a marginal change occurred in the distribution of the industry until after 1861.

To simplify the ensuing analysis, ten regions of silk production have been delimited, based not only on the concentration of production but also on what has been learnt of the historical evolution of the industry and its system of linkages. Thus the regions, as defined in Table 5.1. and analysed in Table 5.2., have either a functional identity (for example the link between the Cotswold throwsters and the Warwickshire weavers) or are homogenous concentrations of the silk industry.⁽⁷⁾ The maps which accompany the analysis are generally drawn on a county basis to permit the development of a time sequence to show change within the regions: in using

(7) Capitals are used for the initial letters of the regions in subsequent references.

TABLE 5.1.

A REGIONAL DIVISION OF THE SILK MANUFACTURING COUNTIES

REGION.		CONSTITUENT COUNTIES
The Pennine Provinces	The South West Pennines	Cheshire, Staffordshire.
	Lancashire	Lancashire.
	Yorkshire	Yorkshire.
	The East Midlands	Derbyshire, Nottinghamshire, (Leicestershire).
	Warwickshire & The Cotswolds	Warwickshire, Worcestershire, Gloucestershire.
	Norfolk	Norfolk.
	Essex and Suffolk	Essex, Suffolk.
	London and the Chilterns	{ London, Middlesex, Surrey, Kent, Hertfordshire, Buckinghamshire.
	Berkshire and Hampshire	Berkshire, Hampshire, (Oxfordshire).
	The South West	Wiltshire, Somerset, Dorset, Devon.

Note: Counties in brackets had a silk industry in later years, but not in 1850.

TABLE 5.2.

THE REGIONAL DISTRIBUTION OF THE POWERED
SILK INDUSTRY: 1838

	No. of Mills	EMPLOYMENT		POWER	
		No.	% of total	No.	% of total
S. W. Pennines	104	13,326	40	1,172	36
Lancashire	31	5,591	17	565	17
Yorkshire	16	1,084	3	277	9
East Midlands	24	3,665	11	238	7
Pennine Province	175	23,666	71	2,258	69
Warwicks & Cots.	21	992	3	121	4
Norfolk	4	2,274	7	120	4
Essex & Suffolk	10	1,906	6	148	5
London & Chilts.	11	1,161	4	145	4
Berks. & Hants.	5	401	1	48	2
The South West	37	3,151	9	436	13
ENGLAND	263	33,553	100	3,270	100

them it is important to bear in mind that the county data refer to relatively localised phenomena.

There are problems in using the Factory Inspectors' data as a basis for a regional analysis. The 1838 Returns give the most precise locational evidence, but the 1850 county figures the most meaningful evidence of the industry's structure. The two sets of data cannot easily be intermeshed, as the intervening period was one of significant change. Figure 5.3. shows the change between 1838 and 1850 in the number of workers employed in the factories and reflects the differential regional growth in both the throwing and weaving branches. The most important change during the 1840s was in weaving, where the application of power to looms proceeded rapidly, as shown in Figure 5.4. Power looms, first used in silk production in the early 1830s, numbered only 1700 in 1835, and weaving or combined mills were of little importance at that date. By 1850 the number of power looms had more than trebled and their relative distribution across the regions had changed substantially. There was particularly vigorous growth in Lancashire (in the absolute number of looms) and in Warwickshire (in relative terms), and employment in these counties rapidly expanded as a result. (see Figure 5.3.).

FIGURE 5.3.

CHANGE IN EMPLOYMENT IN SILK MILLS - 1838-1850

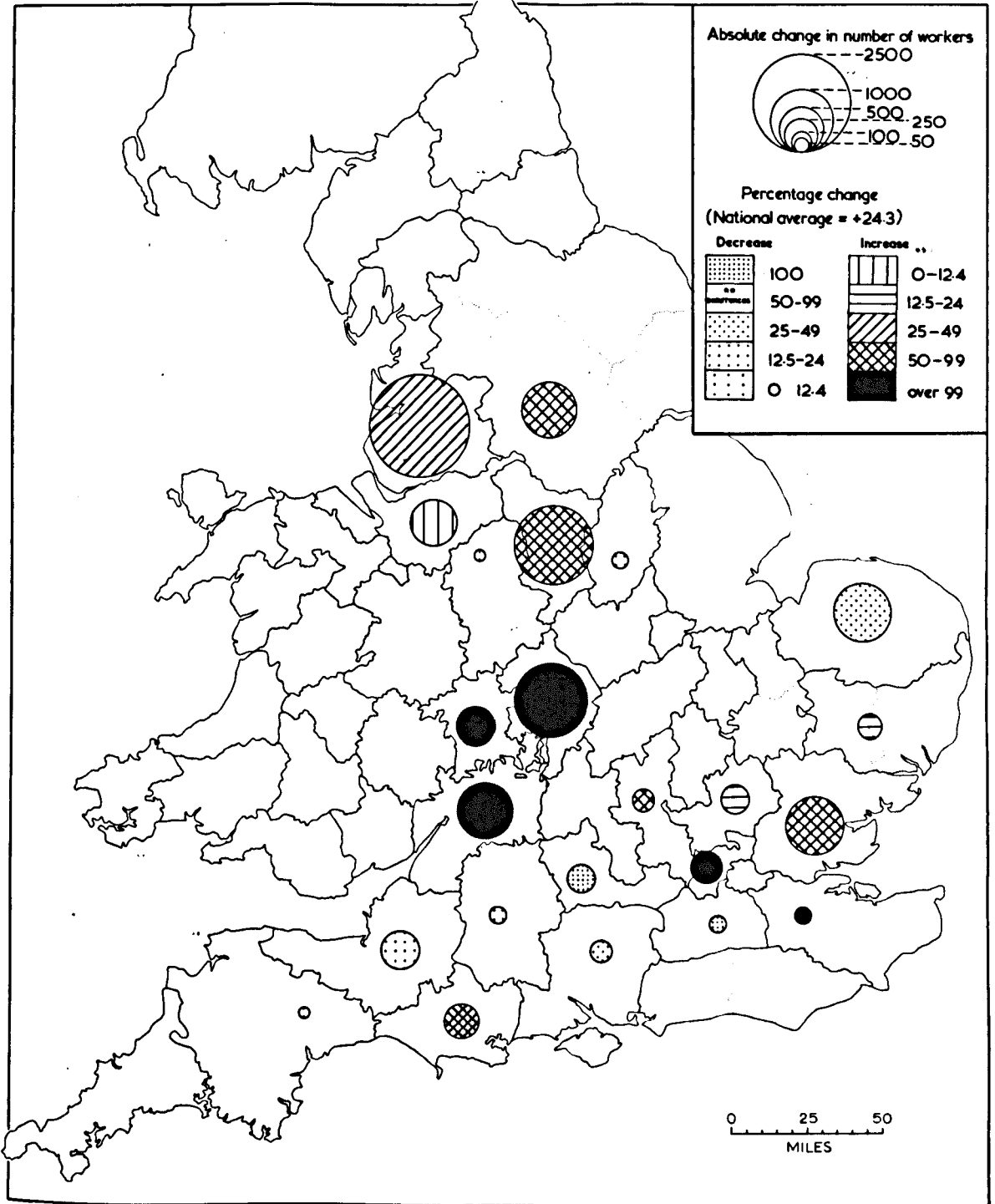
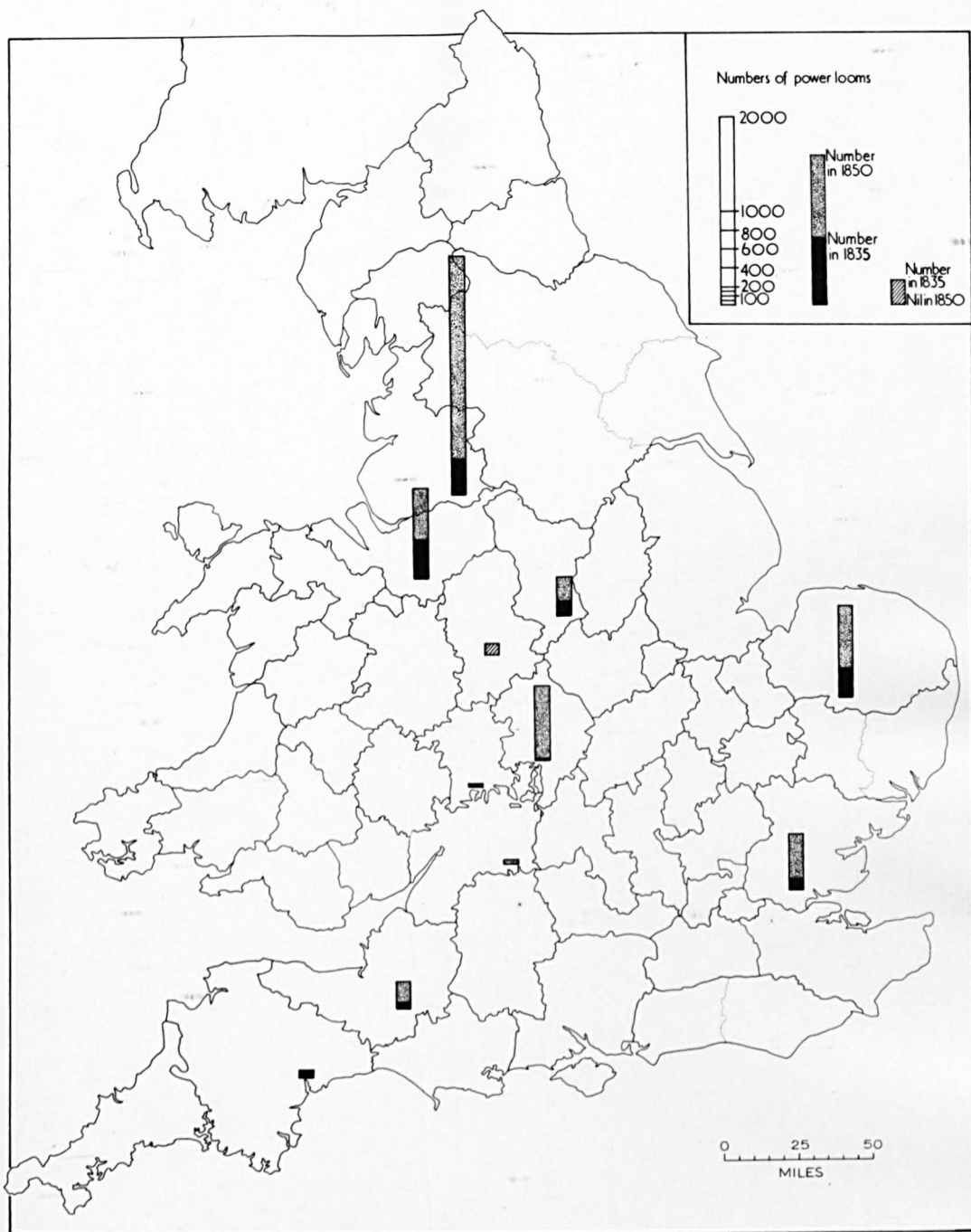


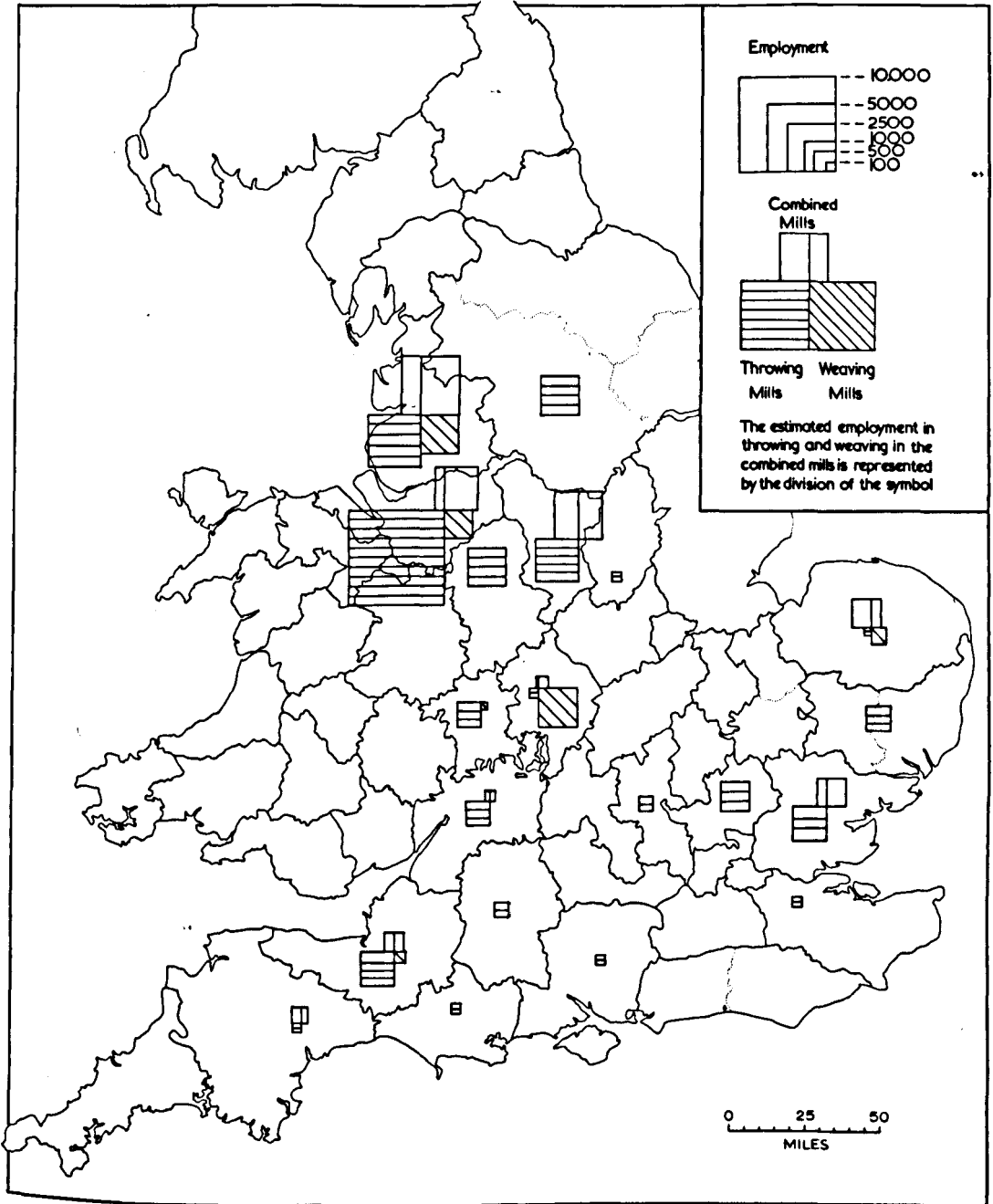
FIGURE 5.4. THE EXPANSION OF POWERED WEAVING - 1835 - 1850.



More important than the changes in the distribution of the industry between 1838 and 1850, were the changes in organisation which the expansion of the new powered weaving branch brought about. In particular, the combined mill had emerged as the centre of weaving, as shown in Figure 5.5.: by 1850 over sixty-five per cent of power looms in silk were installed in combined mills. This growth of the combined mills, overshadowing that of the specialised weaving mill, suggests that it was the throwsters who had the capital, and possibly the power supply, available to apply to mechanised weaving, while the less highly capitalised merchant-organisers of domestic weaving were less able to take advantage of the emergence of power looms and establish specialised weaving enterprises. The hypothesis that the old established (and often water powered) throwing unit acquired looms to become a combined mill is supported by an analysis of the power source of the different types of mill. In 1850, of the forty weaving sheds established in the previous twenty years, only one used any water power and the rest were powered entirely by steam. On the other hand, the four combined mills in the south west were entirely dependent on water power, almost half of the power for Cheshire's combined mills was from water, and

FIGURE 5.5.

THE STRUCTURE OF THE MECHANISED SILK INDUSTRY - 1850



in Essex and Derbyshire some water power was used. Thus established throwsters appear to have dominated the powered weaving branch of the silk industry in its early years, a situation closely paralleling that which had already been found in cotton manufacture.

As the Returns give no indication of the division of employment between throwing and weaving in the combined mills, an estimate has been made using the ratios of labour to spindles and looms found in the specialised mills (see Table 5.3.). These ratios varied considerably between the regions and so an average of local and national ratios has been used for each county. In Table 5.3. the margin of error shows the extremes which the local or national data would give if used alone. This estimate of the division of labour between throwing and weaving appears to be reliable and, as seen in the Table, accords broadly with an independent measure of specialisation gauged from the proportion of spindles to looms in the combined mills.

An attempt has been made in Table 5.4. and Figure 5.6. to rank the regions defined above with reference to each of the measures of importance available in 1850, and using these and the maps so far considered it is possible to estimate the

FIGURE 5.6.

THE REGIONAL DISTRIBUTION OF EMPLOYMENT POWER & EQUIPMENT IN SILK MILLS - 1850

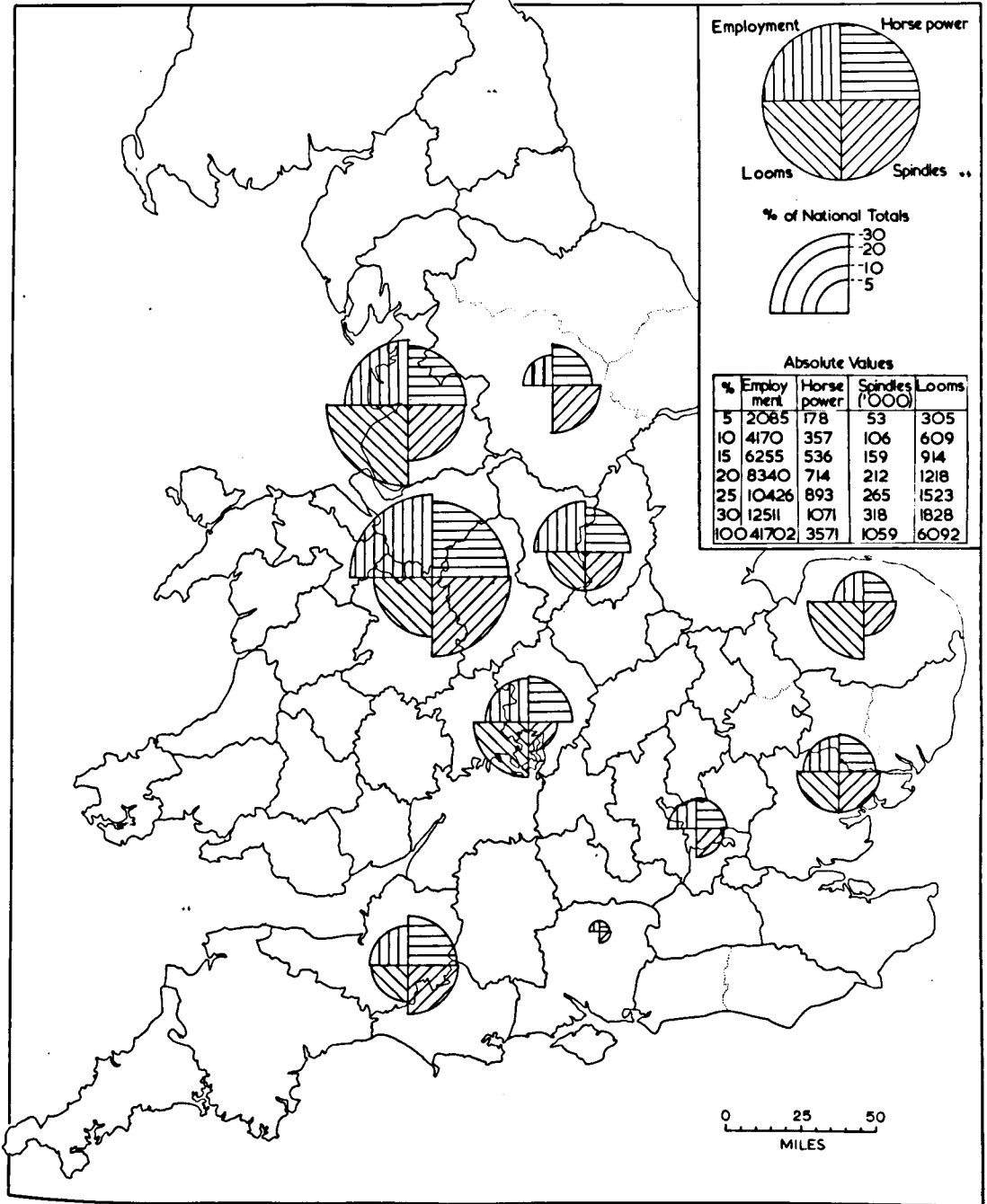


TABLE 5.3.

THE ESTIMATED DIVISION OF LABOUR BETWEEN
THROWING AND WEAVING IN COMBINED MILLS: 1850

County	Total Employment In Combined Mills	Estimate of Mean Employment In:-		Error (+ or -)	Spindles ÷ Looms
		Throwing	Weaving		
Cheshire	2,033	-325	1,708	116	17.5
Lancs.	3,538	1,125	2,413	60	38.3
Derbys.	2,642	1,219	1,423	234	45.2
Warwicks.	142	9	133	2	6.1
Gloucs.	121	60	61	4	72.7
Essex	1,014	295	719	140	21.1
Norfolk	1,049	588	461	221	93.9
Somerset	406	250	156	33	87.8
Devon	291	146	146	42	42.0
ENGLAND	<u>11,236</u>	<u>4,017</u>	<u>7,220</u>	-	44.1

- Notes (1) A high ratio in the final column suggests an industry in which throwing predominated.
(2) For the significance of the last two columns see text.

TABLE 5.4.

A COMPARISON OF THE VARIOUS MEASURES OF THE
REGIONAL DISTRIBUTION OF THE POWERED SILK
INDUSTRY: 1850

	EMPLOYMENT		POWER		SPINDLES		LOOMS		Mean Rank
	% of Total	Rank	% of Total	Rank	% of Total	Rank	% of Total	Rank	
S.W. Pennines	33.3	1	29.0	1	30.3	1	15.7	2	1.25
Lancashire	19.7	2	16.3	2	15.4	2	32.5	1	1.75
The South West	7.4	5	11.2	3	12.4	3	6.3	7	4.50
East Midlands	12.7	3	10.4	4	5.8	7	6.7	6	5.00
Warwicks & Cots	8.4	4	9.7	5	4.3	9	13.9	4	5.50
Essex & Suffolk	6.9	6	6.5	7	8.9	5	9.3	5	5.75
Yorkshire	4.0	8	8.4	6	12.1	4	-	8	6.50
Norfolk	3.2	9	3.4	9	6.0	6	15.6	3	6.75
London & Chilts.	4.1	7	4.8	8	4.4	8	-	8	7.75
Berks & Hants.	0.3	10	0.2	10	0.4	10	-	8	9.50
<u>ABSOLUTE TOTAL VALUES</u>									
ENGLAND	41,702		3,571		1,059,308		6,092		-

relative importance of the regions in the mechanised silk industry and to characterise their distinctive pursuits.

iii) REGIONAL ANALYSIS

In 1850 the industries of the South West Pennines and Lancashire together accounted for over forty-five per cent of the national total of spindles, looms and power in silk mills and over fifty-three per cent of the factory labour force. However, the structure of the industry was very different, but complimentary, in these two functionally linked regions. The South West Pennine towns clearly dominated England's throwing industry (see Figure 5.6.) and powered weaving was important in Cheshire, chiefly in combined mills which appear to have concentrated on weaving rather than throwing (see Table 5.3.). Within the entire region Macclesfield was by far the most important centre and in 1838 accounted for over fifty-eight per cent of the factory employment in Cheshire and Staffordshire combined. Employment in Macclesfield's silk mills had grown considerably over the previous three years from under 6,000 in 1835 to almost 7,800 in 1838. At Congleton, by contrast, employment had declined by 400 persons and two mills had stopped working since 1835 and, though far more important than any of the remaining towns in the region,

Congleton's silk mills employed under half the number of Macclesfield's. In Leek, silk mills employed under 800 persons; this was a much smaller centre and distinguishable from the shorterlived and less significant silk towns of the South West Pennines (see Figure 5.1.) by its specialisation on producing sewing silks and twist, and by the early development of silk dyeing in the town. Ribbon weaving was losing its importance at Leek, and although there were over 100 powered ribbon looms at work in the 1830s, none were recorded in 1850, and it was 1856 before any powered broad weaving looms were noted in the town. (8)

Figure 5.4. shows how much more strongly the powered weaving branch grew in Lancashire than in Cheshire in the 1840s. By 1850 Lancashire, with almost one-third of the national total of power looms, was by far the major centre for powered weaving. The industry was concentrated in the south east of the county and it was here that the specialised weaving shed, producing broad silk cloth, was most strongly developed. The growth of powered weaving here reflects both the former importance of cottage silk weaving and the easier availability of capital in the commercially advanced cotton manufacturing

(8) "Hand Loom Weavers". H.C. (1840) vol. XXIII p.493:
"Fact. Insp. Ret." (1835 and 1856).

region. The organisation of much of the weaving in large scale, specialised sheds, a feature which became very common in the boom after 1850, suggests that established weaving units were being transferred from weaving other yarns to silk .. production.⁽⁹⁾ Nevertheless in 1850, as in Cheshire, the majority of power looms were found in combined mills, which had probably been established by the larger throwsters, and in which only a small proportion of the labour force was engaged in throwing. Although second only to the South West Pennines in importance as a throwing region, Lancashire's output of yarn did not satisfy the local demand from both hand and power loom weavers, and considerable quantities of yarn were imported from Cheshire, amounting in the 1830s to two-thirds of the region's needs of over 20,000 lbs per week.⁽¹⁰⁾ There was thus a strong functional link between the Lancashire weavers and the Cheshire throwsters and this became even more marked, as production in both regions became more specialised, in the boom that lay ahead.

Elsewhere in the Pennine province silk throwing and spinning dominated the mechanised industry, with only a

(9) See below p.p.205-6. (10) Warner (1921) p.158

feeble development of powered weaving (see Figure 5.5.). It was in north Lancashire, at the Galgate mill near Lancaster, that waste silk spinning⁽¹¹⁾ was commenced in England in 1792. Two other mills were founded near Lancaster (see Figure 5.2.) .. which also specialised in waste silk spinning, but they soon turned away from silk. The original mill continued to produce spun silk into the twentieth century, but was insignificant beside the mills, some of them established by members of the Galgate firm, which were found by 1850 in the heart of the textile province in south east Lancashire and the West Riding of Yorkshire.⁽¹²⁾ In the latter region, Halifax and Huddersfield were the most important silk manufacturing towns in 1838 (see Figure 5.1.). There was no powered weaving of silk in the county in 1850 and waste silk spinning was well-established as the dominant pursuit. This required relatively more power than throwing and consequently the apparent importance of Yorkshire depends on the measure used: it is greater in terms of power than of employment (see Figures 5.1. and 5.6.).

In the East Midlands employment was evenly divided between the throwing and combined mills, but it appears that throwing

(11) See above p.58.

(12) See Warner (1921) pp.170-172 for details of the north Lancashire industry.

dominated even in the latter mills (see Table 5.3.). Yarn supplies to the hosiery manufacturers was the industry's chief market,⁽¹³⁾ but the manufacture of plain ribbons by power, on a scale sufficient to challenge the Coventry trade was rapidly expanding in Derby's combined mills in the 1830s and 1840s. The use of large amounts of labour and power in conjunction with relatively low totals of fixed equipment characterised both throwing and combined mills in 1850. The dominance of Derbyshire's industry compared with the four small mills in Nottinghamshire is apparent from Figure 5.5., and the importance of Derby itself, where ninety-three per cent of the county's employment was concentrated in 1838, can be seen in Figure 5.1.

In both Yorkshire and the East Midlands the demand for yarn was rapidly increasing, from the weavers of mixed goods and the hosiery and ribbon manufacturers respectively, and in both Yorkshire and Derbyshire the numbers employed in the silk mills increased considerably between 1838 and 1850, as shown in Figure 5.3. In Nottinghamshire, by contrast, hosiery manufacture continued to dominate the economy and employment in silk remained static.

(13) See above p.68

To the south of the Pennines, Warwickshire and the Cotswolds form a distinctive and self-contained region. In Coventry the first attempt to install powered ribbon looms in 1831 met with resistance from the weavers. Their riots prevented the extensive use of power in weaving until the more advanced manufacturers in Derby threatened to take all the trade in plain ribbons.⁽¹⁴⁾ Consequently, after a slow start, the installation of power looms proceeded rapidly (see Figure 5.4.) and by 1850 almost fourteen per cent of England's power looms were in the town. Specialised weaving was entirely dominant in Warwickshire (see Figure 5.5.) and even the two small combined mills concentrated heavily on weaving.

The insignificance of combined mills among Warwickshire's ribbon concerns (compared with their dominance in regions of broad loom weaving) was a result of the trade's organisation, which had its roots deep in the past. At the end of the eighteenth century the ribbon trade was managed by ten or twelve merchant-manufacturers who kept warehouses in Coventry and London. The capital required to enter the trade was so great that there were few changes in organisation until toward

(14) See Prest (1960) pp.48-9 and 93, quoting Hall (1861) pp.15-16.

the end of the Napoleonic wars. At that time there was a sudden increase in the demand for ribbons and the London wholesalers disregarded the established trade connections and placed orders direct with the "undertakers" who gave out the weaving in Coventry. A large number of undertakers thus became small masters overnight.⁽¹⁵⁾ When power looms were introduced to the trade about twenty years later it appears that the long-established merchant-manufacturers had sufficient capital to build large powered weaving mills, while the new petty masters were unable to utilise the new techniques and for the most part continued to depend on hand weaving. By 1851 few mills had been built: the Ordnance Survey map shows six large factories and six smaller ones using power.

Throwing was never carried out to any great extent in Coventry. From the early period of the trade, when in 1718 throwing was commenced at Blockley,⁽¹⁶⁾ mills in the Cotswolds were the major suppliers of yarn to the Coventry weavers. A number of other towns on the border of Worcestershire and Gloucestershire were involved by 1838 (see Figure 5.2.), though Blockley was still the most important. With the

(15) "Hand loom Weavers" H.C. (1840) vol.XXIV pp.49-50 and 214-15; see also Prest (1960) pp.49-51.

(16) See above p. 103 and Warner (1921) p.327.

increasing demand from Coventry for yarn, employment in these silk throwing mills increased considerably between 1838 and 1850 (see Figure 5.3.), but in both Coventry and the Cotswolds the structure of the industry remained virtually unchanged. Throwing remained dominant in the Cotswolds and virtually non-existent in Coventry (see Figure 5.5.): in 1850 there were 40,000 spindles installed in the silk mills in Worcestershire and Gloucestershire and only 5,400 in Warwickshire. Two small weaving concerns, probably closely tied to Coventry, were established in the Cotswolds in the early period of ribbon weaving by steam (see Figure 5.4.). The choice of this location probably stemmed from the resistance to the use of power by the Coventry weavers referred to above, and there was little expansion of weaving in the area once power was accepted in Coventry.

Despite these weaving mills in the Cotswolds, the dominant feature of the ribbon trade was the interdependence of Coventry's weavers and the throwing mills on the Worcestershire-Gloucestershire border. Thus this branch of manufacture furnishes another example of the close inter-regional linkages, in which the silk industry was so strong.

Throughout the south of England from Norfolk to Devon, the most distinctive feature of the silk industry in the 1840s was its contraction, shown in Figure 5.3. Decline appears to have been greatest in Norfolk where factory employment was almost halved between 1838 and 1850. However, over 1,000 of the 2,274 factory operatives recorded in the county in 1838 were at work for one firm, established in 1833, which had one throwing and one weaving mill. This firm was already in difficulty by 1838 and the subsequent failure of this short-lived venture accounts for most of the decline apparent in the 1840s.⁽¹⁷⁾ Other concerns, notably the Grouts,⁽¹⁸⁾ continued to operate on much the same scale as formerly.

Elsewhere in southern England the decline of employment in the silk factories was more significant. In Hampshire one half of, and in Berkshire and Surrey the whole of, the small powered industries was lost, a trend perhaps linked with the decline of ribbon manufacture in the area.⁽¹⁹⁾ Even in the more important Chiltern throwing industry at least three mills ceased working during these twelve years, though the five mills found in 1850 had increased total employment above the 1838

(17) See Warner (1921) p.293 (18) See above p.101
 (19) "Hand loom Weavers" H.C. (1840) vol.XXIII
 pp.298-301

level. Only in Essex and Dorset, and in the small Buckingham section of the Chiltern industry, did employment increase at more than ^{the} average rate for England. (see Figure 5.3.).

Silk throwing was the major occupation in the south of England and weaving took place in only six mills, all of which combined the two processes (see Figure 5.5.). In Essex the huge Courtauld's mill which employed over 1,000 workers and had 570 looms installed, accounted for all the weaving in the county. The Norfolk industry was dominated by two large combined mills at Yarmouth and Norwich (established by the Grouts),⁽²⁰⁾ in which over three-quarters of the county's factory workers were employed (see Figure 5.5.). Despite the collapse of one major weaving mill mentioned above, powered weaving was rapidly expanding in the county (see Figure 5.4.) and by 1850 the number of looms installed was substantially surpassed only in Lancashire. Thus, although one of the less significant regions by most criteria (see Figure 5.6.), Norfolk appears to have been developing into a major centre of powered weaving. The remaining power looms in the south of England were in three combined mills in Somerset and Devon (see Figure 5.5.), but generally in the South West throwing was the

⁽²⁰⁾ "Hand Loom Weavers" H.C. (1840) vol.XXIII p.301.

dominant occupation. The importance of the region is perhaps exaggerated in Figure 5.6., as declining employment may have led to some excess capacity being included in the figures for equipment in 1850. Moreover, the industry here comprised relatively small scattered units: in 1838 there were thirty-seven mills in the region but only four parishes, Taunton, Bruton, Shepton Mallet and Sherborne, had more than one mill (see Figure 5.2.).

In the South West silk manufacture thus had the characteristics of an archaic industry. It was dominated by small units, in which the newer branch of powered weaving was scarcely developed; and it was scattered and tending to decline in the face of competition from large scale, advanced producers elsewhere.

Thus the Factory Inspectors' Returns reveal the mechanised silk industry as considerably more scattered than most other branches of textile manufacturing. Nevertheless the Returns show that almost everywhere mills were located in close proximity to each other and that throughout England silk was manufactured in distinctive regions which were small in extent. It is also clear from the foregoing analysis that much of the industry was in fact heavily concentrated: the South West

Pennine and Lancashire regions employed fifty-three per cent of the factory workers in silk, and the East Midlands a further thirteen per cent, compared with a total of only eighteen per cent in the whole of southern England, from Devon to Norfolk. Both the concentration and dispersion that were characteristic of the silk industry's distribution were to be of great importance in its future development.

B. THE DISTRIBUTION OF NON-FACTORY EMPLOYMENT IN THE SILK INDUSTRY.

i) INTERPRETING AND MAPPING THE CENSUS DATA.

The over-riding weakness of the Factory Inspectors' Returns (which is more serious in relation to silk than to cotton manufacture) is the fact that they record only factory employment and so they seriously underestimate the number of silk weavers. The slow rate at which powered weaving was adopted by the silk industry and the differences in the distribution of powered and hand loom, make it necessary to employ some source other than the Factory Inspectors' Returns to measure the regional distribution of silk weaving. Local

directories and histories give valuable information and have been used frequently in the earlier chapters, but their value for national comparisons is slight. The Hand Loom Weavers Commissioners' Reports of 1840 are also patchy in coverage and do not permit a national total to be calculated since they enumerate looms using silk only where they dominated the weaving of an area, and in any case the figures themselves are little more than estimates. The later Factory Inspectors' Returns included an estimate of employment in unpowered workshops, but these do not distinguish silk from other textiles and can add little to this analysis. There remains only the Population Census as a source giving adequate detail for the whole of England and from which it is possible to deduce the distribution of manual workers in silk with fair accuracy.

Until 1851 the occupational statistics presented by the Census were unreliable, particularly in the textile industries which had a large number of occupations common to different branches: a "weaver", for example, might have worked in cotton, wool, worsted, linen or silk, and might indeed have switched from one to another. In the small silk industry the recorded totals of weavers were likely to be rendered very inaccurate by the presence of large numbers of weavers of unspecified fabrics, and in some regions silk weavers were included with

the weavers of more important yarns. In the 1851 Census an attempt was made, for the first time, to list occupations within their industrial context and silk workers were grouped together for the first time.⁽²¹⁾ There was still scope for considerable error arising from the principles of the classification as well as from the practical difficulties of collection, and analysis is made more difficult as regional inequalities in the degree of error are likely to occur. For example, the requirement that the unemployed enter their last occupation would tend to inflate totals in areas where silk manufacture dominated employment compared with regions where alternative employment could be found. Also, in areas where silk was one of a number of fibres woven, its importance is likely to have been underestimated and detail lost, despite the industrial base of the classification. Nevertheless the Census presents useful information enabling the regional analysis of the mechanised branch of manufacture to be extended to the entire silk industry.⁽²²⁾

(21) See "Guide to Official Sources. No.2." H.M.S.O. (1951) pp.27-30.

(22) See Bellamy (1953) pp.306-8 for a detailed account of the shortcomings of the occupational statistics in the Census.

Details of occupation are given in 1851 for the population at all ages of counties and, with less application to this study, of principal towns. Data ^{are} is also available for Registration Districts, but these referred only to those over .. twenty years of age, and for this reason they cover on average only two-thirds of the silk industry's labour force and in some counties as little as forty per cent of all workers. In general this is perhaps a sufficient proportion to indicate the distribution of the industry at Registration District level, except where the industry consisted of mills predominantly employing children. The major weakness of the classification adopted in the 1851 Census is that no distinction was made between throwsters and weavers, both being classed as manufacturers; and the subdivisions of the trade which were given, with the exception of ribbon weaving, were relatively minor and were of little regional significance. (23)

It is therefore a considerable problem to plot the distribution of hand loom weavers with any accuracy. It is possible, however, to gain some impression of the division

(23) The subdivisions usually given were: Manufacturer, ribbon manufacturer, fancy goods manufacturer, silk mercer, dealers in silk, other workers.

between weavers and throwsters by comparing the Census and the Factory Inspectors' Returns. The occupation of the workers employed in the factories is known, and it is reasonable to assume that the majority of the remainder were hand loom weavers. Figure 5.7. indicates both the total employment in the silk industry (factory and domestic) in 1851 as revealed by the Census (Map A), and an estimate of the proportion of total workers who can be considered as factory operatives by comparing the Census data with the Factory Inspectors' Returns of 1850 (Map B), and Table 5.5. gives a regional summary of the figures.

At a county level and using a broad percentile measure, the comparison of the two sources appears to give an acceptably accurate indication of the division between factory and non-factory employment. A more detailed analysis is precluded by anomalies arising from inaccuracies within, and the different classifications adopted by, the two sources, as well as by differences in boundaries and dates of collection. In fact, even at the level of aggregation adopted, three counties, Dorset, Worcestershire and Middlesex, showed factory employment in excess of the total calculated from the Census. Nevertheless, in general a low percentage figure in Figure

FIGURE 5.7.

TOTAL EMPLOYMENT IN SILK MANUFACTURE - 1851

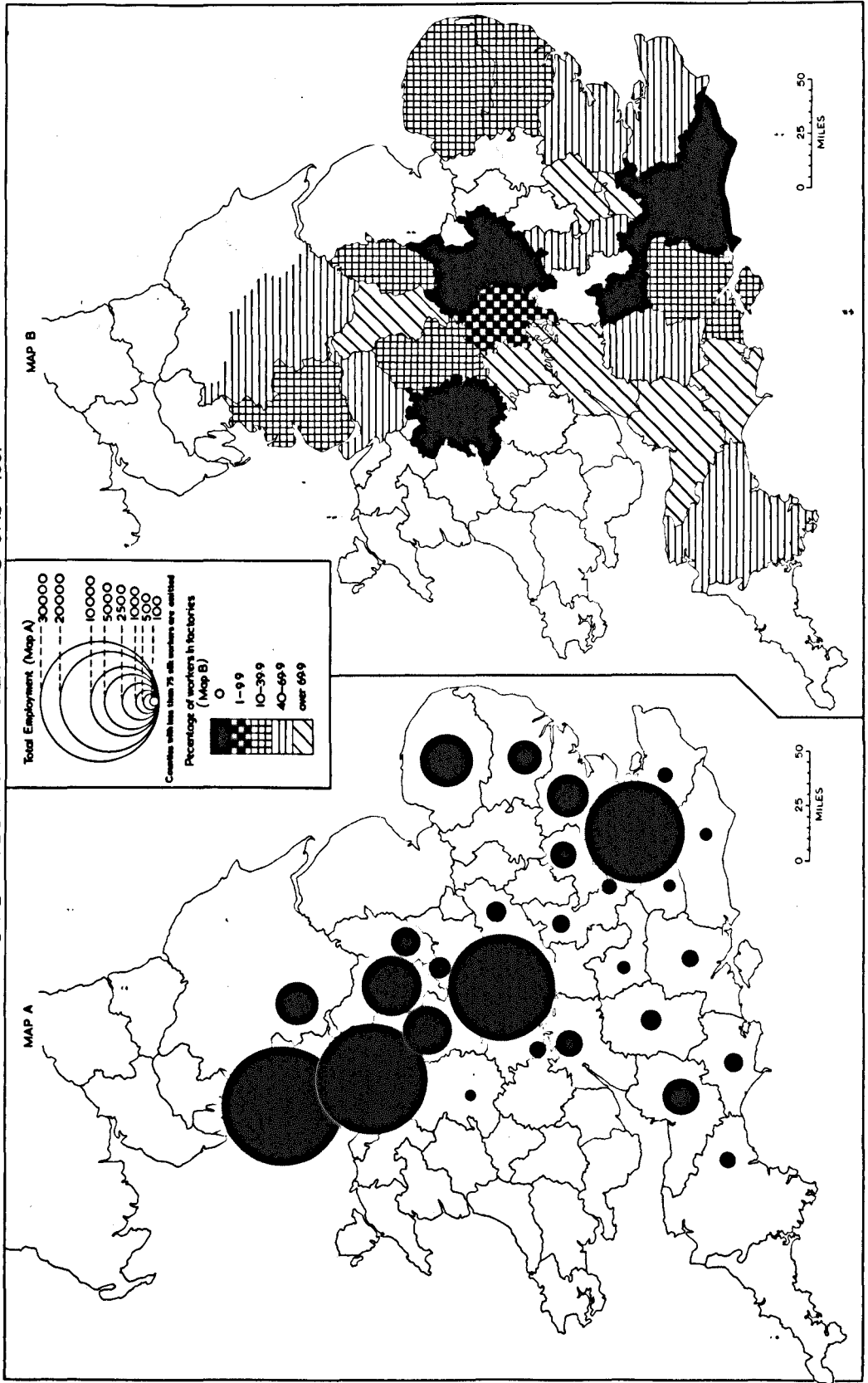


TABLE 5.5.

TOTAL AND FACTORY EMPLOYMENT IN THE SILK
INDUSTRY IN THE EARLY 1850s

REGION	TOTAL EMPLOYMENT		FACTORY EMPLOYMENT		FACTORY EMPLOYMENT As % of Total
	No.	% of Total	No.	% of Total	
S.W. Pennines	27,125	20.0	13,890	33.3	51.2
Lancashire	31,691	23.4	8,208	19.7	25.9
Yorkshire	3,478	2.6	1,687	4.0	48.5
East Midlands	8,168	6.0	5,289	12.7	64.7
Pennine Province	70,462	51.9	29,074	69.7	41.3
Warwicks.& Cots.	24,217	17.9	3,509	8.4	14.5
Norfolk	5,786	4.3	1,350	3.2	23.3
Essex & Suffolk	5,739	4.2	2,891	6.9	50.3
London & Chilts.	23,123	17.0	1,696	4.1	7.3
Berks & Hants	668	0.5	111	0.3	16.6
The South West	3,929	2.9	3,071	7.4	77.9
Other	1,645	1.2	0	0	0.0
ENGLAND	<u>135,569</u>	<u>100.0</u>	<u>41,702</u>	<u>100.0</u>	<u>30.7</u>

- Notes:- (1) Leicestershire (which did not have a powered industry in 1850) is excluded from "The East Midlands".
 (2) "Other" Counties employing over 75 silk workers were:- Northamptonshire (660), Leicestershire (510), Sussex (100) and Shropshire (99).

5.7B. can be assumed to show a labour force in which domestic weavers were important and a high figure an industry dominated by the mechanised branch.

ii) REGIONAL ANALYSIS

It is apparent from Figure 5.7A. that, of the regions delimited previously, four dominated total employment in the industry. Lancashire and the South West Pennines each employed over twenty per cent of the national total and the silk-working regions centred on Coventry and London together accounted for a further thirty-five per cent. Except for the South West Pennines all of these regions accounted for a much greater percentage of total employment than they did of factory employment (see Table 5.5.). The counties of London and Warwickshire together employed over 43,000 persons in 1851, almost one-third of England's total silk workers, compared with under three per cent of the industry's factory operatives: here, clearly, were the great concentrations of domestic workers.

In Lancashire, despite the importance of powered weaving barely one-quarter of the labour force were mill workers and it appears that there were about 23,000 domestic weavers.

Thus even Figure 5.4. underestimates Lancashire's enormous importance in silk weaving. In the South West Pennines about fifty-one per cent of the total of 27,000 silk workers recorded by the Census were factory operatives. This is a greater proportion than was found in the other three major regions (see Table 5.5.), which suggests that a greater proportion of the weaving industry here was mechanised, as well as illustrating the dominance of throwing in the entire silk industry of the region, and not merely in its mechanised branch. Despite their dominant importance in the mechanised branch of production, Lancashire and the South West Pennines clearly employed many hand loom weavers.

Thus it is apparent that in these four regions were employed the greatest absolute numbers of domestic weavers and that here (except in the South West Pennines) domestic workers far outnumbered factory operatives.

Within these regions further analysis of the Census shows considerable localisation of the silk industry (see Table 5.6.). In the south east the focus of the industry, as depicted by the Census, was firmly within London itself. Two Registration Districts in east London formed the area of greatest concentration, though other parts of London took part in silk

TABLE 5.6.

THE AREAL CONCENTRATION OF THE MANUFACTURING
LOCALITIES IN THE MAJOR SILK MANUFACTURING
REGIONS: 1851

	TOTAL EMPLOYMENT (over 20 yrs)	% of Region	% of .. England
<u>Region: London & Chilterns</u>	18,359	100.0	20.0
County: Metropolitan London	16,718	91.1	18.3
Manufacturing Locality	12,092	65.9	13.2
<u>Region: Warwicks. & Cotswolds</u>	17,261	100.0	18.9
County: Warwickshire	16,695	96.7	18.3
Manufacturing Locality	15,852	91.8	17.4
<u>Region: South West Pennines</u>	16,046	100.0	17.6
Manufacturing Locality	14,074	87.7	15.4
<u>Region: Lancashire</u>	21,520	100.0	23.6
Manufacturing Locality	16,856	78.3	18.5
<u>ENGLAND</u>	<u>91,340</u>	-	<u>100.0</u>

The "Manufacturing Localities" are composed of the following
Registration Districts (employment over 20yrs. in brackets):-

<u>London</u>		<u>South West Pennines</u>	
Bethnal Green (9,504)		Macclesfield (9,934)	
White Chapel (2,588)		Congleton (2,186)	
		Leek (1,954)	
<u>Warwickshire</u>		<u>Lancashire</u>	
Coventry (8,039)		Leigh (4,502)	Oldham (4,210)
Foleshill (4,675)		Manchester (4,129)	Ashton (1,145)
Nuneaton (3,138)		Salford (1,568)	Bolton (1,302)

manufacture and twenty Metropolitan Registration Districts .. employed over 100 adults.

The ribbon industry of Warwickshire was heavily located in the city of Coventry (of which Foleshill was a part) and the only major outlier was in the Registration District of Nuneaton. (24)

In the South West Pennines the three adjacent Registration Districts of Macclesfield, Congleton and Leek accounted for almost eighty-eight per cent of the adults employed in the entire counties of Cheshire and Staffordshire and over half the remainder were in the nearby rural parts of Stockport Registration District where about 1100 adult silk workers were found. (25) There are no finer details for Congleton or Leek, but in Macclesfield Registration District over ninety-one per cent of the adult workers lived in Macclesfield itself and the town accounted for almost sixty-four per cent of silk workers of all ages in Cheshire.

(24) See Table 5.6. and Prest (1960) pp.44-5.

(25) Stockport Registration District recorded 1292 persons over twenty years of age employed in silk manufacture of whom 181 were in Stockport itself.

In Lancashire the area seen to be important in the 1830s retained much of the industry. The chief focus of mill employment in the Registration Districts of Manchester and Salford contained almost 5,700 adult silk workers, and the hand loom weaving areas round Ashton and Oldham employed 5,355. Leigh was almost as important, employing 4,500 persons over twenty years of age and the fine cotton spinning and weaving centre of Bolton, not mentioned in the 1830s, had a sizeable industry in 1851 (see Table 5.6.). Many other Lancashire towns, both among those where cotton was manufactured and beyond the cotton province, had small numbers of domestic silk workers so that in Lancashire the industry was rather less concentrated than in the other major regions.

Together these four manufacturing localities, comprising fourteen Registration Districts, accounted for sixty-five per cent of the adult employment in silk in England, and the four regions of which they were a part for eighty per cent (see Table 5.6.).⁽²⁶⁾ Thus the 1851 Census confirms the

(26) This percentage is reduced to seventy-eight per cent when workers of all ages are considered, due to the greater proportionate importance of factory employees (among whom there were many children) elsewhere.

conclusion based on the Returns of factory employment that the silk industry - though more widespread than most other textile industries - was concentrated into a number of dominant districts. The stature of Coventry and the Spitalfields area of London as centres of hand loom weaving - entirely missed in the Factory Returns - is evident from the Census, and the importance of Lancashire and the South West Pennines is enhanced.

Beyond these major regions, domestic silk workers were relatively insignificant in number, but nevertheless they were strongly concentrated into dominant regions. The most important of these was Norfolk where in total there were 4,500 silk workers unaccounted for by factory employment. Norwich registration district contained over seventy per cent of the county's adult silk weavers and there was a secondary concentration in Yarmouth. Significantly, both towns with domestic weaving also dominated the powered branch of the industry (see Figure 5.2.). In Suffolk, the much smaller industry employed an almost equally large proportion of outworkers as did Norfolk's, although in Essex factory employment was absolutely and relatively more important than in the other two counties, and thus it appears that the combined mill there accounted for a major part of the weaving industry of the

county. The modern industry which was developing in Essex, under the influence of the City capitalists and the initiative of the Courtaulds, was thus already distinct from the more traditional form of silk manufacturing found elsewhere in East Anglia.

In Yorkshire, too, there was apparently a domestic silk industry, employing as many workers as the throwing and spinning concerns, weaving pure silk and mixed goods. Huddersfield, where over 1,000 adults were employed in silk manufacture in 1851, appears to have been the chief centre of pure silk weaving. The weaving of mixed goods was widespread but, as it was largely integrated with worsted manufacture, it is difficult to discover its detailed distribution. (27)

In the East Midlands, where throwing was seen to dominate the powered branch of silk manufacture, there is a sharp contrast between the two counties concerned. In the early 1850s, most of Derbyshire's silk workers were mill operatives, and Derby itself, employing over 3,000 adults dominated the total industry, as well as its mechanised section. In Nottingham-

(27) See above p. 55-57.

shire, however, the majority of the 1,500 silk workers appear to have been domestic weavers (see Figure 5.7B), and perhaps the Census (Figure 5.7A) gives a better indication than the Factory Inspectors' Returns (Figures 5.2. and 5.3.) of the relative importance of silk manufacturing in these two counties.

Elsewhere the number of domestic silk workers was very small. It is clear from Figure 5.7B that in the Cotswold and Chiltern sub-regions little employment existed outside the powered throwing mills, except in Buckinghamshire. Aylesbury, where a mill was established in the boom of the 1820s, ⁽²⁸⁾ continued as an isolated centre of domestic weaving (perhaps still using workhouse labour), and in all almost 100 adults were employed. In the South West of England three quarters of the 4,000 workers recorded by the Census appear to have been factory operatives, though on the fringes of the region, in Wiltshire and Devon a slightly greater percentage of workers were cottage weavers (see Figure 5.7B). It is surprising that there should have been so slight a concentration of cottage weavers of silk in the South West by 1850, a region in many respects similar to Norfolk in its early

(28) See above p.13.

development. There was a longstanding textile tradition in the region, and the declining woollen industry had encouraged the transfer of workers to silk weaving in the 1820s.⁽²⁹⁾

Clearly the domestic silk weavers here were among the first to suffer competition from manufacturers using power looms in the South West and elsewhere, and the trade was already disintegrating. As has been shown, the mechanised branch was itself archaic and declining in the South West⁽³⁰⁾ and by 1850 both domestic and factory employment had contracted into five major centres: in Dorset and Somerset the Registration Districts including the mill towns of Taunton, Shepton Mallet, Frome, Sherborne and Overton employed, in 1851, a total of 1,275 adult silk workers, more than two-thirds of the industry's adult labour force in the region as a whole, and over ninety per cent of that of the two counties.

Thus, beyond the major regions, there was little domestic employment in silk which was not clearly associated with the powered branch. In fact, as Figure 5.7. shows, there were only two areas, apart from London itself, where a large number of domestic silk workers were found relatively distant from silk mills. In the four counties to the south and west of

(29) See above p.104

(30) See above p.137

London there had been some powered concerns in 1838 but by 1850 only one mill remained, at Whitchurch in Hampshire. This was the centre of a small domestic industry, but concentrations of silk workers were also recorded elsewhere in these counties. There were almost 100 adults engaged in silk manufacture on the Isle of Wight, and in the neighbouring counties of Berkshire and Surrey (where four mills had stopped working since 1838) there were over 300 silk workers. Reading remained the chief centre, with 154 adult employees in 1851, although the Census detail shows that the town had lost its former specialisation on ribbon weaving.⁽³¹⁾ Employment at all ages in these counties, with Sussex added, amounted to only 856 persons, half of whom were in Hampshire.

In Leicestershire and Northamptonshire there were also substantial silk industries which were entirely domestic: in Leicestershire employing 510 persons and in Northamptonshire 660. The workers were heavily localised to Leicester and Kettering, and it seems likely that these trades had evolved from, and were perhaps ancillary to, the major textile concerns of the two counties, hosiery and lacemaking respectively.

(31) "Hand loom Weavers" H.C. (1840) vol.XXIII p.298 ..

Thus the 1851 Census confirms the conclusions based on the Returns of factory employment that silk manufacturing - though more widespread than most other textile trades - took place in relatively small and concentrated localities. Apart from in the two major districts of domestic silk weaving in Spitalfields and Coventry, there were few domestic silk workers employed who were not in close proximity to the mechanised branch of the industry. In consequence the maps and analysis based on the Factory Inspectors' Returns omit only to show the importance of these two major areas of weaving, and elsewhere do not seriously distort the pattern of location by omitting large numbers of cottage weavers outside the localities of mechanised concerns.

The Census data confirms the Factory Inspectors' figures, too, in showing that there was a marked specialisation between throwing and weaving in the regions. Where analysis of the factory industry showed a predominance of throwing, in the Cotswolds and Chilterns, and in the East Midland and Yorkshire regions, the Census data verifies that little weaving took place. Although the South West Pennine region employed many domestic and factory weavers, here too the Census confirms that throwing was the dominant concern. The Census material

indicates the considerable importance of domestic weaving in London, and shows the significance of domestic weavers alongside the powered weaving concerns in Coventry, Lancashire and Norfolk, regions where little throwing was done. The only regions of silk manufacture where specialism was less distinct was in the South West and in Essex and Suffolk. The industry in these regions had its roots in domestic weaving but by the mid-nineteenth century appeared to be concentrating increasingly on throwing.

Finally the Census confirms the Factory Inspectors' Returns in showing that, though widespread, the weaving and throwing branches of the trade were concentrated into a number of overwhelmingly dominant districts. In 1851 Coventry and London employed forty-six per cent of England's domestic workers, Lancashire and Cheshire fifty-three per cent of the factory workers and together the four regions focused on these centres contained almost eighty per cent of England's 135,000 silk workers.

REFERENCES FOR CHAPTER V

- J. BELLAMY (1953) "A Note on Occupation Statistics in British Censuses." Population Studies (vol.VI) pp.306-8.
- W. GORE-ALLEN (1958) "John Heathcote and his Heritage."
- G. HALL (1861) "Prize Essay." (see Prest (1960) p.93).
- J. PREST (1960) "The Industrial Revolution in Coventry."
- H.B. RODGERS (1960) "The Lancashire Cotton Industry in 1840." Trans. Inst. Br. Geogr. (No.28) pp.135-53.
- SIR. F. WARNER (1921) "The Silk Industry of the United Kingdom."
- F.A. WELLS (1935) "The British Hosiery Trade."

GOVERNMENT PAPERS

CENSUS VOLUMES: 1851:1861:1871.

FACTORY INSPECTORS' RETURNS

"A Return of the Number of Power Looms used in Factories (1835)" H.C. (1836 vol.XLV) p.195.

"Return of All Mills and Factories ... June 1838." H.C. (1839 vol.XLII) pp.1-

"Number of ... Silk Factories ... in Each County." H.C. (1850 vol.XLII) pp.455-

"Number of ...Silk Factories subject to the Factories Acts in Each County...(1856)" H.C. (1857 (Sess.1) vol. XIV) pp.173-184.

"Guide to Official Sources: No.2 Census Reports of Great Britain: 1801-1931." H.M.S.O. (1951)
especially "Occupations and Industries, 1801-1931."
pp.27-57.

"Report of the Commissionersinto the Condition of Un-
employed Hand Loom Weavers." Assistant Commissioners Reports
H.C. (1839 vol. XLII) pp.511- (1840 vol. XXIII) pp.49-
and pp.367- : (1840 vol. XXIV) pp. 1- and pp.373-

CHAPTER VIREGIONAL CONTRASTS IN THE STRUCTURE AND ORGANISATION OF THE
MECHANISED INDUSTRY IN THE 1840s.A) PROBLEMS OF ANALYSIS

It is clear from an analysis of the Factory Inspectors' Returns that there were considerable regional variations in the organisation, efficiency and progressiveness of the silk industry during the mid-nineteenth century. Unfortunately, there is very little collaborative material of these contrasts from other sources, for the silk industry did not attract the wealth of contemporary comment and analysis found, for example, in the cotton industry. Consequently this chapter, which examines the industry in the relatively stable decade of the 1840s has to rely almost entirely on the Factory Inspectors' Returns for 1838 and 1850.

In this single source there is an insufficient breadth of information available for a very detailed analysis to be possible. Comparisons of regions based solely on the labour and power utilised tend to ignore the possibly substantial

variations in relative costs, techniques of production and the quality of goods produced, about which little information exists, and without details even of output it is hazardous to interpret the findings.

Moreover, as seen above, the data which are available in the Returns are weak analytical tools in a number of respects.⁽¹⁾ In 1850 when the deepest level of technical detail was given it was only on a county basis, and the aggregation of mills with widely differing combinations of equipment and labour into the county totals considerably hinders a study of actual conditions. In addition, in both 1838 and 1850 it is impossible to determine where idle equipment has been included in the Returns, and this too renders very detailed analysis unreliable. A further difficulty arises in the data for combined mills which do not divide the labour or power applied between the throwing and weaving processes. The division of these resources between the two branches as a whole is therefore in doubt, and analysis of the weaving branch in particular, for which the combined mills were largely responsible, is almost impossible.

(1) See above pp. 120-124.

Despite these deficiencies, the Factory Inspectors' Returns clearly distinguish broad regional contrasts in the industry's use of power and labour, although the dearth of other contemporary information prohibits much comment on the relationship between the two. As is so often the case in historical geography, the material available for study is severely restricted, and so the best there is merits analysis to the limits imposed by its shortcomings.

B) REGIONAL CONTRASTS IN POWER SOURCE.

In the south of England, as in the Pennine province,⁽²⁾ there was considerable regional variation in the relative importance of steam and water as power sources in the mechanised silk industry (see Figure 6.1.). The greater dispersion of the industry in the south, chiefly to riverine sites, reduced the incentive to adopt steam engines and in 1838 only forty-eight per cent of the power applied to the southern industry was from steam.⁽³⁾ Table 6.1. summarises the considerable changes in the power source of the industry between 1838 and 1850, by which date the proportion of power derived from

(2) See above Chapter II pp.28-50.

(3) In the Pennines eighty-two per cent of power was from steam at that date.

**FIGURE 6.1. POWER UTILISATION IN THE SILK INDUSTRY OF ENGLAND
IN THE 1830s.**

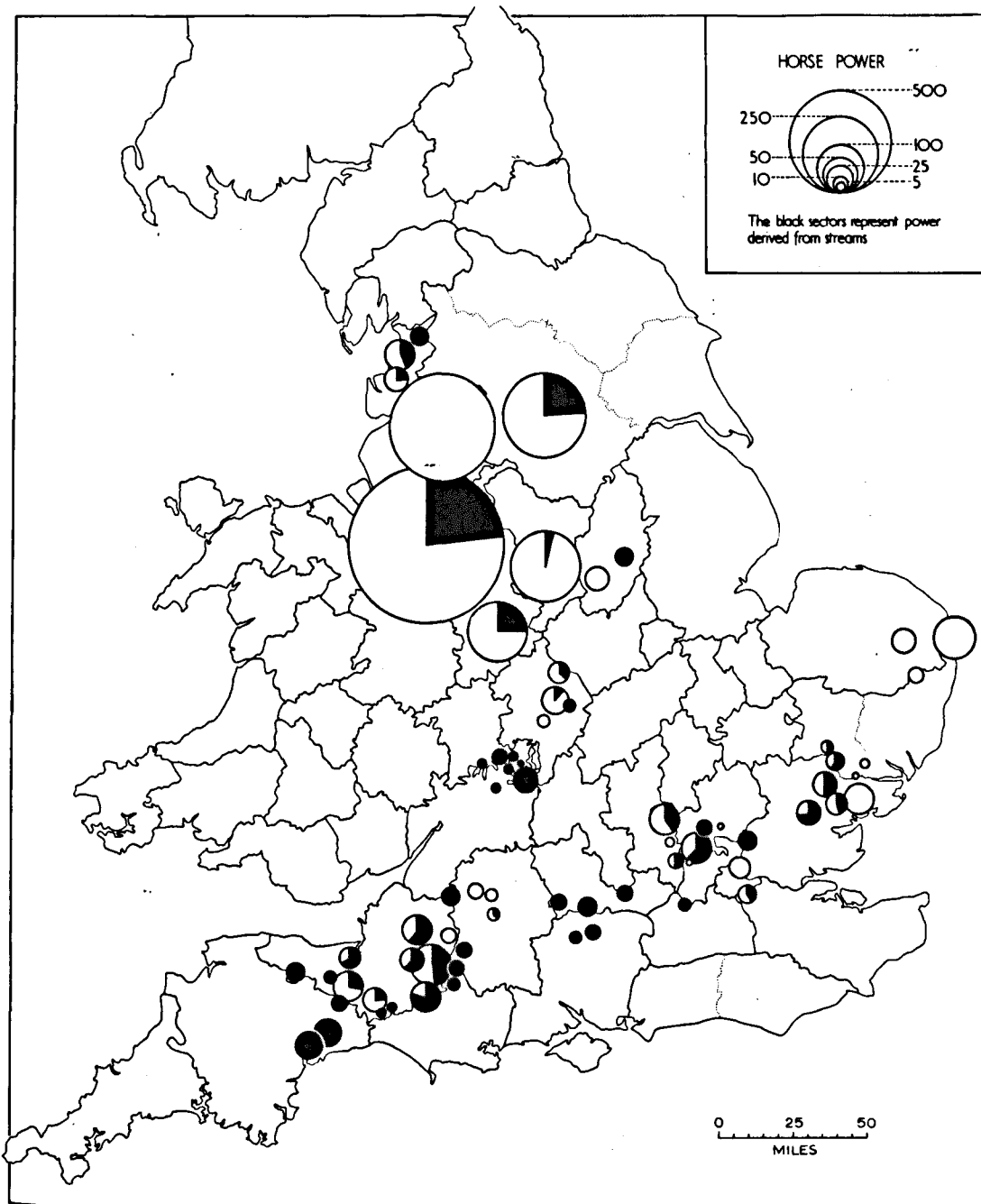


TABLE 6.1.

CHANGES IN THE SOURCE OF POWER IN SILKMILLS: 1838 - 1850

REGION (or sub-region)	No. of Mills 1838	CHANGE IN No. of Mills 1838 - 50	CHANGE (1838 - 50) IN H.P. from:-			
			<u>Steam</u>		<u>Water</u>	
			H.P.	% change	H.P.	% change
S.W. Pennines	104	+3	-133	-15	-2	-1
Lancashire	31	-2	+17	+3	+1	+3
Yorkshire	16	0	+2	+1	+20	+23
East Midlands	24	+4	+148	+73	0	0
Warwickshire	9	+14	+131	+247	+2	+17
The Cotswolds	12	+8	+40	∞	+54	+96
Norfolk	4	0	+2	+2	0	0
Essex & Suffolk	10	-1	+114	+133	-29	-46
London & Chilts.	11	-1	+58	+77	-31	-44
The South West	37	-12	+13	+9	-49	-17

steam in southern England had risen to sixty-six per cent.

Of the eighty-eight silk mills south of the Pennines in 1838 the power source of sixty-three is known, and using the data for the size and number of engines it is possible to estimate the power source of the remainder (see Table 6.2.). A striking feature is the number of mills which obtained power from both sources: in 1838 almost one-fifth of the mills where the power source is known and an estimated quarter of the total used both steam and water. Some of these employed auxiliary steam engines to recirculate water or drive machinery in a drought,⁽⁴⁾ though the large number of workers employed in some of these mills suggests that steam engines were installed to expand production beyond the limits imposed by the water power available at the site.⁽⁵⁾

Steam power was most readily used where coal was easily obtained. The Norfolk industry benefitted from its position on the coastal coal route from the north east to London and was the only region where the industry was entirely dependent on steam in 1838, though in Warwickshire, where local coal was cheap and plentiful, steam engines supplied the bulk of

(4) See above p.104.

(5) See below p. 166.

TABLE 6.2.

POWER SOURCES OF THE SILK MILLS SOUTH OF
THE PENNINE PROVINCE: 1838

REGION (or sub-region)	Number of Mills with Power derived from:-					
	STEAM		WATER		BOTH STEAM AND WATER	
	A	B	A	B	A	B
Warwickshire	1	5	1	2	0	2
Cotswolds	0	0	12	12	0	0
Norfolk	4	4	0	0	0	0
Essex & Suffolk	3	3	2	2	5	5
London	1	1	1	1	1	1
Chilterns	3	4	1	1	2	3
Berks & Hants.	0	0	5	5	0	0
South West	5	8	12	18	4	11
TOTAL	17	25	34	41	12	22

Note: Column A relates to parishes where the power source of all mills is known. Column B is an estimate for all mills. see p. 316.

power in 1838 and the extensive additions over the next twelve years were almost exclusively steam powered.

The industry in the south east also derived a large proportion of its power from steam: in London coal was readily obtainable; the Chiltern industry probably obtained canal-borne coal from the Midlands, and in Essex and Suffolk the sluggish streams encouraged the use of auxiliary steam engines. In this entire area rather more power was derived from steam than from water in 1838, though few mills relied solely on steam (see Table 6.2. above). By 1850 water provided only eighteen per cent of the power in the whole of eastern and south-eastern England (compared with forty-five per cent in 1838). The greatest increases in the use of steam power occurred in Essex and Hertfordshire, which were the only counties in England where the data reveals water power abandoned in association with an increased use of steam power (see Table 6.3.).

Elsewhere in southern England the silk industry was heavily dependent on water power in 1838. In the Cotswolds and Berkshire - Hampshire regions all mills were water powered (see Figure 6.1.). In the South West only eight of the thirty-seven mills appear to have been solely dependent on

steam (though many more used auxiliary steam engines), despite the locally available coal from the Bristol - Somerset coalfield and the development of a canal system to distribute it. Between 1838 and 1850 widespread decline led to a decrease in both water and steam power in south western England, although where expansion occurred - notably in Dorset and Gloucestershire - the utilisation of both power sources increased.

A summary of the changes in power utilisation by the silk industry between 1838 and 1850 is given in Table 6.3. Clearly there is little evidence, anywhere in England, of water power being replaced by steam in areas where the industry expanded, as there was in the cotton industry at that time.⁽⁶⁾ More water power than steam was abandoned in declining situations and steam was used for most new developments but, in contrast to other textile industries, considerable additional water power was developed in areas where the silk industry expanded. This perhaps was a result of the tendency in much of England for the silk industry to adopt mills from other uses rather than build new ones, and reflects both the lower power requirements of silk manufacture

(6) See Taylor (1949) p.115.

TABLE 6.3.

SUMMARY OF CHANGES IN POWER UTILISATION:

1838 - 1850

NATURE OF CHANGE	NO. OF COUNTIES IN CATEGORY	TOTAL CHANGE IN H.P. FROM:-	
		STEAM	WATER
Increase in power from steam and water	10	+446	+97
Decrease in power from steam and water	9	-160 ⁽¹⁾	-118
Increase in power from steam but decrease in power from water	2 ⁽²⁾	+136	-49
Decrease in power from steam but increase in power from water.	2 ⁽³⁾	-32	+28

Notes: (1) 117 H.P. of this decline was accounted for by
Cheshire.

(2) The Counties of Hertfordshire and Essex.

(3) The Counties of Staffordshire and Wiltshire.

and the lesser amounts of capital available in the industry.

C) REGIONAL CONTRASTS IN THE STRUCTURE OF THE LABOUR FORCE

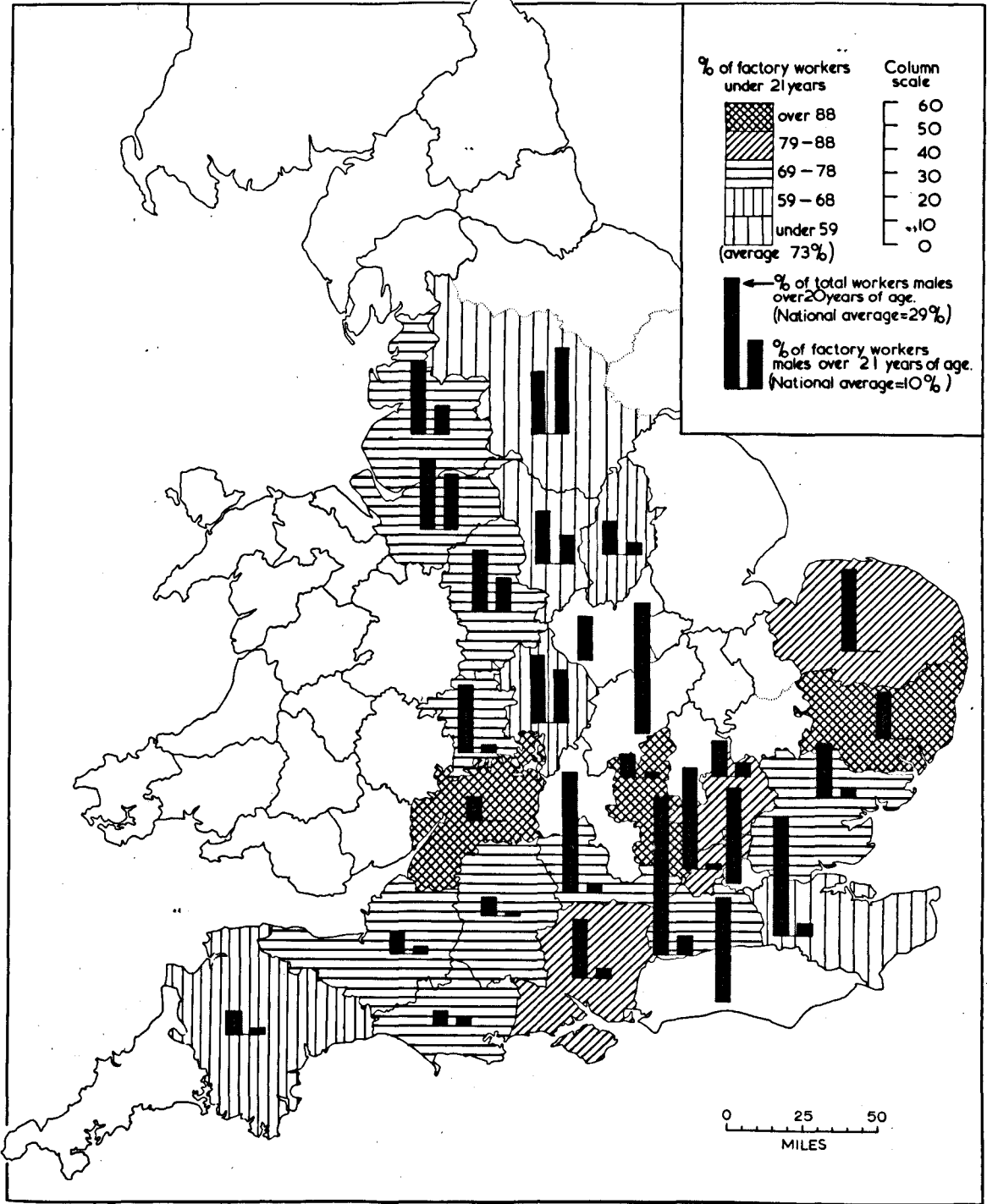
Figure 6.2. maps the most significant aspects of the data available in the Census, as well as the Factory Inspectors' Returns, for analysing the structure of the labour force of the entire industry (including domestic workers) and of its mechanised branch. The Factory Returns for 1838 have been used as the age groups given compare more closely with the Census data than they did in 1850.⁽⁷⁾

The factory industry of the Pennine counties and Warwickshire showed a much greater reliance than elsewhere on adult males, which suggests that these traditional textile regions had a more permanent craft labour force committed to silk. Moreover the proportion of children in the silk mills of these counties was low, especially in Yorkshire and Derbyshire, which reinforces the impression that here more skill was employed in silk manufacture than in other parts of England.

(7) In the 1838 Returns the age groups were under 21 and 21 and over; in 1850 males were shown aged under 13 and 13 and over and females, under 13, 13 to 18, and over 18 years of age. The Census has five year age groups.

FIGURE 6.2.

THE STRUCTURE OF THE SILK INDUSTRY'S LABOUR FORCE IN THE MID-NINETEENTH CENTURY



Elsewhere very few adult males were employed in the factories: the extreme was reached in Norfolk and Suffolk where none were recorded. In fact only two patterns of labour structure were found in the mills of southern England. The labour force was almost entirely made up of children (see Figure 6.2.), or was predominantly female, with very few males of any age employed. Throughout the South West well over eighty per cent of factory workers were females and in the Kent mill the proportion reached ninety-six per cent. Silk throwing, which required less skill than weaving, was predominant in southern England, with fifty-two of the sixty-eight mills at work in 1850 engaged solely in throwing. Thus there is clear evidence, from both the structure of the mills' labour force and the processes carried on, that the mechanised silk industry in the south was very rudimentary. Little craft skill was employed and only the simplest products were made which required little labour more sophisticated than child machine minders.

The data derived from the Census in Figure 6.2. shows that there were considerable contrasts in the structure of the total, as well as the factory, labour force. Adult males were clearly dominant in the domestic silk weaving industry

in the traditional areas of the south east: in London and in each of the counties immediately to the south and west over forty per cent of the labour force of the entire silk industry was adult male, contrasting sharply with the industry in Suffolk, Essex and the Chilterns where men accounted for an average of only twenty per cent of all workers.

In the other major concentrations of domestic silk weaving in Lancashire, the South West Pennines and Warwickshire there were also a relatively high levels of participation in silk manufacture by men, who comprised between twenty-six per cent and thirty per cent of the labour force in these counties. In Yorkshire too, where general textile weaving was long established, a similar proportion of men were employed by the industry, but throughout the East Midlands, where hosiery manufacture was the primary occupation the proportion of men employed in silk manufacture was much lower, in Nottinghamshire reaching only thirteen per cent. Men were also predominant in the smaller, but long established silk industry in Norfolk, where they were emphatically employed only in the domestic and not the factory industry,⁽⁸⁾

(8) See above p. 163.

and in the small and localised domestic industry of Northamptonshire.

Elsewhere even where factory employment was not entirely dominant, the proportion of adult males in the industry was much lower. In the South West, for example, the entire industry, like the mechanised branch was predominantly female employing, and here about three-quarters of the domestic weavers were women. (9)

In short it is clear that in both the factory and domestic industries in the Pennine province and Warwickshire, and in the domestic industry around London men were employed to a much greater degree than elsewhere, and that in East Anglia and the South West especially, female or child labour dominated silk production. From this it would appear that the industry in these major traditional regions of silk weaving had the resources of a work force more skilled and permanent than was the case elsewhere.

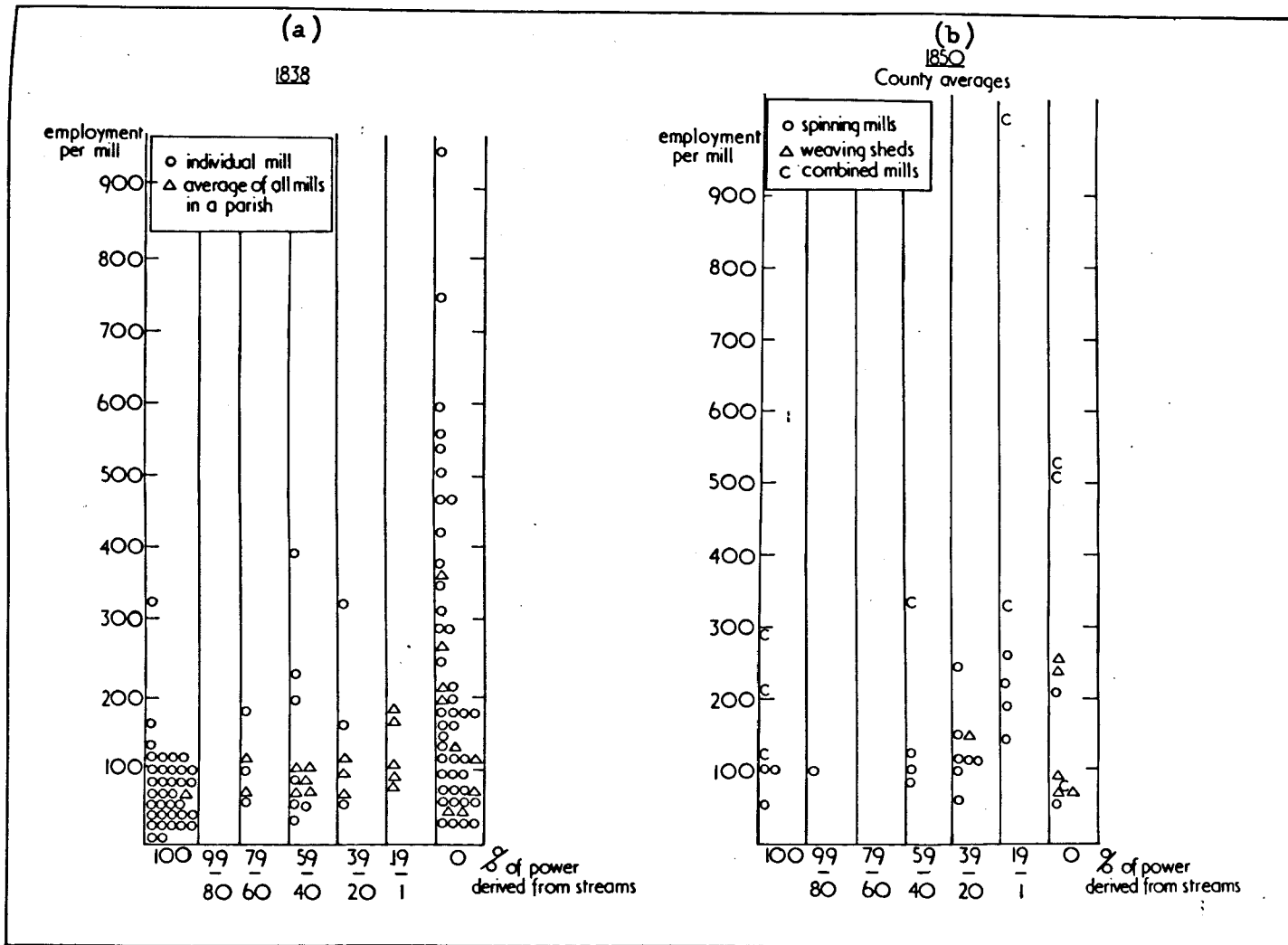
(9) A comparison of the Factory Returns and the Census reveals about 1,000 domestic workers in the South West. (see above p.149) The same procedure shows over 700 of these to be female.

D) REGIONAL CONTRASTS IN THE SIZE OF ESTABLISHMENTS.

The number of employees per mill was probably one of the most significant variables recorded by the Factory Inspectors' Returns. In part the variations can be attributed to differences in both the power source and the process carried on. Mills which depended solely on water power appear to have had the size of their labour force restricted by the power available. Figure 6.3a shows that of the mills for which individual detail was available in 1838 only four which were water powered employed over 110 persons. In contrast, half the mills with auxiliary steam engines and the majority of those driven solely by steam were larger. The same tendency is apparent from the less detailed data in Figure 6.3b which also shows the way in which mill size varied with process in each of the counties. Employment per mill in combined mills in 1850 was considerably greater than in either the specialised throwing or weaving mills with similar power sources. This was almost certainly because the mills where employment was increased by the addition of weaving capacity were already among the largest and most prosperous throwing mills. (10)

(10) See above p. 125.

FIGURE 6.3. UNIT EMPLOYMENT IN SILK MILLS RELATED TO POWER SOURCE - 1838 AND 1850.



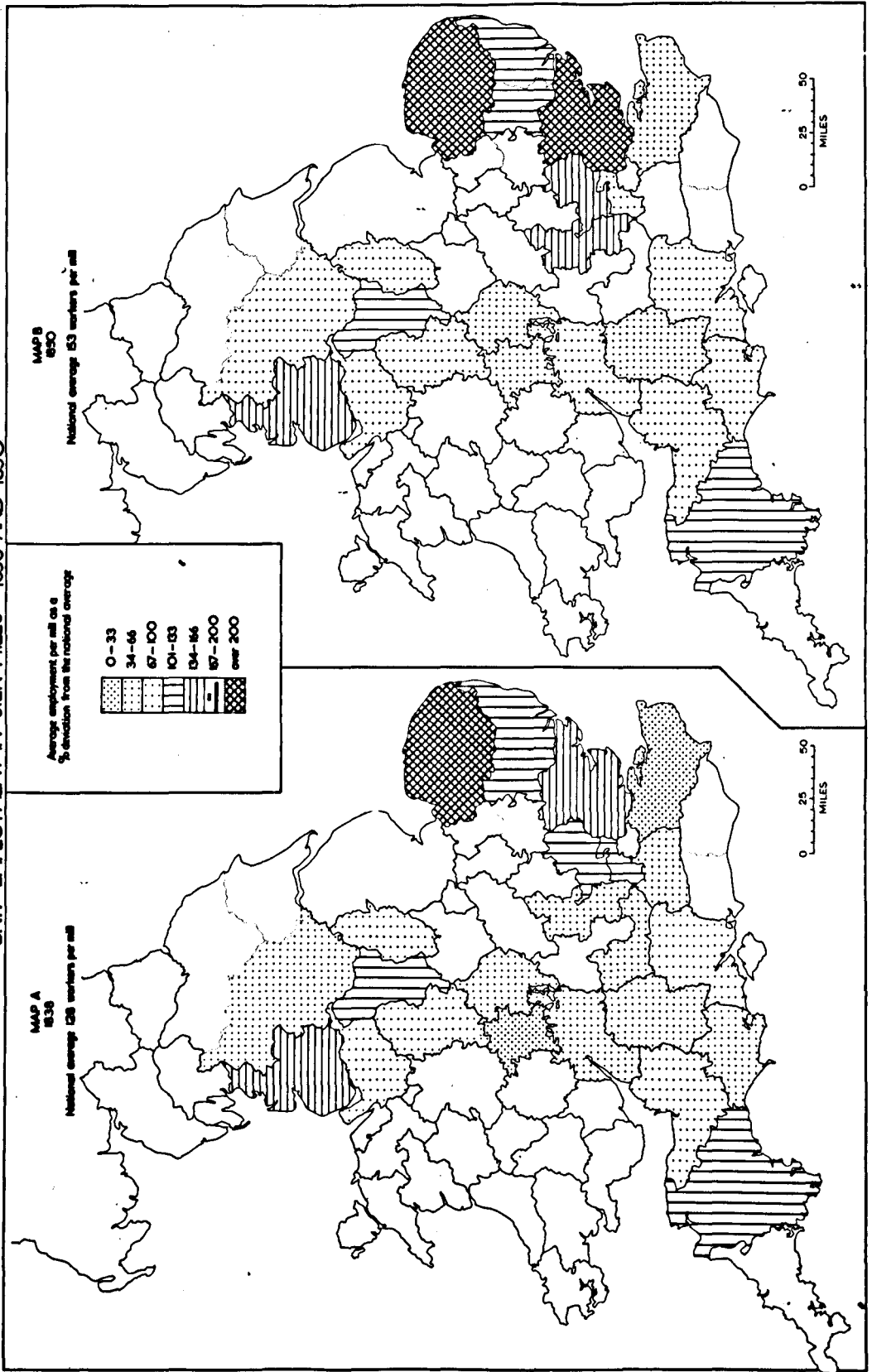
The range in the number of employees per mill on a national scale is evident from Figure 6.3a. Within the regions and counties the range is little smaller. For example, in Somerset employment per mill varied from under 30 at the Batheaston mill to over 175 at each of the mills at Frome and Pilton. In the South West Pennines differences were also considerable, ranging from an average of 162 employees per mill in Macclesfield to an average of only 94 at Congleton, with even smaller mills in the outlying districts.

Despite the difficulties of interpreting the aggregated data, and despite the general increase in the number of employees per mill between 1838 and 1850,⁽¹¹⁾ in some regions of silk production average employment per mill appears to have varied significantly and consistently from the national average, as shown in Figure 6.4. In Devon and Derbyshire the large number of employees in the average mill was due merely to the influence of the typically large combined mills. In Lancashire and in the whole of East Anglia, on the other hand, units were large in all branches of production, with

(11) The national average of employment per mill increased from 128 in 1838 to 153 in 1850, and the number of mills employing under 80 persons declined from ten to one.

FIGURE 6.4.

UNIT EMPLOYMENT IN SILK MILLS - 1838 AND 1850



the single exception of the declining Norfolk throwing mill. Employment per mill in the specialist throwing area of the Chilterns increased by more than the national average between 1838 and 1850 and at the latter date only the Essex throwing mills were, on average, larger. The contrast between the large scale mills in the Chilterns and East Anglia, and the much smaller scale of the industry in the South West is striking. Employment per mill was also well below the National average in Warwickshire and Worcestershire, a feature intensified in the former county in the 1850s by the introduction of the cottage factory.⁽¹²⁾

It is not a straightforward matter to assess the significance of these regional differences in employment per mill, but some tentative conclusions can be put forward. In Warwickshire the small units were a result of the peculiar organisation of the ribbon industry on a family workshop basis. The typically large Lancashire mill probably reflects the influence of the progressive cotton industry and the more ready availability of capital from a developed banking and credit system. In Norfolk and the Chilterns large numbers of workers were employed, but these were predominantly

(12) See below p p. 200-202.

children and the goods produced were probably stereotyped and simple.⁽¹³⁾ Finally the data for the South West Pennines probably conceal great variations in unit employment within the three major towns where the industry was concentrated. However the region clearly did not owe its continued domination of the throwing industry to any concentration on large scale units, which were in fact more characteristic of its major competitors. The reasons for the survival of silk production must therefore be sought elsewhere than in large scale production.

E) REGIONAL CONTRASTS IN THE COMBINATION OF INPUTS

The relationship of power to employment can be examined for each parish in 1838 and the resulting ratios (shown graphically in Figures 5.1 and 5.2 above) show that in fifty-six of the ninety-three parishes with silk mills there was an average of between four and twelve employees per horsepower. Technical information is not available to assess the significance of relatively small differences between ratios, though the factors affecting mills showing extreme ratios can be surmised with some confidence.

(13) Compare above pp.164-65.

Almost one-third of the twenty-three parishes where mills employed an average of under six workers per horse power were found in Yorkshire or North Lancashire, where the emphasis on spinning staple lengths of waste silk probably accounts for the relatively high amounts of power applied to the mills. On the other hand, isolated mills which show a high ratio of power to employment, were almost all water powered and probably had under used power resources and declining employment.⁽¹⁴⁾ At the other extreme the labour intensive industry apparent in a number of mills in Norfolk and Suffolk⁽¹⁵⁾ probably reflects the cheap child labour used, though in the Chilterns, an area also remarkable for the youthfulness of its mill operatives, only one mill (at Rickmansworth) appeared to be so labour intensive. Like other mills which showed a high ratio of labour to power (notably at Evercreach and Ditchheat in Somerset), the Suffolk mills quoted above had only very small engines installed and were virtually manual concerns. Among the largest centres of the silk industry in 1838 there was a

(14) For example Aylesbeer, Batheaston, and Staplegrove in the South West; Evesham (Worcestershire) and Alstonfield (Staffs).

(15) Viz: Norwich, Ditchingham, Hadleigh and Nayland.

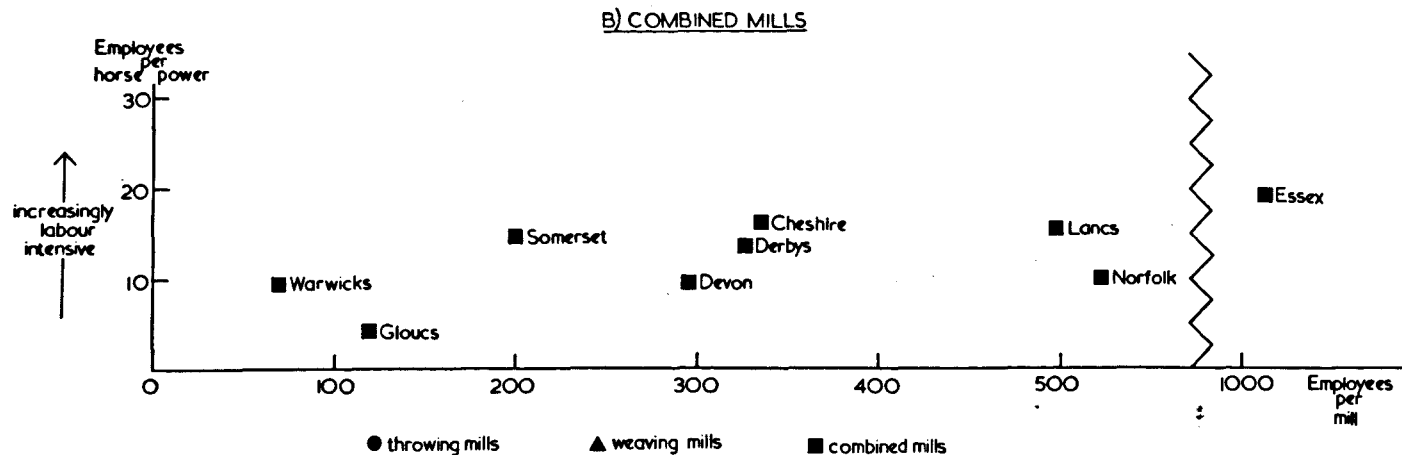
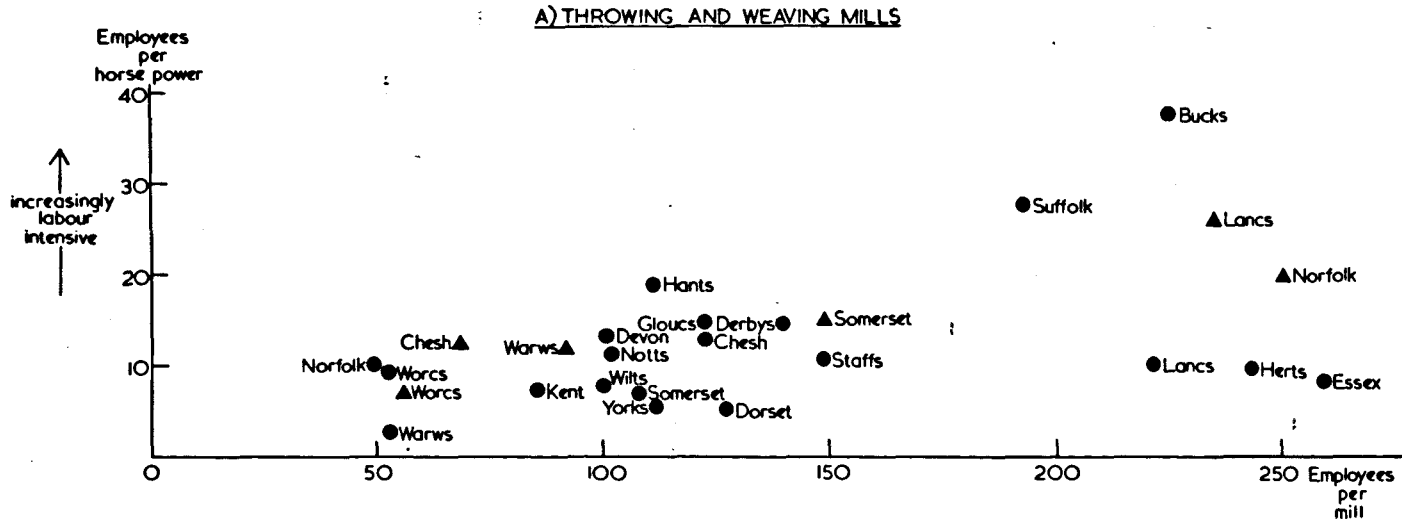
marked contrast between Macclesfield and Derby on the one hand where large amounts of labour were used relative to power, and Manchester and Congleton on the other which were relatively capital intensive, though the reasons for these differences are obscure.

Although the Returns for 1850 show that weaving was more labour intensive than throwing at a national level, the variations between counties and the limited number of cases available for study preclude a more detailed analysis. In 1850 silk weaving mills in England employed an average of 15.5 workers per horse power (12.1 workers of the exceptionally labour intensive industries of Norfolk and Lancashire are excluded) and combined mills 14.1 workers, compared with an average of only 10.4 employees per horse power in throwing mills. In most counties the ratio of employees to power in 1850 was within the range found in 1838, although many changes in detail had occurred, associated with the increase in the average size of mills.

The most significant regional variations in the relative use of power and labour are apparent from Figure 6.5. Among the counties where large throwing mills were general,

FIGURE 6.5.

THE RATIOS BETWEEN EMPLOYMENT AND POWER IN SILK MILLS-1850



Lancashire, Hertfordshire and Essex appear to have had a technically more progressive industry (in the sense that machine replaced labour) than Suffolk and Buckinghamshire, where the concerns were extremely labour intensive. The weaving industries of Lancashire and Norfolk were obviously organised on a quite different scale and possibly used different techniques from those elsewhere, including the Cheshire mills where smaller, relatively power intensive units were common in 1850. Of the combined mills, the apparently power intensive mill in Gloucestershire was entirely dependent on water power, and the power resources actually at work may consequently have been over-rated. At the other extreme was the huge Essex mill,⁽¹⁶⁾ which was relatively labour intensive and may have used essentially manual weaving techniques. However, the most striking feature of the combined mills was that almost all used power and labour in proportions close to the national average, irrespective of the size of the labour force.

Clearly there were many factors influencing the ratios between power and labour revealed by the Factory Inspectors'

(16) For further details see p.225.

Returns. Different processes required the application of power and labour in different proportions, with waste silk spinning using relatively more power than throwing and weaving being more labour intensive than either of the preparatory processes. A variety of techniques, using different proportions of power and labour, must have been used in the silk mills, though the Returns do not give details of production methods and there is no information available from any source to assess the relative efficiency and profitability of the different methods. Finally, mills using water power, or mills which had declining employment and unused equipment, may appear in the Returns to be more power intensive than in fact they were.

Despite the consequent difficulties of interpretation it appears that in the Pennine province and in the immediate vicinity of London the bulk of the industry was truly capital intensive. In these regions there was keen competition for labour from other industries and this was almost certainly a crucial factor in encouraging the extensive investment in sophisticated equipment which replaced labour with power. Conversely the regions where competition for labour was much less intensive (notably in the Chilterns, Norfolk, Suffolk, the Cotswolds and the South West) the silk industry appears in

general to have been much less dependent on power and instead to have used proportionately more of the relatively easily available labour resources of the predominantly farming communities.

Further analysis of the relationship of spindles to both horsepower and employment in the specialised throwing mills appears to yield meaningful results. However the weakness of the Factory Inspectors' Returns (particularly those resulting from aggregation and the possible inclusion of unused equipment)⁽¹⁷⁾ render this analysis much less reliable than the ones already undertaken and, in the absence of much supporting evidence from other sources, the conclusions are extremely tentative. Certainly the inadequate amount of data available for weaving precludes a similar analysis of that branch of manufacture in either the specialised or the combined mills.⁽¹⁸⁾

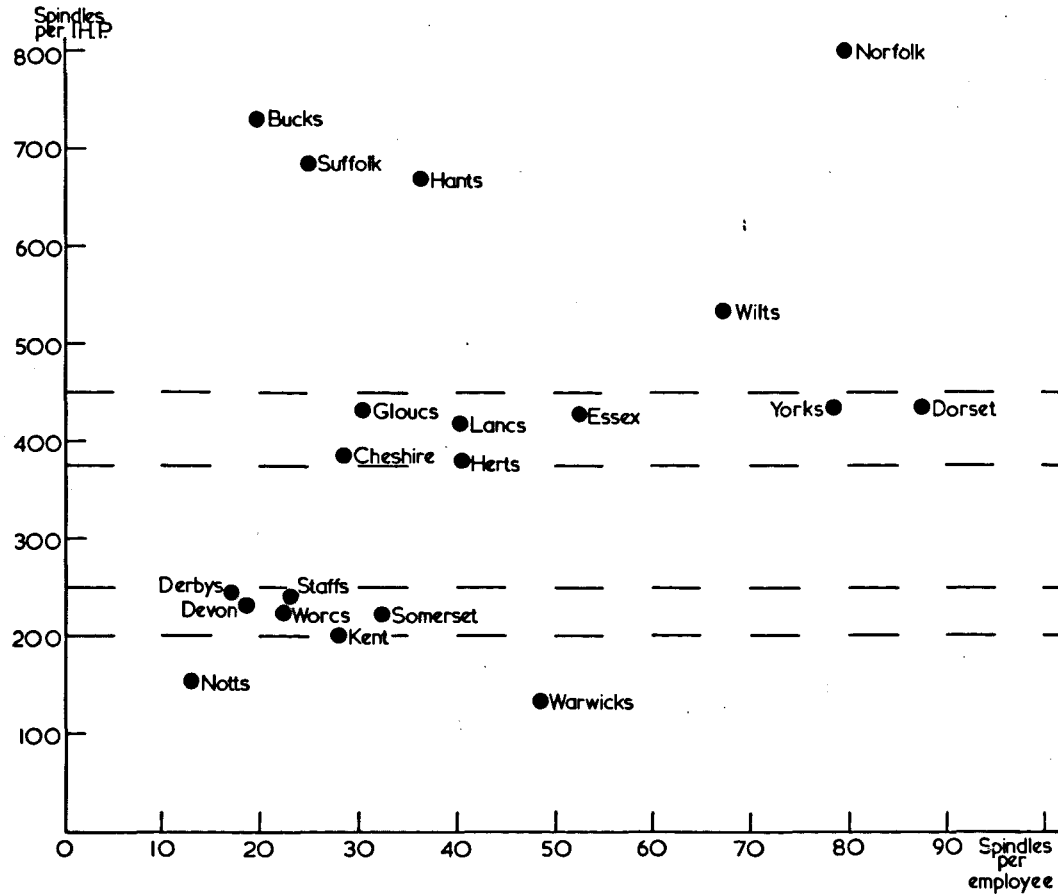
Figure 6.6. shows that in most counties the average ratio of spindles to horsepower fell within two quite narrow bands: either between 200 and 250 spindles were installed per horsepower or between 375 and 450 spindles. In addition

(17) See above p.120.

(18) See above p. 157.

FIGURE 6.6.

THE RELATION OF SPINDLES TO POWER AND LABOUR IN
THROWING MILLS - 1850



rather less labour was employed per spindle in the upper range (see Figure 6.6.). This suggests two quite separate techniques: one combining the power with fewer spindles, which consequently operated at a greater speed, the other using slower spindles and lesser amounts of labour. In those counties where the slower spindles were found (chiefly in the Pennine province and around London) it is likely that the highest quality of yarns were produced, for these could only be thrown on slow moving equipment,⁽¹⁹⁾ and elsewhere the simpler high speed processes of twisting and doubling and the production of lower quality yarns were dominant. Thus this evidence adds weight to the argument that there was a marked regional differentiation in the quality of goods produced.⁽²⁰⁾

The major exceptions to this simple - and perhaps oversimplified - division based on the ratio of spindles to horsepower were the extremely low powered and labour intensive mills in Buckinghamshire, Suffolk and Hampshire, and the industries of Norfolk and Wiltshire, which had declined since

(19) See Rawlley (1919) pp.248-251

(20) Compare above pp.163 and 165.

1838, so that unused spindles were probably included in the Returns, distorting the position of these counties.

Even if the throwing industry did fall into this simple two-fold division at the end of the relatively stable period of the 1840s, the throwing branch expanded rapidly in the 1850s and underwent considerable upheaval, which involved large increments of power and perhaps the application of new or improved techniques.⁽²¹⁾

F) CONCLUSION: THE STRENGTH OF THE REGIONS

In discussions of nineteenth century industrial geography there has been a tendency in the past toward glib and incomplete explanations. The fate of industries was seen as being primarily related to factors such as the proximity to power supplies and markets, the development of communications systems, local climatic variations and a ready supply of labour.⁽²²⁾ Such oversimplified explanations are dubiously true in any industry and are certainly inadequate in the case of the silk trade. The regions in which silk

(21) See below pp. 191-93.

(22) The silk industry is discussed at length in these terms by Warrington (1932) and Mellows (1933 and 1934).

manufacturing developed and survived most strongly were not, in fact, those which were best endowed with these advantages. Some other factors have already been reviewed in this account of the industry, for example the competition with stronger industries for factory space, labour and power resources. (23)

In this chapter evidence has been considered which emphasises differences in technical efficiency and progressiveness, in levels of skill in the labour force, and in the quality of the products of the various regions, and it is clear that these factors, too, were significant in accounting for regional variations in the prosperity and strength of the industry.

The nature and paucity of the evidence available in fact compel the skill of the labour force to be judged mainly from the proportion of men employed, and technical efficiency and progressiveness mainly in terms of the size of establishments, and the amount of power used compared with labour and equipment. However, the conclusions of the various, largely independent analyses undertaken all point in very much the same direction and so it is possible to give a reasonably confident summary of the comparative strength of the regions.

(23) See above esp. Chapter III esp: pp.59-72

Most evident is the fact that the Lancashire industry was organised on a large scale and a highly capitalistic base, and in these respects was more like the cotton industry than silk production elsewhere. Power supplies were almost invariably steam; a high proportion of the labour force consisted of skilled adults; establishments in all branches of production were large; high quality goods appear to have been produced and, apart from in the weaving sheds, the amount of power employed per workers was high. The industry in much of the south east of England and in Norfolk was in many respects similar to Lancashire's. Production units were about the same size, though the labour force, with a much lower proportion of men, was probably less skilled. In Norfolk, Essex and Hertfordshire power and labour were used in proportions similar to those found in Lancashire but, in total contrast, the mechanised industry of Suffolk and Buckinghamshire (which was limited to throwing) was peculiarly labour intensive and probably less progressive, producing only low quality yarns. The one mill which remained in Hampshire by 1850 was similarly labour intensive, employed mainly children and was almost certainly engaged in only the simpler processes of yarn production. The amounts

of labour, power and spindles employed in the mill hardly changed, even in the boom years of the late 1850s and the mill soon closed in the difficult period after the 1860 Treaty.⁽²⁴⁾

In the South West region the industry operated on a much smaller scale and appears to have been less advanced than around London. The number of workers employed per mill was fewer; the apparently high consumption of power probably merely reflected the region's dependence on water power; the labour force in both factory and domestic industries was almost entirely female, and the ratios in which spindles were combined with power and labour suggest that simple goods were produced. Perhaps the industry in Dorset was an exception to this general rule, for here silk throwing was almost entirely controlled by one firm, known to be progressive and to have had initiative and competence.⁽²⁵⁾ Here the industry expanded, the number of workers employed almost doubling in the 1840s (see Figure 5.3) and the data shown in Figure 6.6. suggest that higher quality yarns were produced.

(24) See below p.230 and Figure 8.2.

(25) See Warner (1921) p.335-6 and below p. 270.

In the Cotswolds, the Gloucestershire mills may have been the major source of the varied and high quality yarns required by the Coventry ribbon weavers, as the mills here showed considerably higher ratios of spindles to horsepower than in either Worcestershire or Warwickshire (see Figure 6.6.). In other respects, however, they seem technically less advanced than their Worcestershire counterparts, for they operated on a smaller scale and were relatively labour intensive concerns.

Little comment is possible on the specialised waste silk spinning which dominated the Yorkshire industry, but the evidence available and the industry's subsequent growth suggest that silk spinning was already technically advanced and able to hold its own against anyone in the world.⁽²⁶⁾

In Warwickshire on the other hand the commercial, if not in 1850 the technical, basis of specialisation was unstable and collapse was imminent.⁽²⁷⁾ In the East Midlands, Derbyshire appears to have had the stronger industry in 1850, especially in terms of the proportion of men employed and the large scale of production (see Figures 6.2. and 6.4.),

(26) See Warner (1921) pp.403-6 and 417-20: and below pp. 278-281.

(27) See Prest (1960) pp.56-63 and 88-93: and below pp. 200-201.

while in Nottinghamshire silk production continued to be secondary to hosiery manufacture, which in particular appears to have restricted the relative availability of male workers to silk manufacturers.

In the South West Pennines large variations between individual enterprises are concealed in the county data and it is possible to draw few conclusions from figures which aggregate almost one-third of the total English industry. It is evident, however, that a relatively high proportion of the labour force were men (which suggests a greater measure of skill than in many regions) and that, in the throwing mills of Cheshire at least, a large range of high quality yarns were produced.⁽²⁸⁾ It is clear, however, that large scale units of production did not predominate. Nevertheless, whether the strength of the industry in this region lay in its overall concentration and the resulting economies,⁽²⁹⁾ or in the diversity of its organisation and products, it was able to maintain its dominating position, almost unimpaired, through the violent changes that lay ahead.

(28) See Figure 6.6. and compare with "Tariff Commission" (1905) 3279. A Macclesfield throwster said they produced over 100 different yarns. In Leek twisting and doubling were more important and hence the spindle/power ratio is low.

(29) See above pp. 77-80.

REFERENCES FOR CHAPTER VI

The major statistical sources for this chapter are:-

FACTORY INSPECTORS' RETURNS

"A Return of the Number of Power Looms used in Factories (1835)" H.C. (1836 vol.XLV) p.195.

"Return of all Mills and Factories... June 1838" H.C. (1839 vol.XLII) pp.1-

"Number of...Silk Factories....in each County..." H.C. (1850 vol.XLII) pp.455-

Additional reference is made to:-

C.L. MELLOWES (1933) "The Geographical Basis of the Natural Silk Industry of the West Pennines." Unpubl. M.A. thesis: University of London.

C.L. MELLOWES (1934) "The Geographical Basis of the West Pennine Silk Industry." J. of the Textile Inst. (1934) Proceedings pp.376-388.

J. PREST (1960) "The Industrial Revolution in Coventry."

R. RAWLLEY (1919) "Economics of the Silk Industry: A study in Industrial Organisation."

A.J. TAYLOR (1949) "Concentration and Specialisation in the Lancashire Cotton Industry (1825-1850)." Econ Hist. Rev. Series II vol.1 pp.114-122.

SIR F. WARNER (1921) "The Silk Industry of the United Kingdom."

B.G. WARRINGTON (1932) "The Historical Geography of the Silk Industry in Macclesfield, Congleton and Leek." Unpubl. B.A. Thesis: University of Liverpool.

GOVERNMENT PAPERS.

"Report of the Tariff Commission: Evidence on the Silk Trade." Vol.2 Pt. 6. (1905)

CENSUS VOLUMES: 1851

CHAPTER VIITECHNICAL ADJUSTMENT TO A CHANGING ECONOMIC CLIMATE:1850 - 1870

During the 1850s and 1860s the English silk industry was again subject to particularly violent fluctuations. Rapid expansion occurred in the mechanised branches throughout the 1850s accompanied by changes in the techniques of manufacture and in the organisation of the mills. Toward the end of the decade there were more mill workers in the silk industry than at any time before or since. A sharp recession occurred in the spring of 1860, following the sudden removal of tariff protection and this developed into an extended depression, which was intensified between 1863 and 1865 by a world shortage of raw silk.⁽¹⁾ However the increase in foreign competition did not lead to any immediate or absolute collapse of the English silk industry. In 1867 the mechanised industry still employed a labour force almost as large as it had in 1850 before the

(1) See Fact. Insp. Report (1865) p.315: "Tariff Commission." (1905) 3595. 3257.

intensification of the boom; and production reached a second peak between 1870 and 1872 when the chief continental competitors were again at war "and orders flowed in from the continent in a golden stream."⁽²⁾ But this recovery was shortlived and once conditions returned to normal only one or two specialised branches of production showed any further expansion. From the mid 1870s the industry as a whole suffered a gradual and continuous decline.

Considerable changes occurred in the distribution of the silk industry as a result of the fluctuations in fortune over these twenty years and the events of this period were very significant in shaping the development and distribution of the industry for the next half century. This chapter considers, as far as the data allows, the technical background to the changes, and Chapter VIII examines the changes which occurred in the distribution of silk manufacturing.

(2) Davis (1961) p.378.

A) THE FACTORY INSPECTORS' RETURNS IN A PERIOD OF CHANGE

The Factory Inspectors' Returns provide the most suitable available data for a study of the fluctuating fortunes of the silk industry, for, as in 1850, few other sources exist. Returns were made sufficiently frequently over the period (in 1850, 1856, 1861, 1867 and 1870) to give some indication of the short term changes which occurred, and information is available for the power and equipment installed and not merely for the number of workers employed. The Returns are thus a far superior source to the infrequent Population Censuses. Nevertheless, there are still a number of difficulties to be aware of when using the data.

Firstly, the Returns were not designed to record fluctuations in activity and do not generally occur in the most significant years for the purposes of this analysis. In most counties in England activity in the mechanised silk industry was greatest at some time between 1856 and 1861 (two years for which Returns were made); and there is no satisfactory measure of the nadir which the industry reached in the 1860s, for by 1867, when the Returns show a minimum of employment and equipment almost everywhere, many sections

of the industry were in fact already on the way to recovery.

A second major weakness of the Returns lies in the difficulty of analysing individually and in detail either the throwing or the weaving branch of the industry. It has already been seen that the classification used by the Factory Inspectors makes it difficult to divide the labour and power used in combined mills between the two basic branches of the industry, even in the relatively static and "normal" conditions of 1850.⁽³⁾ In the rapidly changing circumstances of the following twenty years the difficulties increase. The ratios between labour, power and equipment installed in both specialised and combined mills changed quickly. Manufacturers responded to fluctuations in demand by immediately increasing or decreasing their labour forces, but the amount of equipment installed and the size of the power source was changed only slowly in response to new conditions. Additional machinery was seldom installed in the early stages of expansion, and during decline there was invariably an unknown quantity of equipment installed in the mills

(3) See above p.126 and p.157.

(and recorded in the Returns) which was not in use. The ratios between the different measures were consequently constantly changing in a haphazard way, as shown in Table 7.1., and must be treated with caution. In particular, they are emphatically not sufficiently realistic to be used as a basis for estimating the division of labour or power in the combined mills between yarn and cloth production.

It is possible to make an exception of a single year, 1867, when, as in 1850, the industry was in the early stages of expansion and it is likely that equipment was fully, but not over used. For that year alone the ratios between labour, equipment and power are sufficiently reliable to use with little reservation, and only in 1867 is it possible to estimate the division of labour between the throwing and weaving processes in the combined mills, using the same method as previously⁽⁴⁾ (see Table 7.2.). In the other years for which data are available, the ratios are unreliable, as there is almost certain to be either temporarily high levels of labour employment or unused equipment represented in the Returns. Thus in 1856 and 1870 demand for silk was running high and many mills were working beyond their normal

(4) See above p.126.

TABLE 7.1.

THE CHANGES IN THE NUMBER OF WORKERS AND AMOUNT OF
EQUIPMENT USED IN SILK MILLS IN ENGLAND: 1835 - 1878

	Persons Employed	Horse Power	Spindles Installed ('000)	Looms Installed
Number in 1838	33,553	3,270	N.A.	1,714 ⁽¹⁾
% Change 1838 - 50	+24	+9	N.A.	+255
Number in 1850	41,702	3,571	1,059	6,092
% Change 1850 - 56	+33	+42	+0.5	+52
Number in 1856	55,300	5,054	1,064	9,260
% Change 1856 - 61	-7	+34	+23	+15
Number in 1861	51,191	6,750	1,306	10,635
% Change 1861 - 67	-21	-3	-12	-0.8
Number in 1867	40,256	6,535	1,148	10,551
% Change 1867 - 70	+18	+27	-3	+15
Number in 1870	47,311	8,294	1,115	12,135
% Change 1870 - 74	-6	N.A.	+18	-20
Number in 1874	44,419	N.A.	1,319	9,749
% Change 1874 - 78	-9	N.A.	-24	+27
Number in 1878	40,216	N.A.	999	12,335

Notes: (1) Number in 1835.
The Table gives the information for each year in which a full return was made by the Factory Inspectors' in these forty years. Less detailed returns were made in 1835 and 1847.

TABLE 7.2.

THE ESTIMATED DIVISION OF LABOUR BETWEEN THROWING
AND WEAVING IN COMBINED MILLS: 1867

COUNTY	TOTAL EMPLOYMENT IN COMBINED MILLS	ESTIMATE OF MEAN EMPLOYMENT IN:-		ERROR (+ or -)	SPINDLES ÷ LOOMS
		THROWING	WEAVING		
Cheshire	1,542	686	856	68	40
Staffs.	849	656	193	149	87
Lancs.	3,652	796	2,856	237	18
Yorks.	240	194	40	4	233
Derbys.	1,173	419	754	61	44
Notts.	291	98	193	24	39
Warwicks.	175	18	157	17	5
Essex	1,851	1,107	744	250	107
Norfolk	2,369	1,661	708	41	84
Somerset	376	273	103	51	91
Wilts.	521	328	193	91	59
Devon	300	181	119	44	43
ENGLAND	13,339	6,417	6,916	-	51

Notes: (1) A high ratio in the final column suggests an industry in which throwing predominated.

(2) For the significance of the last two columns see above p.126.

capacity, and in 1861 and 1874 the market was dull and unused equipment appears in the Returns. The imbalance between the different measures of activity is particularly great in 1861 when the figures for power and equipment recorded in the Returns are near to the maximum levels reached at the height of the boom a year or two earlier, while the industry's work force had already been considerably reduced.

This study of the data deficiencies suggests that figures for persons employed are the most satisfactory for tracing the fortunes of the silk industry in the various regions. On the one hand, they are the most sensitive to short term change, and on the other they relate most meaningfully to both the throwing and the weaving branches of the industry. But the data in the Returns do not relate to the years that were the peaks and troughs of activity and so to provide a more significant statement the employment figures have been slightly modified. Figure 8.1. has been drawn to show, for each county, ⁽⁵⁾ the increase in employment between 1850 and the year in which the "peak" of employment was recorded. (In most cases this was in 1856 but in a few counties not until 1861). Similarly Figure 8.2. shows the

(5) Data in the Returns were aggregated at a county level throughout the period.

decline between the "peak" recorded in 1856 or 1861 and the "nadir" recorded in the 1860s (which in all but five counties occurred in 1867).

At a national level the sum of "peak" employment for each county almost certainly gives a reasonable indication of total employment reached at some time between 1856 and 1861, but employment at the industry's nadir was probably considerably below the sum of the minimum figures recorded. It therefore appears justified to make comparisons at national, regional and county levels in terms of the "peak" and "nadir" reached, but it is impossible to say how accurately these recorded extremes represented actual conditions.

Chapter VI has already shown that an analysis based solely on employment data is liable to ignore the considerable differences between regions in the techniques of silk manufacture. Before turning to a regional analysis of the industry based largely on employment figures, it is therefore proposed to study the evidence available for the changes in the techniques and organisation of the silk industry which occurred in the twenty years of rapid change after 1850. ..

B) TECHNICAL ADJUSTMENTS IN THE THROWING BRANCH

The most significant technical change which occurred in silk throwing in the mid-nineteenth century was that production became increasingly power intensive. By 1850 the techniques of production appear to have improved sufficiently to allow output to be boosted simply by increasing the speed of the spindles. Consequently, with the incentive of increasing demand during the 1850s, there was a considerable increase in the relative use of power in the specialised silk throwing mills.⁽⁶⁾ However, these changes appear to have been largely limited to the more progressive industry of the Pennine province, and here the industry became technically even further advanced than in the specialised mills of southern England, where output appears to have been increased by the application of increasing amounts of labour (see Table 7.3.). In contrast to these generally backward mills, the few combined mills in East Anglia and

(6) Production also became more power intensive in the combined mills but, like labour, it is not possible to relate power directly to the throwing or weaving processes. See above pp. 126 and 157.

TABLE 7.3

A) A COMPARISON OF THE RATES OF CHANGE IN THE LABOUR EMPLOYED AND THE POWER AND SPINDLES INSTALLED IN SPECIALISED SILK THROWING MILLS IN THE PENNINE PROVINCE AND SOUTHERN ENGLAND: 1850 - 1867.

Period	% Change in:-		
	EMPLOYMENT	HORSE POWER	SPINDLES
	<u>ENGLAND</u>		
1850 - 56	+19.5	+32.7	-8.7
1856 - 61	-8.6	+39.0	+29.9
1861 - 67	-23.6	-19.2	-24.8
	<u>PENNINE PROVINCE</u>		
1850 - 56	+14.5	+42.3	-11.9
1856 - 61	-4.8	+59.3	+39.2
1861 - 67	-8.4	-7.7	-1.1
	<u>SOUTHERN ENGLAND</u>		
1850 - 56	+32.8	+13.4	-2.1
1856 - 61	-17.2	-12.8	+12.7
1861 - 67	-63.8	-62.6	-78.7

B) RATES OF CHANGE IN THE LABOUR EMPLOYED AND THE POWER, SPINDLES AND LOOMS INSTALLED IN THE COMBINED MILLS OF SOUTHERN ENGLAND: 1850 - 1867

Period	EMPLOYMENT	HORSE POWER	SPINDLES	LOOMS
1850 - 56	+42.0	+38.4	+35.4	+4.2
1856 - 61	-0.3	+37.4	+13.4	-9.4
1861 - 67	+38.5	+19.7	+49.3	+69.0

the South West appear to have become increasingly power intensive (though the evidence is less reliable) and in these throwing probably remained as technically advanced as in the Pennine province.

In short, despite the relatively small increases in the employment of labour and in the number of spindles installed in the throwing branch of the silk industry, there can be little doubt that the output of thrown and spun silk yarn increased considerably during the 1850s, for much of the throwing branch responded to boom conditions by greatly increasing its productivity, and machinery as well as labour became more productive by the application of greater amounts of power.

After 1860, when the incentives of booming output and high profits disappeared, there was little further improvement in the productivity of silk throwing and, with extreme competition from imported yarns, the differences in the level of technical advancement between the throwing industry in the Pennine province and the south of England became critical. Although a wide variety of yarns were produced, the throwsters output was largely of standardised products. Identical yarns

could be brought from Italy and France where wages were lower⁽⁷⁾ and where the manufacturers benefitted from the economies of vertical integration, which were made possible by concentrating all processes from sericulture to silk throwing in one place.⁽⁸⁾ Even in the Pennine province the throwing branch declined in the face of cheaper imports. But weaker units seem to have been eliminated leaving, if anything, a slightly more power intensive industry which was better able to withstand the commercial stresses. In the south the combined mills (whose products remained in demand) expanded, but the labour intensive and rather backward industry in the specialised mills collapsed and its simple products were replaced by imported goods (see Table 7.3.).⁽⁹⁾

Although the techniques of silk throwing underwent considerable change between 1850 and 1870, the organisation of this branch of manufacture appears to have altered little. Specialised throwing mills continued to account for the bulk of output, gauged from the number of spindles installed,

(7) Wages were lower everywhere on the continent and in Italy amounted to only half the British rate.

"Tariff Commission" (1905) 3072, 3149.

(8) See Rawlley (1919) p.226: "Tariff Commission" (1905) 3310. 3108.

(9) The industry in the combined mills and the regional impact of all these changes is considered in greater detail below. See p.p.277-234.

although the collapse of these mills in the south of England increased the relative importance of the combine mills after 1860. (see Table 7.4.). Despite the increased productivity of labour, the scale on which the throwing mills operated remained relatively stable. In England as a whole the average number of workers in throwing mills fluctuated between 107 and 131 between 1850 and 1874, and, except in the South West where the scale of operations increased considerably, the regional differences in the average size of the mills remained much as they were in 1850 (see Table 7.5.)⁽¹⁰⁾

Thus silk throwing continued to be organised chiefly in specialised mills and on the same scale as it was in 1850. Technical advances, involving the increased application of power, were made particularly in the mills of the Pennine Province, but the more backward industry of the south largely collapsed after 1860 when identical but cheaper products could be imported. A more detailed analysis of the regional implications of these changes will be made in Chapter VIII, but in general terms commercial difficulties brought an increasing concentration of production and employment into the more efficient mills of the Pennine province.

(10) Compare with Figure 6.4. above.

TABLE 7.4.

ANALYSIS OF
SPINDLES INSTALLED IN COMBINED SILK MILLS IN
ENGLAND: 1850 - 1878

YEAR	TOTAL SPINDLES IN SPECIALISED WEAVING AND COMBINED MILLS No. in '000	SPINDLES IN COMBINED MILLS	
		No. in '000	% of TOTAL
1850	1,059	173	16
1856	1,064	253	24
1861	1,306	254	19
1867	1,148	358	31
1870	1,115	344	33
1874	1,319	346	27
1878	999	353	35

TABLE 7.5.

REGIONAL VARIATIONS IN THE SIZE OF THE SPECIALISED
SILK THROWING AND SPINNING MILLS: 1850 - 1874

Region	<u>Average employment per mill as % of</u> <u>national average in :-</u>					
	1850	1856	1861	1867	1870	1874
S.W. Pennines	95	88	74	77	79	87 ⁽¹⁾
Lancashire	169	100	219	234	228	220
Yorkshire	85	77	108	119	72	119
East Midlands	101	128	127	129	141	99
Warwicks. & Cots.	55	80	78	97	127	77 ⁽¹⁾
Norfolk	38	-	-	-	-	166
Essex & Suffolk	179	177	223	187	187	
London & Chilts.	183	176	168	145	205	161
Berks. & Hants.	85	61	83	-	62	-
The South West.	85	108	114	114	140	131

Note: (1) Staffordshire is included with Warwickshire and the Cotswolds, not with the South West Pennines in 1874.

C) TECHNICAL ADJUSTMENTS IN THE WEAVING BRANCH

In the weaving branch of the silk industry, techniques of production changed much more in the mid-nineteenth century than they did in throwing and, as a result, the organisation of silk weaving changed completely. During the 1840s power looms were at last technically efficient and able to handle the delicate silk yarns.⁽¹¹⁾ Powered weaving was rapidly extended and the greater productivity of these looms initiated the collapse of domestic weaving, though not immediately or inevitably. For example, in the Warwickshire ribbon trade the boom of the 1850s was so intense that the number of hand loom weavers was virtually maintained at around 20,000 until late in the decade, despite a three fold increase in the number of power looms installed.⁽¹²⁾ But in the regions of broadsilk manufacture many hand loom weavers were quickly made redundant (as they had been in cotton twenty years previously). Thus despite the prosperity of the mechanised branch of the industry (where employment increased by 9,500 persons between 1850 and 1861), employment in the domestic branch⁽¹³⁾ of silk

(11) See above p. 124. (12) See below p. 222.
 (13) The Domestic branch is assumed to consist of those workers recorded by the Censuses but not included in the Factory Inspectors' Returns. See above pp. 141-42.

manufacture was already declining in the 1850s⁽¹⁴⁾ and after the 1860 Treaty the rate of decline accelerated (see Table 7.6.).

In the 1850s the collapse of domestic weaving was felt almost everywhere, though some regional contrasts were apparent. In Essex and Suffolk, where high quality goods continued to be woven by hand, the decline of domestic weaving was as slight as in the Warwickshire ribbon trade. In Lancashire and the South West Pennines employment of domestic workers had declined by only one-quarter by 1861, despite the considerable expansion, especially in Lancashire, of the number of power looms. These regions were clearly the dominant centres of broad weaving (by power and by hand) during the boom, for in almost all other regions the domestic industry declined at a much greater rate. (see Table 7.7.).

By 1871, after a decade in which the entire silk industry had been in difficulties, the domestic industry virtually ceased to exist except in Warwickshire and the three major regions of broad weaving. Even in these four regions - Lancashire, London, Warwickshire and the South West Pennines - the absolute decline of employment in the domestic industry was extremely heavy, with a loss by 1871 of 50,000 of the

(14) Before 1850 there was no data available in the Census or elsewhere to assess the numbers employed in the domestic industry. See above pp.139-40.

TABLE 7.6.

TOTAL EMPLOYMENT IN THE FACTORY AND DOMESTIC SILK INDUSTRIES
IN ENGLAND: 1850 - 1871

YEAR	FACTORY EMPLOYMENT		DOMESTIC EMPLOYMENT		TOTAL EMPLOYMENT		% of total employment found in factories
	No. of workers	% change over decade	No. of workers	% change over decade	No. of workers	% change over decade	
1850/51	41,702	} +23	93,945	} -29	135,647	} -13	31
1861	51,191		66,798		117,989		
1870/71	47,311	} -8	34,742	} -48	82,053	} -30	58

Note: Domestic employment is assumed to be the difference between factory employment (derived from the Factory Inspectors' Returns) and total employment (derived from the Population Census).

TABLE 7.7.

THE DECLINE OF NON-FACTORY EMPLOYMENT IN THE
SILK INDUSTRY: 1851 - 1871

Region	Estimated Number of Domestic Silk Workers			% Decline	
	1851	1861	1871	1851-61	1851-71
Lancashire	23,483	17,691	9,070	25	61
London & Chilts.	21,427	12,847	6,658	40	69
Warwicks.	20,790	18,771	9,801	10	53
S. W. Pennines	13,235	9,996	6,177	24	53
Norfolk	4,436	1,991	19	55	100
Essex & Suffolk	2,848	2,643	1,089	7	62
East Midlands	3,389	1,605	1,890	53	44
Yorkshire	1,791	126	-315 ⁽¹⁾	93	-
The South West	858	616	127	28	85
Hants, Berks, Sussex.	657	274	128	58	81
Other	1,031	238	98	75	93
ENGLAND	93,945	66,798	34,742	29	63

Notes: (1) The negative value for Yorkshire in 1871 arises from the different data bases of the sources used to estimate domestic employment.

(2) The Cotswold counties, which had small negative values in all years, have been included with "Other".

80,000 non-factory workers found in 1851. But the rate of decline was below the general level and the proportion of England's domestic workers found in these areas increased from eighty-four per cent to ninety-one per cent. Elsewhere a significant number of domestic workers were retained only in Nottinghamshire and Leicestershire, where lace production was prospering and in Suffolk, where high quality goods continued to be hand woven.⁽¹⁵⁾ Even in Norfolk, formerly a major region of hand loom weaving, power looms completely displaced the domestic weaver.

Thus the increased productivity of the power loom led to the rapid but regionally selective collapse of domestic weaving in the silk trade, as it had rather earlier in the other textile industries. But in silk, the finer and more intricate products still required hand weaving,⁽¹⁶⁾ and in the major centres of production a small but significant domestic industry continued after hand weaving had ceased elsewhere.

The power loom not only developed sufficiently to replace much of the silk weaving by hand in the mid-nineteenth

(15) See Warner (1921) pp.319-20.

(16) See Davis (1961) p.133; Rawlley (1919) p.208.

century, it was also continually improved and became increasingly productive itself. In these advances, the ribbon loom appears to have lagged behind the broad loom (partly because the small scale of the organisation in the former trade increased the difficulties of applying improved methods)⁽¹⁷⁾ and so Warwickshire's industry is treated separately in the following analysis.

The most significant technical advance, in both broad-weaving and ribbon manufacture, was that labour was being increasingly efficiently used. In the specialised weaving mills more power was applied per worker and the ratio of looms to workers was increasing throughout the 1850s (see Table 7.8.). In broad loom weaving, where the greatest changes occurred, there were by 1861 only one and a half persons for each loom compared with over two in 1850. The amount of power applied to broad looms appears to have increased during the last few years of the boom, but in ribbon weaving the number of looms was increased without a corresponding expansion in the power applied, most probably with slower and less efficient working as a result. The rate of technical change in the combined mills, which survived the

(17) See below pp.201-203.

TABLE 7.8.

THE APPLICATION OF LABOUR AND POWER TO LOOMS
IN THE SPECIALISED SILK WEAVING MILLS
IN ENGLAND: 1850 - 1861

YEAR	<u>EMPLOYMENT</u> <u>PER 1 H.P.</u>		<u>LOOMS PER</u> <u>1 H.P.</u>		<u>LOOMS PER</u> <u>EMPLOYEE</u>	
	Warwicks. (Ribbon)	The Rest of England (Broad)	Warwicks. (Ribbon)	The Rest of England (Broad)	Warwicks (Ribbon)	The Rest of England (Broad)
1850	12.1	18.6	4.9	9.2	0.40	0.49
1856	12.3	16.8	5.4	9.2	0.44	0.54
1861	9.6	12.4	6.0	8.3	0.62	0.66

slump most strongly, was probably at least as great as in the specialised concerns, but details are not available.

In broad weaving (in contrast with silk throwing) a greater increase in the use of power appears to have occurred after the 1860 treaty. (see Table 7.9.). Neither domestic hand loom production nor the more labour intensive weaving mills using scarcely any power were able to compete with goods from the Continental manufactures (particularly in France) who used cheap hand labour. For these economic rather than technical reasons silk weaving was rapidly concentrated into large factories using modern looms and relatively large amounts of power.⁽¹⁸⁾ The number of power looms installed for broadweaving continued to increase after 1860 (see Table 7.10.); production became even more power intensive, and the number of employees per loom was further decreased (see Table 7.11.). In fact, this was the last stage in this industry's technical revolution which had begun, in 1717, earlier than in other textile industries, but lacked the economic incentive to reach completion until late in the nineteenth century.

(18) See Rawlley (1919) p.236

TABLE 7.9.

AVERAGE RATIOS OF POWER TO LOOMS AND EMPLOYMENT IN
ENGLAND'S MILLS WEAVING BROAD SILK: 1850 - 1867

YEAR	<u>H.P. PER</u> <u>EMPLOYEE</u>		<u>H.P. PER</u> <u>LOOM</u>	
	H.P.	% change	H.P.	% change
1850	0.0537	} +10	0.109	} 0
1856	0.0592		0.109	
1861	0.0806	} +36	0.121	} +11
1867	0.1495		0.186	
		} +85		} +53

Note: This table relates to all specialised silk weaving mills in England except those in Warwickshire.

TABLE 7.10.

THE NUMBER OF POWER LOOMS INSTALLED IN
ENGLAND'S SILK MILLS: 1850 - 1870

YEAR	LOOMS IN WARWICKSHIRE (Ribbon)		LOOMS IN THE REST OF ENGLAND (Broad)		TOTAL LOOMS
	No.	% change	No.	% change	
1850	753	} +131	5,339	} +41	6,092
1856	1,741		7,519		9,260
1861	2,065	} +19	8,570	} +14	10,635
1867	1,408		9,143		10,551
1870	2,021	} +44	10,114	} +11	12,135

TABLE 7.11.

THE APPLICATION OF LABOUR AND POWER TO LOOMS
IN THE SPECIALISED SILK WEAVING MILLS IN
ENGLAND: 1861 - 1870

YEAR	<u>EMPLOYMENT</u> <u>PER 1 H.P.</u>		<u>LOOMS PER</u> <u>1 H.P.</u>		<u>LOOMS PER</u> <u>EMPLOYEE</u>	
	Warwicks. (Ribbon)	The Rest of England (Broad)	Warwicks (Ribbon)	The Rest of England (Broad)	Warwicks (Ribbon)	The Rest of England (Broad)
1861	9.6	12.4 (1)	4.9	9.2 (1)	0.40	0.49
1867	12.5	6.6	6.9	5.3	0.55	0.82
1870	11.7	4.3	7.1	2.6	0.60	1.01

Note: (1) Weaving mills in Norfolk, which were recorded as having extraordinarily large power supplies, have been omitted.

Despite these improvements in productivity, many of the plainer products of the English silk weavers were still more expensive than imported manufactures. The producers of fashionable articles had a measure of protection by being able to reach the London market ahead of their overseas competitors, but most of the industry rapidly became concentrated on producing a limited range of high quality goods in which the English manufacturers were technically and commercially advanced.⁽¹⁹⁾

It is impossible to assess what technical change took place after 1861 in the powered ribbon weaving industry of Warwickshire, for production declined rapidly in the powered as well as the manual branch of the industry in the face of competition from low cost domestic producers in France (see Table 7.10 and 7.7.). The small scale and labour intensive nature of its powered branch was a major cause of the collapse of Coventry's trade, though the timing of the treaty (which left huge stocks of unsaleable goods in the warehouses)⁽²⁰⁾ and a prolonged strike in Coventry⁽²¹⁾ added to the

(19) See "Tariff Commission" (1905) 3310 and below pp.257-262.

(20) "Tariff Commission" (1905) 3390

(21) See Prest (1960) pp.119-127.

manufacturers' difficulties in facing competition. The powered section of the industry was briefly revived during the Franco-Prussian War, but when conditions on the continent returned to normal the entire trade contracted markedly.⁽²²⁾

D) REGIONAL CONTRASTS IN THE ORGANISATION OF POWERED WEAVING

A major reason for the differences in productivity and efficiency - and so in the response to the 1860 treaty - of the powered broad weaving and the Warwickshire ribbon industries stemmed from the great contrast in the organisation of these two branches of weaving. The small scale and labour intensive organisation, characteristic of ribbon manufacture, was a result of the development from 1847⁽²³⁾ of "cottage factories"⁽²⁴⁾ in Coventry alongside the few large scale mills. Table 7.12 shows the huge increase in the number of "factories" in the 1850s, especially in the last few years of the decade, and the resulting decline in the average scale of operation. In fact Table 7.12. rather underestimates the number of cottage factories at the height of the boom: in 1860 there were 383

(22) See below p.p. 271-273.

(23) See Fact. Insp. Report (1859) p.452.

(24) A cottage factory was formed when power from a shared steam engine was applied to the looms in the weavers' workshop in the garret of his house. The "Factory" was either converted from hand working or, later, specially built. See Prest (1960) p.96

TABLE 7.12.

THE SCALE OF OPERATION IN WARWICKSHIRE'S

RIBBON WEAVING MILLS: 1850 - 1861

DATE	No. of WEAVING MILLS	TOTAL No. of LOOMS	AVERAGE EMPLOYMENT PER MILL	AVERAGE HORSE POWER PER MILL	AVERAGE No. of LOOMS PER MILL
1850	19	704	92	7.5	37
1856	88	1,741	45	3.7	20
1861	326	2,065	10	1.1	6

with between two and six looms in each. In total they contained between 1,000 and 1,500 looms, almost exactly the same number as were installed in the fifteen large scale mills (with an average of eighty-three looms each) at work in the city in 1859. (25)

The cottage factory was less efficient than the large scale mills, (26) and their establishment and apparent success in the 1850s was for social rather than economic reasons.

The outdoor weavers, the "first hand journeymen", who owned their own looms and who detested the lower class of factory workers, were determined to continue working at home even in an age of steam power. (27) A steam engine at the end of a row of weavers' houses provided power to their "topshops" and the weavers gained a measure of the benefits of mechanised production while maintaining their independence and superior social status. (28)

After 1860 the cottage factory lingered on for a considerable time, but this was more on account of the capital invested in the system than because it had any intrinsic

(25) Fact. Insp. Report (1859) p.452 (1861) and p.446.

(26) See Prest (1960) p.113 and compare above p.198.

(27) See Prest (1960) pp.52-3.

(28) See Prest (1960) pp.94-112.

merit or ability to meet competition,⁽²⁹⁾ but by the start of the twentieth century the industry which remained was concentrated into the large scale mills.⁽³⁰⁾

In marked contrast to the small scale and distinctive organisation of ribbon manufacture in Coventry, the broad weaving section of the industry - which for the purposes of this analysis is taken to include all mills outside Warwickshire - comprised predominantly large scale units. But even in this branch there were considerable variations in the organisation of production in different regions. In the major broad weaving areas of southern England (in Essex, Norfolk and the South West) the weaving industry remained almost static. The number of looms installed hardly increased in the boom (in fact in East Anglia production expanded most rapidly after 1861) and the scale of operation, with considerably larger combined mills in Essex and Norfolk than in the South West, changed little during the twenty years after 1850.⁽³¹⁾ (See Tables 7.13. and 7.14.). The small scale, specialised weaving mills, which had been found in Norfolk and the South

(29) See Fact. Insp. Report (1865) p.314

(30) See Warner (1921) p.125 and below p.273.

(31) See above p.168.

TABLE 7.13.

POWERED LOOMS IN THE SILK MILLS OF SOUTHERN ENGLAND:
1850 - 1870

YEAR	<u>THE SOUTH WEST</u>		<u>NORFOLK</u>		<u>ESSEX</u>		<u>OTHER</u> ⁽¹⁾	
	Total No. of Looms	% in Combined Mills	Total No. of Looms	% in Combined Mills	Total No. of Looms	% in Combined Mills	Total No. of Looms	% in Combined Mills
1850	386	68	951	67	570	100	0	-
1856	346	88	1,029	64	569	100	74	0
1861	425	91	632	62	591	100	16	100
1867	406	91	1,536	81	728	100	79	0
1870	458	90	1,254	100	765	100	121	0

Note: (1) Looms in Gloucestershire and Worcestershire (significant only in 1850) were probably ribbon looms and like Warwickshire's have been omitted. The 16 looms recorded in 1861 were in Suffolk; the remainder were around London.

TABLE 7.14.

THE SCALE OF OPERATIONS IN THE COMBINED MILLS OF SOUTHERN
ENGLAND: 1850 - 1870

YEAR	THE SOUTH WEST			NORFOLK			ESSEX		
	Average number of:-			Average number of:-			Average number of:-		
	Looms per mill	Spindles per mill	Employees per mill	Looms per mill	Spindles per mill	Employees per mill	Looms per mill	Spindles per mill	Employees per mill
1850	87	6,200	232	318	29,900	525	570	12,000	1,014
1856	77	4,500	199	164	19,700	509	569	25,300	1,089
1861	65	4,900	177	548	25,100	548	591	31,800	1,166
1867	74	4,900	239	208	17,400	395	728	77,500	1,851
1870	103	6,700	181	209	17,300	376	383	24,700	836 ⁽¹⁾

Note: (1) It appears that a small combined mill operated in Essex in 1870 in addition to the longstanding huge one.

West, declined in importance and the more efficient, large scale combined mill became even more dominant.⁽³²⁾

In the East Midlands, too, the small amount of weaving of both broad goods and ribbons⁽³³⁾ was concentrated into combined mills (see Table 7.15.). These operated on an even smaller scale than those in the South West (but were not nearly so tiny as the Warwickshire ribbon concerns) and their throwing enterprises appear merely to have produced enough yarn for their own needs (see Table 7.15.). Despite the considerable local supply of yarn, specialised weaving mills were found in the East Midlands only at the height of the boom. In 1861, there were twenty-eight mills recorded, half of them in Leicestershire. These too operated on a very small scale, with an average of only thirty-three looms and sixty employees each, and they had completely disappeared by 1870.

This sudden appearance and abrupt collapse of small scale producers as boom and slump alternated was one of the distinctive features of the silk industry. It demonstrates

{32} Compare with Rawlley (1919) pp.233-234.

{33} See above p.71.

TABLE 7.15.

WEAVING IN THE SILK MILLS OF EAST MIDLANDS: 1850 - 1870

YEAR	TOTAL No. of Looms	% in Combined Mills	<u>Scale of Operation in Combined Mills:-</u>		
			LOOMS per	SPINDLES mill	EMPLOYMENT
1850	407	100	51	2,300	330
1856	399	100	57	3,699	347
1861	967	6	28	1,484	109
1867	531	76	48	2,073	146
1870	379	100	26	3,302	164

the difficulty of analysing the geography of the industry for any "normal" period: in fact the locational patterns of silk manufacture were as ephemeral as the prosperity of the industry itself.

In Lancashire, where the number of looms more than doubled in the 1850s, weaving was organised quite differently. Table 7.16. shows that by the late 1850s most looms were installed in large scale, specialised weaving sheds which had increased considerably in number and size since 1850. By 1861 there were twenty-seven mills specialising on silk weaving with an average of about one hundred and fifty looms in each. The link between the Cheshire throwsters and the Lancashire weavers was still vitally important: the number of spindles installed in Lancashire's silk mills actually declined over the decade (though the power applied to them increased) and much of the yarn output of Cheshire's mills must have been woven in Lancashire.

The rapid increase in the number of mills weaving silk in Lancashire suggests that a number of established mills turned from other textiles as profits in silk increased during the 1850s. In the subsequent slump some of the mills appear to have reverted to producing non-silk fabrics and

TABLE 7.16

WEAVING IN THE SILK MILLS OF LANCASHIRE: 1850 - 1870

YEAR	Total No. of Looms	<u>SPECIALISED WEAVING MILLS</u>			<u>COMBINED MILLS</u>		
		No. of Mills	No. of Looms	Looms Per Mill	No. of Mills	No. of Looms	Looms Per Mill
1850	1,977	7	763	109	7	1,214	173
1856	3,770	24	2,507	104	9	1,263	140
1861	4,201	27	3,875	144	5	326	65
1867	4,191	12	1,409	117	8	2,782	348
1870	5,238	25	4,837	193	3	451	150
1874	2,666	12	1,204	100	4	1,462	366

others may have combined silk throwing with weaving.⁽³⁴⁾

In all, the number of mills which specialised on weaving silk was halved between 1860 and 1867. But in 1870 when profits were again high, many mills again concentrated on silk weaving (see Table 7.16.). The variations may not, in fact, have been as extreme as the Returns suggest. Mills which always kept some looms in silk may merely have increased the number, with the result that they were classified as silk rather than, say, cotton mills in the Returns.⁽³⁵⁾

This alternation from fibre to fibre also underlies the difficulty of establishing representative locational patterns for the nineteenth century silk industry - an enormously more difficult task than for the cotton or wool - worsted trades. Indeed, the distribution of silk manufacturing was probably one of the most unstable and rapidly changing aspects of the industrial geography of Victorian Britain.

The general features of silk weaving in Lancashire, considered above, are evident, but the reasons behind the rapid fluctuation in the number of looms and in the scale of operations in combined mills (see Table 7.16.) are more obscure.

(34) See below p. 207.

(35) See above p.121.

A likely explanation is that a number of very large mills which specialised on weaving silk in the booms, applied some of the surplus power to silk throwing in the slumps. At the same time, smaller combined mills, which operated in the booms, appear to have left silk altogether when competition - from large scale producers at home as well as from imports - increased. In 1861, moreover, the largest combined mills, which had perhaps produced silk goods throughout the previous decade appear to have left the trade before the Returns were compiled.

In short, three distinct forms of organisation appear to have operated in Lancashire's combined mills. First, there were the original medium scale producers of yarn and cloth who operated through the 1850s. Secondly there were relatively small scale manufacturers who produced silk goods in the booms but quickly reverted to other textiles when silk's profitability was challenged. And thirdly there were large scale manufacturers who combined throwing and weaving when power was available in the slump, but who specialised on weaving in the boom.

There is little detailed evidence available from other sources to support these conclusions which are based solely on an analysis of the facts presented by the Factory Inspectors'

Returns. However, the transfer by textile firms from fibre to fibre as business dictated was a well-established practice,⁽³⁶⁾ and it is clear that in this, or in some similar fashion, the number of looms weaving silk in Lancashire could be rapidly adjusted to the trade's fluctuating prosperity. Thus the concentration and organisation of textile manufacturing in Lancashire led to a great degree of flexibility which, coupled with the earlier development of the domestic silk industry in the region, ensured the expansion of silk weaving there in its periods of prosperity. After 1870, however, when the silk industry could no longer match the profitability of cotton, silk manufacturing again became totally subservient to the major pursuit and the number of looms in silk declined.⁽³⁷⁾

In Cheshire specialised weaving mills became even more numerous than in Lancashire in the late 1850s, but the scale of operation in the two counties was quite different. In 1856 there were eleven sizeable weaving mills in Cheshire containing, on average, eighty-seven looms: by 1861 the number of weaving mills had increased to thirty-seven but the average

(36) Compare above p.9 and Warner (1921) p.154.

(37) See below p.p.284-87.

number of looms was only fourteen (see Table 7.17.). This was almost certainly the result of many small workshops, hither-to unpowered, having steam engines added in the last few years of the boom.⁽³⁸⁾

The numbers of combined mills in Cheshire also increased considerably during the late 1850s. These mills, which on average employed between 150 and 200 workers, were the largest units in the Cheshire silk trade. They probably grew from the biggest and most successful throwing enterprises, for at first they concentrated heavily on throwing⁽³⁹⁾ and accounted for almost one-fifth of Cheshire's spindles in 1861. Nevertheless they soon dominated the weaving branch, and contained more looms and wove on a larger scale than the specialised mills. In Staffordshire (presumably chiefly at Leek) six combined mills operating on a similar scale were recorded in 1856 and these certainly continued production until 1870 and probably until considerably later⁽⁴⁰⁾ (see Table 7.19.)

After the 1860 treaty, when competition in the market for thrown silk was particularly severe, many of the combined

(38) Compare Davis (1961) p.135.

(39) Moreover the average size of the specialised throwing mills declined markedly after the combined mills were established. See Table 7.18. and compare above p.125.

(40) After 1870 data in the Factory Returns are aggregated at a district, and not a county level, over most of the country and details for Staffordshire are not available. - but see below p.295.

TABLE 7.17.

WEAVING IN THE SILK MILLS OF CHESHIRE: 1850 - 1870

YEAR	TOTAL No. of Looms	SPECIALISED WEAVING MILLS			COMBINED MILLS		
		No. of Mills	No. of Looms	Looms Per Mill	No. of Mills	No. of Looms	Looms Per Mill
1850	955	11	178	16	6	777	130
1856	1,125	11	953	87	5	172	35
1861	1,509	37	529	14	24	980	41
1867	1,361	14	330	24	9	1,031	115
1870	1,524	16	765	48	8	759	95

TABLE 7.18.

UNIT EMPLOYMENT IN CHESHIRE'S SILK MILLS:1850 - 1870

YEAR	COMBINED MILLS	SPECIALISED THROWING MILLS	SPECIALISED WEAVING MILLS
1850	339	121	69
1856	161	105	125
1861	148	82	28
1867	171	91	26
1870	191	93	75

TABLE 7.19.

COMBINED SILK MILLS IN STAFFORDSHIRE: 1850 - 1870

YEAR	No. of MILLS	No. of LOOMS	LOOMS PER MILL	EMPLOYEES PER MILL
1850	0	0	-	-
1856	6	172	29	160
1861	6	210	35	207
1867	7	169	24	121
1870	6	120	20	170

mills in Cheshire failed, or turned to other textiles,⁽⁴¹⁾ as did many specialised throwing mills in the county. In the weaving branch many of the small scale and recently developed mills, which generally produced the plainer goods,⁽⁴²⁾ appear to have failed completely when profits in silk vanished in the face of cheap imports. The nine combined mills which remained in 1867 concentrated to a greater degree on weaving rather than throwing, a trend subsequently maintained (see Table 7.20.). The scale of operations was large (see Table 7.18.) and as time went on the firms turned increasingly to high quality goods.⁽⁴³⁾ The combined mills continued to dominate silk weaving in Cheshire for the rest of the century (see Table 7.20.), and large scale integrated concerns, operating in a number of mills became increasingly important.⁽⁴⁴⁾

Thus the silk industry, even in its most important centre, did not operate on a scale which allowed the intense specialisation which was so characteristic of the Lancashire cotton industry. Nor had the South West Pennines the diversity of textile pursuits and the resulting flexibility which permitted

{41} See Fact. Insp. Report (1865) p.313: Head (1887)

{42} See Warner (1921) p.135.

{43} See Warner (1921) pp.135-6. Rawlley (1919) p.208

{44} See Rawlley (1919) p.233 and 236 and below p.288.

TABLE 7.20

SILK WEAVING AND THE COMBINED MILLS IN CHESHIRE:1850 - 1889

YEAR	TOTAL LOOMS	% OF LOOMS IN COMBINED MILLS	SPINDLES PER LOOM IN COMBINED MILLS
1850	955	81	18
1856	1,125	15	118
1861	1,509	65	77
1867	1,306	76	40
1870	1,524	50	41
1874	1,735	62	23
1878	1,910	59	15
1885	1,857	69	30
1889	1,053	43	27

rapid increases and decreases in the number of looms weaving silk. Hence it was in Lancashire, where these features were found, rather than Cheshire, that silk weaving grew most rapidly and could be revived most easily in these years of intermittent - but sometimes considerable - profitability.

E) CONCLUSION.

This chapter has attempted to illustrate some of the changes in the techniques and organisation of silk production which were made as the manufacturers attempted to adjust to the rapidly changing economic environment. The impact of these changes was far from uniform, for the productivity of labour and equipment changed at different rates and at different times in the various regions and branches of production. One of the major differences was between the two major branches of production. In throwing productivity increased rapidly during the boom of the 1850s, but after 1860 techniques changed little and employment declined. In the weaving branch power looms replaced hand looms in the 1850s, but the major improvements in productivity appear to have been encouraged by the exposure to competition after the 1860 treaty.

There were, too, considerable inter-regional contrasts within each branch of production. In throwing the more productive techniques appear to have been applied to a much greater extent in the Pennine province, and in the powered weaving branch different forms of organisation produced marked regional variations in the importance of labour in production.

The regional contrasts in these changes in the techniques and organisation of manufacturing were the most important (though not the only) factors which explain the far from uniform changes in the number of workers employed by the silk industry between 1850 and 1870. This chapter thus forms an essential background to the analysis of trends and changes in employment which follows in Chapter VIII.

REFERENCES FOR CHAPTER VII

The major statistical sources are:-

FACTORY INSPECTORS' RETURNS.

"Number of ... Silk Factories ... in each County."

- 1850: H.C. (1850 vol. XLII) pp.455 -
- 1856: H.C. (1857 (Sess.1) vol.XIV) pp.173 - 84.
- 1861: H.C. (1862 vol.LV) pp.629 - 640.
- 1867: H.C. (1867-68 vol.LXIV) pp.811-826.
- 1870: H.C. (1871 vol.LXII) pp.105-116.

"Return of the number of Factories and Workshops authorised to be inspected under the Factories and Workshops Acts."

- 1874: H.C. (1875 vol.LXXI) pp.57-
- 1878: H.C. (1878-79 vol.LXV) pp.201-
- 1885: H.C. (1884-85 vol.LXXI) p.1087-
- 1889: H.C. (1890 vol.LXVII) p.169-

CENSUS VOLUMES: 1851, 1861, 1871

Additional reference is made to:-

FACTORY INSPECTORS' REPORTS.

- 1859: H.C. (1860 vol.XXXIV) p.402-
- 1860: H.C. (1860 vol.XXXIV) p.471-
- 1861: H.C. (1861 vol.XXII) p.409-
- 1865: H.C. (1866 vol.XXIV) p.251-

"Report of the Tariff Commission: Evidence on the Silk Trade." Vol.2. Pt.6. (1905).

C.S. DAVIS (1961) "A History of Macclesfield."

J. PREST (1960) "The Industrial Revolution in Coventry."

R. RAWLLEY (1919) "Economics of the Silk Industry: A Study
in Industrial Organisation."

SIR. F. WARNER (1921) "The Silk Industry of the United
Kingdom."

CHAPTER VIIIEXPANSION AND CRISIS: CHANGING EMPLOYMENT IN THE INDUSTRY,1850 - 1870

In 1850 there were 41,702 persons employed by the powered silk industry in England. The hypothetical "peak" of employment reached in the late 1850s was 57,940, an overall increase of thirty-nine per cent.⁽¹⁾ After the 1860 treaty employment in the silk mills declined by over one-third: at the "nadir" there were 38,543 persons employed; in 1867 there were 40,256. Thus in the powered silk industry employment increased sharply in the 1850s but by the mid - 1860s had declined again to very near the 1850 level. This considerable fluctuation, so characteristic of the silk industry throughout its history, was completely missed by the Population Census which mirrored only the decline in domestic employment over the period.⁽²⁾

There were considerable regional variations in the rates of growth and decline, caused in part by the spatial differences in the industry's organisation and its application of improved

(1) See above pp.189-190 for the method of deriving the peak and nadir of employment in the industry.

(2) Compare above pp.195-197.

techniques considered in Chapter VII, but also resulting from the varying competitiveness of the regional specialisms.⁽³⁾

Figures 8.1. and 8.2. show the changes which occurred in the boom and slump respectively each related, to ease comparisons, to the average rates of increase and decrease.⁽⁴⁾

A) REGIONAL FORTUNES IN THE BOOM OF THE 1850s: THE GEOGRAPHY OF EXPANSION.

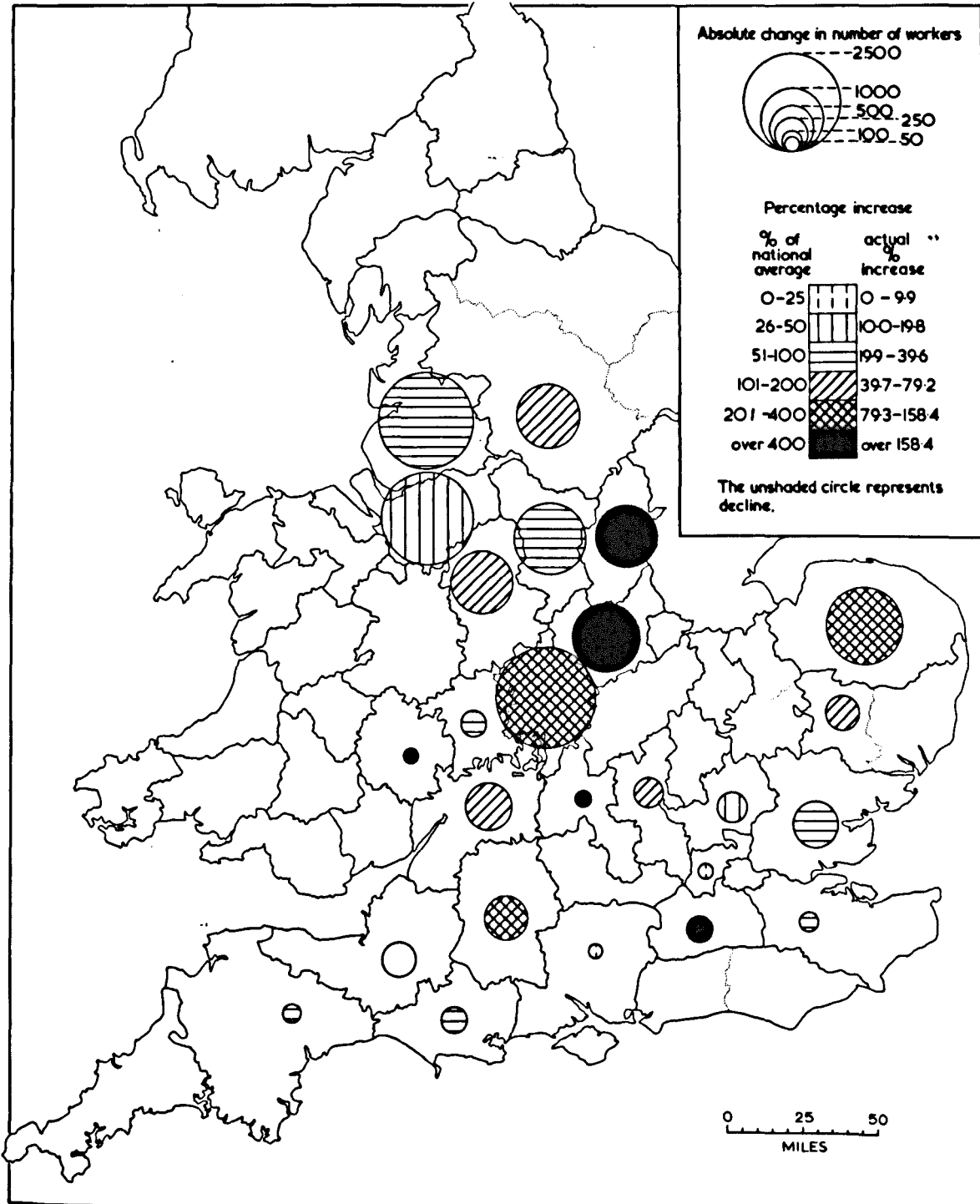
During the phase of expansion in the 1850s the major centres of the silk industry in Cheshire, Lancashire and Derbyshire accounted for over one-third of the national increase in factory employment, but they failed to expand at so rapid a rate as the industry in the country as a whole. In 1850 these three counties together employed sixty-one per cent of England's factory workers in silk, but at the industry's "peak" only fifty-four per cent. In Cheshire factory employment expanded particularly slowly: by only 17.4 per cent

(3) The manufacturing regions referred to in this chapter are those delimited in Chapter V. See above p.123 and Table 5.1.

(4) For figure 8.1. the average is based only on the counties where employment increased, and for Figure 8.2. only where there was decline. The averages are thus slightly higher than the overall averages quoted above.

FIGURE 8.1.

THE CHANGE IN FACTORY EMPLOYMENT - 1850 TO THE 'PEAK'



between 1850 and its recorded zenith in 1856, compared with a national rise of almost forty per cent between 1850 and the "peak". This sluggish response to the boom of one of the industry's chief centres may seem surprising but it is easily explained. The powered industry here was relatively capital intensive,⁽⁵⁾ and so a quick increase in the labour force would be unlikely. Moreover there were not the masses of labour available that could be (and were) recruited to swell the total work force of the already labour intensive industries of rural areas in southern England.⁽⁶⁾ Rather, the silk towns of the South West Pennines, if anything, lost their immediate sources of local rural labour to Manchester and the cotton towns, which in the long term exerted a much stronger attraction on the surplus rural labour of south Cheshire and north Staffordshire.⁽⁷⁾ Nevertheless all three towns were able to increase their populations by rather more than the national rate, though with nothing like the rapidity of the early years of the century when silk was newly established (see Table 8.1.).

(5) See above p.p.173,181 &191(6) See below pp.224-26.

(7) See Smith (1951) pp.206 and 209.

TABLE 8.1.

THE POPULATION OF THE SOUTH WEST PENNINE SILK TOWNS: 1801 - 1851

	MACCLESFIELD		CONGLETON		LEEK		ENGLAND AND WALES
	Population	% change over preceding decade	Population	% change over preceding decade	Population	% change over preceding decade	% change over preceding decade
1801	8,743	-	3,861	-	3,489	-	-
1811	12,299	+40.7	4,616	+19.6	3,703	+6.1	+14.0
1821	17,746	+44.3	6,504	+40.6	4,855	+31.1	+18.1
1831	23,129	+30.3	9,352	+43.7	6,374	+31.2	+15.8
1841	24,137	+4.4	9,222	-1.4	7,223	+13.3	+14.3
1851	29,648	+22.8	10,520	+14.0	8,602	+19.1	+12.7

Note: The Populations relate to the township as defined by the Census.

In Macclesfield, the major centre of the silk trade and much the largest town in the South West Pennine region, there were obvious difficulties in continuing to expand the labour force. In 1851 the industry already dominated the town, with 14,500 persons, sixty-three per cent of the occupied population, engaged in silk manufacture. Although the town's population - and silk's work force - probably continued to grow until the late 1850s, the extreme concentration of the industry there seems to have hindered further growth (and so limited subsequent decline).

In Lancashire, too, employment in the mechanised industry increased slowly, though here the equipment installed in the decade shows that powered weaving was being rapidly extended. The number of power looms installed doubled between 1850 and 1861 and the proportion of the nation's broad looms⁽⁸⁾ found in the county rose from thirty-seven per cent to almost fifty per cent (see Table 8.2.). As the industry was less concentrated than in Cheshire and as it was an insignificant employer beside cotton, it would seem that the technical advances accompanying this expansion in equipment rather than

(8) Broad looms are taken to be all looms outside Warwickshire. See above p.203.

TABLE 8.2.

EMPLOYMENT AND EQUIPMENT IN LANCASHIRE'S
SILK MILLS: 1850 - 1861

A) THE CHANGE IN LANCASHIRE.

	No. In 1850	% change 1850-56	No. in 1856	% change 1856-61	No. in 1861
Mills	29	+52	44	+9	48
Employment	8,208	+29	10,558	-15	8,931
Spindles ('000)	163	-28	118	+8	128
Looms	1,977	+91	3,770	+11	4,201
Power	583	+56	908	+29	1,173

B) WORKERS EMPLOYED AND BROAD LOOMS INSTALLED IN LANCASHIRE
AS A PROPORTION OF ENGLAND'S.

	% of England's total in:-		
	1850	1856	1861
Employment	20	19	17
Broad looms	37	50	49

Note: Broad looms are taken to be all looms outside Warwickshire. See p.203.

labour shortage explain the relatively low rate of increase in employment in the county's silk factories.⁽⁹⁾

In Derbyshire the situation appears to have been similar. Equipment, chiefly for throwing, was increased at a much greater rate than was employment during the decade and, although the number of workers was almost the same in 1861 as in 1850, the county's share of total spindles rose from 5.3. per cent to 7.5 per cent (see Table 8.3.).

The industry in these three counties underline the problems of using only employment data to measure change. The productivity of labour, but not the number of workers employed, increased rapidly and, though the capital intensive industry expanded, the increased output which resulted is underestimated by the statistics available (which are largely limited to employment figures).

Since employment in these counties expanded relatively little during the boom, particularly in Macclesfield where there were additional problems of a labour shortage, workers in the industry were to some extent protected against subsequent redundancy, so that here the work force remained more

(9) See above p.205 for an account of the technical progress in weaving in the county.

TABLE 8.3.

EMPLOYMENT AND EQUIPMENT IN DERBYSHIRE'S
SILK MILLS: 1850 - 1861

	No. in 1850	% change 1850-56	No. in 1856	% change 1856-61	No. in 1861
Employment	4,880	+25	6,106	-23	4,732
Spindles	56,300	+73	97,419	+1	98,210
Looms	407	-4	390	+15	449
Power	337	+59	537	+2	549

stable than elsewhere. In short, the effects of the cyclical fortunes of the silk industry were less pronounced in these major centres of the trade than elsewhere.

In the smaller and more specialised silk manufacturing towns on the borders of the South West Pennine and East Midland regions employment increased at much greater proportionate rates than in the major centres. In Lancashire, Cheshire and Derbyshire together employment in silk increased by only twenty-three per cent between 1850 and the "peak", but in Nottinghamshire, Staffordshire and Yorkshire the increase amounted to eighty per cent, but from a much smaller base. In the South West Pennines the employment structure of both Congleton and Leek was dominated by silk to a much lesser extent than in Macclesfield. As a result employment in the industry could expand at a more rapid rate, even though the growth in the towns' populations was probably little different from Macclesfield's up to the late 1850s (see Table 8.4.). In Nottinghamshire the throwing industry benefitted from the increasing demand from the hosiery and lace industries, and in Leicestershire an entirely new powered weaving industry, employing rather more looms than Derbyshire's concerns, was

TABLE 8.4.

POPULATION AND SILK WORKERS IN THE SOUTH WESTPENNINES 1851 AND 1861

Township	Population		% change 1851 - 61
	1851	1861	
Macclesfield	39,048	36,101	-7.5
Congleton	12,572	14,385	+14.4
Leek	8,602	9,057	+5.3.

Registration District	Employment in silk (over 20 yrs)		% of Total Employment (over 20 yrs)		% change in employment in silk 1851 - 61
	1851	1861	1851	1861	
Macclesfield	9,934	10,083	41	40	+1.5
Congleton	2,186	2,802	21	23	+28.2
Leek	1,954	2,337	24	25	+19.6
Macclesfield Borough (data for all ages).	14,552	13,155	63	62	-9.6

found in 1861.⁽¹⁰⁾

In Yorkshire, the small silk industry increasingly specialised on waste silk spinning, a branch which was expanding rapidly in the 'fifties and destined to be even more prosperous after the 1860 treaty. Output was increased chiefly by large increments of power, but the labour force was also considerably expanded (see Table 8.5.).

Thus within the Pennine province there was evidence of a peripheral growth in the industry during the boom of the 1850s. While the major centres still accounted for the bulk of employment in the industry, the smaller concentrations of manufacturing (also technically progressive) expanded much more rapidly, usually in response to a particular and specialised demand for silk goods.

While the Pennine province continued to dominate the silk industry throughout the 1850s (with between sixty-seven per cent and seventy per cent of the industry's factory workers), the distribution of silk manufacturing in the Midlands and south of England changed considerably. Thus it was here, rather than in the Pennines, that the boom - and subsequently

(10) This industry may have had its origin in the domestic employment noted previously in the county. See p.151.

TABLE 8.5.

EMPLOYMENT AND EQUIPMENT IN YORKSHIRE'S
SILK MILLS: 1850 - 1861

	Number in:-			% change 1850-61
	1850	1856	1861	
Mills	16	27	27	+69
Employment	1,687	1,692	2,644	+57
Spindles ('000)	129	117	123	-5
Looms	0	0	8	∞
Power	299	455	1,279	+328

the slump - had the greatest geographical significance.

The branch of the silk industry which underwent the most rapid expansion during the 1850s was ribbon manufacture, located almost entirely at Coventry.⁽¹¹⁾ Total employment in ribbon weaving in and around the city was estimated to be 25,000 in 1857.⁽¹²⁾ The domestic branch was at best static during the decade,⁽¹³⁾ but, as shown in Figure 8.1., the mechanised concerns rapidly increased their labour force. Between 1850 and 1856 total employment in both the mills and the tiny cottage factories in Warwickshire more than doubled: with an increase of 2,500 in the number of workers, the absolute rise in employment was greater than in any other county.

This massive growth was associated with the strangely labour intensive character of the ribbon trade. Even in 1856 the mechanised industry accounted for less than twenty per cent of the employment in ribbon manufacture in Warwickshire (though it was responsible for a much greater proportion of the output). Since the factory industry was so small a proportion

(11) See above pp.198 and 200-203 for the technical background of the Coventry ribbon trade.

(12) Bray (1857) p.9.

(13) The increase in total employment in the Warwickshire silk industry between 1851 and 1857 is very close to the increase in factory employment between 1850 and 1856. Compare above p.195.

of the whole there was unlikely to be any check to its growth through labour shortage. Despite the continuing importance of the domestic branch, the transfer from hand looms to powered weaving was considerable. As explained above, this took an unusual form, for much of the additional power was installed by the domestic weavers in their own topshops, who thus became "factory"workers.⁽¹⁴⁾

Additional domestic workers were also recruited during this intense boom, effectively replacing those lost to the powered industry and equipped with their outdated looms.⁽¹⁵⁾ Many of the workers in this extremely labour intensive trade were women in the nearby mining villages,⁽¹⁶⁾ though there was also a considerable influx of workers from the surrounding rural areas of the south Midlands. This region, despite the growth of the Birmingham - Black Country industrial region, had a persistent labour surplus throughout the nineteenth century and was the origin of migrant streams to the south Staffordshire collieries, and to London and the northern industrial regions.⁽¹⁷⁾ In periods of prosperity the ribbon

(14) See above pp.201-202.

(15) Compare above p.222.

(16) See above p.108.

(17) Lawton (1958) pp.168 and 174.

trade could thus easily recruit additional workers, without looking far beyond the immediate vicinity of the district.⁽¹⁸⁾

While the Coventry trade prospered, the throwing mills in the Cotswolds which supplied the ribbon weavers also expanded output. Employment in the sub-region increased by just over 700 workers (easily absorbed from the surrounding country-side), and the rate of increase (forty-seven per cent) was rather greater than the national figure.

From Figure 8.1. it is apparent that Norfolk was the only other region where the number of workers in the silk mills was considerably increased in the 1850s. This followed sharp contraction during the previous decade⁽¹⁹⁾ and reflected the growth of crape manufacture, one of the most successful branches of the industry which was to be of considerable importance in the future. Although employment in Norfolk's mills in 1856 had scarcely regained its 1838 level, the industry was in a much stronger position than twenty years previously when it produced chiefly low quality goods.

(18) See Lawton (1958) pp.171 and 174.

(19) See above p.135.

In Essex, too, the number of workers employed in the manufacture of crape was increased during the boom by the Courtaulds, whose mill at Bocking was almost certainly the huge combined mill noted in the Factory Returns.⁽²⁰⁾ However, greater increases in employment occurred in the specialised throwing mills in the county which, like these mills elsewhere in southern England, increased the labour but not the power applied to throwing. Much of the industry in East Anglia and throughout southern England was thus overgrown and labour intensive, clearly reflecting the ease of labour recruitment in dominantly non-industrial regions of persistent out-migration.⁽²¹⁾

In the rest of southern England the brief lease of life given to technically simple and labour intensive throwing⁽²²⁾ halted the decline of employment (except in Somerset) which had been the keynote of the previous decade.⁽²³⁾ But these scattered mills, surrounded by a declining domestic industry were too remote and backward to respond much to the boom: employment increases were nowhere very great in either absolute or relative terms, and exceeded the national rate only in

(20) See Warner (1921) pp.299-300 and 307; and above p.136.

(21) See Smith (1951) p.206-208 and Osborne (1964) pp.141-146 and 151-155.

(22) See above p. 179.

(23) See above p.135 and Figure 5.3.

Wiltshire and Buckinghamshire.

It is clear that, measured in terms of the distributions of workers (an imperfect yardstick), the prosperity of the 1850s caused a dispersal of silk manufacture. Growth was relatively slightest in the regions of greatest concentration, the South West Pennines and Lancashire, and relatively greatest elsewhere, particularly on the margins of the Pennine province (in Yorkshire, Nottinghamshire, Leicestershire and Staffordshire) and in Coventry and East Anglia. But in southern England there were also some backward and archaic silk manufacturing localities, notably in the South West, which lagged so far behind technically and commercially, that they failed to respond to the boom with any vigour.

But in effect the dispersal brought by prosperity paved the way for a locational contraction soon to come during the years of decline after 1860. To the south of the Pennine province, at least, the growth of the industry was achieved by the further recruitment of workers to an already highly labour intensive system. When cheap silk from the French hand looms entered after 1860 these manufacturing districts were almost without exception the hardest hit and there was a reconcentration of the industry into the more productive mills of the Pennine province.

B) REACTION TO THE 1860 TREATY: THE GEOGRAPHY OF DECLINE.

Radical changes in the distribution of the silk industry were brought about by the slump in the early 1860s (see Figure 8.2.): indeed the following decade shaped its modern distribution. Both long-term and short-term consequences of the 1860 treaty can be distinguished. The former involved a gradual concentration of silk manufacture into two or three dominant regions. But the short term dislocation was more general and less regionally systematic.

The towns which specialised most heavily on silk manufacture, particularly Macclesfield and Coventry, were hard hit and struggled through a number of years of extreme unemployment and hardship.⁽²⁴⁾ But in these towns silk manufacture, though much reduced, continued to dominate the national industry to such an extent that revival was assured in the improved conditions of the early 1870s. During the slump, employment in the mechanised industries in Cheshire, Lancashire and Warwickshire, respectively the dominant centres of throwing, powered broad weaving and ribbon weaving, all declined at rates very close to the national average and all maintained large shares of their specialised pursuits (see Table 8.6.). In the short

(24) See Prest (1960) pp.127-131; Tariff Commission (1905) 3390, and above p.200-201

FIGURE 8.2.

THE CHANGE IN FACTORY EMPLOYMENT - 'PEAK' TO 'NADIR'

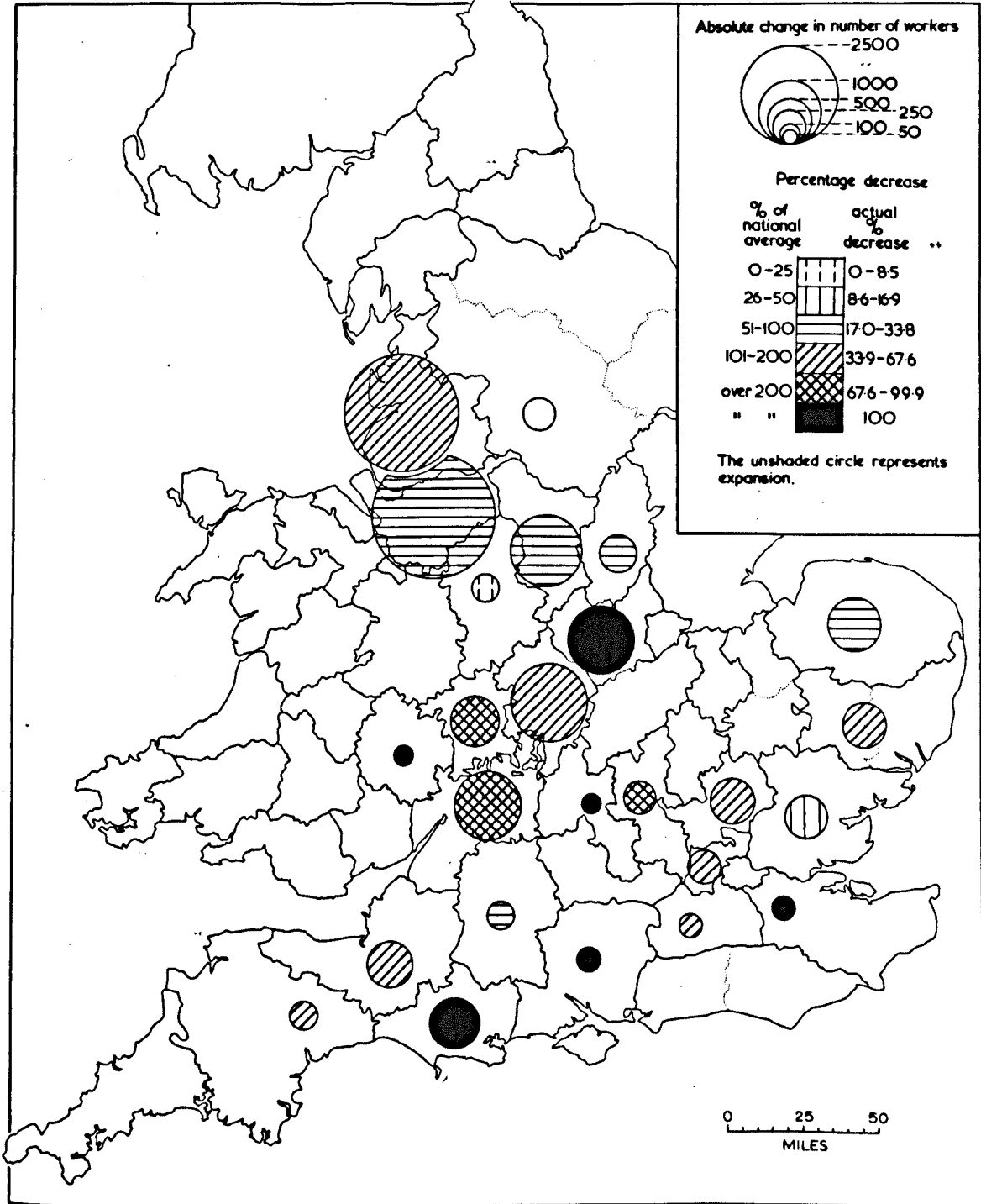


TABLE 8.6.

THE DECLINE IN EMPLOYMENT IN THE 1860s IN THE
SILK INDUSTRY'S DOMINANT CENTRES.

County	% of National Employment		% Change in Employment Peak-Slump	% of National total of:-			
	Peak	Slump		Spindles		Looms	
				Peak	Slump	Peak	Slump
Cheshire	25.1	25.8	-32	35.5	35.6	(16.2	14.7)
Lancs.	18.2	17.9	-35	(9.8	12.7)	39.5	39.7
Warwicks.	7.6	7.5	-35			19.5	13.3
National Totals	57,940	38,543	-34	1,306	1,148	10,635	10,551
				(thousands)			

term, therefore, the dominant features of the regional pattern of silk manufacture showed little overall change, but this masks many complex contrasts at a more local scale.

In the Pennine province the smaller, specialised throwing regions chanced to be supplying trades whose demand for silk was still increasing in the 1860s. For example, from 1861, when employment appears to have been at a minimum, the throwing mills of the East Midlands increased production through the rest of the decade, particularly in Nottinghamshire where demand from the silk lace industry stimulated production.⁽²⁵⁾ In Yorkshire, rising demand for spun silk caused employment to grow continually, and in Staffordshire, where the major firms were now heavily specialised on producing sewing silks and twist,⁽²⁶⁾ more workers were employed in 1867 than had been in the late 1850s (see Table 8.7.). Here, then, were anomalous districts on the fringes of the major Pennine manufacturing regions in which the growth of the industry continued despite the 1860 treaty and the removal of protection.

In much of southern England, on the other hand, small centres of silk manufacture, which had barely managed to hold

(25) In contrast, the attempt to establish powered silk weaving in Leicestershire failed and by 1867 employment had declined to nothing.

(26) See Tariff Commission (1905) 3238 and below pp.292-93.

TABLE 8.7.

THE CHANGE IN EMPLOYMENT IN THE SILK MILLS OF THE PENNINE PROVINCE:1856 - 1867

Region or County	<u>Specialism</u>	<u>Employment</u>			<u>% Change</u>
		1856	1861	1867	1856 - 67
EAST MIDLANDS		7,528	7,077	6,526	-13
Derbys.	Throwing for	6,106	4,732	4,786	-22
Notts.	hosiery and lace	1,422	1,116	1,740	+22
Leics.	Weaving.	0	1,229	0	0
YORKSHIRE	Waste silk Spinning	1,692	2,644	2,879	+70
SOUTH WEST PENNINES		16,959	15,831	12,539	-26
Staffs.	Sewing silk and twist	2,403	2,227	2,600	+8
Cheshire	General throwing	14,566	13,604	9,939	-32
LANCASHIRE	Weaving	10,558	8,931	6,880	-35

their own even in the boom conditions of the previous decade, rapidly became unprofitable in the 1860s and declined to extinction or trivial size, and were never to recover. The sub-regions which had specialised in supplying yarn to both broad and ribbon weaving concerns were particularly vulnerable. Thus, when the Coventry ribbon industry suffered its initial severe crisis through French competition, throwing in the Cotswolds practically ceased and was hardly revived when the demand for ribbons picked up again. The Hertfordshire throwing industry, which largely supplied the domestic silk trade in London, survived well enough to be capable of expansion in subsequent booms; but in Buckinghamshire and in the immediate vicinity of London the reduction in mill employment was more extreme and development in the boom of 1870 was very limited (see Table 8.8.). Thus the locational concentration of the industry in times of commercial stress was regionally complex: some of the south Midland districts of manufacture quickly succumbed; others, producing essentially identical goods, showed a greater capacity to survive or at least to postpone their elimination.

In the south and south west of England the further decline of domestic silk weaving through competition from abroad similarly brought about the collapse of a large part of the

TABLE 8.8.

THE CHANGE IN EMPLOYMENT IN THE SPECIALISED SILK THROWING
AREAS OF SOUTHERN ENGLAND: 1856 - 1870

AREA	EMPLOYMENT IN SILK MILLS			% CHANGE	% "DEFICIT" OR
	"Peak" (1856 or 61)	"Nadir" (1867)	Subsequent Boom (1870)	"Peak"- "Nadir"	"SURPLUS" (1870)
Herts.	1,132	615	1,148	-46	+24
Bucks.	386	75	78	-81	-75
Home	708	260	245	-63	-58
Cotswolds	2,230	376	815	-83	-55

- Notes: (1) "Home" includes Middlesex, Surrey and Kent.
(2) "Cotswolds" includes Worcestershire, Gloucestershire and Herefordshire.
(3) The "Peak" occurred in 1856 in all counties except Hertfordshire.
(4) The final column shows the % difference between the actual employment recorded in 1870 and the number expected had the areas maintained their share of national employment from the previous peak.

inefficient and labour intensive throwing industries. By 1867 specialised throwing mills, formerly widespread (see Figure 5.2. above), were found only in Somerset, where domestic weaving was now concentrated, and even here employment and the equipment installed were severely reduced (see Table 8.9.). On the other hand, powered weaving had a much greater potential to survive the slump, in the South West as elsewhere. Though in Somerset the number of looms declined in the 1860s, it appears that a mill in Wiltshire which had formerly specialised on throwing added powered weaving capacity during the slump and in Devon the number of looms was maintained. The decline in the number of power looms (approximately five per cent)⁽²⁷⁾ was thus slight when compared with the decline of seventy-three per cent in the number of spindles. Weaving in the South West was almost entirely carried on in self-sufficient combined mills and the effect of the slump was thus to concentrate both throwing and weaving into relatively few combined mills (see Table 8.10). Thus, in the south of England, as well as in the Pennine province, the concentration of the industry during its periods of decline had a local dimension in addition

(27) Approximate because of an error in the Returns for Wiltshire. See above p.120.

TABLE 8.9.

THE DECLINE OF SPECIALISED THROWING MILLS IN
THE SOUTH WEST AND HAMPSHIRE: 1856 - 1867.

A) NUMBER OF MILLS AND PERSONS EMPLOYED

COUNTY	1856		1861		1867		% change in persons employed "Peak" - 1867
	No.of mills	Persons employed	No.of mills	Persons employed	No.of mills	Persons employed	
Somerset	8	1,069	7	752	4	492	-54
Dorset	5	699	4	707	0	0	-100
Wilts.	3	458	3	457	0	0	-100
Devon	2	133	3	255	0	0	-100
Hants.	1	113	1	93	0	0	-100
TOTAL	19	2,472	18	2,264	4	492	-80

B) SPINDLES INSTALLED

COUNTY	Number of Spindles in:-			% change "Peak"-1867
	1856	1861	1867	
Somerset	26,548	19,500	5,195	-80
Dorset	60,232	28,824	0	-100
Wilts.	19,900	23,193	0	-100
Devon	1,630	9,418	0	-100
Hants.	2,300	3,300	0	-100
TOTAL	110,610	84,235	5,195	-95

TABLE 8.10.

EMPLOYMENT AND EQUIPMENT IN THE COMBINED
MILLS OF SOUTH WEST ENGLAND: 1856 - 1867

	<u>1856</u>		<u>1861</u>		<u>1867</u>	
	No. in Combined Mills	% of all Mills	No. in Combined Mills	% of all Mills	No. in Combined Mills	% of all Mills
Mills	4	16	6	24	5	50
Employment	794	24	1,059	32	1,200 ⁽¹⁾	69
Spindles	18,116	14	29,594	27	24,722	89
Looms (2)	306	88	388	91	369	91
Power	104	24	145	37	152	79

Notes: (1) Estimated due to error in Return for Devon - see p.120.

(2) There was one small specialised weaving mill in Somerset throughout the period.

to its broader regional features.

In the silk manufacturing regions of eastern England (comprising the counties of Norfolk, Suffolk and Essex), employment in the silk mills declined at a lower rate than elsewhere in southern England (see Figure 8.2.), and hand loom weaving appears to have continued to employ many people. This strong survival of the industry resulted chiefly from the specialisation by a few firms on a particular branch of the industry, crape manufacture.⁽²⁸⁾ As production took place in both Essex and Norfolk, the history of the industry in these counties subsequent to 1860 can be considered together; for now, unlike in their earlier development, the forces affecting the two regions were almost identical.⁽²⁹⁾

In Norfolk, "Grouts," the originators of crape, had been joined by two other major producers by 1856.⁽³⁰⁾ These firms made great advances after a brief decline in the early 1860s, and by 1870 accounted for practically the entire silk output of the county. The number of spindles installed in combined mills (which monopolised throwing in the county) was increased

(28) See Warner (1921) pp.265-311 for a wealth of historical detail on the Norfolk and Essex industries and Vict. County Hist. Essex vol.2 (1907) pp.462- for an essentially identical account.

(29) Compare above pp.90-92 and 99-101.

(30) Warner (1921) p.289

by thirty-nine per cent and the number of power looms more than trebled between 1861 and 1867 (see Table 8.11.). Norfolk was consequently once more one of the major silk weaving regions in 1867 and had an increased share of the national totals of both throwing capacity and of persons employed (see Table 8.12).

Similarly in Essex, crane production continued to be extended by the Courtaulds, whose mill at Bo^cking contained all of the weaving capacity of the county.⁽³¹⁾ The number of looms was continually increased from the mid-1850s and between 1861 and 1867 the number of spindles installed was doubled (see Table 8.13.) In addition Courtaulds maintained at least one throwing mill at Halstead and took over one other at Chelmsford in 1868.⁽³²⁾

For the rest of the century crane manufacture continued in Norfolk and Essex,⁽³³⁾ a survival which illustrates the power of the near accident of particular regional specialisms to avert decline in a contracting industry. The recent history of the Lancashire cotton industry, too, is full of such examples.⁽³⁴⁾

(31) See above p. 225.

(32) See Warner (1921) pp.301 and 305.

(33) See below p.p. 265-266.

(34) See Rodgers (1962) pp.301 and 305.

TABLE 8.11.

EMPLOYMENT AND EQUIPMENT IN THE COMBINED
MILLS OF NORFOLK: 1856 - 1867.

A) THE RELATIVE IMPORTANCE OF COMBINED MILLS

	1856		1861		1867	
	No. in Combined Mills	% of all Mills	No. in Combined Mills	% of all Mills	No. in Combined Mills	% of all Mills
Mills	4	57	3	60	6	55
Employment	2,037	73	1,643	81	2,369	88
Spindles	78,690	100	75,356	100	104,549	100
Looms	655	64	392	62	1,247	81
Power	142	78	186	89	231	32(1)

Note: (1) This is low because of the large amount of power returned for the weaving mills in the county. See p.120.

B) THE CHANGE WITHIN COMBINED MILLS

	1856-1861	<u>% change</u>	1861-1867
Mills	-25		+100
Employment	-19		+44
Spindles	-4		+39
Looms	-40		+218
Power	+31		+63

TABLE 8.12.

EMPLOYMENT AND EQUIPMENT IN NORFOLK'S SILK INDUSTRY
AS A PROPORTION OF THE NATIONAL TOTALS.

	<u>% of national total in Norfolk in:-</u>			
	1850	1856	1861	1867
Employment	3.2	5.0	4.0	6.7
Spindles	6.0	7.4	5.7	9.0
Looms	15.6	11.1	5.9	14.6

TABLE 8.13.

EMPLOYMENT AND EQUIPMENT IN THE COMBINED
MILLS OF ESSEX: 1856 - 1867.

A) THE RELATIVE IMPORTANCE OF THE COMBINED MILL

	1856		1861		1867	
	No. in Combined Mill	% of All Mills	No. in Combined Mill	% of all Mills	No. in Combined Mill	% of all Mills
Mills	1	13	1	11	1	25
Employment	1,089	42	1,166	41	1,851	77
Spindles	25,296	23	31,764	20	77,543	69
Looms	569	100	591	100	728	100
Power	53	24	68	31	109	59

B) THE EXPANSION WITHIN THE COMBINED MILL

	<u>% change</u>	
	1856-1861	1861-1867
Employment	+7	+59
Spindles	+26	+44
Looms	+4	+23
Power	+28	+60

Although crape manufacture dominated the output of the powered weaving mills of East Anglia, hand loom weavers continued to find employment, mainly in Suffolk, from firms producing high quality goods and articles for the fashion trade.⁽³⁵⁾ In these pursuits proximity to the London markets continued to be a great asset. Most other branches of the trade here collapsed in the 1860s, however, and many firms, chiefly engaged in weaving plain goods,⁽³⁶⁾ went out of business. As in the South West this brought about a considerable decline in the number of specialised throwing mills in both Essex and Suffolk,⁽³⁷⁾ and in this activity the expansion of the previous decade⁽³⁸⁾ was reversed (see Table 8.14).

One of the general features that emerges from these complex regional and sub-regional trends is the much quicker contraction of throwing outside the Pennine province than within it. There had long been a sharp contrast between the throwsters of the Pennines and those of the south of England,

(35) See above p.197.

(36) Warner (1921) pp.306 and 320.

(37) There were no mills engaged solely in throwing in Norfolk even in the late 1850s. See above p.231 and Table 8.11.

(38) See above p. 225.

TABLE 8.14.

EMPLOYMENT AND EQUIPMENT IN THE SPECIALISED THROWING
MILLS IN ESSEX AND SUFFOLK: 1850 - 1867

	1850	1856	1861	1867	% change "Peak"- "slump"
Mills	8	11	6	4	-64
Employment	1,877	2,359	1,499	799	-66
Spindles	82,700	97,292	127,217	42,356	-67
Power	180	188	161	93	-51

not only in their technical efficiency but also in the strength of their markets. The demand for the products of the Pennine silk mills was maintained from both weavers and other users of yarn, but in the south the small scale and inefficient throwing industries rapidly lost their customers. Local domestic weaving, formerly their major outlet, collapsed and after 1860 weavers using power either manufactured their own yarns or imported the cheaper French and Italian products. Hence throwing rapidly became concentrated into the Pennine province (and particularly into the South West Pennines), with only a small remnant in the south surviving in the self-contained combined mills.

C) CONCENTRATION OR DISPERSAL?

After 1860 silk manufacturing survived in only a few centres in southern England, so that here the industry became considerably more concentrated. By the late 1860s the domestic industry had almost disappeared⁽³⁹⁾ and the powered industry was much reduced: of the eighteen counties south of the Pennine province in which silk mills had been recorded in the boom of the 'fifties, five lost their industry completely and

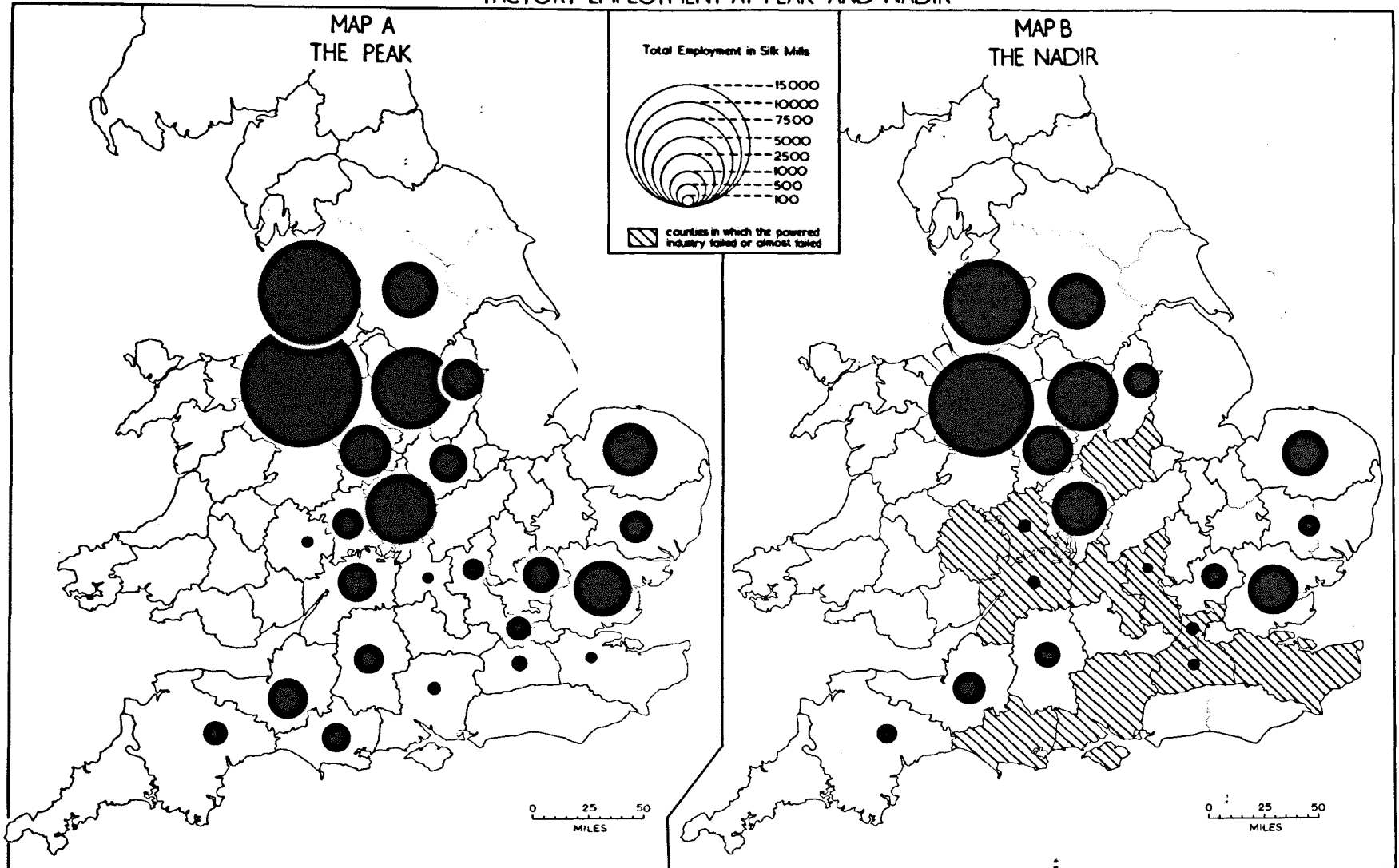
(39) See above pp.196-197.

in a further five employment in silk mills was reduced to very low levels (see Figure 8.3.). The four counties which dominated the southern industry (Warwickshire, Essex, Norfolk and Somerset) thus increased their collective share of employment in silk mills outside the Pennine province from sixty-one per cent at the "peak" to seventy-seven per cent at the industry's "nadir".

Within the regions of southern England where silk manufacturing continued, moreover, the industry became concentrated into fewer localities. In the Essex and Suffolk manufacturing region, Essex increased its share of the industry's mill workers from seventy-five per cent to eighty-seven per cent between the late 1850s and 1867, and the one combined mill in the county employed sixty-seven per cent of the labour force of the entire region in 1867, twice its share of ten years previously. In the Chiltern sub-region, Hertfordshire increased its share of employment from seventy-four per cent to eighty-nine per cent and continued to dominate the mechanised industry of the entire region, including London, despite the development of powered weaving on the outskirts of the city. The withdrawal of the Coventry businessmen from the Cotswold sub-region resulted in the concentration in Warwickshire by 1867 of eighty-nine per cent of the region's employment in silk

FIGURE 8.3.

FACTORY EMPLOYMENT AT 'PEAK' AND 'NADIR'



mills, compared with only sixty-six per cent a decade earlier. In the South West, in contrast, the major part of the industry, accounted for by the combined mills, did not retreat into a single dominant centre but remained relatively scattered. However, the few specialised throwing mills which remained in the region in 1867 were now entirely concentrated in Somerset and the county marginally increased its share of the region's employment from forty-three per cent in 1861 to fifty-three per cent in 1867.

In marked contrast to these trends in the South of England, the mechanised industry in the Pennines province became more dispersed within the regions as the smaller, specialised industries grew in importance (see Figure 8.3.). Between 1850 and 1867 the proportion of Pennine mill workers found in the smaller centres of the silk industry in Staffordshire, Yorkshire and Nottinghamshire doubled from twelve per cent to twenty-five per cent and the dominant centres in Cheshire, Lancashire and Derbyshire correspondingly declined (see Table 8.15.). Table 8.16. shows that it was entirely due to this expansion in the smaller centres that the Pennine province maintained its share of employment in the national industry. Nevertheless almost half of the workers in the English silk

TABLE 8.15.

THE DISTRIBUTION OF EMPLOYMENT IN THE SILK INDUSTRY
OF THE PENNINE PROVINCE: 1850 - 1867

	<u>% OF PENNINE SILK INDUSTRY IN:-</u>			
	1850	1856	1861	1867
Cheshire	42.6	39.6	39.5	34.5
Lancs.	28.2	28.7	25.9	23.9
Derbys.	16.8	16.6	13.7	16.6
TOTAL	<u>87.7</u>	<u>85.0</u>	<u>79.1</u>	<u>75.0</u>
Staffs.	5.1	6.5	6.5	9.0
Yorks.	5.8	4.6	7.7	10.0
Notts.	1.4	3.9	3.2	6.0
TOTAL	<u>12.3</u>	<u>15.0</u>	<u>17.4</u>	<u>25.0</u>
PENNINE PROVINCE	100.0	100.0	100.0 ⁽¹⁾	100.0

Note: (1) Includes Leicestershire: 3.5%

TABLE 8.16.

THE PROPORTION OF EMPLOYMENT IN ENGLAND'S SILK
INDUSTRY FOUND IN THE PENNINE PROVINCE:
1850 - 1867

	<u>% OF ENGLAND'S SILK INDUSTRY IN:--</u>			
	1850	1856	1861	1867
Major Employers (Chesh: Lancs: Derbys.)	61.1	56.4	53.2	53.6
Minor Employers (Staffs: Yorks: Notts.)	8.6	10.0	11.8	18.0
 TOTAL PENNINE PROVINCE	<u>69.7</u>	<u>66.4</u>	<u>67.4</u> ⁽¹⁾	<u>71.6</u>

Note: (1) Includes Leicestershire: 2.4%

industry remained concentrated in the South West Pennine region and Lancashire in 1867⁽⁴⁰⁾ and it cannot be doubted that the economies resulting from the agglomeration of the industry and from the proximity of the services available in the textile manufacturing region of south east Lancashire were significant factors in the survival of this large section of England's silk industry.⁽⁴¹⁾

(40) Forty-eight per cent of England's silk mill operatives were in these two counties in 1867, compared with fifty-three per cent in 1850.

(41) Compare above p.p.77-80.

REFERENCES FOR CHAPTER VIII

The major statistical sources for this chapter are the "FACTORY INSPECTORS' RETURNS," which are listed at the end of Chapter VIII (p. 213).

Additional reference is made to:-

- C. BRAY (1857) "The Industrial Employment of Women: being a comparison of the watch trade of Coventry ... and the people in the ribbon trade."
- R. LAWTON (1958) "Population Movements in the West Midlands 1841-1861". Geography (vol.43) pp.164-77.
- R.H. OSBORNE (1964) "Migration Trends in England and Wales. 1901-1951". Geographia Polonica (vol.3) pp.137-162.
- J. PREST (1960) "The Industrial Revolution in Coventry."
- H.B. RODGERS (1962) "The Changing Geography of the Lancashire Cotton Industry." Econ. Geog. (vol.38) pp.299-314.
- C.T. SMITH (1951) "The Movement of Population in England and Wales in 1851 and 1861". Geogr. J. (vol.117) pp.200-210.

VICTORIA COUNTY HISTORIES

ESSEX (vol.2) (1907) "Silk" pp.462-469.

SIR F. WARNER (1921) "The Silk Industry of the United Kingdom".

GOVERNMENT PAPERS

"Report of the Tariff Commission. Evidence on the Silk Trade."
Vol.2. Pt.6. (1905)

CENSUS VOLUMES: 1801-1871.

CHAPTER IXCONTRACTION, SPECIALISATION AND RATIONALISATION:
THE SHAPING OF THE MODERN INDUSTRY.

Chapters VII and VIII have outlined the rapidity with which adjustments in the techniques, organisation, size and distribution of the silk industry were made to meet the rapidly changing conditions of the mid-nineteenth century - the most disturbed period in the industry's uncertain history. The removal of protective tariffs and the consequent exposure to competition from low cost producers initiated a new period in the history of silk manufacture in which decline was the keynote. However, the industry was by no means extinct. Much of the industry - at least in the powered branch - was revived by a fortuitous boom in the early 1870s when competition from abroad was considerably reduced during the Franco-Prussian War.⁽¹⁾ Over 47,000 workers were employed in the silk mills in 1870, an increase of perhaps 10,000 in five years, and this total was probably exceeded in the next few years. Although this recovery was very shortlived, it gave many manufacturers

(1) See Figure 9.4. for an illustration of the effect of the war on imports of silk goods into Britain.

an opportunity to become firmly established in producing goods which could compete successfully against the French rivals. Silk throwing and the weaving of plain goods virtually ceased once the war was over, but waste silk spinning and the production of high quality dress goods, crapes and pile fabrics received a new lease of life. Nevertheless competition and foreign tariff policies continued to erode the industry. Profits among the firms which continued after 1875 gradually diminished, particularly in the 1880s,⁽²⁾ and it was not until the early twentieth century that the industry stopped contracting and that the number of workers employed remained relatively stable for any length of time.⁽³⁾ By this time, however, the industry employed only 30,000 workers and was quite insignificant among the English textile trades, and England no longer made an important contribution to the world's output of manufactured silk.

Considerable detail of the industry's difficulties and a collection of statistical data illustrating its decline over the latter part of the nineteenth century are contained in the evidence to the Tariff Commission, which considered silk

(2) "Tariff Commission" (1905) 3136.

(3) Rawlley (1919) p.274; Warner (1912) p.1.

manufacturing in 1905 as part of its general survey of British industries. All of the witnesses had long-standing associations with the silk industry and were well-informed, if rather one-sided in their view-point. It is largely on their evidence that the following analysis of the industry's problem is based.

A) THE PROBLEMS OF THE CONTRACTING SILK INDUSTRY

The English silk industry could probably have adjusted much more successfully to the competition from low priced imports⁽⁴⁾ as indeed was attempted in the weaving branch⁽⁵⁾ - but for the fact that the British tariff policy was out of line with practices elsewhere. In contrast to the free trade which Britain preached, protective tariffs were imposed on silk by almost all other manufacturing countries. These were often levied specifically to support particular branches of their own industries;⁽⁶⁾ in the United States of America and Germany, for example, silk industries were established in the late nineteenth century which at first succeeded only

(4) See above pp.192-3 for the reasons behind low cost of production on the continent.

(5) See above p.199.

(6) "Tariff Commission" (1905) 3280.

because of high tariff barriers.⁽⁷⁾

English exporters were thus faced with constantly changing tariffs in many of their markets and whole branches of the silk industry collapsed when new tariffs were imposed. Even the most successful specialisms of the English industry, plush production and crape manufacture, eventually shrank in the face of high tariffs; the plush industry in 1891 when the American trade was stopped, and crape in 1905 when France almost doubled the duty on crape, specifically to encourage home production.⁽⁸⁾

More serious even than this loss of export markets was the practice adopted by foreign manufacturers of selling excess production at cost price or less on the British market, which became "the dumping market of the world."⁽⁹⁾ Dumping also occurred in neutral markets, particularly Canada, reducing still further the prospects of British exports, and when tariffs were imposed elsewhere (notably in the United States of America) continental producers commonly released their considerable stocks onto the London market.⁽¹⁰⁾ These practices,

- (7) "Tariff Commission" (1905) 3247, 3099, 3312
(8) "Tariff Commission" (1905) 3092, 3252, 3312
(9) "Tariff Commission" (1905) 3367.
(10) "Tariff Commission" (1905) 3124, 3123.

encouraged by the British tariff policy, made it impossible for the manufacturers in England to judge how much they could sell, even in their home market - a situation closely paralleled in the cotton industry of the 1950s and 1960s. In contrast, the silk manufacturers abroad had a guarantee of a minimum level of sales and profits at home and a ready market for surplus production in Britain and so an assurance of profit that encouraged investment.

At home the competition with more prosperous industries for capital, labour and factory space, which the silk industry had always faced,⁽¹¹⁾ inevitably grew more acute when its long-term profitability was in doubt. From 1860 (and more especially after 1875) the major problem facing the English silk industry was the attraction and efficient utilisation of capital and labour. Unlike the cotton manufacturers fifty years later the owners of silk mills had no false hopes of the industry's recovery.⁽¹²⁾ On the contrary, silk manufacturers were used to depressions and their reaction was swift. Capital and entrepreneurial ability were rapidly drained away from silk and were seldom replaced. As time went on even

(11) See above p.110.

(12) See Rodgers (1962) pp.300-301

profitable firms were forced to close for the want of new managers entering the business.⁽¹³⁾ Equipment was scrapped, sometimes with indecent haste, as in Congleton, when an alternative use for the mills could be found.⁽¹⁴⁾ Nevertheless, even in the twentieth century the industry would almost certainly have succeeded in attracting new capital had the prospects for profit been greater,⁽¹⁵⁾ and new mills would probably have been built in England by the large continental producers had a tariff been reintroduced.⁽¹⁶⁾

Although much capital was removed from the silk industry, the industry which remained was still beset with masses of redundant and outdated machinery in half idle mills and in these respects faced problems similar to those found in cotton half a century later. The lack of capital and the low expectation of profits prevented improvements being made and the fluctuating market, conditions, exacerbated by dumping, prohibited the mills which remained from working at full capacity for any length of time.⁽¹⁷⁾ In consequence the

(13) "Tariff Commission" (1905) 3061

(14) See Head (1887) p.158; "Tariff Commission" (1905) 3287, and below p. 291

(15) Warner (1903) p.5 and Wardle (1908) p.4.

(16) "Tariff Commission" (1905) 3376, 3387.

(17) "Tariff Commission" (1905) 3061, 3272.

return on capital remained extremely low. It was estimated that unit costs were reduced by five per cent to ten per cent if equipment was continually employed, and in one case a plant estimated to return twenty per cent on capital when fully used was in fact returning only one and a quarter per cent. (18)

The problems of labour supply were, if anything, more serious than those of utilising capital. As in any declining industry there were very few new entrants learning the trade. But in silk the problem was intensified as throwing, which was considered a training for young silk workers who might later move to the more skilled occupation of weaving, declined so rapidly. (19) The scattered distribution of the production centres tended to speed the wastage of experienced and skilled labour from silk, for in most places alternative employment and higher wages could be found locally. Even in towns such as Macclesfield and Coventry, which specialised heavily on silk production, many workers were lost (though here by migration), since essentially similar occupations could be found in the more prosperous textile industries. Many factory and domestic workers are reported to have migrated from both these towns

(18) Rawlley (1919) pp.294-95: "Tariff Commission" (1905) 3147, 3139.

(19) "Tariff Commission" (1905) 3283,3062,3358

to Lancashire, particularly to the fine-spinning centres of Bolton and Colne (where processes were most akin to silk working) and there was a considerable emigration of silk workers to Patterson (New York State) particularly after the American tariffs imposed in the 1890s. (20)

Throughout the country manufacturers were forced to cling to such skilled workers as remained, many of them old, and as they retired so the industry slowly contracted. By the start of the twentieth century it was generally considered that even if the demand for English products had been revived it would have been extremely difficult to build up a suitable labour force - a similar situation to that found in cotton in the late 1850s. (21)

The silk industry was thus facing problems of how best to attract and utilise capital and labour which have subsequently confronted other industries when faced with declining output and profitability. In these respects the parallels between the decline of the silk and cotton industries are relatively close. In other respects, however, their problems

(20) See "Tariff Commission" (1905) 3275, 3317; Prest (1960) pp.130-131; Davis (1961) p.140.

(21) See "Tariff Commission" (1905) 3309, 3145, and compare Rodgers (1962) p.309.

were very different. One of the keys to the strengths and weaknesses of any industry is its spatial concentration and its ability to dominate the economy of a region. The Staffordshire pottery industry, for example, retains a labour force despite its below-average wages because it dominates a region of little industrial diversity. The fragmented distribution which emerged in the silk industry is a less usual feature of industrial development - indeed it made the nineteenth century English silk industry unique among its European competitors and among the textile trades in England.⁽²²⁾ This fragmentation intensified the problems of the declining industry by exposing it to the widest range of rivals for labour, space and capital funds.

Apart from its effect on labour wastage, which has already been considered,⁽²³⁾ perhaps the most serious result of the industry's scattered distribution was that ancillary activities failed to develop adequately even in silk's most prosperous and expansive periods before 1860. For example, firms specialising on building silk-working equipment appear to have

(22) See Rawlley (1919) p.326.

(23) See above p. 246-47.

been established only in Macclesfield and Leeds, and in the latter town it was chiefly silk spinning equipment that was produced.⁽²⁴⁾ Elsewhere the machinery for silk mills was manufactured rather as a sideline by firms whose principal concern was with equipment for the cotton, wool or worsted industries. There was consequently less technical progress and inventiveness in the silk industry than in other textile trades and most advances in design, particularly after 1860, took place on the Continent where there was a significant branch of the textile engineering industry specialised on producing silk-working machinery.⁽²⁵⁾

Some ancillary occupations, such as silk-dyeing, had become widespread in the first half of the nineteenth century, but declined to negligible proportions after 1860 when there was insufficient demand for their specialised skills. Before 1860 specialist silk dyers were found in almost every region of silk manufacture, but by the end of the century only Macclesfield, Leek, Coventry and Nottingham had significant silk dyeing industries and even in these centres the scale of operation was much reduced.⁽²⁶⁾ The small scale of operation

(24) See above p. 58.

(25) "Tariff Commission" (1905) 3153, 3272

(26) "Tariff Commission" (1905) 3155, 3239.

increased costs considerably and many skilled workers were lost to the industry. Hence, like the machine makers, the English silk dyeing firms found it impossible to keep abreast of technical developments (in particular the use of aniline dyes and the "weighting" of silk),⁽²⁷⁾ and by the end of the century dyeing was more cheaply and better done in Lyons or Crefeld than in Britain.⁽²⁸⁾

After 1860, the disabilities found in the ancillary services were evident even in the throwing industry. The English throwsters had none of the advantages of cheap labour and integrated production found in the continental industry,⁽²⁹⁾ and instead had to rely on their ability to supply specialised yarns and to meet orders quickly.⁽³⁰⁾ The throwsters' external linkages with the weavers and other yarn users were thus of paramount importance and in this new role the commercial independence and dispersed distribution of throwing could not be maintained. Large integrated concerns in which throwing was subsidiary to weaving became dominant and, even in the South

(27) Weighted silk yarn consisted of a fine thread considerably thickened with dye. The product was cheap, passed for silk, but rotted quickly. See "Tariff Commission" (1905) 3261.

(28) "Tariff Commission" (1905) p.3306

(29) See above p. 193.

(30) "Tariff Commission" (1905) 3310.

West Pennines and Yorkshire where significant independent throwing and spinning branches remained, specialised throwing firms were responsible only for a minority of the yarn produced.⁽³¹⁾ As happened later in the cotton industry, the separation of the spinning and weaving processes became an embarrassment⁽³²⁾ and, under pressure from foreign competitors, silk throwing in England rapidly contracted into close physical and commercial association with weaving.

The dispersed distribution of silk throwing had prevented, even before 1860, the development of any major central market for yarn, such as existed for cotton, for example, in the Manchester Royal Exchange. This weak marketing organisation hastened the integration of the throwing with the weaving branch in the more competitive circumstances after the Free Trade Treaty. One major ancillary institution of silk production, however, had been maintained in England - the role of London as the European market and distribution centre for raw silk from China, Japan and India.⁽³³⁾ But the collapse of throwing in England caused London to lose this function.

(31) See Rawley (1919) p.233.

(32) See Rodgers (1962) p.307.

(33) This market was established when the British East India Company monopolised the trade in silk.

Figure 9.1. illustrates the decline of the entrepôt functions of London in the early 1860s after accumulated stocks of silk had been sold, and the very low level of re-exporting which took place after the mid-1870s when production on the Continent returned to normal following the Franco-Prussian War. By 1880 southern France and Italy were so much more important users of raw and thrown silk that the major market for products from the Far East became established at Marseilles. The move of the market from London - precipitated by the opening of the Suez Canal which simplified the diversion of exports to the French and Italian ports - made it considerably more costly and time consuming for English throwsters to obtain raw silk, and this branch of production was further injured. (34)

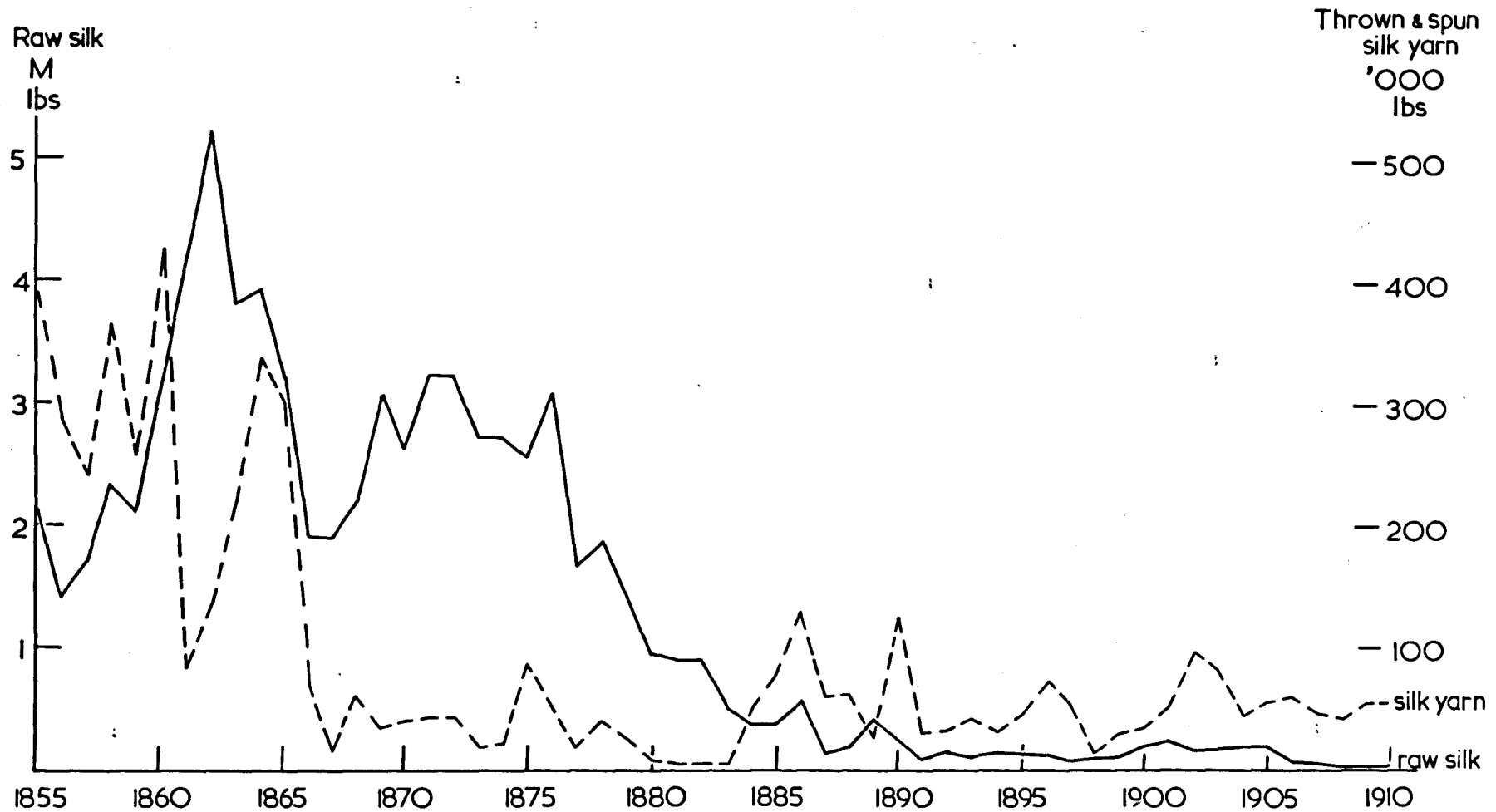
Although throwing and the ancillary industries became much more concentrated into the major regions during decline, silk weaving, in contrast, remained relatively widespread. As seen above, strong regional specialisms had developed in the weaving branch of the industry by the mid-nineteenth century, (35) and in the subsequent decline the products of some of the lesser regions (notably East Anglia and Yorkshire) proved to be more

(34) "Tariff Commission" (1905) 3067,3290

(35) See above p. 112.

FIGURE 9.1.

RE-EXPORTS OF FOREIGN-MADE RAW SILK AND SILK YARN 1855-1910



successful than the staple lines formerly produced in the South West Pennines and Lancashire. Many domestic and powered silk weaving concerns in fact soon failed, particularly in the smaller centres of southern England, and in all regions firms amalgamated so that production was soon concentrated into the hands of a few large scale producers. But the strength of the specialisms of the remaining concerns beyond the South West Pennine region caused weaving, now the strongest branch of the industry, to retain its fragmented distribution.

The contrasted distributions of weaving, throwing and the ancillary services, which resulted from the different patterns of decline, greatly increased the interdependence of the regions in the later nineteenth century. Semi-manufactured goods were often transported twice, and sometimes as many as five times, before the final goods were produced⁽³⁶⁾ and the costs involved could no longer be easily absorbed. Moreover transport costs in England were unduly high because of the "injustice of the Carriers Act"⁽³⁷⁾ and goods manufactured in Lyons could reach the London market having borne

(36) "Tariff Commission" (1905) 3278, 3348.

(37) "Tariff Commission" (1905) 3161. Because of its value silk was charged high rates by the British railway companies, which nevertheless admitted no responsibility if a consignment was lost. See also "Tariff Commission" (1905) 3348.

lower transport costs during manufacture than English-made goods. (38)

Thus, despite the weaknesses which arose from its fragmented distribution, not even the decline of the silk manufacturing forced the industry into a single, compact producing region, and the increased strength and stability which agglomeration might have given the industry were not available for its support. As the later experience of the cotton industry showed, agglomeration does not necessarily lead to rationalisation in a declining industry and, even in a regionally concentrated industry, local specialisms can be extremely resistant to extinction or change. (39) Nevertheless, in the economic environment of the late nineteenth century, greater agglomeration would almost certainly have strengthened the declining silk industry. The industry would have had a firmer hold on its labour force, which would have reduced both the competition with more prosperous local industries for workers and the difficulties of meeting local wage levels and other service charges. (40) Manufacturers could have more

(38) "Tariff Commission" (1905) 3319, 3278

(39) See Rodgers (1962) pp.305-6.

(40) See "Tariff Commission" (1905) 3157, 3272 and above p. p.246-47.

readily formed associations to protect their interests, as their Continental competitors did in the closely-knit combines which emerged.⁽⁴¹⁾ Technical and commercial expertise and the support of ancillary industries would have been more generally available; a more sophisticated marketing apparatus might have developed, and transport costs would have been considerably reduced. But little could have completely prevented the collapse of the silk industry once protection was removed and competition had to be faced; and the fragmented distribution of the industry merely speeded the transfer of labour and capital to more profitable occupations and eased the attendant social distress.

B) ADJUSTMENT TO NEW CONDITIONS: THE NATIONAL PICTURE.

In 1851 there were over 135,000 persons employed in the manufacture of silk in England. By 1911 the industry had lost almost eighty per cent of its labour force and employed under 30,000 workers.⁽⁴²⁾ The decline of the domestic industry,

{41} "Tariff Commission" (1905) 3156, 3100.

{42} The occupational statistics in the Censuses are not strictly comparable over these sixty years. In particular the finishing trades and merchants are treated differently in different enumerations. In this account the same occupations are included in "the silk industry" as far as the data allows. See "Guide to Official Sources, No.2" (1951) Bellamy (1952 and 1953) for a general account of the problems.

already seen to be considerable between 1850 and 1870,⁽⁴³⁾ continued at a great rate. By the late 1870s there were, for the first time, more persons employed in the factories than outside them and by the start of the twentieth century non-factory employment was insignificant (see Figure 9.2.). In 1907 the First Census of Production revealed, in the United Kingdom as a whole, 127 persons employed in unpowered workshops and 74 outworkers manufacturing silk⁽⁴⁴⁾ the remnant of the 90,000 domestic workers of half a century earlier.

In contrast with this absolute collapse of the manual industry, employment in the factories was maintained at around 40,000 (the same level as in 1850 and 1867) until after 1890. In the final decade of the century, however, the tariffs imposed by the United States of America severely reduced exports - from a value of £2.7 millions in 1888 to only £1.2 millions in 1894 - and production in the home market collapsed in the face of huge quantities of silk dumped in England by the continental manufacturers who were also excluded from the American market (see Figure 9.4. below). Thus the

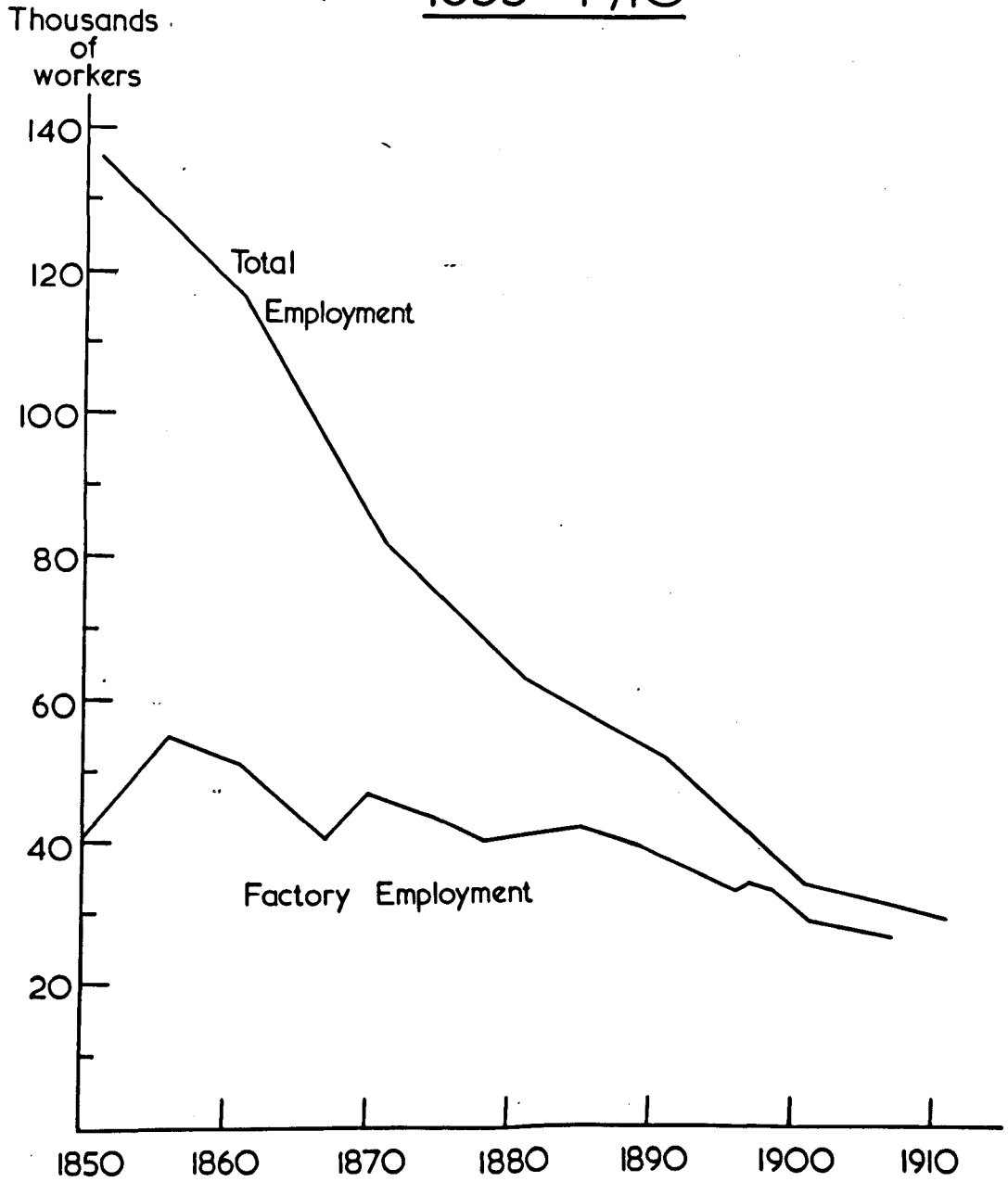
(43) See above p. 195-197.

(44) "Census of Production" (1907) p.313

FIGURE 9.2.

EMPLOYMENT IN SILK MANUFACTURE

1855 - 1910



silk industry - this time in its mechanised branch - again suffered a sharp decline as a result of tariff policies and the dumping of manufactured silk goods in Britain by overseas producers.

By 1890, however, the products of the English silk industry, in both the throwing and weaving branches had changed considerably.⁽⁴⁵⁾ After the upheavals caused by the 1860 treaty and the Franco-Prussian War production of thrown (i.e. continuous filament) silk⁽⁴⁶⁾ - as gauged from the retained imports of raw silk - remained relatively stable from 1875 to 1890, with about two and a quarter million pounds of raw silk used each year (see Figure 9.3.). After a decade of disruption the size of the throwing branch was halved and only one million pounds of silk a year were used after 1900.

In the waste silk spinning branch (i.e. spinning short staple lengths of damaged silk) fortunes were very different. The English silk spinning industry had long been technically advanced and until 1861 there were few foreign producers to provide any competition.⁽⁴⁷⁾ From the late 1830s production

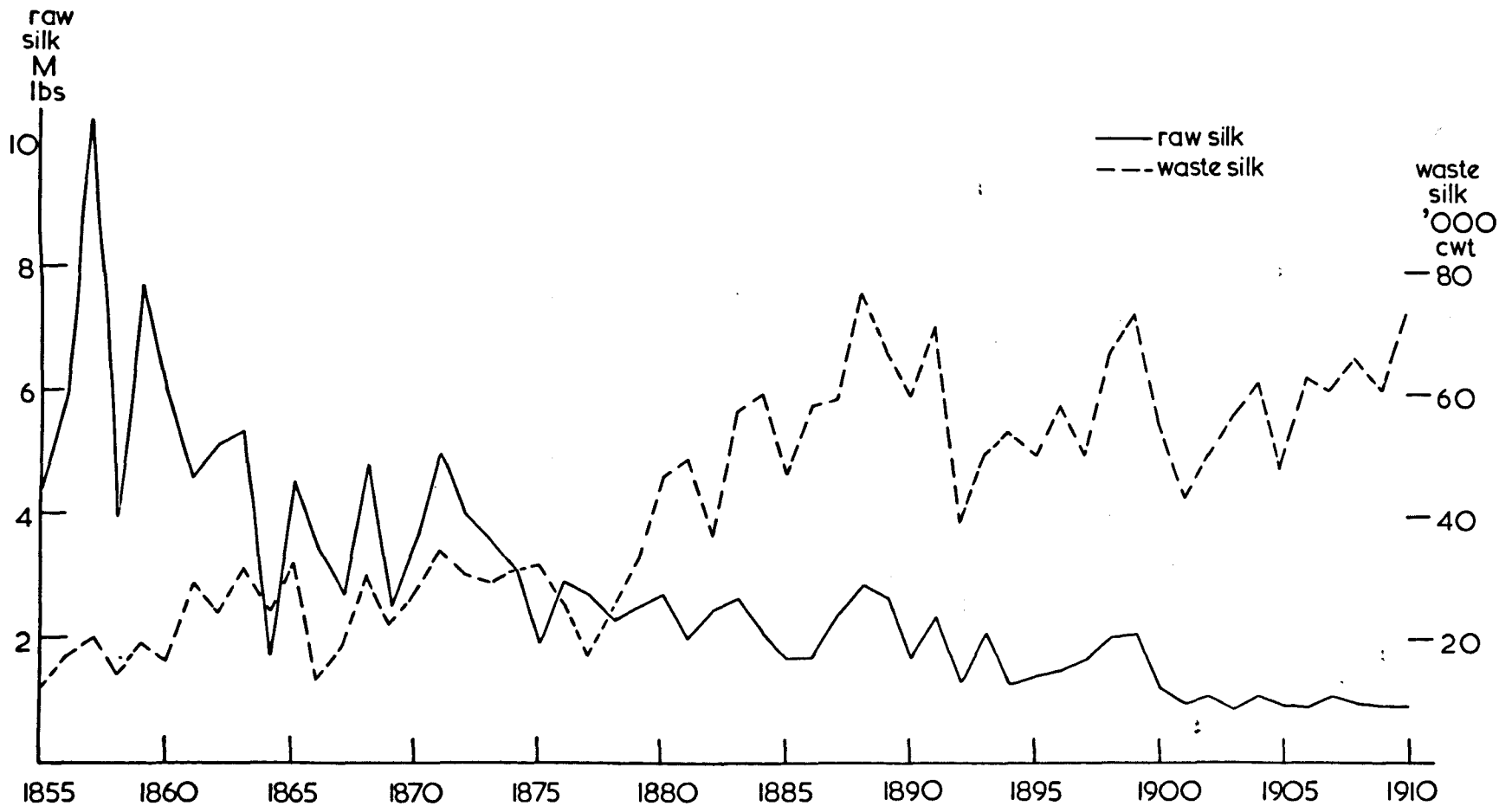
{45} See above esp. pp. 227-233.

{46} Also called net silk.

{47} See Warner (1921) pp.402-8; "Tariff Commission" (1905) 3339.

FIGURE 9.3.

RAW AND WASTE SILK IMPORTS RETAINED IN BRITAIN 1855-1910



had expanded, particularly in Yorkshire and around Manchester, where proximity to the more progressive textile industries was an advantage.⁽⁴⁸⁾ But it was not until the 1870s that spun silk began to replace thrown silk as the major yarn produced in England (see Figure 9.3.). During the Franco-Prussian War when competition was slight many new firms became strongly established and in Bradford, the centre of the trade, business was almost doubled.⁽⁴⁹⁾ The prices of raw materials and the yarns produced fluctuated considerably; competition between firms was extreme, and the advantages lay with large concerns with adequate resources.⁽⁵⁰⁾ Nevertheless, profits could be considerable and waste silk spinning attracted the speculation formerly found in silk throwing. Many new firms were set up, but many failed, as shown in Table 9.1.

Details of the spindles installed convey little impression of the change in emphasis or the overall decline in yarn production. There were no estimates of the division of equipment or labour between the throwing and the spinning

(48) Compare above p.58 and see Warner (1921) pp.417-18 and 403.

(49) Warner (1921) p.226.

(50) See "Tariff Commission" (1905) 3595 and Warner (1921) pp.424-426.

TABLE 9.1.

WASTE SILK SPINNING IN ENGLAND: 1792 - 1913

A) THE NUMBER OF FIRMS SPINNING WASTE SILK IN ENGLAND:
1792 - 1913

YEAR	NUMBER OF FIRMS
1792	1
c.1835	8
1870	24
1886	30
1904	24
1913	22

B) NEW FIRMS AND FAILURES IN WASTE SILK SPINNING:
1870 - 1904

		FAILED 1870-1904	REMAINING IN 1904
Number in 1870	: 24 of which	15	9
Founded 1870-1904	: 28 of which	13	15
TOTAL existing at some time 1870-1904	<u>52</u>	TOTAL FAILED <u>28</u>	TOTAL REMAINING <u>24</u>

branch until 1907; there were large numbers of spindles idle for considerable periods particularly in throwing; and the average output of a spinning spindle appears to have been nearly three times that of one throwing silk.⁽⁵¹⁾ However the figures for output and trade in the Census of Production make it clear that the spinning branch was much more important: in 1907 over four times as much spun silk as thrown silk was produced; almost all home demand was satisfied (compared with under two-thirds for thrown silk) and over one-quarter of the output was exported (see Table 9.2.).

In the weaving branch, too, there were considerable changes in emphasis. Spun silk was increasingly used rather than the more expensive thrown silk in many goods and by 1907 over sixty-five per cent of all yarn used in England had been spun (see Table 9.2.). Moreover goods in which silk was mixed with other yarns became increasingly important. Pile fabrics (which increased greatly in importance after 1870) and many of the dress cloths and smallware goods produced were mixed fabrics⁽⁵²⁾ and by 1907 almost half the broad goods produced by "the silk trade" - by quantity and value - were made from

(51) See "Census of Production" (1907) p.314. Even in this census only about half of total spindles were recorded.

(52) See "Tariff Commission" (1905) 3317 and Warner (1921) p.232.

TABLE 9.2.

PRODUCTION AND TRADE OF SILK AND SILK GOODS INTHE UNITED KINGDOM: 1907

	PRODUCTION	EXPORTS	EXPORTS AS % OF PRDN.	HOME (1) CONSUMPTION	% HOME PRODUCED
	<u>'000 lbs</u>	<u>'000 lbs</u>		<u>'000 lbs</u>	
Thrown Silk Yarn	1,000	34	3	1,544	62
Spun Silk Yarn	4,000	1,036	26	3,276	90
Spun Silk as % of total	80	97	-	68	-
Broadstuffs	<u>'000 yds</u>	<u>'000 yds</u>		<u>'000 yds</u>	
All silk	10,527	7,044	67	69,485	5
Mixed goods	7,941	5,974	75	18,436	11
TOTAL	<u>18,464</u>	<u>13,018</u>	70	<u>87,921</u>	6
Narrow Goods (all silk & mixed)	<u>£'000</u>	<u>£'000</u>		<u>£'000</u>	
Ribbons	121	42	35	2,488	3
Smallware (2)	1,852	465	25	3,296	60

Notes: (1) Home Consumption = Home production not exported + Imports retained.

(2) Smallware goods include Neckties, handkerchiefs, scarves, mufflers, sewing silks, trimmings, bindings, braids, lace cords and other manufactures of silk.

other yarns mixed with silk. Indeed the silk industry was already losing its identity: there were probably more goods made from silk mixed with other yarns produced outside the industry than within it. (53)

Of greater significance than this change in the materials used, however, was the change in the nature and quality of the goods produced. Figure 9.4. gives some indication of the huge quantity of manufactured silk goods imported after 1860 which replaced many of the English products. It has been seen that it was mainly the lower quality products which were replaced and that in England the industry soon became very specialised on higher grades of work. (54) It was these few specialised lines which now formed the backbone of the silk industry.

Crape (especially black mourning crape) was a strongly established English product (55) which became very fashionable in Europe in the mid-nineteenth century and production - and exports - boomed until the late 1880s when the fashion gradually

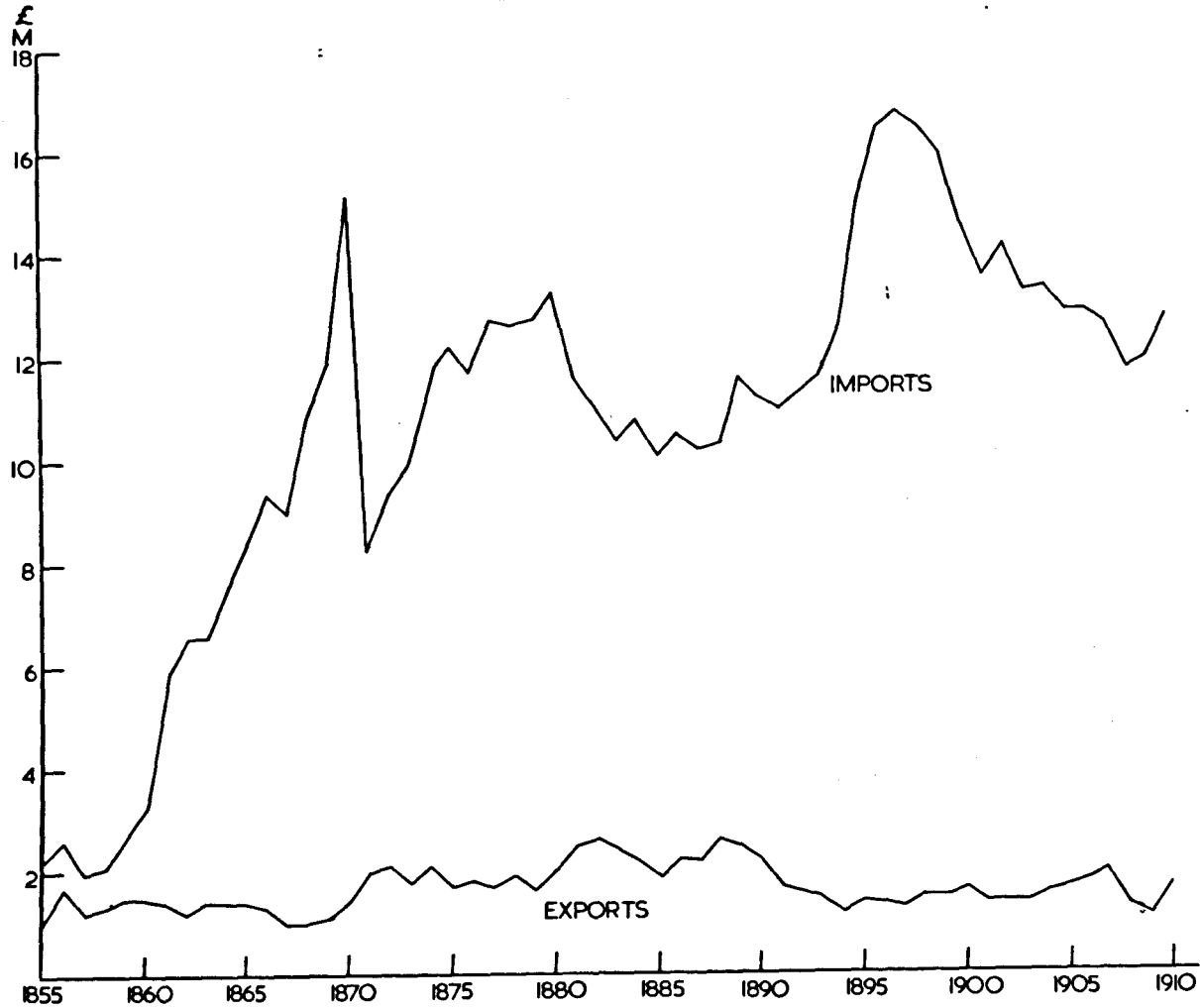
(53) See Warner (1921) pp.218 and 231-32. The problem of enumerating the mixed-goods trade is discussed in "Census of Production" (1907) pp.284-86.

(54) See above p. 119.

(55) See above p. 231-33.

FIGURE 9.4.

IMPORTS AND EXPORTS OF MANUFACTURED SILK GOODS
1855 — 1910



declined.⁽⁵⁶⁾ Great quantities of pile fabrics, particularly plushes and artificial seal skins, were also exported especially to the United States of America before tariffs were imposed in the 1890s.⁽⁵⁷⁾

These goods made up the bulk of the silk exports from Britain.⁽⁵⁸⁾ which were, in fact, at a higher level between 1870 and 1890 than they had been immediately before the 1860 treaty (see Figure 9.4.). In 1907 they still clearly made up a large proportion of total manufacture, for seventy per cent of broad goods were exported (see Table 9.2.).

In addition, small quantities of a wide range of other goods were produced, chiefly for the home market. Rich furniture silks, dress silks and linings were the main broadstuffs, but the bulk of home demand for these goods was met by imports (see Table 9.2.). The silk smallware industry (defined in Table 9.2.) was based to a much greater extent than broad silk manufacture on the home market and in 1907 met over half the demand of British consumers. Although their

(56) See Warner (1921) pp.284-9, 299-300 and 307.

(57) Tariff Commission 3312-3320 and compare above p. 243.

(58) See "Census of Production" (1907) p.313 and Tariff Commission (1905) 3071-82, 3312-20 and 3252.

manufacture was relatively insignificant in the 1880s (when crape and plush production were at their height), smallwares accounted for over half the value of the woven silk goods produced in the early twentieth century (see Table 9.3.) and this was probably one of the strongest branches of the industry.

C) ADJUSTMENT TO NEW CONDITIONS: A REGIONAL ANALYSIS.

Although the silk industry declined considerably after 1860 it still retained a remarkably scattered distribution at the start of the twentieth century (see Figure 9.5.): of the twenty-eight counties in which over seventy-five silk workers were employed in 1851, fifteen still produced silk in 1901. Decline was considerable in the counties immediately to the south and west of London, as shown in Figure 9.5., but elsewhere all of the silk manufacturing regions delimited previously retained at least a remnant of production.

The major reason behind this continuing widespread distribution was that the industry remained very specialised within the various regions: each manufacturing district

FIGURE 9.5.

STRUCTURE OF THE SILK INDUSTRY - 1901 and CHANGE IN TOTAL EMPLOYMENT - 1851 - 1901

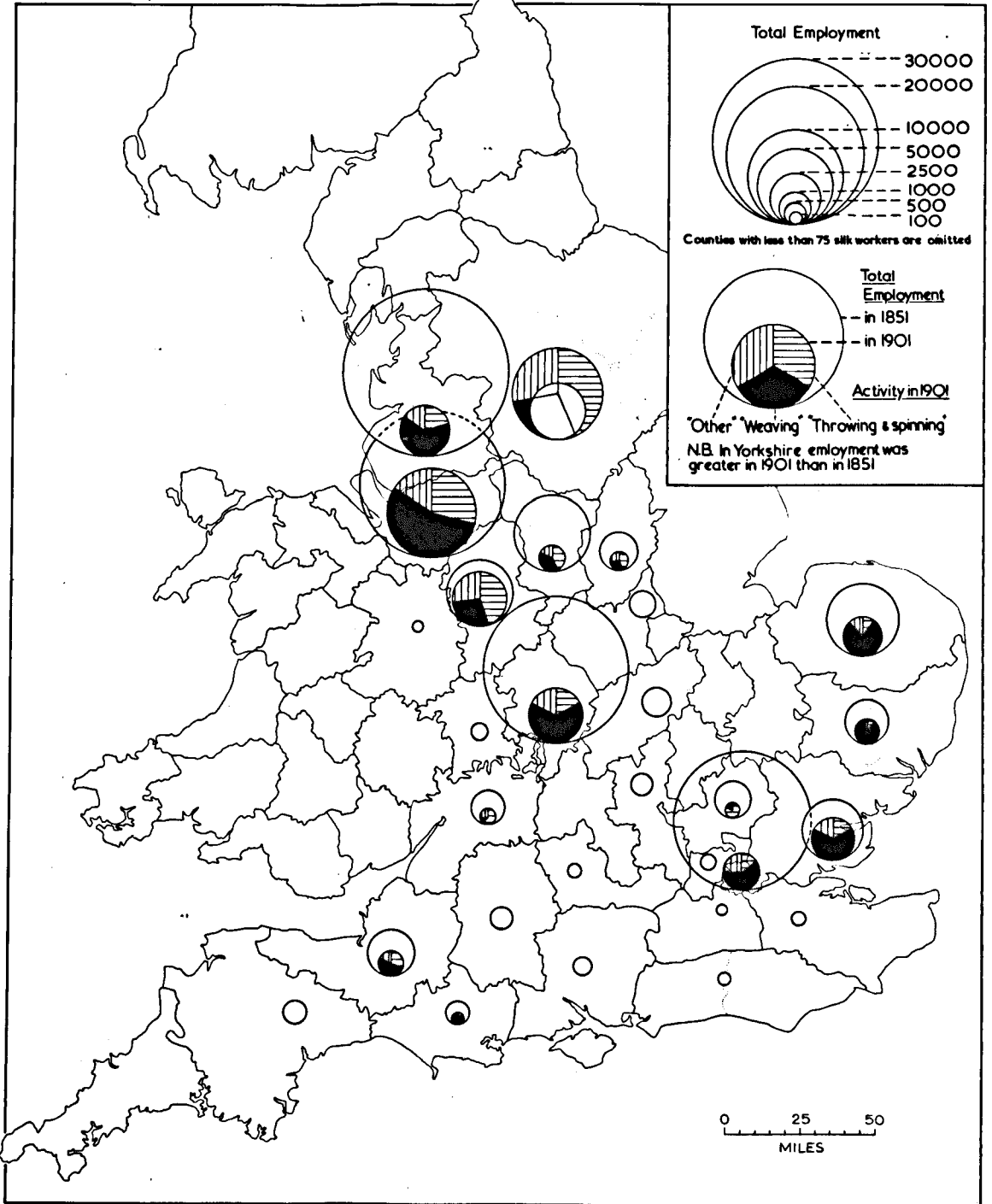


TABLE 9.3.

VALUE OF THE OUTPUT OF THE VARIOUS SECTIONS OF THE
SILK WEAVING TRADE IN THE UNITED KINGDOM: 1907

	£'000	% of Total
Broadstuffs		
All silk	869	20
Mixed Goods	696	25
Total Broadstuffs	<u>1,565</u>	<u>45</u>
Ribbons	121	4
Ties, Handkerchieves, Scarves, Mufflers Etc. }	576	17
Trimmings, Bindings, Braids, Laces, Cords, etc. }	879	25
Sewing Silks	314	9
TOTAL	<u>3,455</u>	<u>100</u>

Note: Although this table relates to the whole of the U.K., very little of the production took place outside England.

produced only a limited range of goods (see Table 9.4.), and in consequence no one region came to dominate all sections of the industry. Though almost everywhere the emphasis of the industry changed as manufacturers attempted to adjust to the new conditions, the origins of the regional specialisations can invariably be found in the period before 1860 and there was a marked absence of the strong development of any branch of manufacture, however successful, in any region other than its traditional base. (59) As a result the fortunes of the various sections of the trade had considerable regional impact and the effect of changes in the demand for any particular product was often restricted to one manufacturing district. This section therefore studies the changing fortune of the regions - which were by now almost independent of each other - in order to discover what factors shaped the distribution of the industry in the early twentieth century (as shown in Figure 9.5.).

(59) In part this was because the different branches of production - lace, sewing silk, smallware, ribbons, crape, pile fabrics etc. - used different machinery. See Rawlley (1919) p.239

TABLE 9.4.

THE DISTRIBUTION OF THE VARIOUS BRANCHES
OF THE ENGLISH SILK INDUSTRY: 1904

<u>Trade Name of Area and Towns</u> <u>Comprised in it.</u>	<u>Class of Goods Chiefly Made.</u>
MACCLESFIELD :— Macclesfield, Congleton.	Silk Handkerchiefs, Mufflers, Materials for Men's Ties, Shirts, &c., Printing Silk, Sarsnets, Crêpes, Ladies' Scarves, Wraps. Sashes, Curtains, Damasks, Spun-silk, Machine Twist, Filoselle.
MANCHESTER DISTRICT :— Manchester, Middleton, West Houghton.	Dress Silks, Tailors' Lining Silks, Galloons, Bindings, Ribbons, Chenilles, Sarsnets and Handkerchiefs.
LONDON DISTRICT :— Spitalfields, Braintree, &c.	Rich Furniture Silks, Silks for Men's wear, Linings, Satins, Dress Silks, Brocades, Damasks, Taffetas, Umbrella Silks, Cravat Silks, Silk Crêpes, Crêpe-de-Chine, Gauzes.
NOTTINGHAM AND LEICESTER :—	Silk Lace and Hosiery, Silk Nets, Veilings, Gloves, Shawls, Elastic Webs.
DERBY :—	Silk Trimmings, Silk Cords.
YORKSHIRE :— Bradford, Manningham, Saltaire, Halifax.	Dress Goods, Plushes, Velvets, Seals, Surahs, Spun Silk Yarns.
NORWICH :— Norwich. Yarmouth	Crêpes, Chiffons, Gauzes, Crêpe-de-Chine, Brocades, Damasks, Satins, Dress Silks.
COVENTRY :—	Ribbons, Bindings, Silk Fringes.
LEEK (Staffs.) :—	Weaving Yarns, Embroidery Silks, Sewings, Machine Twist, Tailors' Twist, Prussian Bindings, Braids, Trimmings, Laces, Damasks, Knitting Silks, Brocades.
SHERBORNE :—	Figured Dress Goods, Gros-grain, &c.
FROME :—	Silk Crêpes, &c.

THE SOUTH EAST

In the south east of England (including East Anglia) the various sections of the silk trade traditionally located there gradually became intermingled as firms amalgamated and their products were diversified. Nevertheless, the marked regional specialisms remained.

In the Chiltern sub-region the preponderance of throwing continued (see Figure 9.5.), though production was on a much smaller scale. After the catastrophic decline in the 1860s throwing was briefly revived (but only in Hertfordshire) during the Franco-Prussian War,⁽⁶⁰⁾ and a few concerns survived until the slump of the 1890s. By the early twentieth century, however, the only remnant of this once significant throwing sub-region was a single mill at the long established silk centre of St. Albans. To meet the new competitive conditions production had been diversified and a wide range of sewing and hosiery silks as well as organzines and trams for weaving was manufactured.⁽⁶¹⁾

(60) See above p.229

(61) Warner (1921) pp.322-23.

The other major established specialisation of the silk industry in the south east was crape production, which had been carried on in the mills of Norfolk and Essex from the early nineteenth century. In the period when English crape was in great demand⁽⁶²⁾ most new firms joined the established leaders - the Grouts and the Courtaulds - in the traditional East Anglian centres. At the height of the trade in the 1880s and early 1890s over eighty per cent of the persons engaged in its production were employed in the counties of Essex, Norfolk and Middlesex (see Table 9.5.) and in 1900 there were about eight major firms manufacturing crape in the district.⁽⁶³⁾

Although the south east was the major crape producing area in England, only a minority of silk workers were directly engaged in its manufacture (in 1891 less than 1,000 of the 8,000 silk workers in the south east)⁽⁶⁴⁾ and the weaving of a wide range of high quality broadsilks (see Table 9.4.) was more significant for employment. This branch, like crape production, was chiefly located in the large scale, modern

(62) See Warner (1921) pp.299 and 284 and above p.231-2

(63) See Warner (1921) pp.295 and 306.

(64) However, many workers would be employed in throwing and other processes in the combined crape mills.

TABLE 9.5.

PERSONS EMPLOYED IN CRAPE MANUFACTURE: 1881 AND 1891

	1881		1891	
	No.	% of Total	No.	% of Total
Essex	671	57	455	50
Norfolk	166	14	225	25
Middlesex	101	9	94	10
THE SOUTH EAST	<u>938</u>	<u>80</u>	<u>774</u>	<u>85</u>
Somerset	87	7	100	11
Cheshire	57	5	4	-
Lancs.	47	4	1	-
Other	53	4	36	4
ENGLAND AND WALES	<u>1,182</u>	<u>100</u>	<u>915</u>	<u>100</u>

combined mills of East Anglia (almost all of which were in Essex and Norfolk) which in 1889 employed seventy per cent of the workers and contained over ninety per cent of the spindles and power looms found in the south east.

But an important part of the high class trade remained in Suffolk, particularly around Sudbury, and here power looms only slowly replaced hand weaving.⁽⁶⁵⁾ Some combined mills may have operated in Suffolk in the late 1870s and 1880s, but by 1901 almost all workers were employed in weaving (see Figure 9.5.). In London itself hand weaving also continued and a small number of power looms were installed after 1870,⁽⁶⁶⁾ but more significant was the migration of firms from Spitalfields to Suffolk from the mid-1890s.⁽⁶⁷⁾ The links between these two districts appear to have remained stronger than those between London and the more modern industry of Essex,⁽⁶⁸⁾ and Suffolk still exerted an attraction by being an area of lesser labour competition.⁽⁶⁹⁾ Thus the migration of silk

{65} Compare above p.196. and see Warner (1921) pp.320-21

{66} Between 1870 and 1889 there were never more than one hundred power looms in silk in the metropolitan area. See "Fact. Insp. Ret." (1870-1889)

{67} Vict. County Hist. Suffolk vol.2 (1907) p.274.

{68} Compare above Chapter VI esp. p.178

{69} See above p.225.

manufacturing from London, which had begun over a century earlier,⁽⁷⁰⁾ was almost complete by 1900.

The imposition of tariffs in America and France caused a marked decline in the silk industry of the south east, particularly in crape production,⁽⁷¹⁾ and by 1911 there were barely half the number of silk workers employed as twenty years previously. In 1911 three-quarters of the 5,000 workers in the south east were found in East Anglia, where only twelve important firms remained, of which Courtaulds was by far the largest.⁽⁷²⁾

THE SOUTH WEST

In the South West of England the silk industry, which had been archaic and declining throughout the mid-nineteenth century,⁽⁷³⁾ survived surprisingly strongly. During the Franco-Prussian War employment in the region's mills increased by almost seventy per cent (from 1,737 workers in 1867 to 2,940 in 1874). Of the throwing mills which ceased working after the 1860 treaty⁽⁷⁴⁾ eleven re-commenced operations at

(70) See above pp.93-98. (71) See above pp.242-43.

(72) See Warner (1921) pp.295,306 and 321.

(73) See above pp.135,179 and 225.

(74) See above pp.229-30.

this time and most continued to operate until the 1880s, although the scale of operation gradually declined: in 1870 there was an average of 157 workers per mill, in 1885 only 90.⁽⁷⁵⁾ In weaving, too, employment was largely maintained and five mills (either combining weaving with throwing or specialised on weaving) continued to operate until the 1890s.

There is some evidence to suggest that, in part, silk manufacturing was maintained in the South West by the activities of firms based outside the region. Two firms from Derby in turn occupied a mill at Malmesbury between about 1855 and 1889 and, it appears, employed the majority of Wiltshire's silk workers.⁽⁷⁶⁾ In the early twentieth century a Bingley firm bought one of Sherbourne's silk mills and as late as 1925 Brocklehursts of Macclesfield began silk, rayon and wool weaving at Warminster, a concern which continued to operate until 1960.⁽⁷⁷⁾

This intervention by firms based at some distance from the region suggests that here, as in Suffolk the lesser competition

(75) See Fact. Insp. Ret. 1870 - 1889.

(76) See Warner (1921) p.332: Vict. County Hist. Wilts. vol.4 (1959) p.177 and compare with Fact. Insp. Ret. 1870 - 1889.

(77) Warner (1921) p.336. Vict. County Hist. Wilts. vol.4 (1959) p.177: and information from the firm.

for labour was a major attraction.⁽⁷⁸⁾ Throughout the later nineteenth century the silk industry was generally unable to compete with more prosperous industries for labour⁽⁷⁹⁾ but, it appears, it was able to survive in this predominantly agricultural region.

However, the intervention of distant firms was not the sole or even the most important reason behind the continuing silk industry in the South West, for three local firms, all long established in the region, showed great initiative and entrepreneurial ability and it was chiefly due to these firms that such a large industry remained into the twentieth century. In Somerset, the throwing branch of the industry had, by 1889 become almost entirely concentrated into the hands of one firm who owned at least three of the five throwing mills operating in the county. This firm (originally Rawlinsons of Taunton, founded before 1822)⁽⁸⁰⁾ extended its products to include silks for sewing, lace and hosiery as well as for weaving⁽⁸¹⁾ (a diversification reminiscent of that found in the St. Albans mill)⁽⁸²⁾ and was still able to expand its business in the

(78) See above p. 266. and compare Osborne (1964) p.145-6.

(79) Compare above p.246.

(80) See Warner (1921) pp.339.

(81) Warner (1921) pp.339-40. (82) See above p. 264.

twentieth century.

At Frome a second long established firm, Thompson and Le Gros, continued to produce crape, though after the French tariffs of 1905 production dwindled and by 1907 the firm was insignificant besides Rawlinsons, whose mills employed two-thirds of Somersets' 700 silk workers. (83)

In Dorset at least three of the silk mills were owned by the Wilmotts of Sherborne from 1770 until 1907. Originally this firm concentrated chiefly on throwing, but after 1870 power looms were installed and the major occupation was the weaving of high quality dress goods. (84) (see Table 9.4.).

WARWICKSHIRE AND THE COTSWOLDS

The impact of declining employment probably felt more strongly in the Warwickshire ribbon trade than in any other branch of silk manufacture. The industry, small scale, labour intensive and largely domestic, was quite unable to meet the competition from imports after 1860. The long term rate of decline between 1851 and 1901 was, in fact, slightly lower than in the major districts of broadweaving in London and

(83) Warner (1921) p.340 and "Fact. Insp. Ret." (1907)

(84) Warner (1921) pp.333-36.

Lancashire, but the concentration of ribbon weaving in Coventry and the lack, initially, of much alternative employment added to the combination of factors which made for an immediate and rapid collapse of the trade in 1860,⁽⁸⁵⁾ caused Coventry to be the silk town in which distress was greatest and most prolonged.

Inevitably decline was greatest in the domestic branch⁽⁸⁶⁾ In 1871 silk manufacturing in Warwickshire employed 13,700 persons, barely sixty per cent of the level of ten years previously, though in the powered industry 3,900 people found employment in 1870, almost as many as in the boom of the late 1850s. After another twenty years the industry still employed almost 6,000 people of whom probably about half were domestic workers. But employment was halved again during the slump of the 1890s.

The mechanised branch, in the cottage factories as well as in the large scale mills, thus remained almost intact for thirty years after the 1860 treaty. Indeed there were more cottage factories recorded in the boom caused by the Franco-Prussian

(85) See above p.200.

(86) See above Table 7.7.

War than there were in the late 1850s.⁽⁸⁷⁾ When conditions on the continent returned to normal, the trade in plain ribbons was again lost to the French domestic producers and the Coventry trade survived primarily because it could meet the demands of fashion at short notice and was able to reach the English market ahead of foreign producers. But this fancy section of ribbon weaving was always in a precarious position, for it was only in plain ribbons that demand, and hence employment were at all predictable and continuous.⁽⁸⁸⁾ Without this stabilising influence the remainder of the industry could not maintain a large, skilled labour force, ready to rapidly extend production as fashion dictated. Hence, brief periods of prosperity were followed by long stretches when trade was slack.⁽⁸⁹⁾

(87) The 1874 Factory Returns recorded 405 silk weaving mills in the West Midland District. This total includes the large scale mills in Coventry and perhaps one or two mills in Staffordshire, but almost all of these 405 mills were cottage factories in Coventry.

{88} See Warner (1921) p.122.

{89} See Warner (1921) pp.123-5 for details.

Fashion turned finally and completely against ribbon in the 1890s and, added to silk's other problems in that decade, this caused the near extinction of the powered ribbon industry, especially in the cottage factories. Even in 1889 there were over three hundred weaving "factories" employing an average of nine persons working in the Factory Inspectors' West Midland district,⁽⁹⁰⁾ and the cottage factories still clearly accounted for much of the ribbon manufactured. Thereafter, however their number rapidly declined; by 1903 the last few cottage manufacturers had ceased operating⁽⁹¹⁾ and only the large scale silk factory remained in Coventry.

The products of the Coventry industry changed considerably after 1870. As in the manufacture of broadgoods, thrown silk was replaced by the cheaper spun yarn, and cotton and other yarns were mixed with silk.⁽⁹²⁾ By the twentieth century the town's manufacturers had turned to a diverse range of high quality narrow goods less dependent on the fashion market. Illuminated and lettered ribbons, tapes, and bookmarks, elastic webbing, frillings, labels, ties and hat-bands⁽⁹³⁾ were all

(90) See note 87 above. At least 260-280 of the mills were cottage factories in Coventry.

(91) Warner (1921) p.125. Vict. County Hist. Warwicks. vol.2 (1909) p.263.

(92) "Tariff Commission" (1905) 3392; Warner (1921) p.125

(93) Vict. County Hist. Warwicks. vol.2 (1909) p.263. Warner (1921) p.125.

produced, some of them competing strongly with the small-ware and narrow woven goods of the South West Pennine and East Midland manufacturers.⁽⁹⁴⁾ One notable firm, established by the Cash brothers, who were major proponents of the cottage factory system,⁽⁹⁵⁾ successfully survived the transitions of raw material and product and is still producing ribbons and name-tapes to-day.

The collapse of Coventry's trade had an immediate effect on the throwing mills in the Cotswolds⁽⁹⁶⁾ where much of the yarn for the ribbon weavers had been produced. Even when the Coventry trade was prosperous in 1870 there were only six mills and 800 persons employed in silk throwing in Gloucestershire and Worcestershire. (compared with twenty three mills and over 2,000 workers in 1856) and the industry gradually dwindled over the next twenty years, particularly as some of the throwsters moved their businesses to Coventry.⁽⁹⁷⁾ The evidence available suggests that few changes in product or organisation occurred and in 1901 there were less than 200 silk workers employed in the Cotswolds, perhaps in a single

(94) See below pp. 276. (95) See Prest (1960) pp.106

(96) See above p.229

(97) Warner (1921) pp.236 and 237.

throwing mill (see Figure 9.5.).

THE EAST MIDLANDS

In the East Midlands the major effect of the 1860 treaty was to destroy the self-sufficient silk industry which had grown up in Derby.⁽⁹⁸⁾ Although this had been highly mechanised, the products of both the broad and ribbon weavers were chiefly plain goods⁽⁹⁹⁾ and these were rapidly replaced by imports. Consequently the entire silk industry of the East Midlands reverted to being little more than a yarn supplier to the region's other textile industries and the fate of silk manufacturing was entirely bound up in their changing demand.

In the hosiery trade other yarns increasingly replaced silk during the 1850s especially as they were more suitable for the powered hosiery machines which were at last being introduced,⁽¹⁰⁰⁾ but the demand for silk yarn was maintained through the 1860s by the rapid expansion of lace manufacture in the region.⁽¹⁰¹⁾ Moreover, two new textile industries developed in Derby from the mid-1850s which used some silk yarn.

(98) See above pp.68-71.

(99) See Warner (1921) pp.208-9

(100) Smith (1962) 27-8. (101) See above p.228.

One was the manufacture of elastic silk surgical bandages, which employed forty machines in about 1860.⁽¹⁰²⁾ The other was the production of elastic webbing, particularly for elastic-sided boots.⁽¹⁰³⁾ This was chiefly centred in Leicester, close to the footwear industry, but it developed in Derby (and also in Coventry) where it was a natural extension of the existing ribbon and tape manufacturing. The number of firms involved in producing elastic web rose from two in 1855 to sixteen in 1867,⁽¹⁰⁴⁾ and even in 1871 its manufacture was still making a significant contribution to the town's industrial expansion.⁽¹⁰⁵⁾

The demand for silk yarn from these expanding industries, particularly lace, resulted in an increase in the number of spindles installed in the silk mills, and in both counties employment in the silk industry was maintained for about a decade after the initial contraction following the 1860 treaty (see Table 8.7. above.). Indeed in Nottinghamshire, where the boom in lace manufacture was most strongly felt, employment

(102) Felkin (1867) p.519

(103) See Smith (1964) pp.329-331.

(104) Kelly's Directories (1855 and 1867)

(105) The 1871 Census attributed some of the increase in Derby's population to the extension of elastic web factories.

in the silk mills reached its highest recorded level in 1867. In Derby, however, perhaps the most significant contribution to the new industries was the release of workers, experienced in narrow fabric weaving, to the elastic web industry during its critical period of growth in the early 1860s. (106)

But from the mid-1870s the silk industry contracted almost continually. The conclusion of the Franco-Prussian War reduced the demand for home thrown silk in the East Midlands and the silk using industries, especially lace, were themselves affected by changes in fashion. In Derby the number of silk manufacturers fell from twenty-one in 1864 to only two in 1912, one of whom was a throwster and the other a narrow braid manufacturer. (107) In addition about seven firms used silk (chiefly for electrical and millinery wire, trimmings, bandages, and lace) of which perhaps two threw or wound silk for their own use. (108) In Nottinghamshire, too, silk throwing declined steadily from the mid-1870s, except for a brief recovery around 1880 when silk lace returned to fashion. (109)

(106) Compare Smith (1964) p.330

(107) Kelly's Directories (1864 and 1912); Warner (1921) p.211.

(108) Warner (1921) p.211

(109) See "Fact. Insp. Ret." (1878): "Technical Instruction" (1884) pp. xxxii-xxxix and liv.

The number of silk mills in the county declined from eighteen in 1867 to only two in 1913, both of which were engaged in throwing or spinning.⁽¹¹⁰⁾ Silk was used by many lace, hosiery and smallware firms in the district, but the quantities involved were very small.⁽¹¹¹⁾

Though silk manufacture was thus of great importance in the East Midlands in the first half of the nineteenth century and was critical in stimulating the growth of Derby as an industrial town long before, by the twentieth century it was almost dead (see Figure 9.5.) and had been replaced by other textile activities in a region remarkable for a variety of textile interests. The fate of silk here aptly illustrates one of the general conclusions that emerges from this study as a whole - that in the long term silk was unable to survive in areas where it was exposed to the competition of other stronger textile trades.

YORKSHIRE

In Yorkshire, alone among the silk manufacturing regions

(110) "Fact. Insp. Ret." (1867); Warner (1921) p.195.

(111) For example, less than five per cent of British lace was made from silk in 1907; "Census of Production" (1907) p.361-63. See also Warner (1921) p.197.

of England, there were more workers employed in the industry in 1901 than in 1851 (see Figure 9.5.), but as elsewhere the reasons behind the industry's fortunes can be found in the specialisms that had developed by the mid-nineteenth century. Silk yarn was produced in Yorkshire from the 1830s mainly for the use in the production of mixed fabrics rather than all-silk goods and, since spun silk was more suitable than thrown for combining with other yarns, it was this branch which developed strongly in the next twenty years.⁽¹¹²⁾ Technical progress was considerable, not least because of the close association and the changing requirements of the other vigorously growing textile and clothing industries, and the English spun silk industry was far in advance of any competitors overseas.⁽¹¹³⁾

By 1861 there were twenty-five mills in Yorkshire preparing and spinning (and perhaps throwing) silk, located predominantly in Bradford, Brighouse, Halifax and Huddersfield.⁽¹¹⁴⁾ After the Free Trade Treaty the spinning branch of the silk

(112) See above pp.257-59.

(113) See Warner (1921) pp.401-416.

(114) See "Fact. Insp. Ret." (1861) and Warner (1921) pp.226, 245, 247, 255.

industry expanded considerably as many silk users throughout England turned to the cheaper yarn.⁽¹¹⁵⁾ Although silk spinning was established elsewhere - notably in Lancashire, the South West Pennines and the East Midlands - the industry in these regions remained almost static and by 1884 only six firms were noted outside Yorkshire.⁽¹¹⁶⁾ In contrast to these regions where silk spinning was closely associated with the declining sections of silk manufacture, the relatively independent industry in Yorkshire expanded. During the 1860s a number of new firms were formed and during the Franco-Prussian War the entire silk spinning industry in Yorkshire became firmly established.⁽¹¹⁷⁾

For the rest of the century there were between twenty and thirty specialised silk spinning mills in Yorkshire, in which employment had risen to almost 5,000 by the late 1880s. These mills supplied yarn to users throughout England (and indeed exported substantial quantities),⁽¹¹⁸⁾ but their close links with the Yorkshire mixed weaving trade were always of paramount importance and it was on these links that their

(115) See above p.259.

(116) "Technical Instruction" (1884) pp.xxxvi-viii

(117) Warner (1921) p.226.

(118) See above p.259 and Table 9.2.

prosperity largely depended.

In the mixed weaving trade - which was recorded statistically partly in the "silk industry" and partly with other textiles by the Factory Inspectors - silk was used to varying degrees as fashions changed and as new fabrics and yarns were produced.⁽¹¹⁹⁾ There was, however, one specialism which for a time dominated the silk using section of the mixed trade and which was alone largely responsible for the expansion of the region's silk industry. From about 1867, Listers, one of the most important silk firms in Yorkshire, started to weave velvets by power. Their manufacture was profitable and production was extended in 1881 to longer pile fabrics, particularly plushes and artificial seal skins, which were made of silk mixed with other yarns.⁽¹²⁰⁾ These goods sold extraordinarily well on both sides of the Atlantic⁽¹²¹⁾ and many of Yorkshire's weaving firms turned to supplying these markets. Within the silk industry (as recorded by the Factory Inspectors) the weaving of these fabrics was concentrated into a few combined mills which from 1870 accounted for almost half of the

(119) See Warner (1921) pp.218-2.

(120) "The Times" (June 27th 1913) p.10.

(121) Warner (1921) pp.230. "Tariff Commission" (1905) 3313.

industry's employment in the region (see Table 9.6.). In the plush boom of the 1880s two huge mills, each employing well over 1,000 workers, dominated employment: Listers Manningham Mills at Bradford and Fosters Black Dike Mills at Queensbury, near Halifax. (122)

But these products, too, were subject to the whims of fashion and the burdens of tariff policy. In the 1890s fashion turned to cheaper and less durable fabrics than silk and the tariffs imposed by the United States of America rapidly reduced the volume of exports of pile fabrics; in the case of Listers alone from £300,000 in 1891 to under £4,000 in 1893. (123) Nevertheless the broadly-based mixed fabric industry could adapt itself relatively easily to changing circumstances and employment in the "silk mills" was largely maintained.

In 1897 employment in Yorkshire's silk mills was little below the peak of 10,000 reached in 1889, though by 1901 rather fewer silk mill operatives (8,781) were recorded by the Factory Inspectors, significantly slightly lower than the total

(122) "The Times" (June 27th 1913) pp.6 and 10.

(123) "The Times" (June 27th 1913) pp.10. "Tariff Commission" (1905) 3312-3320.

TABLE 9.6.

EMPLOYMENT IN SPINNING AND COMBINED MILLS IN YORKSHIRE: 1861 - 1889

COMBINED MILLS

SPINNING MILLS

(including any throwing mills)

	No. of Mills	Employment	Workers per Mill	% of all Workers	No. of Mills	Employment	Workers per Mill	% of all Workers
1861	1	54	54	2	21	2,537	121	96
1867	1	240	240	8	20	2,544	127	88
1870	6	1,961	327	47	27	2,190	81	52
1874	6	2,766	461	49	22	4,845	129	50
1878	4	2,315	579	48	24	2,550	106	52
1885	3	3,645	1,215	46	24	3,962	165	50
1889	4	4,886	1,222	49	31	4,922	159	49

of silk workers, in all textile mills, recorded by the Census.⁽¹²⁴⁾ The main concentrations of the industry in the early twentieth century were still in Bradford (where Listers remained important silk manufacturers for a considerable time) and Brighouse, the main centre of silk spinning. Together these towns accounted for almost two-thirds of the workers employed in silk and most of the remainder were in the Factory Inspectors' Halifax district (which included the large Black Dike Mill at Queensbury). The total number of workers, and their distribution was almost exactly the same six years later, though the number of workers returned as silk weavers gradually declined.⁽¹²⁵⁾

In the early twentieth century Yorkshire thus employed almost one-third of England's silk workers. Nevertheless, silk remained only a very small part of the total textile trade of the county or even of the towns in which it was most concentrated. In 1911 less than three per cent of the West Riding's 273,372 textile workers manufactured silk and even in

(124) Some workers in "silk mills" may not have been entered as silk workers in the Census classification and workers in unspecified yarns were classed separately.

(125) "Fact. Insp. Ret." (1901 and 1907) "Census" (1901 and 1911).

Bradford the proportion reached only 6.6 per cent. Clearly the silk industry in Yorkshire continued to derive its strength from being integrated with the varied textile activities of the region, but it was their servant, rather than an independent industry. It could consequently only survive for as long as fashion allowed or until cheaper yarns of cotton or artificial silk were developed with some of the characteristics of silk which could be substituted for it.

LANCASHIRE

In Lancashire, as in Yorkshire, the relationship between silk and the other more important textile industries continued with little change. The flexibility in the organisation of weaving was again demonstrated after the Franco-Prussian War. In the glut immediately after the war, half the mills weaving silk stopped working or turned to other yarns (see Table 7.16. above), though in the more stable and profitable conditions in 1878 production was again considerable. In that year there were forty-four silk mills in Lancashire (twenty-nine of them specialised weaving mills), 6,500 factory workers employed and almost 5,000 looms - forty per cent of the national total - installed.

Although Lancashire was thus still responsible for a considerable proportion of England's broad silks, the plain dress goods⁽¹²⁶⁾ which made up the bulk of the region's production were not strongly competitive in the new conditions. Few changes appear to have been made in the type of cloth produced and manufacturers probably merely turned to cotton as profits in silk diminished. Gradually over the next ten to fifteen years silk manufacture declined. By 1889 there were still thirty-seven silk mills in the county, but employment had declined to just over 4,000 and there were barely 2,500 looms installed, only twenty-four per cent of the national total. (see Table 9.7.).

Silk manufacturing in Lancashire, already considerably reduced, was particularly hit by the tariff changes in the 1890s so that by the start of the twentieth century little remained. About half of the 1700 silk weavers recorded by the 1901 Census were employed by two firms; Robinson and Millington of Patricroft the only survivors of the thirty-one silk manufacturers operating in the Manchester area in 1852⁽¹²⁷⁾

(126) Warner (1921) pp.164-5.

(127) "Tariff Commission" (1905) 3300: Warner (1921) pp.162.

TABLE 9.7.

EMPLOYMENT AND EQUIPMENT IN LANCASHIRE'S SILK MILLS:1878 - 1889

	No. of Mills	EMPLOYMENT		LOOMS		SPINDLES	
		No.	% of England	No.	% of England	No. ('000)	% of England
1878	44	6,581	16	4,904	40	109	11
1885	47	5,009	12	3,361	29	86	8
1889	37	4,128	10	2,539	24	72	7

and Courtaulds, who in 1900 bought a large weaving shed at Leigh.⁽¹²⁸⁾ The remainder of the employment in weaving was scattered through many of the towns of south east Lancashire (notably Oldham, Rochdale and Bolton)⁽¹²⁹⁾ where it was probably concentrated into small departments of large textile concerns.

Silk throwing in Lancashire declined even more rapidly than weaving after the 1860 treaty. There were never more than seven throwing or spinning mills recorded in the county after 1861, and the last firm stopped operating in 1903.⁽¹³⁰⁾ Lancashire shared to some extent in the expansion of silk spinning and plush production in the 1880s, though this was never as strongly developed as in Yorkshire. Two large mills were established in this branch in Rochdale and Heywood but both had ceased operating by 1905,⁽¹³¹⁾ and the only silk spinning concerns which remained were in small mills on the fringes to the textile province, most of them by then apparently owned by Listers.⁽¹³²⁾

Thus in Lancashire the silk industry continued to be subservient to the stronger cotton industry. It was quite

(128) Warner (1921) p.307.

(129) "Census" (1901); "Fact. Insp. Ret." (1901)

(130) "Tariff Commission" (1905) 3300.

(131) Warner (1921) p.262-3 "Tariff Commission" (1905)

(132) E.g. at Todmorden, Skipton and Ripley. See Warner (1921) pp.263-4.

unable to compete with the more generally prosperous industry for labour and other resources after the 1860 treaty, except in its own brief periods of great prosperity and it consequently suffered a gradual but continuous decline.

THE SOUTH WEST PENNINES

The fortunes of the three towns which made up the South West Pennine silk manufacturing region were remarkably dissimilar after 1860. In Macclesfield, by far the most important centre, the industry's products were gradually changed to meet the new conditions, but it was still necessary for employment in the town's silk mills to be considerably reduced before the industry again achieved stability. In the brief boom around 1871, 13,000 persons were employed in manufacturing silk (by hand and power), the same number as a decade earlier, but by 1901 the number was halved (see Table 9.10. below). (133)

Silk throwing in Cheshire, as elsewhere was severely reduced in the mid-1870s. The number of spindles in the county fell from 348,000 in 1874 to only 171,000 in

(133) "Census" (1861, 1871 and 1901).

1878, but this level was then maintained until about 1890, after which there was further considerable decline. In Macclesfield these were between seventy and eighty firms of throwsters operating in the 1850s; by 1884 their number was reduced to thirty-three and by 1905 to only seven. Spun silk was produced by the larger manufacturers as part of their varied activities, but this branch never developed to any significant degree in the town. In 1884 for example, only one firm of silk spinners is noted.

As the importance of throwing rapidly declined in Macclesfield, so the relative dependence on weaving increased. In this branch, too, the number of firms declined - from eighty to one hundred in the 1850s to twenty to twenty-five in 1905⁽¹³⁶⁾ - but many of the firms which remained were large scale manufacturers who combined many branches of the silk industry rather than the small workshop operators and domestic undertakers of half a century earlier.⁽¹³⁷⁾

Inevitably hand loom weaving was reduced, though surprisingly slowly. In 1884 there were estimated to be between

- (134) "Tariff Commission" (1905) 3243. "Technical Instruction". (1884) p. xxxiv-v.
 (135) "Technical Instruction" (1884) p. xxxvi-vii.
 (136) "Tariff Commission" (1905) 3243.
 (137) See Warner (1921) pp.135-137.

2,000 and 2,200 hand loom weavers at work in Macclesfield, compared with between 5,000 and 8,000 in the 1850s.⁽¹³⁸⁾ Power looms were equally slow in replacing the hand looms, though their number increased almost continuously from 1870 (see Table 7.20 above). By 1889 there were 2,053 power looms in Cheshire weaving silk, almost all in Macclesfield, and the region was running close to Lancashire and East Anglia as the major weaving centre (see Table 9.8.). Eventually, in the 1890s there was a considerable decline in the manual trade, and by 1905 there were only five firms employing a total of about 1,000 hand loom weavers.⁽¹³⁹⁾ Powered weaving appears almost to have held its own through this lean decade,⁽¹⁴⁰⁾ and in the early twentieth century employment was stable and profits increasing.⁽¹⁴¹⁾

In addition to these changes in the methods of manufacture, there were also changes in emphasis in the products made. Of the wide range of broadcloths, formerly manufactured, the plainer types were soon eliminated.⁽¹⁴²⁾

(138) "Technical Instruction" (1884) p. xxxiii-iv.

"Tariff Commission" (1905) 3276, 3261.

(139) "Tariff Commission" (1905) 3276, 3261. Davis (1961) p.196. In 1969 two firms were recorded as "hand loom silk weavers" in the town's industrial directory.

(140) See Davis (1961) pp.197-207.

(141) Warner (1912) p.2. and Warner (1921) p.135.

(142) Warner (1921) p.135.

TABLE 9.8.

DISTRIBUTION OF POWER LOOMS: 1870 - 1889

	1870		1874		1878		1885		1889	
	No.	% of total	No.	% of total	No.	% of total	No.	% of total	No.	% of total
Lancashire	5,288	44	2,666	27	4,904	40	3,316	29	2,539	24
East Anglia	2,019	17	2,109	22	1,998	16	2,428	21	2,247	21
Cheshire	1,524	13	1,735	18	1,910	15	1,857	16	2,053	19
Other	3,304	27	3,239	33	3,523	29	4,082	35	3,891	36
ENGLAND	<u>12,135</u>	<u>100</u>	<u>9,749</u>	<u>100</u>	<u>12,335</u>	<u>100</u>	<u>11,728</u>	<u>100</u>	<u>10,730</u>	<u>100</u>

Note: Over half of the looms outside these three regions were in the West Midlands district and were mostly ribbon looms.

At the same time smallware, especially scarves, ties and handkerchiefs, which had always had a major place in Macclesfield's trade, became even more important. A large regular order for silk handkerchiefs from the Navy, which was invariably divided among the town's manufacturers, was very significant especially when other trade was slack, and this alone played a great part in keeping the industry, and the town, in relative prosperity. (143)

In this branch of the trade - making small woven and knitted articles, particularly neckwear, handkerchiefs and silk squares - Macclesfield had few rivals and maintained a strong hold on the home market (compare Table 9.2. above). The potential of this market was greater than may be thought, and these goods formed a large part of the silk industry's output (see Table 9.3. above). It was in this relatively prosperous branch of production that the strength of the town's industry lay in the twentieth century.

In Congleton, where the silk industry had always been less firmly established than in Macclesfield, employment in silk manufacturing was reduced to an almost insignificant

(143) "Tariff Commission" (1905) 3256; Warner (1921) pp.136-7.

level by the early twentieth century. Since the town was heavily dependent on silk throwing, much of the industry's decline followed quickly upon the Free Trade Treaty.

Employment fell from 5,186 persons in 1861 to 1,276 in 1883, but was maintained at between about 1,000 and 2,000 through the 1880s. (144)

The dominance of throwing in the town's silk industry was maintained: in 1886 seventy per cent of the 2,222 silk workers were employed by the twelve firms of throwsters which remained, half of them by the two largest firms. (145)

The decline of silk working in Congleton was hastened by the introduction to the town of fustian and velvet cutting. (146) This minor textile trade was commenced in 1867, brought to the town by two Lancashire firms who had seen Congleton referred to as "a town without a trade." (147) During its most prosperous period (from about 1870 to 1890) many mills were stripped of their silk working equipment and converted to fustian cutting. (148)

(144) Head (1887) pp.155-6.

(145) Head (1887) pp.155-6.

(146) Fustian cutting consists of cutting the loops in the weft of these fabrics to form the pile. It was entirely a manual trade. See Head (1887) p.158-9.

(147) Head (1887) p.158.

(148) Head (1887) p.158

By 1905, four small firms were all that remained of Congleton's silk industry.⁽¹⁴⁹⁾ ..Rather less than 700 workers were employed and spun silk was the only important product.⁽¹⁵⁰⁾ Even fustian cutting, itself in a depressed condition, was as important for employment in the town (see Table 9.10. below).

Although its specialism on throwing thus brought about the virtual extinction of the silk industry in Congleton and its temporary replacement by fustian cutting, the latter trade did not survive long. In the early twentieth century the general smallware, knitwear and clothing trades which had failed to grow out of the silk trade a century earlier were at last introduced, and it was in these that the town's future development lay.

In Leek, the third and in 1861 the smallest silk town of the South West Pennines, the number of workers employed in silk manufacturing declined, but at a much lower rate than in the Cheshire centres (see Figure 9.5.). The relative strength of silk here can be attributed almost entirely to the specialism

(149) "Tariff Commission" (1905) 3243. Warner (1921) p.148.

(150) The two largest of Congleton's firms were silk spinners. Warner (1921) p.148.

on sewing silks and thread. Like Macclesfield and the small-ware trade, Leek felt little competition from manufacturers elsewhere in England or abroad.⁽¹⁵¹⁾ The industry was progressive and the town's products had a world wide reputation and market.⁽¹⁵²⁾ Leek thus satisfied much of the home demand for sewing silks and thread, and production and employment remained relatively stable throughout the late nineteenth century.⁽¹⁵³⁾ By 1907 this branch of the trade, located almost entirely in Leek (see Table 9.4.), had grown to become a significant branch of the English industry and accounted for almost ten per cent of the value of all silk goods manufactured in Britain (see Table 9.3.).

Most other branches of Leek's industry which had developed - though only to a limited extent - in the years before 1860, soon collapsed. Both broadweaving (chiefly of velvets) and the manufacture of ribbons ceased soon after the Free Trade Treaty.⁽¹⁵⁴⁾ However, dyeing remained a small but important part of the town's textile industry, largely because of the enterprise of the Wardle family.⁽¹⁵⁵⁾

(151) "Technical Instruction" (1884) pp.1-11.

(152) "Technical Instruction" (1884) p.11.

(153) "Tariff Commission" (1905) 3238-39.

(154) Warner (1921) p.124; "Tariff Commission" (1905) 3238.

(155) See Table 9.10 below; "Tariff Commission" (1905) 3239 and Warner (1921) pp.142-45.

The firms engaged in the production of sewing silks in Leek maintained their position chiefly by making continual adjustment to the changing technical and commercial environment. For example, hand twisting was rapidly replaced by more productive powered equipment after the 1860 treaty⁽¹⁵⁶⁾ (though hand twisting continued for highest grades of work even in the twentieth century).⁽¹⁵⁷⁾

Moreover, new materials were used by the industry as conditons changed. Originally the twist and thread was made from thrown silk yarn. But when in the 1880s there was severe competition from Swiss manufacturers using spun silk, the Leek industry quickly turned to the cheaper raw material, and in 1882 a silk spinning mill was established in the town to meet this new demand.⁽¹⁵⁸⁾ Later still mercerised cotton was used with silk in the Leek mills and in the early twentieth century the newly developed "artificial silk" was added to the other yarns in use in the town.⁽¹⁵⁹⁾

As well as keeping to the forefront of developments in

(156) Fact. Insp. Report. (1865) p.251.

(157) Warner (1921) p.140.

(158) "Technical Instruction" (1884) p.xxxvi.

Warner (1921) p.142.

(159) Warner (1921) p.140. "Tariff Commission" (1905) 3238.

twist and thread manufacture, Leek's silk industry was diversified to include the production of many goods which were manufactured by technically allied processes. Braids, cords, bindings and laces were the most important and the steady demand which existed for these, occasionally augmented by the requirements of fashion,⁽¹⁶⁰⁾ made for a prosperous industry. In the final decade of the century one of the major firms introduced yet another branch of manufacture - the production of some of the smallware goods associated with the Macclesfield trade (for example, ties, scarves and hatbands).⁽¹⁶¹⁾ Although closely associated with its other smallware manufacturing activities - and despite the proximity of Macclesfield - the specialisation of the town's industry had been so intense that the production of these goods had hitherto been insignificant.

This diversification into narrow goods and smallware gave added strength to Leek's industry, though the manufacture of sewing silks and thread remained the basic product of all the major firms until the first decade of the twentieth century.⁽¹⁶²⁾ Leek had survived the collapse of the silk

(160) "Tariff Commission" (1905) 3238-9.

(161) Vict. County Hist. Staffs. vol.2 (1967) p.211.

(162) See Warner (1921) p.141-2.

industry so successfully that, with about 3,000 persons employed in silk manufacture, it competed strongly with Macclesfield as the major centre and was no longer the mere outlier it had been fifty years previously.

In the future Leek's specialist sewing silk and thread industry was to dwindle almost to nothing as artificial fibres increased in importance and this branch of manufacture became dominated by large textile combines, based in other textiles and other regions. Its place was taken by the manufacture of smallware, already established, and by the knitwear and clothing industries which were being introduced to the town in the early twentieth century. (163)

These contrasts in their response and adjustment to the decline of the silk industry of the three South West Pennine towns are aptly summed up in their population statistics (see Table 9.9.). In both Macclesfield and Congleton the collapse of silk manufacturing brought about an almost continuous reduction in the towns' populations throughout the second half of the nineteenth century. Indeed the population of Macclesfield has scarcely regained, even now, the level

(163) Vict. County Hist. Staffs. vol.2 (1967) p.212
 "Tariff Commission" (1905) 3238.

TABLE 9.9.

THE POPULATION OF THE SOUTH WEST PENNINE SILK TOWNS: 1851 - 1911

MACCLESFIELD			CONGLETON		LEEK		ENGLAND AND WALES
Population	% change over preceding decade		Population	% change over preceding decade	Population	% change over preceding decade	% change over preceding decade
					Township	U.D.	
1851	39,048	-	10,520	-	8,602		-
1861	36,101	-7.5	12,344	+17.3	9,057		+11.9
1871	35,450	-1.8	11,344	-8.1	10,127		+13.2
1881	37,514	+5.8	11,116	-2.0	11,486	12,863	+14.4
1891	36,009	-4.0	10,744	-3.3		14,128	+11.7
1901	34,624	-3.8	10,707	-0.3		15,434	+12.2
1911	34,797	+0.5	11,309	+5.6		16,663	+10.9

Notes: (1) Figures for Macclesfield refer to the Borough and are not comparable with those for the township in Table 8.1.

(2) Figure for Congleton refer to the Borough from 1861 in which year it was identical with the township referred to for earlier years.

(3) Leek Urban District, first noted in the Census for 1881, was much larger than the township of Leek and Lowe used for earlier years, and figures are not strictly comparable.

reached in 1851.⁽¹⁶⁴⁾ In Leek, by contrast, the relative stability of the industry allowed the town's population to continue to expand and in 1881, for the first time there were more people living in Leek than in Congleton. Nevertheless, even in Leek the increase in population in every decade after 1851 was at a lower rate than in England and Wales as a whole.

Symptoms of a depressed area became evident at an early date in the industrial structure of the South West Pennine towns. Little diversification of industry occurred and silk continued to dominate the employment structures of the three towns (see Table 9.10.). In Macclesfield the cotton industry was at last able to appropriate some of the town's labour and factory space, and in Congleton fustian cutting for a time employed more workers than silk. But in all three towns it was silk and the closely associated knitwear and smallware trades (variously recorded in Censuses as silk, other textiles or clothing)⁽¹⁶⁵⁾ that dominated the declining volume of

(164) In 1967 the borough's population was 40,900 (Official Guide (1969) p.74), in 1851 when the borough covered a smaller area it was 39,048.

(165) The distinction in the Censuses and other sources between these closely associated branches of the textile and clothing industries was never very precise. See for example "Census" (1911) vol.X.pt.1. p.536 and appx. p.274. In the South West Pennines where it was (and still is) a matter of pride to be associated with silk, the problems of definitions are increased. In particular, this renders the local directories an unreliable source. Compare p.299. below.

TABLE 9.10A.

THE STRUCTURE OF EMPLOYMENT IN MACCLESFIELD: 1861 - 1911

	1861			1901			1911		
	No.	% of mfr.	% of total	No.	% of mfr.	% of total	No.	% of mfr.	% of total
Silk	13,136	76.7	64.1	6,598	54.7	42.2	5,227	42.6	29.4
Other Textiles*	574	3.4	2.8	1,814	15.0	11.6	2,287	18.6	12.9
Clothing	1,555	9.1	7.6	1,475	12.2	9.4	2,554	20.8	14.4
Food Drink & Tobacco	811	4.7	4.0	1,321	10.9	8.5	997	8.1	5.6
Wood and Metal	613	3.6	3.0	507	4.2	3.2	724	5.9	4.0
Other Manufacturing	440	2.6	2.1	352	2.9	2.3	487	4.0	2.7
TOTAL MANUFACTURING	17,129	100.0	83.6	12,067	100.0	77.2	12,276	100.0	69.1
Agriculture & mines	718	-	3.5	305	-	2.0	466	-	2.6
Service Occupation	2,633	-	12.9	3,252	-	20.8	5,026	-	28.3
TOTAL OCCUPIED	20,480	-	100.0	15,624	-	100.0	17,768	-	100.0
* OTHER TEXTILES	1901		1911		1901		1911		
Dyeing	262		313	Smallware	504		: { 433		
Cotton	1,048		1,245	Other				{ 296	

TABLE 9.10B.

THE STRUCTURE OF EMPLOYMENT IN CONGLETON : 1861 - 1911

	1861			1901			1911		
	No.	% of mfr.	% of total	No.	% of mfr.	% of total	No.	% of mfr.	% of total
Silk	2,802	45.9	23.4	1,196	38.0	26.7	739	22.1	14.3
Other Textiles*	189	3.1	1.6	1,020	32.4	22.8	1,332	39.8	25.7
Clothing	1,531	25.1	12.8	290	9.2	6.5	547	16.3	10.6
Food, Drink & Tobacco	484	7.9	4.0	439	14.0	9.8	349	10.4	6.7
Wood and Metal	698	11.4	5.8	148	4.7	3.3	277	8.3	5.4
Other manufacturing	396	6.5	3.3	53	1.7	1.2	102	3.0	2.0
TOTAL MANUFACTURING	6,100	100.0	50.9	3,146	100.0	70.3	3,346	100.0	64.7
Agriculture and mines	3,437	-	28.7	329	-	7.4	407	-	7.9
Service Occupation	2,458	-	20.5	1,000	-	22.3	1,422	-	27.5
TOTAL OCCUPIED	11,995	-	100.0	4,475	-	100.0	5,175	-	100.0
* OTHER TEXTILES	1901		1911			1901	1911		
Fustian	776		852	Dyeing	14	57			
Cotton	206		159	Smallware & Other	34	264			

Note: 1861 data refer to persons over 20 years of age in the Registration District. See p. 317

TABLE 9.10C

THE STRUCTURE OF EMPLOYMENT IN LEEK: 1861 - 1911

	1861			1901			1911		
	No.	% of mfr.	% of total	No.	% of mfr.	% of total	No.	% of mfr.	% of total
Silk	2,313	52.7	24.6	3,132	58.2	45.0	2,985	47.6	34.4
Other textiles*	117	2.7	1.2	909	16.9	13.0	1,479	23.6	17.0
Clothing	1,007	23.0	10.7	389	7.2	5.6	609	9.7	7.0
Food, Drink & Tobacco	305	7.0	3.2	440	8.2	6.3	365	5.8	4.2
Wood and Metal	337	7.7	3.6	367	6.8	5.3	411	6.6	4.7
Other Manufacturing	306	7.0	3.3	145	2.7	2.1	424	6.8	4.9
TOTAL MANUFACTURING	<u>4,385</u>	<u>100.0</u>	<u>46.7</u>	<u>5,382</u>	<u>100.0</u>	<u>77.3</u>	<u>6,273</u>	<u>100.0</u>	<u>72.2</u>
Agriculture and mines	3,510	-	37.4	9	-	0.1	155	-	1.8
Service Occup.	1,492	-	15.9	1,569	-	22.5	2,259	-	26.0
TOTAL OCCUPIED	<u>9,387</u>	-	<u>100.0</u>	<u>6,960</u>	-	<u>100.0</u>	<u>8,687</u>	-	<u>100.0</u>

* OTHER TEXTILES

	1901	1911		1901	1911
Smallware	480	903	Other	152	135
Dyeing	277	441			

Note: 1861 data refers to persons over 20 years of age in the Registration District. See p. 317

employment, for "replacement" industries were slow to grow. Thus the silk towns faced problems to be repeated a half-century later in many Lancashire cotton towns. (166)

It is no part of the purpose of the present study to trace the economic development of the former silk manufacturing regions into the twentieth century, but for the South West Pennines, the most persistent centre of the trade, it seems appropriate to add a few comments on the transition from the nineteenth century to the modern industry. As silk slowly lost its dominant position and was partly replaced by a general textile and clothing trade - using a wide range of yarns and manufacturing diverse products - the region's economy found some stability at a lower level of population and employment. But all the towns of the South West Pennines, especially Macclesfield, maintained their links with the silk industry late enough to develop an interest in artificial fibres, which had close links with silk as they began their early technological progress. Though it now contains merely a small part of the diverse textile industry of the country, increasingly dominated

(166) See Jackson (1960) for a detailed analysis of the population and employment data for Macclesfield.

by the commercial giants, the South West Pennines continue to be known as the silk manufacturing region of Britain. Even in 1967 Macclesfield's trade directory lists fifty-seven firms as "Silk and associated products,"⁽¹⁶⁷⁾ though in fact very few of these firms handle as much silk as they do man-made fibres.

D) CONCLUSION

It is clear that the problems which beset the silk industry after 1860 caused it to decline considerably in size and brought about a marked change in its products. Surprisingly, the industry's contraction only slowly brought a locational concentration into one dominant region. At least a remnant of production was long maintained in almost all of the regions of manufacture which had been important in the mid-nineteenth century, largely because of the initiative of a few manufacturers who specialised on products for which demand was maintained at home and abroad. But by the early twentieth century the industry was virtually extinct in most of its

(167) Official Guide to Macclesfield (1969) p.69.

traditional centres and even the formerly important concentrations such as London, Lancashire, Coventry and the East Midlands had been extinguished. There were by this time only three significant areas of survival: the South West Pennines, Yorkshire and East Anglia, which together accounted for over seventy per cent of England's silk workers.⁽¹⁶⁸⁾

In East Anglia silk manufacture soon declined as crape, the specialism which had maintained the industry through the late nineteenth century, lost its popularity. In Yorkshire the silk industry, always closely integrated with other textiles, rapidly lost its identity and became a progressively smaller part of the mixed fabric trade. The South West Pennines thus became the dominant region of what was by now little more than a relic industry. But even here the place of silk declined as the towns turned to more general and varied branches of the textile and clothing industries, and became an integrated part of the Lancashire textile empire rather than an almost independent outlier.

(168) Using the Census data for 1901 or, 1911 they account for seventy-one per cent of England's silk workers; using Fact. Insp. Ret. (1901), for seventy-five per cent.

REFERENCES FOR CHAPTER IX

- J. BELLAMY (1952) "Occupations in Kingston upon Hull, 1841-1948". Yorks. Bull. of Econ. & Soc. Research (vol.4) pp.33-50.
- J. BELLAMY (1953) "A Note on Occupation Statistics in British Censuses." Population Studies (vol.6) pp.306-8.
- C.S. DAVIS (1961) "A History of Macclesfield."
- W. FELKIN (1867) "A History of the Machine Wrought Hosiery and Lace Manufactures."
- R. HEAD (1887) "Congleton, Past and Present."
- J.N. JACKSON "The Population and Industrial Structure of Macclesfield." Unpubl. Ph.D. thesis: University of Manchester.
- KELLY'S DIRECTORIES: Derbyshire (1855, 1864, 1867, 1912).
- MACCLESFIELD - Official Guide (1969).
- R.H. OSBORNE (1964) "Migration Trends in England and Wales, 1901-1951" Geographia Polonica. (vol.3) pp.137-162.
- J. PREST (1960) "The Industrial Revolution in Coventry."
- R. RAWLLEY (1919) "Economies of the Silk Industry: a study in Industrial Location."
- H.B. RODGERS (1962) "The Changing Geography of the Lancashire Cotton Industry." Econ. Geog. (vol.38) pp.299-314.

D.M. SMITH (1962) "The Silk Industry of the East Midlands."
East Midd. Geogr. (vol.3 pt.1) pp.20-31.

D.M. SMITH (1964) "The Location of Elastic Web Manufacture in
England and Wales" East Midd. Geogr.
(vol.3 no.22) pp.326-336.

THE TIMES (27th June 1913) "Textile Notes."

VICTORIA COUNTY HISTORIES

STAFFORDSHIRE (vol.2) (1967) "Silk" pp.206-223.

SUFFOLK (vol.2) (1907) "Silk" pp.273-4.

WARWICKSHIRE (vol.2) (1908) "The Ribbon Trade of
Coventry." pp.257-263.

WILTSHIRE (vol.4) (1959) "Silk" pp.176-77.

SIR T. WARDLE (1908) "The Revival of the Silk Trade." Address
at Macclesfield School (Apr. 22nd).

SIR F. WARNER (1903) "The British Silk Industry" Paper to the
Society of Arts. (Dec. 15th).

SIR F. WARNER (1912) "The British Silk Industry: Its Development
Since 1903." (Paper to the Royal Society of
Arts. Feb. 21st.)

SIR F. WARNER (1921) "The Silk Industry of the United Kingdom."

GOVERNMENT PAPERS

FACTORY INSPECTORS' RETURNS

1870-1889 see p.213 above for details

1896: H.C. (1896 vol.XIX) p.89.

1901: H.C. (1902 vol.XII) p.1.

1907: H.C. (1909 vol.LXXIX) p.851.

FACTORY INSPECTORS REPORT

1865: H.C. (1866 vol.XXIV) p.251.

CENSUS VOLUMES (1861-1911)

"Report on the English Silk Industry" by Sir T. Wardle in:
"Second Report of the Royal Commission on Technical Instruction"
(Vol.III pp.xxix-cv) Vol.15 of Reports from Commissioners etc.
H.C. (1884 vol.XXXI) appx.

"Report of the Tariff Commission Evidence on the Silk Trade."
Vol.2. Pt.6 (1905)

"First Census of Production" (1907)

"General Report on the Textile Trades" pp.284-87.
"Report on Silk" pp.310-315.
"Tables on Silk" pp.358-360.
"Tables on Lace" pp.361-362.

"Guide to Official Sources: No.2. Census Reports of Great
Britain: 1801-1931" H.M.S.O. (1951).

CONCLUSION

This study of the silk industry in the eighteenth and nineteenth centuries has analysed the changing location of the first English textile industry to experience the complete economic cycle of prosperity and expansion followed by unprofitability and decline. The primary purpose of this thesis has been to express this cycle in spatial terms. In the course of the study a number of general hypotheses of industrial location have been tested in relation to the industry. Some of the factors found to be most significant in the spatial shifts of the silk industry are specific to it; others have a more general application.

One of the keys to the understanding of the silk industry, which is of lesser importance in many other industrial studies, is the considerable fluctuation in fortune experienced by the manufacturers. This was caused largely by the external influences of changes in the degree of protection offered by tariffs coupled with variations in the intensity of foreign competition. The silk trade, particularly in the late nineteenth century, was concerned to defend its home market; other textile industries were still expansionist and still

attacking overseas markets until much later. But these sudden and nation-wide alternations of boom and slump in the silk industry were different only in their frequency and intensity from the economic changes felt in most industries.

Over the long term the most important single factor affecting the location of the silk industry was undoubtedly the labour supply, and the changing location of the industry largely reflected regional contrasts in the availability of workers. Unlike many other industries, silk did not enjoy a sufficiently assured long term prosperity to be able to attract and maintain a workforce permanently dependent upon it. Thus its history is plagued by competition for labour resources from more continuously prosperous industries like cotton and the wool-worsted manufactures. Where the silk industry's location placed it in close juxtaposition with stronger industries (particularly textiles) it was liable to suffer the rapid erosion of its workforce when its own profitability was in doubt and had difficulty in rebuilding its labour supply when prosperity returned. But where the industry was located in agricultural areas, with little competition for labour, it was possible for the workforce to be expanded rapidly when economic conditions allowed. Thus, the silk industry became established in the South West and East Anglia in the employment

vacuum left by the declining wool and worsted trades, and in silk's brief periods of prosperity employment in the industry could be expanded rapidly throughout southern England.

Compared with the supply of labour, the power requirements of the silk industry placed few restraints on its location, at least after the eighteenth century competition for water power with the early west Pennine cotton industry was lost. The power required for silk throwing and weaving was less than for other textile trades and the high value products could more easily absorb the costs of water engineering or coal transportation. Even in the more permanent and established centres of production coal was used to provide steam power only where it was readily available or where the exhaustion of water power resources necessitated some other power source. But even here a local supply of coal, so critically important in some industries such as cotton, was only a secondary consideration.

Moreover, in the short term booms mills could easily be adapted from other uses and many of the ventures in silk manufacturing, essentially speculative and short term, did not warrant the installation of expensive new equipment. Many of the mills that moved into and out of the silk industry in this

way were small, old and water powered.

Silk's fluctuating prosperity and the incessant competition for its resources of labour, power and factory space from more stable industries coupled with a lesser need for concentration resulted in the industry taking up and retaining a scattered distribution. During its booms there was a certain amount of territorial expansion as mills were converted to silk manufacture and as the areas of domestic weaving were extended. But there were, nevertheless, clearly defined and more permanent districts into which the industry retreated in times of recession. Thus a distinction has to be drawn, throughout the nineteenth century, between the distribution of the industry in prosperity and its distribution in decline, for no one stable locational pattern existed.

The origin of these areas with a stable association with silk manufacturing is often obscure. Towns with declining traditional textile industries (especially in the south and south west), from which labour and other resources could be drawn, frequently adopted the trade. But elsewhere silk manufacturing appears to have had almost accidental origins, often resulting from the ability of an enterprising individual or family. In an unstable industry, so subject to cyclical

change and thus offering opportunities to the speculator in times of prosperity, the influence of the able entrepreneur is bound to be more strongly marked in the locational pattern than in other, stabler industries.

Only where the industry became firmly and permanently established could it restrict the growth of other manufactures: thus, this industry does not accord well in its distribution with the general tendency for the nineteenth century to be characterised by strong areal specialisation of industry. Only in a few districts, for example the South West Pennines and Coventry, could silk dominate the local labour force, secure a measure of protection from competing industries, and so survive many of the changes in fortune so typical of the trade.

The distribution of these predominantly silk manufacturing districts in relation to the general regional pattern of industrial specialisation is complex. In the Pennines competition from stronger industries caused the specialist silk towns to be restricted to the fringes of the textile province. Thus the South West Pennine towns have a unique stability in their association with silk: from the mid-eighteenth to the mid-twentieth centuries they have been a permanent feature of

the locational pattern. But during the years of prosperity in the mid-nineteenth century the South West Pennines was merely the strongest single focus in a geographically widespread industry. However, some silk production took place in the heart of both the cotton and the worsted regions but only where there were surplus resources available, an organisational framework and a local market for a specialised product. Given these conditions manufacturers were able to take advantage of silk's periods of prosperity without suffering in its recessions. In the south of England, where competition for the available resources was less intense, the distribution of silk manufacturing tended to expand and contract more markedly, but it is possible to distinguish here "cores" in which the industry was relatively permanent and "marginal zones" into which it expanded strongly in prosperity.

As in other industries, a system of regional specialisation on particular processes or products evolved early in the silk trade's development. Throwing was conducted in quite separate regions from weaving for much of the industry's history, and weaving districts specialised on particular products. These specialisms were very resistant to change so that the prosperity or failure of a particular branch of manufacturing had marked regional implications. Some sections

of the industry remained profitable even in the late nineteenth century when the trade as a whole was in continual decline. In consequence decline was not accompanied by the marked regional concentration which might be expected, since some outliers specialised in what remained prosperous sections of the trade.

It has been possible, if only to a limited extent, to consider the locational influence of differences in technique and organisation between separate regions and sections of the industry. There are data available for the power and equipment used by the industry and not merely for the size of its labour force. Thus it has been possible to study regional differences in the relative importance of capital equipment and labour and to relate these variations to the influence of labour competition and the proximity of more rapidly advancing industries. Labour-intensive systems of organisation have been identified in some areas of silk manufacture: their ability to expand quickly in times of prosperity, but with the consequence of quick decline at periods of intense competition, adds to the silk industry's characteristic locational instability. The technical data available thus adds an important dimension to the locational analysis and permits the character of the industry in the different regions to be

more easily discerned.

The silk industry amply illustrates many of the factors and forces involved in the problem of the locational analysis of industry in the context of historical geography. By its fluctuating nature and fragmented distribution it throws into sharper relief than is possible in many more stable and compact industries some aspects of economic geography which are significant, but often lightly treated in many industrial studies.

APPENDIX 1.

SOURCES FOR MAPS, DIAGRAMS AND TABLES.

The basic data for the following Figures and Tables are from the Factory Inspectors' Returns for the years stated.

FIGURES:- 5.1. - 5.6., 6.3. - 6.6.

TABLES:- 2.3. - 2.6., 3.2., 3.6., 5.2. - 5.4., 6.1. - 6.3.,
7.1. - 7.5., 7.8. - 7.20., 8.2., 8.3., 8.5. - 8.16.,
9.6. - 9.8.

Sources for the remainder are as follows:-

FIGURE

- 2.1. Unwin (1924) op.cit. Chapter 2. p.22.
- 2.2. Maps by: Enclosure Award Commission (1796), Dawson (1832) Cowley (1838).
- 2.3. MSS. map (1818) at Manchester Central Library, Yates, (1820) op.cit. Chapter 2. pp.99-100. Tythe Redemption Map (1843).
- 2.4. O.S. 1:63,360 Geol. Survey 1:63,360. Hull (1866) op.cit. Chapter 2. Mellows (1933) op.cit. Chapter 2. J.I. Jones (1969) "Licensed Coal Mining in North Staffordshire." N.Staffs Field J. (vol.9) pp.79-91.
- 2.5. O.S. 1:63,360. Hadfield (1966) op.cit. Chapter 2. Harrison (1886) op.cit. Chapter 1.
- 2.6. Glovers Directory (1843).
- 2.7. O.S. 1:2,500 (1852).

FIGURE

- 2.8. "Fact. Insp. Ret." (1838).
- 3.1. "Fact. Insp. Ret." (1835) and "Silk Report" (1832) p.818.
- 3.2. "Fact. Insp. Ret." (1838).
- 4.1. "Fact. Insp." Ret." (1838).
- 5.7. "Census" (1851), Fact. Insp. Ret." (1850).
- 6.1. "Fact. Insp. Ret." (1838).
- 6.2. "Fact. Insp. Ret." (1838), "Census" (1851).
- 8.1. "Fact. Insp. Ret." (1850,1856,1861.).
- 8.2. "Fact. Insp. Ret." (1856,1861,1867).
- 8.3. "Fact. Insp. Ret." (1856,1861,1867).
- 9.1. "Annual Statement of Trade" (1856-1911).
- 9.2. "Fact. Insp. Ret." (1850-1907), Census (1851-1911).
- 9.3. "Annual Statement of Trade" (1856-1911).
- 9.4. "Annual Statement of Trade." (1856-1911).
- 9.5. "Census" (1851+1901).

TABLE

- 2.1. 1800: estimated; 1817, Corry (1817) op.cit. Chapter 2 p.197; 1835+1838 "Fact. Insp." Ret."; remainder from "Silk Report" (1832) pp.299 and 804-5.

TABLE

- 2.2. 1811: Warner (1921) p.136; remainder from Chaloner (1949) op.cit. Chapter 2. appx.1. pp.131-135. (A list of Boulton & Watt. engines erected in Cheshire 1778-1817 compiled from the records of the firm.
- 3.1. "Silk Report" (1832) p.816.
- 3.3. "Report into Framework Knitters" (H.C. 1845 vol.XV) pp.15-16. except 1739 which is from Deering (1739) "History of Nottingham." p.100.
- 3.4. "Report into Framework Knitters " (H.C. 1845 vol.XV) appx. pt.2. (Notts & Derby) p.12.
- 3.5. Based on Smith (1962) p.27.
- 3.7. Local directories viz:
Macclesfield: 1790: Barfoot and Wilkes; 1818: Pigot and Dean; 1828 & 1834 Pigot.
Congleton: as Macclesfield - supplemented in 1818 by Yates (1820) p.99 for ribbon weavers.
Leek: 1784: Bailey; 1809: Holden; 1818 Parsons & Bradshaw; 1828: Pigot; 1834: White.
- 4.1. "Hand loom Weavers" (H.C. 1840 vol.XXIV) pp. 5 and 319-351.
- 4.2. "Hand loom Weavers" (H.C. 1840 vol.XXIV) pp.5 and 28.
- 5.5. "Fact. Insp. Ret." (1850) "Census" (1851).
- 5.6. "Census" (1851).
- 7.6. "Census" (1851,1861 & 1871) "Fact. Insp. Ret." (1850 , 1861 & 1870).

TABLE

- 7.7. As Table 7.6.
- 8.1. "Census" (1801-1851).
- 8.4. "Census" (1851 & 1861).
- 9.1.A) 1792 & 1835 Bowden in "Tariff Commission" (1905) 3593;
1870, 1886 & 1904 Solly in "Tariff Commission" (1905)
3338; 1913 "The Times" (June 27th 1913) p.42.
B) Solly in "Tariff Commission" (1905) 3338.
- 9.2. "Census of Production" (1907).
- 9.3. "Census of Production". (1907).
- 9.4. "Tariff Commission." (1905) 3058-3060.
- 9.5. "Census" (1881 and 1891).
- 9.9. "Census" (1851-1911).
- 9.10. "Census" (1861,1901 and 1911).

APPENDIX 2.NOTES ON SOME TABLES AND FIGURES.Table 6.2. Estimating the power supply in the mills of southern England.

Column A relates to mills in parishes where the power source of each mill is evident from the Factory Inspectors' Returns (i.e. in parishes where there is only one mill or one power source per mill, or where all engines (or all but one) derive their power from the same source). In parishes where the power source of individual mills cannot be deduced in this way, an estimate is made using the data for the number and size of engines and water wheels installed (compare Table 2.3. above). If, for example, in a parish with five mills there were one large and two smaller steam engines and four water-wheels then there would probably be one steam and one water powered mill and three mills using both sources. This procedure was only needed for one parish in each of Warwickshire and Hertfordshire and for four parishes in the South West, so the estimated totals are probably close to the actual situation. This procedure cannot be applied to parishes in the Pennine province where there were more mills in each parish and so a greater likelihood of error.

Table 9.10. Deriving the structure of employment from the
Census.

Occupations listed in the 1861 Census have been grouped to coincide as far as possible with the industrial grouping used in the 1901 and 1911 Censuses, following Bellamy (1952) op.cit. Chapter 9. Nevertheless, changes in some orders make comparisons difficult, particularly in clothing where most workers in 1861 were dressmakers or shoemakers.

In the absence of more detailed information, the data for Congleton and Leek in 1861 refer to the entire registration district and therefore include many agricultural workers. The Census only gave the occupation of workers over twenty years of age in these tables and therefore omits the many children working in the silk mills.

In Macclesfield the data referred to persons of all ages working in the Borough and so these difficulties do not arise. In 1901 and 1911 the data for all three towns refers solely to the town (M.B. or U.D.) and to all workers over ten years of age.

Figures 2.8. and 5.1. Key to Abbreviations.

A	Ashton	Ld	Leeds
Al	Alstonfield	Lh	Leigh
B	Birstall	M	Macclesfield
C	Congleton	Mc	Manchester
Cf	Chesterfield	Mw	Middlewich
Ch	Cheadle	Nc	Newcastle
D	Derby	Nt	Nottingham
E	Eccles	P	Pentrich
Ha	Halifax	Sa	Sandbach
Hu	Huddersfield	St	Stafford
K	Keele	T	Tideswell
L	Leek	W	Wilmslow

Figure 3.2. Whalley and Prestbury Parishes.

Whalley parish includes the towns of Nelson and Colne.

The data for Prestbury parish ^{are} is divided between Macclesfield and the rest of the parish (notably Bollington) as in Table 3.6.

Figure 8.1. The year in which the "Peak" of employment occurred.

Of the twenty-five counties with a mechanised silk industry at the height of the boom:-

- 5 (Devon, Wiltshire, Hertfordshire, Essex and Leicestershire) recorded a peak in 1861.
- 1 (Yorkshire) recorded a continuous increase between 1850 and 1867. In Figures 8.1. and 8.2. 1861 has been regarded as the "peak".
- 1 (Somerset) recorded a continuous decline between 1850 and 1867. In Figures 8.1. and 8.2. an average of employment in 1856 and 1861 has been used as the "peak".

The remaining eighteen counties recorded a peak of employment in 1856.

Figure 8.2. The year in which the "Nadir" of employment occurred.

The "nadir" of employment in the 1860s occurred in 1867 in all counties except Nottinghamshire, Derbyshire, Staffordshire and Norfolk where it occurred in 1861, and in Yorkshire where employment increased continuously through the 1860s.

APPENDIX 3.

DATES AND DETAILS OF THE FACTORY INSPECTORS'
RETURNS OF SILK MILLS: 1835 - 1907.

<u>DATE</u>	<u>REFERENCE</u>	<u>AREAL DETAIL</u>	<u>DATA GIVEN</u>
1835:	H.C.(1836 vol.XLV)p.51.	Unsystematic	but includes looms by County.
1838:	H.C.(1839 vol.XLII)p.1.	Parish	Employment power only
1847:	H.C.(1847 vol.XLVI)p.1.	County	Employment only.
1850:	H.C.(1850 vol.XLII)p.455.	"	{ Employment Power Spindles and Looms by Type of Mill.
1856:	H.C.(1857(Sess.1)vol.XIV) p.173.	"	
1861:	H.C.(1862 vol.LV)p.629.	"	
1867:	H.C.(1867-68 vol.LXIV) p.811.	"	
1870:	H.C.(1871 vol.LXII)p.105.	"	
1874:	H.C.(1875 vol.LXXI)p.57.	"Districts" of grouped counties	{ Employment Spindles and Looms (but not power) by type of mill
1878:	H.C.(1878-79 vol.LXV) p.210.		
1885:	H.C.(1884-85 vol.LXXI) p.1087.		
1889:	H.C.(1890 vol.LXVII)p.169.		
1895:	H.C.(1896 vol.XIX) p.89.	Districts centred on major towns	{ Employment Only
1896:	H.C.(1896 vol.XIX)p.89.		
1897:	H.C.(1898 vol.XIV)p.1.		
1898-99:	H.C.(1902 vol.XII)p.1.		
1901:	H.C.(1902 vol.XII)p.1.		
1907:	H.C.(1909 vol.lxxix)p.851.		

Note: The Districts for 1874-1889 were:-

HOME (Middlesex, Surrey and Kent).

SOUTH MIDLAND (Herts., Bucks., Oxford, Northampton,
Hants., Beds., and Cambr.).

EASTERN (Essex, Suffolk and Norfolk).

SOUTH WESTERN (Wilts., Dorset., Devon, Cornwall and
Somerset).

WEST MIDLANDS (Gloucester, Hereford, Salop, Stafford,
Worcester and Warwick).

NORTH MIDLAND (Leicester, Rutland, Lincoln and Notts.).

SOUTH EASTERN (Berks., Sussex and Hants).

NORTHERN (Durham, Northumberland, Cumberland and
Westmorland).

Cheshire, Lancashire, Yorkshire and Derbyshire were
noted individually.

APPENDIX 4

TECHNOLOGY, STRUCTURE AND THE PATTERN OF LINKAGES

IN THE SILK INDUSTRY

A) TECHNIQUES OF PRODUCTION

The production of silk fabrics involved a series of distinct processes which can be considered under four main headings:

(1) the initial stages of the production of silk by the silk worms and the reeling of silk from the cocoons, (2) the production of yarn, by winding, throwing or spinning the silk produced, (3) the weaving of the yarn into cloth and (4) the dyeing and finishing of the products. The detailed operations needed at each of these stages varied considerably from product to product and the position of dyeing and finishing in the sequence was variable, as will be seen below.

Silk originates as a continuous fine filament which is formed into a cocoon by the silk worm bombyx mori and held in place by a gum, sericin, extruded with the silk. Silk worm rearing had long been practiced in China and was introduced to southern Europe and the eastern Mediterranean during the sixteenth century. Sericulture

was never commercially successful in England because the climate was not quite warm enough to produce mulberry leaves (the silk worm's main food) sufficiently early in the year. In the countries where silk worms were reared it was almost always as a small-scale sideline to agricultural activities. The initial collecting points of the sericulturists' output were the filatures where the silk was reeled. Reeling could only take place in the neighbourhood of worm rearing because the bulk of the cocoons and the ease with which they could be damaged prohibited their transport over long distances. (1)

In the filatures the cocoons were first heated to kill the pupa and then were floated on hot water to soften the gum. The outer layers of the cocoon which were composed of short and often damaged lengths of filament were discarded to become one of the major sources of "waste" silk used in the silk spinning mills. The ends of the continuous filaments in the inner cocoon were then found and those from between 3 and 8 cocoons were then laid together and reeled off to form a single strong thread, the individual filaments of which cohered because of the gum. It was

(1) Rawley (1919) p. 79-95; Ure (1835) p. 229-235.

in this form, reeled into skeins, that the "raw silk" was received by the English importers.⁽²⁾

These production processes affected the later stages of manufacturing in two main ways. Firstly the price of raw silk was liable to considerable variation both because the silk worm was susceptible to a number of diseases which could reduce the output of silk to very low levels in some years and also because output could not be readily changed to meet the violent fluctuations in demand. These changes in the price of raw silk were important because the cost of the raw material, and the difference between this and the selling price of the finished goods, were one of the main determinants of the silk manufacturer's profit.⁽³⁾

Secondly, the quality of the raw silk exported to Britain was generally very low. Irregularities arising from variations in the thickness of individual filaments or by their breaking during

(2) Rawley (1919) p. 148-52; Ure (1835) p. 234-5;
Singer et al. (1958) vol. 4, p. 309-10.

(3) Hughes (1960) p. 122-5; Ure (1835) p. 233;
Rawley (1919) p. 146. See Appx. 5 p.378-381.

reeling caused variations in the strength and thickness of the thread. The silk from China, the main source for English manufacturers during the nineteenth century, was particularly poorly reeled, though some silk of a higher quality was produced in Italy and France. This however was frequently not available for export, and when it was its price was two to three times that of the Asiatic silks.⁽⁴⁾

The low quality of the raw material greatly reduced the benefits of extensive mechanisation in the throwing and weaving mills, since stoppages of machinery and breakages of the thread were inevitable. However, the quality of raw silk was relatively insignificant where labour intensive methods of manufacture predominated, and workers could be used to remove slugs of gum and knotted silk and to retie broken threads. Moreover it was an

(4) Rawley (1919) p. 244-9; Ure (1835) p. 235-6; above Chapter I, p. 19; Coleman (1969) p. 16; Herty (1909) p. 711-12; Mason (1910) p. 13-15; Singer (1958) p. 309; Badnall (1828).

economic proposition to use cheap labour in this way to reduce the wastage of the valuable raw material. There was thus little incentive for continental manufacturers, who used particularly cheap labour, to expend capital on improving the quality of raw silk.

In England a few manufacturers attempted to secure a supply of raw silk of dependable quality but they met with little success. Attempts to reel silk in England (and later in America) came to nothing because of the difficulty of obtaining cocoons,⁽⁵⁾ and attempts to control filatures abroad met with only limited success. Between 1831 and 1858 Courtaulds lost heavily on investments in filatures in Spain and at Beirut and subsequently bought all their raw silk on the London market.⁽⁶⁾ Grouts operated a filature in Bengal in the 1830s but this too appears to have been a shortlived experiment.⁽⁷⁾ The only English firm which was known to have

(5) Mason (1910) p. 12; Fairbairn (1865) p. 223.

(6) Coleman (1969) p.104-5.

(7) "Silk Report" (1832) p.695-8.

successfully reeled its own silk for any length of time was Heathcotes, the lace manufacturers.⁽⁸⁾ John Heathcote established filatures in Italy and Sicily in 1825 and these continued working into the twentieth century.⁽⁹⁾

Thus the English manufacturers on the whole appear to have been unwilling or unable to influence the quality of silk produced in the filatures and, like their Continental counterparts, were content to save silk at the expense of labour. It was consequently not until the 1870s, when the American industry developed with a much greater emphasis on fast moving equipment and capital intensive techniques, that any steps were taken to improve the quality of raw silk available.⁽¹⁰⁾

Because of the considerable variations in quality, the raw silk available in London was classified only by origin and type, and manufacturers would only buy silk after inspecting the quality of each bale.⁽¹¹⁾ Imported European "raws" were generally high

(8) See above Chapter V, p.121.

(9) Warner (1921) p.341; Gore Allen (1958); Singer et al. (1958) vol. 4, p.310.

(10) Mason (1910) p.15-18 and 27-9. (11) Rawlley (1919) p.334.

quality white silks from Italy and France suitable for organzine throwing, though the quantities used in England were limited by its scarcity and its price.⁽¹²⁾ In the eighteenth century the Levant had been the major source of England's raw silk, but during the nineteenth century Asiatic silks were of prime importance.⁽¹³⁾ These were available in three distinct types. Most common was the white Tsatlee silk from China which took dye well, though its quality and evenness of reeling varied considerably. Canton silk was coarse and fluffy and suitable only for cheap goods while Bengal silk, a soft yellow yarn, was of limited use except for low quality black cloths.⁽¹⁴⁾

Some of the uncertainties of silk buying were removed and the marketing apparatus improved after 1851 when a "conditioning house" was established in London. Silk has the ability to absorb and release considerable quantities of water with consequent variations in weight. In the conditioning house the "true mercantile weight" or the "conditioned weight" of each bale was calculated based on a standard content of 11% water by weight.

(12) See above p.325.

(13) Hertz (1909) p.711-12; Mitchell and Deane (1962); Schumpeter (1960).

(14) Rawlley (1919) p.244-46; Coleman (1969) p.197; Singer et al. (1958) vol. 4, p.309.

The conditioners also undertook to sample the silk for gum content and other characteristics and to re-sort the raw silk into different grades. However it was not until the twentieth century that the system was sufficiently advanced or the quality of raw silk sufficiently dependable for the imported raw material to be bought by sample. (15)

At this stage the raw and waste silk entered into the ambit of the manufacturer. Yarn was produced either by throwing the continuous filament or by spinning the short lengths of waste generated at each stage of production. (16) These processes were quite distinct and will be treated separately.

The stages through which the continuous filament went varied considerably in complexity with the type of yarn being produced. For some purposes the initial stages of winding and cleaning was all that was required. In this process the raw silk was wound from the skeins onto bobbins, after being washed and dried. On its path to the bobbin the silk passed through closely

(15) Rawlley (1919) p.317-325; Warner (1921) p.442;

Ure (1835) p.253; Mason (1910) p.25-26.

(16) See above Chapter III, p.57-58.

adjusted knives which cleaned the silk and prevented any large knots or irregularities from passing. It was at this stage in particular that labour was used intensively to cut out irregularities and deal with breakages in the silk. The untwisted single thread which emerged from the cleaning and winding process was known as "dumb singles" and could be used as a yarn in the manufacture of some goods.

Although throwing used in its widest sense included winding, technically it referred only to the twisting process which was used to produce a firmer, stronger yarn. As in other textiles, the twist was produced by passing the thread between two sets of bobbins, revolving at different, carefully adjusted speeds. Between the bobbins the thread passed through the eye of a flier, attached to and revolving with the take-off bobbin. "Singles" were produced when a single thread of raw silk was twisted in this manner. "Tram", the most common yarn for weft, was produced by winding together two or three untwisted "dumb singles" on a doubling mill and giving just sufficient twist (about one turn to the inch) to hold the yarn produced together and to give it sufficient strength to withstand the weaving process. A highly

twisted variety of tram called "marabout" was used in the manufacture of ribbons and gauzes. (17)

For the warp thread a stronger yarn, "organzine", was required which was twisted in a slightly more complex fashion. Two or three twisted singles were doubled and twisted together in a direction contrary to that of the singles of which it was composed. The most highly thrown organzine, with up to 100 twists to the inch, was used in lace manufacture; crape required silk with a fairly high throw of about 50-70 twists, but for most weaving a low thrown silk, with under 30 twists to the inch, was usual. (18)

Given the form of the throwsters raw material there was less scope for variation in the fineness of the initial dumb singles than there was, for example, in the thread produced by a cotton manufacturer. The eventual fineness of a yarn (denoted by its denier) depended chiefly upon the amount of doubling and throwing. There was consequently little specialisation on particular grades of yarn within throwing mills beyond those which arose by the demand of the weavers supplied. In the early days of the industry

(17) Mason (1910) p.14; Ure (1835) p.247-248; "Silk Report" (1832) p.197-9.

(18) Rawlley (1919) p.213; Ure (1835) p.247.

some mills were not equipped with the fast-moving powered equipment on which organzine was thrown,⁽¹⁹⁾ but by the nineteenth century a well equipped throwing mill could produce the three types of yarn (singles, tram and organzine) with a high or low throw as required. One Macclesfield throwster, for example, stated that they produced over 100 different yarns in their mill.⁽²⁰⁾ On the other hand, many of the short lived speculatively established mills, especially those in the south of England, concentrated on the simplest process of winding and were incapable of producing even tram.⁽²¹⁾

The introduction of power to silk throwing in England did little to alter the method of production beyond making it possible to throw organzine on the fast, evenly running equipment.⁽²²⁾ In fact the techniques of silk throwing remained static both in England

(19) See above Chapter I, p.19.

(20) "Tariff Commission" (1905) 3355.

(21) Warner (1921) p.443-4.

(22) See above Chapter I, p.17-18.

and on the Continent until the slump following the French peace of 1815 provided an incentive for English manufacturers to reduce costs by improving productivity.⁽²³⁾ The Manchester firm of textile engineers, Fairbairn and Lille, redesigned throwing equipment and introduced some of the principles then in use in driving cotton machinery. At about the same time Samuel Courtauld patented an organzine throwing spindle which was for many years the best in the world. These developments, elementary though they were, made an enormous difference to the efficiency of the machinery. Spindle speeds reached 3,000 r.p.m. compared with the French and Italian machines which operated at 300-800 r.p.m. and labour costs were reduced by almost half. With these developments it at last became, in the 1820s, an economic necessity in England to throw silk by power.⁽²⁴⁾

Fairbairns remained the leading suppliers of silk throwing equipment until after the 1860 treaty and Britain's most advanced mills were ahead of any on the continent, though in fact subsequent

(23) Singer et al. (1958) vol. 4, p.311.

(24) Fairbairn (1865) p.213; Coleman (1969) p.64-5 and 79; Singer et al. (1958) vol. 4, p.311; Ure (1835) p.239; "Silk Report" (1832) p.99 and 277.

technological advance was slight. Spindle speeds were slightly improved and machinery was made to run more evenly but until the quality of the raw silk was improved, significant progress in making silk throwing less dependent on labour was impossible.⁽²⁵⁾ Thus it was not until American manufacturers had improved silk reeling machinery in the 1870s that any very highly capital intensive throwing systems were developed (also in America) and spindle speeds were again increased, this time to 12,000 r.p.m.⁽²⁶⁾

If silk throwing machinery was only slowly improved in the first half of the nineteenth century, the improved techniques were even more slowly adopted by the English manufacturers. While the industry was protected from foreign competition and while there was a plentiful supply of women and children to work in the mills, there was little incentive for the manufacturers to apply new methods, and so slow, inefficient mills remained in operation. Moreover the speculative and short term nature of many of the entries into the silk trade, the lack of capital available in many of the small undertakings and the fact that profits

(25) Ure (1835) p.249 and 262; Coleman (1969) p.85;

Fairbairn (1865) p.213-5 and 223.

(26) Mason (1910) p.111-114.

depended less on mechanisation than on the price of the raw material, and the difference between this and the selling price during the booms, ⁽²⁷⁾ all militated against the application of advanced and capital intensive methods of production.

Generally however, the onset of a slump and the resulting increase in competition often provided sufficient incentive for the larger, more strongly established and more highly capitalised firms to improve their competitive position by installing more advanced machinery for both throwing and weaving. Thus the installation of new equipment in Macclesfield's mills was reported in the slumps of 1815, the late 1820s, and after 1860; and Courtaulds' reaction to an emergency by bringing their equipment up to date is well-documented on a number of occasions in the nineteenth century. ⁽²⁸⁾

The production of silk yarn from the short lengths of waste silk was quite separate in technology, and usually in organisation, from silk throwing. The machinery used was closely akin to that in the cotton flax or worsted trades, the yarn itself was often one

(27) Coleman (1969) p.135-9 and above p.324.

(28) Davies (1961) p.135; Fairbairn (1865) p.213;
Coleman (1969) p.67, 101-3 and 164.

of combined fibres (for example spinning wool, flax or alpacca together with silk), and the product, even if made entirely of silk was almost invariably woven into mixed fabrics.⁽²⁹⁾ Thus at all stages of manufacture close links were established with other stronger textile industries.⁽³⁰⁾ These links alone were probably sufficient to ensure a relatively advanced industry, but the silk spinners had an additional advantage over the throwsters in that they did not import a semi-manufactured raw material. Rather they concentrated all stages of manufacture into their English mills and controlled the quality of the product at each stage.

The raw material for the silk spinners came in approximately equal amounts from the overseas producers of raw silk (where over half of the silk produced by the silk worm was unreelable) and from the waste of throwing and spinning mills in England.⁽³¹⁾ After being degummed⁽³²⁾ the fibre was ready to undergo the processes, common to all textile spinning, of dressing, carding

(29) See above Chapter III, p.56 and below p.341-2.

(30) See above, esp. Chapter III, p.54-59.

(31) Singer et al. (1958) vol. 4, p.313; Rawlley (1919) p.258-9.

(32) See below p.352.

or combing and eventually spinning. After spinning, the yarn could be doubled and twisted as necessary to increase its strength and weight.

During the early development of the industry in England, from 1792 to the 1830s "short staple" machinery, similar to that in use in the cotton trade was used for silk spinning. The major drawback of this system was that it required the silk filaments, up to nine inches long, to be cut into lengths of between one and two inches. In the 1830s, equipment for spinning silk was developed which was modelled on the machinery capable of dealing with a longer staple as found in flax and worsted mills. Equipment designed in the late eighteenth century for preparing flax and wool for spinning (for example, Woods' combined combing and spinning machine, Cartwright's comb and Axon's cleaning and fining machine)⁽³³⁾ were then rapidly applied to long silk spinning, and the links between silk spinning and the West Riding of Yorkshire were established.⁽³⁴⁾

(33) B.P. 1130 (1776); B.P. 1787 (1790) and B.P. 1935 (1793).

(34) Singer et al. (1958) vol. 4, p.314; Warner (1921) p.403-408; see above Chapter III, p.55-8.

As well as this major technological change there were a number of individually small improvements to the detail of the machinery for preparing, spinning and cleaning the yarn (notably Lister's silk comb and his self acting dressing frame) which increased the productivity of labour. (35)

The close links in both organisation, and technology with the more prosperous and progressive worsted industry ensured that these developments were rapidly applied to the industry. (36) In consequence, silk spinning in England became a technologically advanced and capital intensive industry and well able to withstand competition from overseas producers after 1860. (37)

Once a thrown or spun silk yarn had been produced the remaining processes were very similar to those of other textile industries. Some yarn was used in the lace and hosiery trades and some was sold as tailors' and sewing twist but the majority was woven into cloth.

(35) Singer et al. (1958) vol. 4, p.314-6 and 321-26;
Warner (1921) p.413-416.

(36) See above Chapter III, p.56.

(37) See above Chapter IX, p.278-280.

The net silk yarn (the continuous filament) which entered the weaving branch was largely used to produce all-silk goods. In the eighteenth and early nineteenth centuries some net silk was used in mixed fabrics, for example in the bombazines made at Norwich, but from the 1830s the expanding spun silk branch provided most of the yarn used in mixed goods. Spun silk blended better with other textile fibres than did net and its lower value ensured that the silk content of a cloth did not increase its price excessively. Conversely, few fabrics were made entirely of spun silk. Pile goods, such as velvets and plushes, which were used extensively as dress materials in the 1880s and 1890s, were fabrics where spun silk was most in evidence, but the backing (the warp) of these was usually a worsted yarn. Some vestings and linings were made entirely of spun silk rather than a composite yarn but these accounted for only a small part of production.

While the industry was protected the silk manufacturers produced a huge variety of fabrics. The "Books" which laid down the rates to be paid to the handloom weavers in the major centres (for example, Spitalfields, Macclesfield, Coventry and Norwich) contained scores of types of cloth and hundreds of items. (38)

(38) See above Chapter IV, p.92-3; Davies (1961) p.193 and 196-8; Warner (1921) p.658C-658N; Clapham (1916) p.460; Prest (1960) p.53-56.

Moreover cloth types, and the names by which they were known changed considerably through time and the quality of work denoted by a particular name was never constant. The confusion arising from this is well illustrated in the case of crape by Warner and Coleman.⁽³⁹⁾ The term Norwich crape, for example, applied to at least four quite separate cloths at different times. Small wonder that Coleman found the distinction between different crapes was not always altogether clear.⁽⁴⁰⁾ However some broad classification of the silk goods produced in England is possible.⁽⁴¹⁾

The most elaborate and expensive broad cloths produced in England were the high quality broadsilks; satin, figured damask, brocades with a complex raised pattern, and heavy gros-grain. These, particularly the satins, were sometimes used for clothing but in general they were more important as furniture silks and curtains.

At the other extreme were the finer silks; taffeta (a thin glossy plain fabric), sarenet (a fine textured lining material),

(39) Warner (1921) p.285-6; Coleman (1969) p.24-7.

(40) Coleman (1969) p.24.

(41) See also Singer et al. (1957) vol. 3, p.178-9 and 193-205 for a general classification of cloths and the terms used.

silks destined for printing, and a variety of gauzes, crapes and chiffons. These silks were chiefly used for clothing in a large variety of forms. Ladies' outerwear was the major market, though there was also a steady demand for silk linings for clothes of heavier materials, shirtings and underwear. The production of crêpe-anglais for mourning dress became a particular speciality of some manufacturers. (42)

There were three major branches of the silk weaving which were not concerned with producing broad cloth from net silk. First was the manufacture of smallware: ties, mufflers, handkerchiefs, wraps, and so on, which was always an important part of the industry in the South West Pennines. Secondly there were the narrow trades, which produced a huge range of goods from the simplest plain types to the complex patterned and figured ribbons, and also included braids, cords and trimmings. This branch was, of course, largely localised in Coventry, though Derby and Leek took some part in the trade. Finally there was the production of mixed fabrics, in which silk was added, usually merely for decoration, to a huge range of cloths, composed chiefly of other textiles. This branch

(42) See above Chapter IX, p.260, 265; Coleman (1969)

was closely integrated with the other textile trades in Pennine England, particularly with the worsted industry in Yorkshire.⁽⁴³⁾

Technical developments in the pure and mixed branches of silk weaving remained largely independent of each other. The close association of the mixed branch with Yorkshire's worsted trade ensured that the many small advances in automatic and powered looms were quickly applied to the trade.⁽⁴⁴⁾ Characteristic of the technical advance in this branch of manufacturing was the perfection of the velvet loom over a period of 10 years at Lister's Manningham Mills. It was largely on the products of this loom that Yorkshire's silk spinning and weaving boom of the 1880s and 1890s was based.⁽⁴⁵⁾

(43) See above especially Chapters III, IV and IX.

(44) Fairbairn (1865) p.185-6; Singer et al. (1958) vol. 4, p.299-304; above Chapter IX, p.280-282.

(45) See above Chapter IX, p.281-282; Warner (1921) p.299-231; Rawlley (1919) p.282.

In contrast to this technically advanced branch of manufacture the net silk branches of the weaving trade were slow to adopt improved techniques of hand weaving or to apply power to the looms. This tardiness was attributed chiefly to the nature and delicacy of the yarn, though the fact that this was in part due to the poor standards of reeling and throwing is ignored by most commentators. (46)

The use of power looms presented particularly great problems for the silk industry. The high tension at which these looms operated required yarns to be uniform and strong, characteristics not found until the American developments of the late nineteenth century. (47) From the 1830s when power looms were rapidly being introduced in other textile trades, until the 1880s, there were consequently very few types of pure silk fabrics which could be woven on power looms. Most high quality broad goods, particularly the complex figured goods and those which used fine dyed silk yarn, could only be manufactured on hand looms for most of the nineteenth century. Indeed the most expensive goods continued to be woven by hand until well into the twentieth century. (48)

(46) But see Mason (1910) p.118-119 and see above p.334.

(47) See above p. 334.

(48) Rawlley (1919) p.208.

Most important of the products which were amenable to the power loom were the narrow goods, where a limited number of warp threads reduced the risk of breakage and where the strong, highly twisted marabout was widely used in the weft. Of the broadgoods, those which were woven in hard silk and subsequently degummed⁽⁴⁹⁾ and dyed in the piece, such as crapes, gauzes, printing silks and some of the coarse vestings and linings, were most easily woven by power. Power looms could also be adopted to weaving the simple smallware goods mentioned above.⁽⁵⁰⁾ However, the quality of yarn used for these cheaper broadgoods and smallware varied enormously and many of the cloths were composed of such low quality yarn that, even for these, hand weaving was obligatory.⁽⁵¹⁾ Many of Lancashire's handloom products, for example, were cheap dress materials, linings and vestings composed of the poorest Bengal singles.⁽⁵²⁾

Thus, until late in the nineteenth century it was impossible to use power for either the highest or the lowest qualities of silk goods. But even those fabrics which could be woven by power were,

(49) For the significance of the degumming process on yarn strength, see below p. 352.

(50) Coleman (1969) p.85-6; "Silk Report" (1832) p.693, 796-7.

(51) Mason (1910) p.118-9. (52) Ure (1835) p.239.

for economic reasons, often hand made. As in the throwing branch, the speculative nature of many undertakings and the protected market militated against a capital intensive and technically advanced industry.⁽⁵³⁾ Thus even manufacturers who operated power looms usually kept some handloom weavers on their books to employ in periods of heavy demand.

Even the handloom branch of the industry was backward compared with its counterparts on the Continent. It has already been seen how the Spitalfields Acts retarded progress in London and how slow the Coventry ribbon weavers were at adopting improved machinery.⁽⁵⁴⁾ English silk manufacturers were also behind their Continental competitors in introducing the Jacquard loom. This loom was the only one specifically designed for use with silk, and was one of the few major advances in weaving to occur after 1750. It enabled complex patterns to be woven automatically on both broad and narrow goods.⁽⁵⁵⁾ It was introduced in France from 1801, but was scarcely used by English silk manufacturers until the 1820s and had not been extensively adopted even 20 years later.⁽⁵⁶⁾ Thus for

(53) See above p.334-5.

(54) See above Chapter IV, p.92-94, 107-8 and Table 4-2.

(55) Singer et al. (1958) vol. 4, p.299 and 316.

(56) Warner (1921) p.454; Thesis Table 4.2; Rawlley (1919) p.198; Ure (1835) p.255-9; Singer et al. (1958) vol. 4, p.316-7.

technical and economic reasons looms common in other textile trades were only slowly adopted by silk manufacturers and hand looms, themselves relatively primitive, continued to be used in silk long after they had been superseded elsewhere.

B) THE DISTRIBUTION OF PRODUCTION AND PATTERN OF LINKAGES

The regional incidence of the various branches of silk manufacture has already been spelt out in the body of the thesis, but it may be useful to summarise it here. The weaving of the high quality broad goods had been an early specialisation of Spitalfields, and it was here that the bulk of production remained. By 1860, however, their manufacture had spread to hand loom weavers in other parts of the country, notably to East Anglia (especially Suffolk) and to the South West Pennines. In addition to producing these elaborate goods the London hand loom weavers also took a large part of the poorer end of the trade. In fact it was these low quality goods which accounted for the majority of employment and output there until 1860. It was, however, the weaving of these goods which was most readily established in the provinces for they benefited most from low wage labour and were not dependent on the

proximity of the fashion market.⁽⁵⁷⁾ Thus their manufacture (on hand looms) was established in the South West Pennines and Lancashire, and the production of low quality goods was the mainstay of the weavers dispersed through southern England.⁽⁵⁸⁾

In the powered section of the weaving trade there was a marked regional specialism. The bulk of crape manufacture took place in East Anglia and the south west of England where three firms, Grouts of Norwich, Courtaulds of Bocking (and elsewhere in Essex) and Thompson and Le Gros of Frome dominated the trade.⁽⁵⁹⁾ This concentration of crape production in the south of England was probably merely a historical accident resulting from the early establishment and rapid growth of these particular firms.

(57) See above Chapter IV, p.92-97.

(58) See above Chapter IV, p.96-8, 104 and Chapter III, p.60-61.

(59) Coleman (1969) p.86; "Silk Report" (1832) p.693; "Fact. Insp. Rept." (1834) p.479 and (1835) p.152; Warner (1921) p.341 and 289-90; above Chapter VIII, p.231-32.

The other major concentrations of power weaving were in the South West Pennines and Lancashire.⁽⁶⁰⁾ Some crape was produced in these counties,⁽⁶¹⁾ but this branch was overshadowed in Lancashire by the manufacture of gauzes, linings, printing silks and other coarse goods which were generally woven in hard silk, and in the South West Pennines by smallware goods especially handkerchiefs.⁽⁶²⁾ Although the production by power of these low quality dress goods and smallware was particularly concentrated in the South West Pennines and Lancashire, even here power loom weavers were outnumbered by hand loom workers producing the same types of goods, until the Free Trade Treaty made their continued existence impossible. In addition, some hand loom weavers, particularly in the South West Pennines but also in Lancashire, turned to the higher quality products associated more with London.⁽⁶³⁾

The dispersed structure of English silk manufacturing and the small and specialised nature of many of the firms in the eighteenth

(60) See above Chapter V.

(61) Coleman (1969) p.86; Warner (1921) p.148.

(62) Warner (1921) p.133-137 and 145-156; Davies (1961) p.129-130; Rawlley (1919) p.208.

(63) See above Chapter V; Warner (1921) p.135-137, 152-156 and 164-165.

and early nineteenth century led to a complex system of inter-firm and inter-regional linkages and movement of materials. These interconnections were to some extent simplified by the organisation of the industry. The merchant-manufacturer who bought the raw silk from the importers often retained ownership and control of the materials throughout the manufacturing processes. This system developed because the major capital requirement was not for machinery, buildings or other fixed assets which could usually be rented, but for the stocks of the expensive raw material.⁽⁶⁴⁾ The merchant-manufacturer would have the yarn thrown and dyed on commission before putting out the yarn to the weavers on his books.⁽⁶⁵⁾

When throwing by power was developed the merchant-manufacturers often provided some of the capital required to establish mills, which, it has been seen, were usually regionally concentrated but spatially separated from the areas of weaving. In this way links between throwsters in particular regions with manufacturers and weavers in others were established. Thus the links between the Cotswold throwsters and the Coventry ribbon weavers were particularly close, and the yarn manufactured in the Chilterns was mainly used in London. At the other extreme throwsters in some regions were

(64) See e.g. Coleman (1969) p.107-9, 265 and 64.

(65) Warner (1921) p.67-68; Davies (1961) p.191.

chiefly engaged in supplying a more or less local market. In the East Midlands yarn was produced chiefly for the local manufacturers of hosiery and lace and the yarn produced by the considerable throwing industry of Lancashire could all be consumed locally. The spun silk yarn manufactured in Yorkshire was mostly used in weaving mills within the county even after 1860 when this cheaper yarn was also widely used in other parts of England. In other throwing regions there was a local demand, sometimes considerable, for yarn but nevertheless a surplus was produced which was used in more distant markets. Some of the yarn manufactured in the south west of England, for example, was used in London, and the South West Pennine throwsters were renowned as suppliers of manufacturers in Lancashire and Spitalfields as well as of local weavers. (66)

Slowly, during the early nineteenth century, the pattern of organisation with small firms of throwsters working on commission was changed. A few of the more successful firms of throwsters were able to build up sufficient capital from the high profits to become independent of the merchant-manufacturers and their commission work.

(66) See above Chapter I, p.17, 20-22; Chapter IV, p.103;

Chapter V, p.129-134; Chapter IX, p.259.

With sufficient capital to purchase their own silk supplies they could also enter the weaving branch and become manufacturers in their own right. Thus Grouts and Courtaulds in the south east and Brocklehursts and Birchenoughs in Macclesfield were all engaged in throwing and weaving by the 1830s.⁽⁶⁷⁾ It was these firms and other like them which first installed power looms in silk mills and so gave rise to the combined mill, so characteristic of the silk industry in the mid-nineteenth century.⁽⁶⁸⁾ Self sufficiency at the level of the firm clearly reduced the number of inter-regional linkages. However, before 1860 the amount of yarn used by these firms, compared with that used by weavers, who had no access to power, was small and inter-regional linkages and the movement of yarn remained important.

Apart from this movement of silk between throwster and weaver the most important inter-firm linkage in silk manufacturing was for the purpose of dyeing. This movement, however, only occasionally had an inter-regional aspect. Dyeing silk was a relatively straightforward process and used simpler techniques than could be

(67) Warner (1921) p.62-3, 136-7, 287 and 299-300; Davies (1961) p.131-3 and 136-7; Coleman (1969) p.70-3, 55, and 78.

(68) See above Chapter V, p.125-6.

applied to cotton or linen. Silk took colours well and did not require bleaching (except in the spun silk branch where the waste silk was generally bleached before spinning). There was however a preliminary process peculiar to silk. This was degumming or boiling-off. In this process the silk filament was freed from the gum by boiling in soap and water. Without this it could not acquire its full lustre and beauty, but after the gum was removed, the silk (known as soft silk) was weak and easily broken. Silk was always degummed immediately before dyeing (except for marabout which was dyed in the gum). For all high quality fabrics it was essential to use soft, dyed silk yarn in the loom, and so boiling off and dyeing occurred between the throwing and the weaving stages. The weakness of the soft, dyed yarn was a major factor restricting the use of power looms. (69)

Dyeing establishments were generally commercially independent of other branches of silk production and dyeing was done on commission. (70) The responsibility for having the silk dyed lay with

(69) Warner (1921) p.403, 441-7 and 449-50; Ure (1835) p.255 and 262; Rawlley (1919) p.208-9, 252 and 319-321.

(70) Rawlley (1919) p.208; "Tariff Commission" (1905) 3238.

the merchant-manufacturer and so dyeing establishments tended to be located close to the major areas of weaving. This pattern was reinforced by the fact that the dyers also undertook the cloth finishing processes. These were in fact very simple for most fabrics and were usually limited to steaming and pressing. (71)

Since London had a major concentration of silk merchants and was a principal weaving centre, silk dyeing was firmly established there from the early days until after 1860. Silk printing (of the cheaper goods woven in hard silk) was also able to survive in London long after calico printing had become established in Lancashire. (72) As silk manufacturing became established elsewhere, so silk dyeing spread from London. Dyeing had been carried on in the South West Pennines even in the era of button making and by the mid-nineteenth century silk dyers were found in Norwich, Manchester, Coventry and the East Midlands, as well as in Macclesfield, Leek and London. (73)

(71) Mason (1910) p.156; Warner (1921) p.144-150.

(72) Wallwork (1968) p.144; Ure (1835) p.262.

(73) See above Chapter IX, p.249-50.

Lancashire became the dominant centre for silk printing.⁽⁷⁴⁾ In fact, the south west of England was the only area of silk weaving where dyeing was not done locally (except perhaps at the Frome crape works). The yarn or cloth produced in the South West thus had to pass through London to be dyed.⁽⁷⁵⁾

Although a number of firms integrated silk throwing and weaving in the early nineteenth century, as seen above, very few branched out into dyeing. In part this was due to the quite separate technology of dyeing, but also because of the large scale of the throwing operations which would be required to maintain a dyeworks economically.⁽⁷⁶⁾ However crape manufacturing was an exception to this. This fabric required complex and specialised finishing and there was great secrecy surrounding the crimping process. As dyeing occurred at the same stage of production both dyeing and finishing were usually (though not always) incorporated into the integrated operations of the large firms.⁽⁷⁷⁾

(74) Warner (1921) p.166. (75) Warner (1921) p.341.

(76) Rawlley (1919) p.238.

(77) Coleman (1969) p.76 and 88-95.

Interfirm linkages also occurred between the manufacturers of silk and the ancillary occupations which supported them. In general, however, these were not significant geographically. A few individuals in a weaving community would undertake to prepare the equipment for the Jacquard loom, and warp spreading and other preparatory tasks would be undertaken by specialists. The actual manufacture of looms, too, was a local craft rather than an organised industry.⁽⁷⁸⁾

In the powered throwing and weaving branches of the industry contact with a more sophisticated ancillary engineering industry was necessary. In the major centres of powered production (Coventry, the South West Pennines, the East Midlands and within the textile province proper) there were a number of independent millwrights and power loom makers,⁽⁷⁹⁾ though doubtless many of the larger firms in these centres, as in the south of England, employed their own engineers and maintained a repair shop.⁽⁸⁰⁾ For major installations and repairs, however, the silk manufacturers

(78) Warner (1921) p.62-3.

(79) See for e.g. Table 3.7 above.

(80) Coleman (1969) p.71-2.

were dependent on more specialised textile engineers. Even before 1860 there appear to have been firms specialising on building silk working equipment only in the South West Pennines and Yorkshire. Most manufacturers were thus dependent on more distant firms (for example Fairbairns of Manchester) who treated the silk trade as a small sideline to their major business. The problems arising from this situation, especially after 1860 when a strong engineering branch would have been an asset, are dealt with elsewhere. (81)

Close commercial links between the silk manufacturers and the market was essential, especially in the sections of the trade influenced by the rapidly changing demands of fashion. London was by far the most important market for silk cloth and goods, though a secondary market, particularly for broad cloth, was established in Manchester, and the spun silk and mixed goods produced in Yorkshire were sold through the Bradford merchants. (82)

Some of the larger manufacturers, particularly those who produced specialised goods, such as crape and ribbons, maintained

(81) See above Chapter IX, p.248-9 and below p.360.

(82) See above Chapter IV, p.96-7; "Tariff Commission" (1905) 3312-7; Warner (1921) p.165-6 and 219.

their own warehouses in London, from which their goods were distributed to the wholesalers.⁽⁸³⁾ In the late nineteenth century Courtaulds attempted to control the selling side of the business even further by appointing agents in the provinces and abroad, who sold the firm's goods on commission.⁽⁸⁴⁾ However the extra capital required to enter selling in this way and the risk involved in holding stocks of finished goods prevented all but the largest firms from attempting to include marketing within their organisation. Most manufacturers, in London and the provinces, consequently sold their finished goods to local silk mercers, who acted as agents for the firms of wholesalers based in London.⁽⁸⁵⁾

After 1860 this strongly developed system of inter-regional linkages between the manufacturing processes was largely destroyed. Many products could not face the competition from foreign manufacturers. As seen in Chapter 9 competition particularly affected ribbon manufacture and the poorer end of the soft silk trade, though production of practically all classes of goods was reduced. Without the demand from the hand loom weavers, the throwing

(83) Prest (1960) p.49-50; Coleman (1969) p.174-5.

(84) Coleman (1969) p.193-4.

(85) Warner (1921) p.68; Table 3.7A above.

industry declined drastically, especially in regions where weaving had not developed, and the dyeing branch of silk production virtually disappeared. (86)

The weaving firms which survived most strongly in the era of free trade were those which used power looms to produce relatively low quality broadsilks or goods which used a hard undyed yarn. A factor in their survival was that many of these firms had already by 1860 integrated throwing and weaving, often in combined mills. (87) Thus they were largely self-sufficient and depended on inter-firm and inter-regional links to only a limited extent. In the competitive conditions the integrated factory was considered ideal and many further amalgamations took place until by the twentieth century there were very few independent firms of throwsters. (88)

Although the production of low quality goods on hand looms was quite uneconomic after 1860, some of the high class trade survived. These manufacturers, especially in London and East Anglia, mostly

(86) See above Chapter IX, especially p.248-252 and 255-261.

(87) See above Chapter V, especially p.125-6.

(88) Warner (1921) p.259-260; Rawlley (1919) p.225-6 and 233.

remained specialised, without any control over throwing concerns. They consequently faced problems of yarn supply. With the collapse of much of the throwing industry in England, they became increasingly dependent on the South West Pennines for domestic supplies of yarn. But in fact their needs were increasingly met from imported yarn, supplied by silk importers and merchants who increased greatly in number after 1860. (89)

The silk manufacturers who were scattered beyond the major areas of production faced the greatest problems of all. Those to survive to the twentieth century overcame their difficulties in one of two ways. Either they developed their throwing branch to produce specialised finished as well as semi-finished products (as happened at Taunton and St. Albans). (90) Or they integrated production as completely as possible and used power looms to produce high value goods (as did Thompson and Le Gros at Frome and Wilmotts of Sherborne). (91) The majority of firms to survive to the start of the twentieth century were consequently self-sufficient to a large degree and the complex network of inter-regional linkages

(89) Warner (1921) p.82-3; Rawlley (1919) p.213 and 281.

(90) See above Chapter IX, p.264 and 269.

(91) See above Chapter IX, p.264 and 269-70.

and flows, especially of semi-processed materials, largely disappeared. Nevertheless, producers could never become completely self-sufficient, for some contact with ancillary industries (especially engineering and dyeing) was essential and for firms outside the Pennine province these ties were inevitably over long distances. Indeed dyeing was often done abroad and in some cases finishing, simple though it was, was not done at all. Even Courtaulds were compelled to bring in technical expertise and key workers from Yorkshire in order to survive.⁽⁹²⁾ Thus, some long-distance links remained for the more isolated firms and in the increasingly competitive conditions it became difficult to absorb the extra costs involved.⁽⁹³⁾

Within the Pennine province the silk industry in Lancashire, Yorkshire and the East Midlands was slowly absorbed into the regions' major textile trades as profits declined. In general adequate services were available locally, but for some specialised processes, particularly the dyeing and weighing of silk the Lancashire manufacturers were faced to look beyond their immediate locality

(92) "Tariff Commission" (1905) 3373, 3306; Coleman (1969) p.172-3, 181-4, and 189-91.

(93) See above Chapter IX, p.253-4.

and often preferred foreign dyers to the firms in the South West Pennines. (94)

In the collapse following the 1860 treaty the South West Pennines were fortunate in having a relatively large and diverse industry. Employment declined and products changed but the various branches of silk manufacture were always present in the locality and the ancillary industries remained strong enough to lend their support to the region. Thus the South West Pennines formed an almost entirely self-sufficient region and manufacturers here did not suffer from the costs of transport and other disabilities of isolation which bedevilled the firms elsewhere. Moreover, firms did not need to be large and independent in order to survive. Integrated firms were of course found in the region, but small establishments specialising on particular grades of work or processes were able to survive in the more complete environment. (95)

Thus in the long term competition in the silk industry placed a premium on regional self-sufficiency and brought about the collapse of most inter-regional links which had been so marked a feature of

(94) "Tariff Commission" (1905) 3306; Above Chapter IX, p.250; Warner (1921) p.166.

(95) See above Chapter IX, p.287-299.

the industry's developmental and mature, prosperous phases. Ultimately in the contraction phase the economies of agglomeration, which had always been important in the South West Pennines,⁽⁹⁶⁾ became a major factor in maintaining this region in a dominant position in the silk industry.⁽⁹⁷⁾

(96) See above Chapter III, p.77-81.

(97) See above Chapter IX, p.300.

REFERENCES FOR APPENDIX 4

The most useful sources for technical and organisational detail of the industry were:-

D.C. COLEMAN (1969) "Courtaulds: an Economic and Social History (vol. 1)"

W. FAIRBAIRN (1865) "Mills and Millwork (pt. 2)"

F.R. MASON (1910) "The American Silk Industry and the Tariff",
American Economic Association Quarterly Third Series, vol. 11,
no. 4, p.1-182.

R. RAWLLEY (1919) "Economics of the Silk Industry: a study in
Industrial Organisation"

C. SINGER et al. (1957-8) "History of Technology", vols. 3-5.

A. URE (1835) "The Philosophy of Manufacture".

Sir F. WARNER (1921) "The Silk Industry of the United Kingdom".

In addition reference was made to:

R. BADNALL (1828) "A View of the Silk Trade".

J.H. CLAPHAM (1916) "The Spitalfields Acts, 1773-1824", Economic
Journal (vol. 26), p.459-71.

C.S. DAVIES (1961) "A History of Macclesfield".

W. GORE-ALLEN (1958) "John Heathcote and His Heritage".

G.B. HERTZ (1909) "The English Silk Industry in the Eighteenth
Century", Eng. Hist. Rev. (vol. 24), p.719-27.

J.R.T. HUGHES (1960) "Fluctuations in Trade, Industry and Finance:
a Study in British Economic Development, 1850-1860".

B.R. MITCHELL and P. DEANE (1962) "Abstract of British Historical
Statistics".

J. PREST (1960) "The Industrial Revolution in Coventry".

E.B. SCHUMPETER (1960) "English Overseas Trade Statistics, 1697-1808".

K.L. WALLWORK (1968) "The Calico Printing Industry of Lancashire
in the 1840s", Trans. Inst. Br. Geogr. (no. 45), p.143-156.

GOVERNMENT PAPERS

"Report of the Select Committee to enquire into the Present State

of the Silk Trade and the Effects of a Change in Tariffs", H.C.
(1831-32, vol. XIX) pl-.

FACTORY INSPECTORS' REPORTS

1834: H.C. (1834, vol. XLIII)

1835: H.C. (1836, vol. XLV)

"Report of the Tariff Commission. Evidence on the Silk Trade",
vol. 2, pt. 6 (1905).

APPENDIX 5TARIFFS, COSTS AND INTERNATIONAL COMPETITIVENESS

The silk industry, wherever it existed, was always subject to violent fluctuations in prices and profitability, caused both by uncertainty and speculation in the market for its raw materials and by the nature of the luxury and fashion-conscious market it supplied.⁽¹⁾ Because of these fluctuations in profitability it was always difficult for the industry to become firmly established in any country unless it was granted some form of privileged treatment, for manufacturers and merchants were likely to fail before they had accumulated sufficient capital to withstand the frequent depressions. Thus in all Western countries protection from foreign competition, usually by tariffs, went hand in hand with the growth of silk manufacturing.⁽²⁾

Before its development in England the silk industry had grown under the umbrella of protection in Italy and France and subsequently governments wishing to encourage the industry - in Germany, Austria,

(1) See above Chapter I, p.3-12.

(2) See above Chapter I, p.3-5; Mason (1910) p.1-4; "Foreign Trade" (1821) p.421)

Russia, the U.S.A. and elsewhere - all imposed tariff barriers behind which the silk industry could grow. Such tariffs were designed to exclude virtually all imports, either of silk goods in general or of particular types, and competition after paying duty at 30%, 50% or even higher rates was almost impossible.⁽³⁾ The English industry was perhaps unique, however, in having its protection withdrawn while many of its products were unable to compete successfully in the home market with their foreign-made counterparts.^(3a)

The system of tariff duties by which protection was granted was always very complex, in England and elsewhere. Ad valorem rates were open to abuse by merchants who could avoid duty by understating the value of their imports. So it was general practice to impose specific rates of duty by weight on different cloths. These rates

(3) See above Chapter IX, especially p.242-4, 256-7, 267 and 281-2 for the effect of these tariffs on the English industry after 1860. Detailed information is contained in "Tariff Commission" (1905) especially 3086-3129, 3254, 3266-7 and 3312-8.

(3a) Imported raw and thrown silk were exempt from duty from 1845 and manufactured silk from 1860. It was this latter change which had by far the greatest effect on the English industry. See below especially pp.387-390.

were designed to achieve an approximately uniform duty at the desired level. ⁽⁴⁾ A complex and frequently changing tariff system resulted from this which makes detailed analysis of the actual rates levied both difficult and unprofitable. However, the general purposes and effects of the tariffs imposed in the silk industry can be considered.

A) TARIFFS AND THE ENGLISH SILK INDUSTRY

The prime aim of the English tariffs in silk in the eighteenth and early nineteenth centuries was to encourage the production at home of the domestic requirements for silk goods. This was thought desirable, both to give some security to the English silk weavers and also to reduce the importation of goods which could be manufactured at home. It was not a primary aim to build up an industry which could compete without protection in either the English or the general world market for silk goods.

These objectives could most easily be achieved by an absolute prohibition on the importation of finished silk goods. In theory

(4) Mason (1910) p.59-60; For an example of the resulting rates see Warner (1921) p.623.

this had been the case from the early fifteenth century when such measures were enacted.⁽⁵⁾ However it was not until the late seventeenth century, after the major influx of French weavers, that serious attempts were made to put the ban into effect. In 1698 French silk goods were prohibited, and those from India and China three years later.

This first absolute protection from foreign competition was shortlived, for from 1713 French silk goods (except ribbons) were again admitted to England, though at high rates of duty. The opportunity to raise revenue from importing silk had taken priority over the protection of its manufacturer at home. This situation continued until the conclusion of the Seven Years War in 1763. Silk manufacture in England had been very profitable during the war but with the peace production was curtailed.⁽⁶⁾ The depression caused such an outcry that an inquiry into the industry was held, which led to the prohibition from 1765 of the importation of all fully manufactured silk goods. As with earlier legislation, this measure was directed primarily against France, the only other major

(5) See Hertz p.710.

(6) See below p.369-70.

silk manufacturing country in Europe. The protection, originally granted to English manufacturers for five years, in fact stayed for sixty.⁽⁷⁾

Behind this barrier the English manufacturers had an assured market in which they faced no competition except from the limited volume of goods brought in by the well-organised smuggling trade.⁽⁸⁾ Only a few attempts were made to extend the market by exporting goods, and these met with little success. English silk goods were entirely banned from the French market by reciprocal legislation⁽⁹⁾ and exports to other countries where competition with the French was on equal terms, were very low. These exports were boosted to some extent when France was at war, but even then they accounted for only a small part of production. For example exports were higher in 1760, during the Seven Years War, than at any other time in the eighteenth century. In that year exports of manufactured

(7) "Silk Manufacture" C.J. XXX (1765) p.213-19; 6 Geo III c.28; above Chapter I, p.3-4 and 8-9.

(8) See above Chapter I, p.4; Warner (1921) p.519-33.

(9) Warner (1921) p.79.

goods reached almost 200,000 lbs compared with an average of just under 50,000 lbs during the first half of the century but they still accounted for less than one-fifth of the imports of raw and thrown silk. (10)

Thus it would seem that in the eighteenth century the English silk manufacturers had little interest in providing for more than the protected home market and were in any case unable to meet competition from French manufacturers in markets open to both countries.

The conditions influencing England's tariff policy on raw and thrown silk were rather different from those affecting manufactured goods. For silk weaving to exist in England it obviously had to be possible to import raw silk and any thrown silk which could not be manufactured at home. There was thus a divergence of interest between the throwster and the manufacturer of finished goods. The former would clearly prefer free access to his raw material coupled with protection from foreign throwsters while the latter would favour unimpeded access to thrown yarns, whether manufactured in England or abroad.

(10) Mitchell & Deane (1962) p.205-6; above Chapter I,

In the early eighteenth century, in fact, both raw and thrown silk were subject to tariffs, chiefly as a means of raising revenue. From 1765, however, the views of the growing body of throwsters were heeded and they received considerable encouragement.⁽¹¹⁾ The duty on raw silks was greatly reduced and the rates charged on those from Italy and the East were equalised. At the same time the tariff on thrown silk was raised and the throwsters' level of protection was thus increased (see Table A5.1).

Subsequently, the tariff rates on both raw and thrown silk were increased as a means of raising revenue particularly during the War of American Independence (when thrown silks were chiefly affected) and in the Napoleonic Wars. In these changes the throwsters' margin of protection, the difference between the duty on raw and thrown silk, was generally maintained or increased. In the depression following the conclusion of the Napoleonic Wars, the throwsters' position was again more firmly buttressed, as had happened 50 years previously, by a reduction in the duty on raw silks and an increase in that on thrown (see Table A5.1).

There can be no doubt that considerable protection was afforded to the throwing industry by these tariffs. Even in the 1830s when

(11) "Silk Manufacture" C.J. (1765) p.208-19.

TABLE A5.1

DUTY ON RAW AND THROWN SILK IMPORTED INTO ENGLAND: 1660-1824

	Duty per lb of 16 oz ⁽¹⁾					
	RAW			THROWN		
	Italy	China	Bengal			
	s. d.	s. d.	s. d.		s. d.	
1660	4	7	4	1660	10	
1690	4	1 3	7	1690	1 7	
1699	7	1 11	11	1699	2 4	
1703	9	2 1	1 11	1703	2 8	
1704	11	2 6	1 3	1704	3 2	
1747	1 3	3 2	1 7	1747	4 0	
1750	1 7	3 2	1 3			
1765	10	10	10	1765	4 6	
1779	11	11	11	1779	4 9	
				1781	4 11	
				1782	5 2	
1784	3 0	3 0	3 0	1784	7 4	
1797	3 3	3 3	3 3	1797	8 0	
1801	5 1	5 1	3 9	1805	11 5	
1807	5 5	5 5	4 9	1807	12 2	
1814	5 7	5 7	3 9	1814 } to 1824 }	14 7	
1817 } to 1824 }	5 6	5 6	3 6			

SOURCE: "Silk Report" H.C. (1831-32 vol. XIX) p.265-6.

NOTES: 1) Until 1784 a lb of 24 oz was used for raw silk. The figures have been converted to ease comparisons with later data.

2) The duty is given to the nearest ld.

the duty on organzine had been reduced to only 3/6 per pound (compared with a negligible rate on raw silk) it was considered that all costs of manufacture were covered.⁽¹²⁾ In the previous period when the differential was higher, the price of English yarn must have been considerably below that of imported thrown silk.

Although the English throwster could thus always meet the price of imported yarns, he could not always manufacture high quality organzines. The Italian raw silk needed for this was often entirely retained for domestic manufacture. Indeed for some years after 1727 its export was absolutely banned.⁽¹³⁾ Consequently there were always considerable imports of thrown silk though on average quantities were always lower than the imports of raw silk and from about 1800 they accounted for a declining proportion of the yarn used in England.⁽¹⁴⁾

Thus until the 1820s silk manufacturing in England was conducted within what was virtually a closed system. Raw materials,

(12) Ure (1835) p.249.

(13) Ure (1835) p.248; above Chapter I, p.19; Appx. 4, p.325.

(14) See Mitchell & Deane (1962) p.205-208.

including some yarns, had to be imported and here foreign governments exerted some influence. But most yarns used in England were produced by English throwsters who had no fear of price competition from imported thrown silk, and the domestic manufacturers faced practically no competition from foreign made goods on the heavily protected home market. Nor was the English silk industry at this time concerned with overseas outlets for its goods. The export of thrown yarn was always negligible and manufactured goods entered foreign markets in any quantity only when normal conditions were disrupted by war.

England's policy of Free Trade, in so far as it affected the silk industry, was gradually put into effect from 1824. In that year the duty on both raw and thrown silk was considerably reduced, and it was lowered further over the next five years (see Table A5.2). Even then, however, the tariffs levied on the various types of thrown silk were sufficient to cover the English manufacturers' costs.⁽¹⁵⁾ The prohibition on the importation of manufactured goods ended in 1826 and was replaced by a tariff ranging from 25% on plain silk to 40% on millinery silk, hats and dresses. For most materials and ribbons the tariff stood at 30%.⁽¹⁶⁾ Falling prices increased the

(15) See above p.373 and Ure (1835) p.249.

(16) See Warner (1921) p.623 for details.

TABLE A5.2

DUTY ON SILK IMPORTED INTO ENGLAND 1824-1860

RAW			THROWN			MANUFACTURED		
	Italy	China	Bengal	s. d.				
1817-24	5/6d	5/6d	3/6d	1814-24	14	8	1765-1826 PROHIBITED	
	}			1824-25	7	6		
1824-26				3d	1825-26	5	0	
				organzine tram singles				
				s. d.	s. d.	s. d.		
1826-45		1d		1826-29	5 0	3 0	3 0	1826-45 c. 30%
				1829-45	3 6	2 0	1 6	ad valorem ⁽¹⁾
1845	FREE ENTRY			1845	FREE ENTRY			1845-60 c. 15%
								ad valorem
								1860 FREE ENTRY

SOURCE: Warner (1921) p.623; Coleman (1969) p.65-6.

NOTE (1) The specific rates charged to achieve this ad valorem duty were varied in 1829 to compensate for price changes (see p. 376).

effective protection and so the rates were revised in 1829 with the aim of bringing them back to around 30% on most goods. But in 1832 they were still at an average of about 37%.⁽¹⁷⁾

In 1845 the tariffs were further reduced. All raw and thrown silk was henceforth imported duty free and the rates on manufactured goods were lowered to an average of about 15%. In 1860 this remaining protection on manufactured goods was finally removed and the entire industry was forced to meet competition unaided.

B) COSTS OF PRODUCTION

From 1826, when silk goods manufactured abroad were first admitted to England, the extent to which manufacturers at home could compete with imported goods must ultimately have been a function of production costs. But the details of these costs which are available are very difficult to interpret. There is some piecemeal information on wages,⁽¹⁸⁾ but without details of production

(17) "Silk Report" H.C. (1831-32, vol. XIX) p.429;

Ure (1835) p.255.

(18) E.g. from Ure, Warner, "Silk Report" H.C. (1831-32, vol. XIX).

methods, other costs and the price the products fetched this is of little value. Another source gives considerable detail of the capital structure of an individual firm:⁽¹⁹⁾ this is useful for showing the over-riding importance of capital availability to maintain stocks of silk,⁽²⁰⁾ but does little to show the relation between capital and other costs. In general, the data are not available to obtain a comprehensive account of the structure of costs in the nineteenth century silk industry.

Moreover, there were obviously considerable variations in the structure of costs within the English industry, depending on such factors as the degree to which production was mechanised, whether factories and equipment were owned or rented, and the precise location of a firm in England.⁽²¹⁾ It would therefore be a dubious exercise to apply the costs of individual manufacturers, even if these did exist, to the industry as a whole.

(19) Coleman (1969) especially p.106-110 and 133-141.

(20) Coleman (1969) especially p.106 and 136.

(21) See Rawlley (1919) p.283-8; Coleman (1969) p.266;

"Tariff Commission" (1905) 3146-52 and compare above Chapter VI and Appx. 4, p.358-60.

However, there were two costs facing manufacturers which all commentators are agreed were dominant. These were the cost of the raw material itself and the cost of labour. Together these two accounted for 90% or more of the final cost of a yarn or a fabric. In the highest quality hand-woven goods the cost of labour sometimes exceeded the cost of the raw materials, but in most cases the actual silk used was the manufacturer's chief expense. Thus for crape between 50% and 70%, for spun silk yarn about 60% and for other goods up to 80% of the final selling price was determined by the cost of the silk⁽²²⁾ (see Table A5.3).

In an industry with fairly stable raw material costs and a dependable demand for its goods such proportions may not be significant. But in silk, with constantly fluctuating prices for raw materials and products these costs assumed great importance.⁽²³⁾ The profits obtained by manufacturers depended to a great extent on the margin between their raw material costs and the price which the

(22) Coleman (1969) p.139; Warner (1921) p.459; "Tariff Commission" (1905) 3149-3152.

(23) See above Chapter I, p.6-7; "Tariff Commission" (1905) 3164-7; Coleman (1969) p.105 and 138 for details of some of these changes.

TABLE A5.3

COST STRUCTURES OF SAMPLE SILK MANUFACTURING FIRMS IN 1905

	% OF TOTAL COSTS	
	Including raw materials	Excluding raw materials
1. SILK THROWING (Charles Woollam & Co., St. Albans)		
Silk	78	-
Labour	16	75
Power	1	4
Other	<u>5</u>	<u>21</u>
	100	100
2. SILK SPINNING (Reade & Co., Congleton)		
Silk	62.5	-
Labour	27.5	73
Power	3	8
Overheads	<u>7</u>	<u>19</u>
	100	100
3. INTEGRATED MILL (Throw, Spin and Weave) (J. & T. Brocklehurst & Co., Macclesfield)		
Silk	no data	-
Labour	-	60-70
Overheads	-	<u>30-40</u>
		100

SOURCE: "Tariff Commission" (1905) 3292, 3344, 3286.

luxury market could bear for the goods produced. The increase in profits made by Courtaulds in the two decades after 1870, for example, was due largely to a decline in raw silk prices and the consequent increase in their profit margin, rather than any improvement in productivity.⁽²⁴⁾

Conversely, a collapse in the market for silk products, coupled with the uncertain and fluctuating raw silk prices led to difficulties in the industry. The history of all major firms is studded with near collapse in the slumps which occurred in their early years and even when they were more highly capitalised a crash in silk prices usually caused a loss.⁽²⁵⁾ Clearly fluctuations in the prices for silk were sufficient to cause the failure of many of the less highly capitalised and less well managed firms.

By being such a major component of cost and by influencing production and profitability to such an extent, the cost of materials assumed great importance for silk manufacturers. A depression in prices, however caused, would always have an extreme effect on the

(24) Coleman (1969) p.135-9.

(25) See Coleman (1969) p.55-6, 101-2 and 106; Mason (1910) p.2-3; Davies (1961) p.134-5 and 137-8 for examples.

industry and would inevitably result in the failure of some firms. Thus, having capital available to weather these frequent storms was probably as significant for the survival and profitability of firms as were the actual running costs of production. (26)

After the purchase of raw materials, the major cost to manufacturers was labour. As already seen, silk production was very labour intensive especially when compared with other textile manufacture in England. Until 1860 (and for twenty or thirty years afterwards) it was possible to reduce the labour content of production to only a limited extent even when the processes were as mechanised as the delicate fibre allowed. (27) Indeed, in 1905 labour was still the most significant running cost to be met by the manufacturers. Even in the more highly mechanised throwing and spinning concerns, labour costs at that time accounted for around 30% of the selling price of the yarn. In hand weaving costs varied between about 20% and 50% dependent on the quality of the goods, though in the powered weaving branch the proportions of labour in the final cost were probably a little lower. (28)

(26) See Coleman (1969) especially p.109 and 136 for the importance of stocks of silk in the capital structure.

(27) Appx. 4, p.325, 334 and 343.

(28) "Tariff Commission" (1905) especially 3149-52.

There is no doubt that total costs were in fact reduced when production was mechanised. This is clearly shown by the improved competitive position of firms which had installed up to date equipment to combat a domestic slump or to counter competition from abroad.⁽²⁹⁾ But it is difficult to assess the benefits of mechanisation in terms of reduced costs.⁽³⁰⁾ Even in crape manufacture, where these savings gave rise to a highly successful branch of the silk industry, an intensive study failed to give any comparison of production costs by hand and power.⁽³¹⁾

Even to the manufacturer using power, however, costs other than those of labour and the raw material made up only a small proportion of the total. In particular, the provision of power, so important in some industries, was only a minor cost to silk manufacturers.⁽³²⁾ And, from the few cases for which details are

(29) See above Appx. 4, p.335. (30) See above Chapter IV, p.173.

(31) Coleman (1969) p.97-102.

(32) See above Chapter II, especially p.43-4 and 48-9.

available, the fixed overhead costs - rent, depreciation and so on - were also relatively small⁽³³⁾ (see Table A5.3).

Thus labour costs were always a major concern, and these costs were undoubtedly always higher in England than on the Continent. The details available for the mid-nineteenth century suggest that wages in England were twice those paid for similar operations in Italy and were almost as far above the French rates.⁽³⁴⁾

The situation reported in more detail to the tariff commission in 1905 was much the same. In France wages were three-fifths of those paid in England and in Italy and Belgium about two-thirds. When the longer hours worked on the Continent were taken into account costs were computed to be between 50% and 55% of those paid in England.⁽³⁵⁾ If labour costs are reckoned to average 30% of total costs (an assumption generally made in 1905) then production costs on the Continent were about 15% lower than those obtained in England.

(33) Bookkeeping methods generally preclude analysis of the role of these costs. Even the many papers left by the Courtaulds failed to give any useful details. See Coleman (1969) Appx. facing p.274.

(34) Badnall (1828); Warner (1921) p.640; Ure (1835) p.249.

(35) "Tariff Commission" (1905) 3149.

Once protection was removed from the silk industry this cost disadvantage could be met only by the English manufacturers who had installed machinery to improve the productivity of labour. As already seen, mechanised techniques were being adopted by some manufacturers in the second quarter of the nineteenth century.⁽³⁶⁾ As a result some branches of the English industry became technically advanced compared with their continental counterparts. The improved machinery for spinning and throwing which was pioneered and installed in England was hardly adopted on the Continent.⁽³⁷⁾ In those branches of weaving where mechanisation was possible productivity was similarly improved by some firms to a level where competition with low-wage but labour-intensive production methods was possible.

It does not matter that these improved techniques were adopted primarily as a means of countering intensified competition from other domestic producers during the frequent slumps.⁽³⁸⁾ They clearly also improved the firms' competitive position vis-a-vis

(36) Appx. 4, especially p.335. (37) Ure (1835) p.249.

(38) See Appx. 4, p. 335.

low-wage manufacturers overseas. Indeed some products of the mechanised branches, for example crape, were even able to compete in foreign markets. Exports of silk goods consequently rose considerably between 1820 and 1860 and remained at about the same level for the remainder of the nineteenth century.⁽³⁹⁾ But for the other branches of weaving where mechanisation was not possible, and for those inefficient producers who clung to outdated methods, competition with cheap labour producers became increasingly more difficult as the tariff barriers were lowered.

C) INTERNATIONAL COMPETITIVENESS OF THE ENGLISH INDUSTRY

It seems clear that the protection afforded to the industry by the tariffs levied between 1826 and 1860 was sufficient to keep foreign competition in the English market at very low levels. The value of manufactured silk goods imported into Britain reached £600,000 within two years of the ending of prohibition, but rose only slowly in the next decade. After a brief slump in the late 1820s production at home recovered.⁽⁴⁰⁾ The Select

(39) See above Fig. 9.4; Coleman (1969) p.69 and 162.

(40) See Prest (1960) p.119-20; above Chapter I, p.6-7.

Committee which investigated the industry's problems in 1832 was quite unable to determine the relative importance of domestic depression and tariff changes in causing this slump. The evidence submitted to it, whether by Free Trader or Protectionist, was tendentious and the report was presented without conclusions or recommendations.⁽⁴¹⁾ From the subsequent history of the industry, however, it would appear that these initial changes in tariffs had only a minor influence on the industry's strength and output.

The halving of duty on manufactured goods in 1845 occurred in a period of rising imports, which extended from 1841 to 1849, and did not in itself appear to have much effect on the level of production in England or on imports. By 1849 imports of manufactured silk had reached a peak of only three million pounds, which was not exceeded for the next ten years. It is interesting that the increase in exports of silk goods from England's progressive and mechanised manufacturers almost exactly matched these increases in imports between 1826 and 1860.⁽⁴²⁾ Clearly production costs on the Continent of practically all manufactured goods were not sufficiently below those prevailing in England for it to be profitable

(41) See "Silk Report" H.C. (1831-32, vol. XIX) p.3.

(42) Mitchell & Deane (1962) p.209-10; P.R.O. Customs 5 (1826-1860); see above p. 385.

to pay even 15% duty in order to enter the market.

The throwing industry was influenced to an even smaller extent by the tariff changes of the 1820s and 1845. After the duty on thrown silk was reduced in 1824 imports of yarn continued to fluctuate violently from under 200,000 lbs to over 800,000 lbs and the 7 year moving average remained at between 250,000 lbs and 400,000 lbs where it had been since 1750.⁽⁴³⁾ Meanwhile imports of raw silk for throwing in England continued to rise steadily from about two million pounds in 1820 to almost six million by 1860. The removal, in 1845, of all tariffs on raw and thrown silk had no apparent effect on these trends, and it was not until after 1860 that the throwing industry declined.⁽⁴⁴⁾

In short, the throwing branch was sufficiently in advance of its continental counterparts in the use of labour saving machinery to be able to meet competition from imports. Inefficient firms failed, but this was more as a result of competition from within England than because their products could be replaced by cheap

(43) See Mitchell and Deane (1962) p.207 and Coleman (1969) p. 15 and 68 for details.

(44) See above Chapter IX, p.250-51.

imports. The collapse of the throwing industry after 1860 occurred not because of competition with overseas throwsters, but because the demand for their products, particularly from the English hand loom weavers, suddenly collapsed.

The waste silk spinning branch was even less affected by tariff policy than was throwing. The major expansion of this branch occurred after the relaxation of protection and from the first it relied on its close ties with the more advanced branches of textile manufacturing and on the innovating genius of the English manufacturers. (45)

The reduction in tariff levels in the 1820s and in 1845 clearly did not make the English market particularly attractive to the overseas producers, even in those branches where their lower labour costs had most effect. But the situation was changed in 1860 when the last 15% of protective duty on manufactured goods was removed. As seen in Chapters 8 and 9 the labour intensive branches of the industry, especially the ribbon trade and the hand weaving of soft silk goods, were now quite unable to compete. Ribbon manufacturing, though partly mechanised, was inefficient. In any

(45) See above Chapter VIII, p.221; Chapter IX, p.278-81; and Appx. 4, p. 335-38.

case the Coventry trade was immersed in internal disagreements and strikes during 1860 which delayed any attempts to meet the new conditions until it was too late.⁽⁴⁶⁾ In the broadsilk branch many of the manufacturers and merchants in London and elsewhere who were dependent on hand looms had already determined that the goods they produced could be procured more cheaply from France once the tariff was completely removed. As soon as the treaty became law they ceased working and many of them turned to importing silk goods instead.⁽⁴⁷⁾

In France, too, the removal of the remaining 15% duty was seen as a clear signal. Attractive, low quality goods were hastily made for the occasion and these flooded the English market.⁽⁴⁸⁾ Imports of manufactured goods, which had been relatively static during the 1850s, rose steeply. In 1860 imports were valued at three and a half million pounds; during the course of the next year they almost doubled and by 1870 they had reached £15 million.⁽⁴⁹⁾

(46) Prest, p.127; and above Chapter VII, p.200 and 210 and Chapter IX, p.274.

(47) Warner (1921) p.84; Rawley (1919) p.281-2 and above Chapter VII, p.200.

(48) Warner (1921) p.84. (49) See Figure 9.4 above.

Although these labour intensive branches collapsed, those branches of weaving which had been able to reduce their labour costs sufficiently by mechanisation were able to continue more or less profitably. As seen in Chapter 9 (where the fate of these branches is traced in detail) production was chiefly for the domestic market though the export trade which had been built up in the previous thirty to forty years continued. Indeed some products (notably spun silk goods and crape) were manufactured so much more cheaply in England that they were able to enter even the French market where textiles were still protected by a 30% tariff.⁽⁵⁰⁾

Clearly, mechanised production, as a means of overcoming the disadvantages of higher labour costs was the key to survival in the English silk industry after 1860. But the need for adequate capital reserves to survive long periods of depressed prices was now even greater than it had been under protection.⁽⁵¹⁾ In the

(50) Ironically, when the 1860 treaty was drafted it was felt that the English textile industry as a whole was so far superior to the French that a 30% tariff barrier for English exports was reasonable. See Warner (1921) p. 79.

(51) Compare above p.334-5 and 377.

1860s the sudden influx of goods onto the British market lowered prices and subsequently the dumping policies of foreign manufacturers, coupled with tariff protection in their home markets,⁽⁵²⁾ made for a fluctuating and uncertain market in England. Many English concerns which may have been able to equal the production costs of overseas manufacturers were forced from business by the declining profits, extended depressions and high capital requirements needed to cope with the uncertain situation.

Thus in the long term the costs of production and the capital requirements of this labour intensive and unstable industry led to the collapse of all but a few specialised branches of silk manufacturing in England once tariff protection was removed.

(52) See above Chapter IX, p.242-4.

REFERENCES FOR APPENDIX 5

- R. BADNALL (1828) "A View of the Silk Trade".
- D.C. COLEMAN (1969) "Courtaulds: an Economic and Social History (vol. 1)".
- C.S. DAVIES (1961) "A History of Macclesfield".
- G.B. HERTZ (1909) "The English Silk Industry in the Eighteenth Century", Eng. Hist. Rev. (vol. 24) p.719-27.
- F.R. MASON (1910) "The American Silk Industry and the Tariff", American Economic Association Quarterly (Third Series vol. 11, no. 4) p.1-182.
- B.R. MITCHELL and P. DEANE (1962) "Abstract of British Historical Statistics".
- J. PREST (1960) "The Industrial Revolution in Coventry".
- R. RAWLEY (1919) "Economics of the Silk Industry: a study in Industrial Organisation".
- A. URE (1835) "The Philosophy of Manufactures".
- Sir F. WARNER (1921) "The Silk Industry of the United Kingdom".

GOVERNMENT PAPERS

- Commons Journal Vol. XXX (1765) "Silk Manufacture", p.208-219.
- "Report of the Select Committee to enquire into the Present State of the Silk Trade and the Effects of a Change in Tariffs"
- H.C. (1831-32, vol. XIX) p.1-

"Second Report from the Select Committee of the House of Lords ...
into Foreign Trade (Silk and Wine)" H.C. (1821, vol. VII)
p.421-464.

"Report of the Tariff Commission. Evidence on the Silk Trade",
Vol. 2, Pt. 6 (1905).