XII: MANUFACTURING INDUSTRIES: Industrial Change in Early Modern Europe, 1520 - 1750

A. ENGLAND: Wool-Based and Cotton Textiles: 1500 to the Industrial Revolution

revised 28 March 2012

Introduction: the Industrial Origins of the Industrial Revolution

- 1) **Final section of the course: on industrial change in early-modern England** and the origins of the modern Industrial Revolution
- 2) **Twin Spearheads of Modern Industrialization, everywhere:**
- a) **textiles**: first, the wool-based textiles (Old & New Draperies)➔ cotton textiles
- b) **coal and metallurgy**: origins of the iron industry

Industrial Origins of the Industrial Revolution in England - 2

- 3) **Our Objectives:** **to see how and why -**
- -a) **industrial developments interacted with changes** in other sectors of the economy: **agriculture, trade, finance**
- -b) **the industrial foundations of the modern Industrial Revolution** were laid in both **textiles and metallurgy**
- - c) **the Industrial Revolution first took place in England,** and from the mid 18th century

Industrial Origins of the Industrial Revolution - 3

- 4) **The Textile Industries**: today's lecture
- a) **Wool-Based Textiles: woollens (Old Draperies) and worsteds (New Draperies)**
- b) **the overwhelming predominance of the woollen textiles** manufacturing industry & trade: 90% of exports
- c) **The major industrial transformation of early-modern England:**
- **shift from the Old Draperies (woollens) to the New Draperies** (worsteds; hybrid woollen-worsteds)
- d) **foundations of the Cotton Industry** of the Industrial Revolution

The Old Draperies: Apogee & Decline

- 1) **Predominance of Woollen Broadcloth Industry in Tudor England**: from the 1460s
- a) **predominance in employment & foreign trade:** providing **90% of English export values** until the 1640s
- b) **supremacy over all of England's industrial rivals**: in Low Countries, France, Italy
- c) **Natural resource endowment: English wools + taxation**
- - **England produced the world's finest wools** : more sheep than people in England
- - **Royal taxation of wool exports**: from 1336 to 1390s ➔ tax burden: about 50% of export values (English wools: 60-70% of Flemish costs)

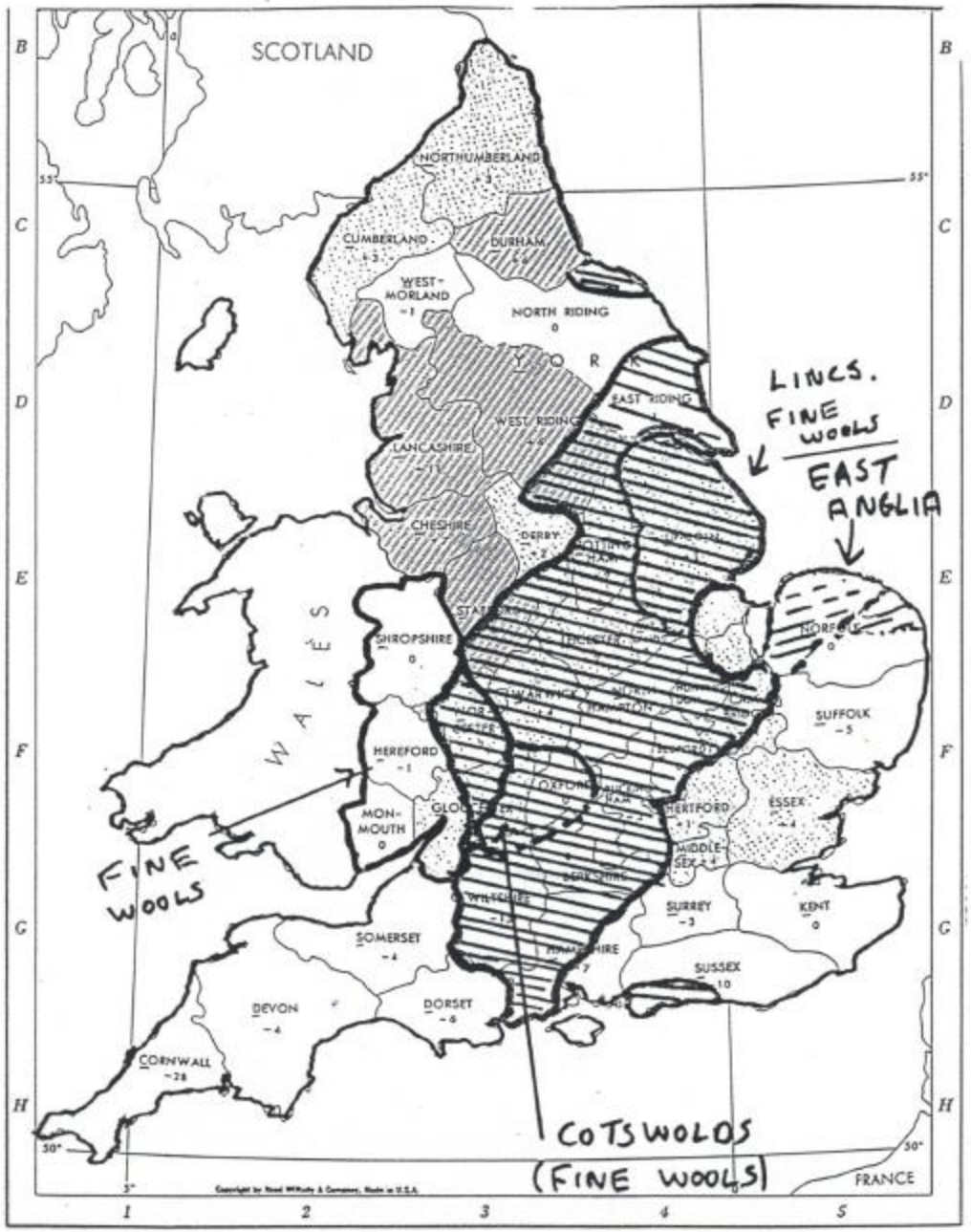
The Composition of England's Export Trade, 1640 - 1750
Percentages of Total Export Values

Commodity	1640	1700	1750
Woollens	92%	48%	33%
Other Manufactures		8%	20%
Foodstuffs		8%	12%
Raw Materials	11%	6%	5%
Re-Exports	4%	31%	29%

Source: Ralph Davis, 'English Foreign Trade, 1660-1700', *Economic History Review*, 2nd ser., 7:2 (1954), 150-66; reprinted in W.E. Minchinton, *The Growth of English Overseas Trade in the Seventeenth and Eighteenth Centuries* (London, 1969)

Old Draperies: Apogee & Decline 2

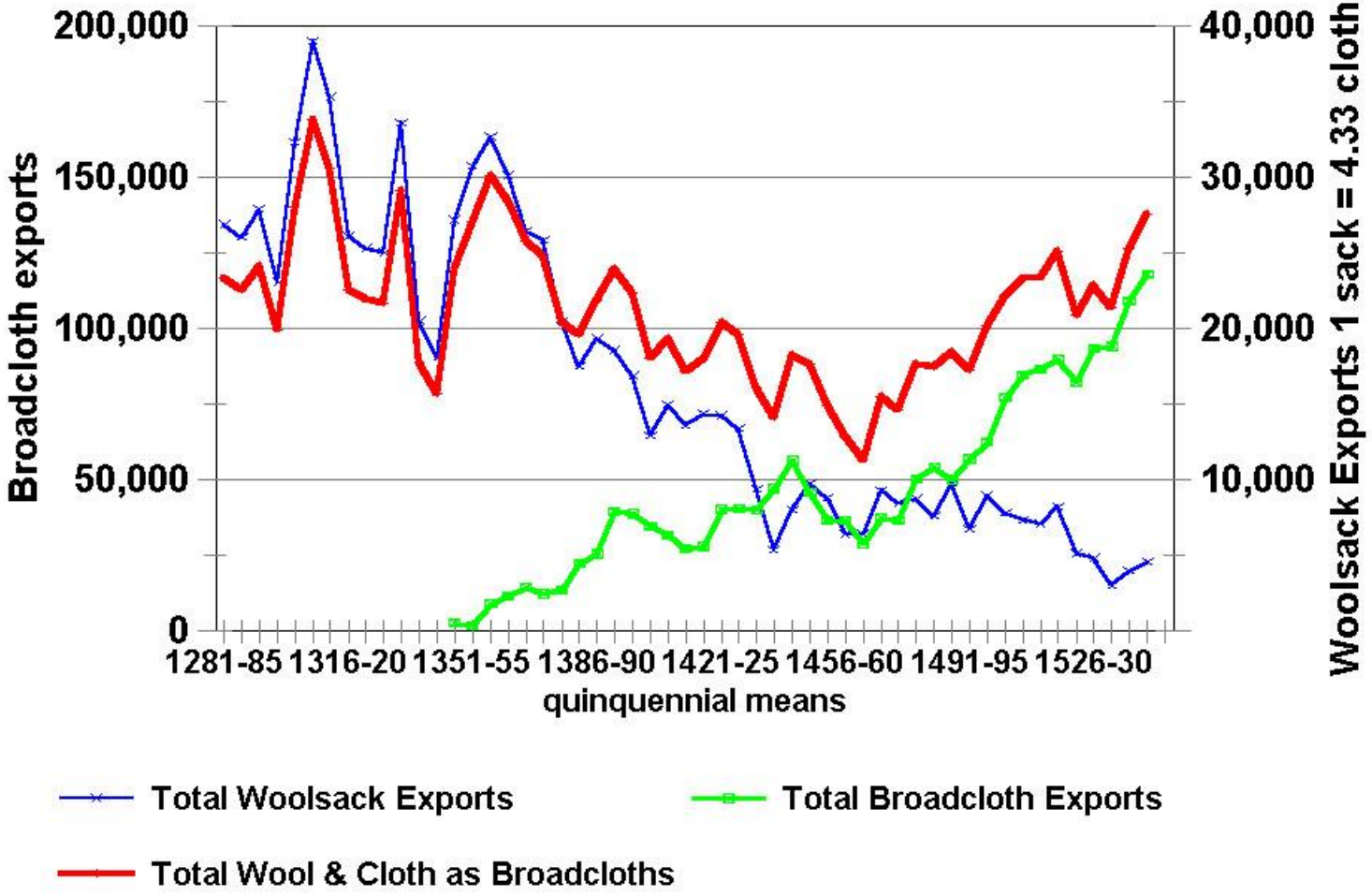
- c) **Natural resource endowment: English wools + taxation**
- - **Royal taxation of cloth exports**: only about **3%** of export values ➔ major if unintended cost advantage for English clothiers ➔ decline of wool exports + rapid expansion of cloth exports, especially from 1460s
- - **competition from Spanish *merino* wools**: but did not surpass quality of English wools before the later 16th century or early 17th century
- d) **Calais Wool Staple Bullion Laws**:
- - final crisis, 1420s to 1460s (first term)


SCOTLAND
NORTHUMBERLAND
CUMBERLAND
DURHAM
WEST-MORLAND
NORTH RIDING
YORK
EAST RIDING
WEST RIDING
LANCASHIRE
CHESHIRE
DERBY
LINCS.
FINE WOOLS
EAST ANGLIA
NORFOLK
SUFFOLK
WALES
SHROPSHIRE
HEREFORD
MON-MOUTH
FINE WOOLS
HERTFORD
ESSEX
MIDDLE-SEX
SURREY
KENT
SUSSEX
SOMERSET
DEVON
DORSET
CORNWALL
COTSWOLDS
(FINE WOOLS)
FRANCE

Memling: *Adoration of the Magi*

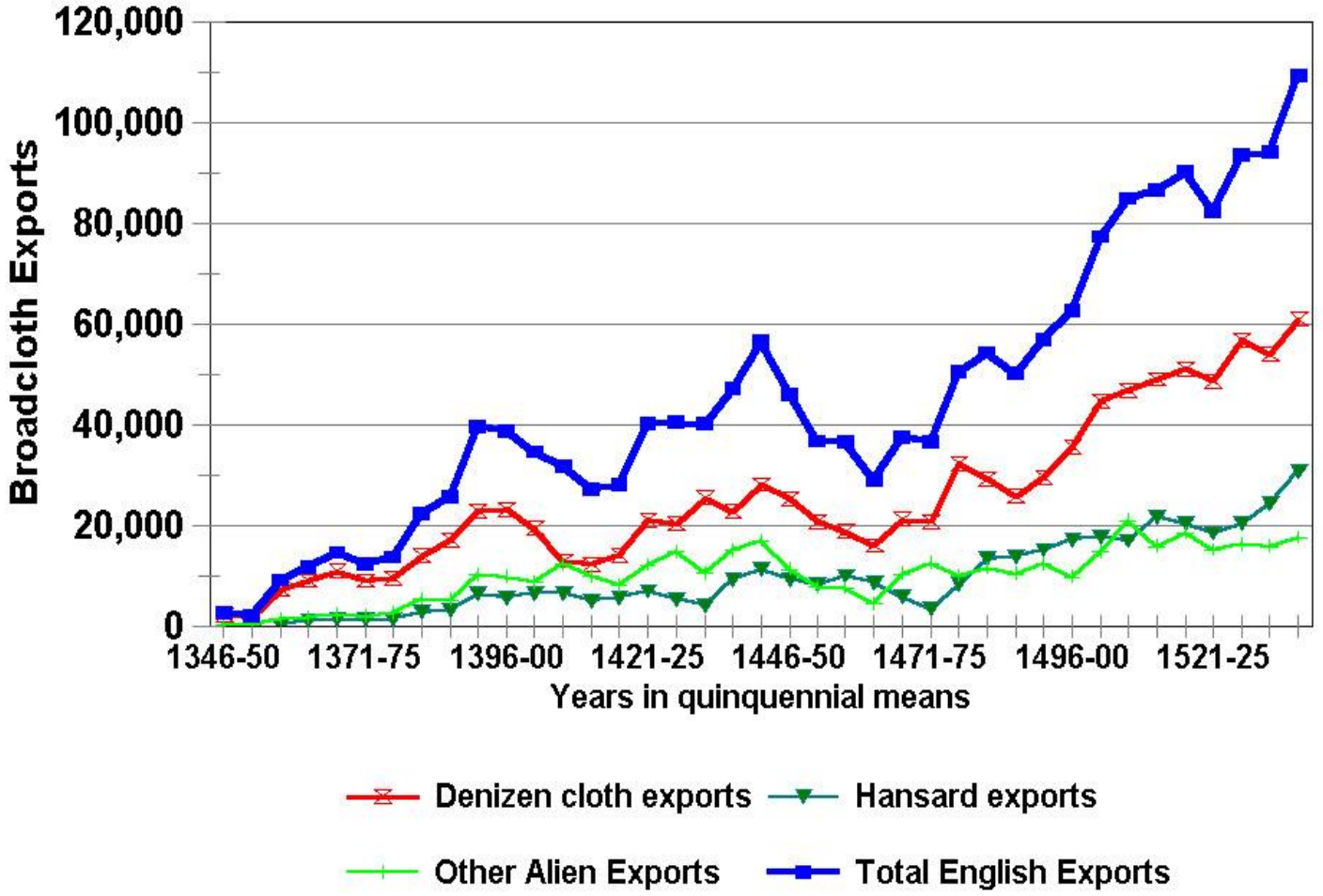
English Wool and Broadcloth Exports

1281-5 to 1541-45 in 5 year means



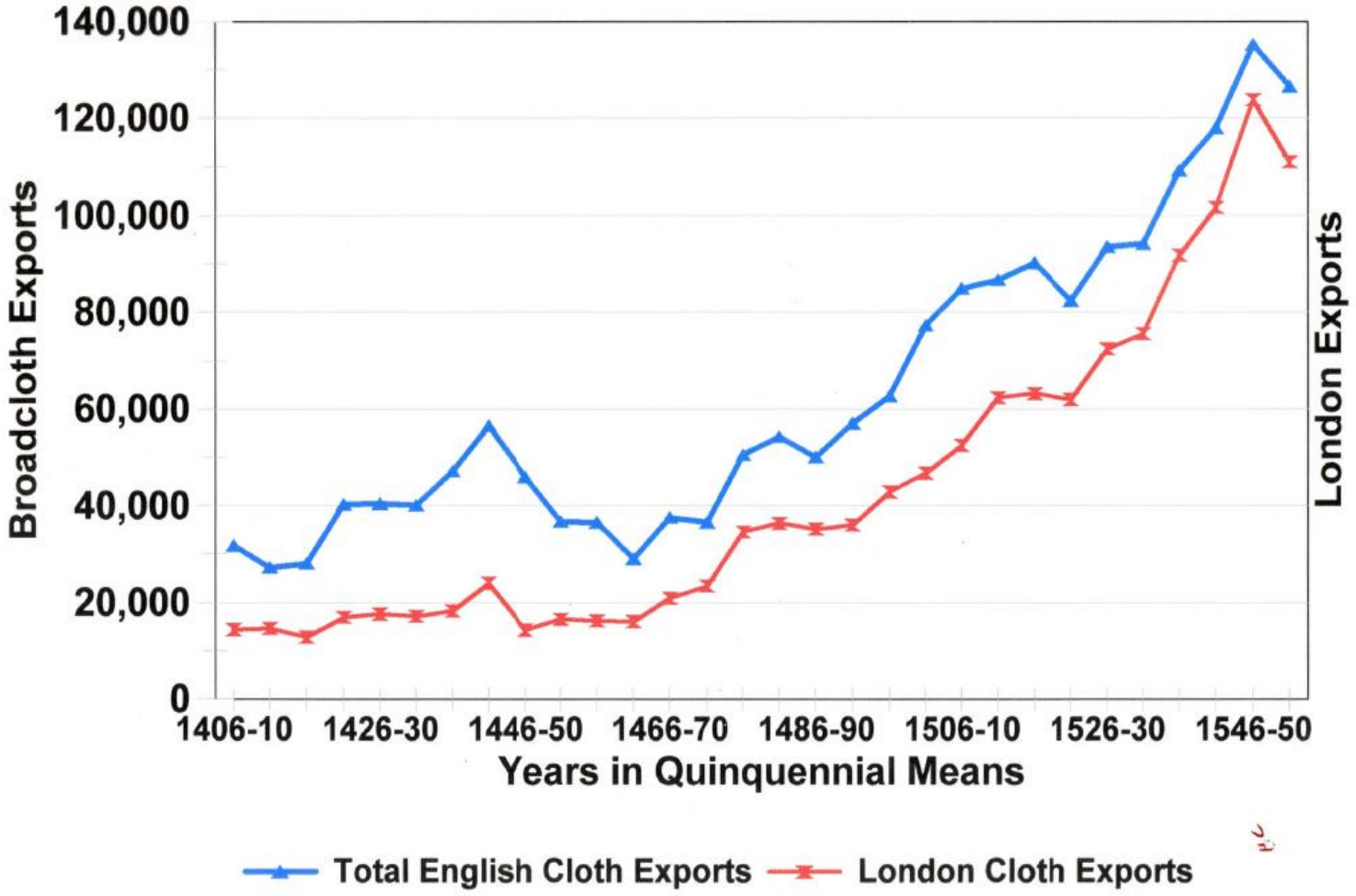
English Broadcloth Exports: 5 yr means

Denizens, Aliens & Hansards 1346-1540

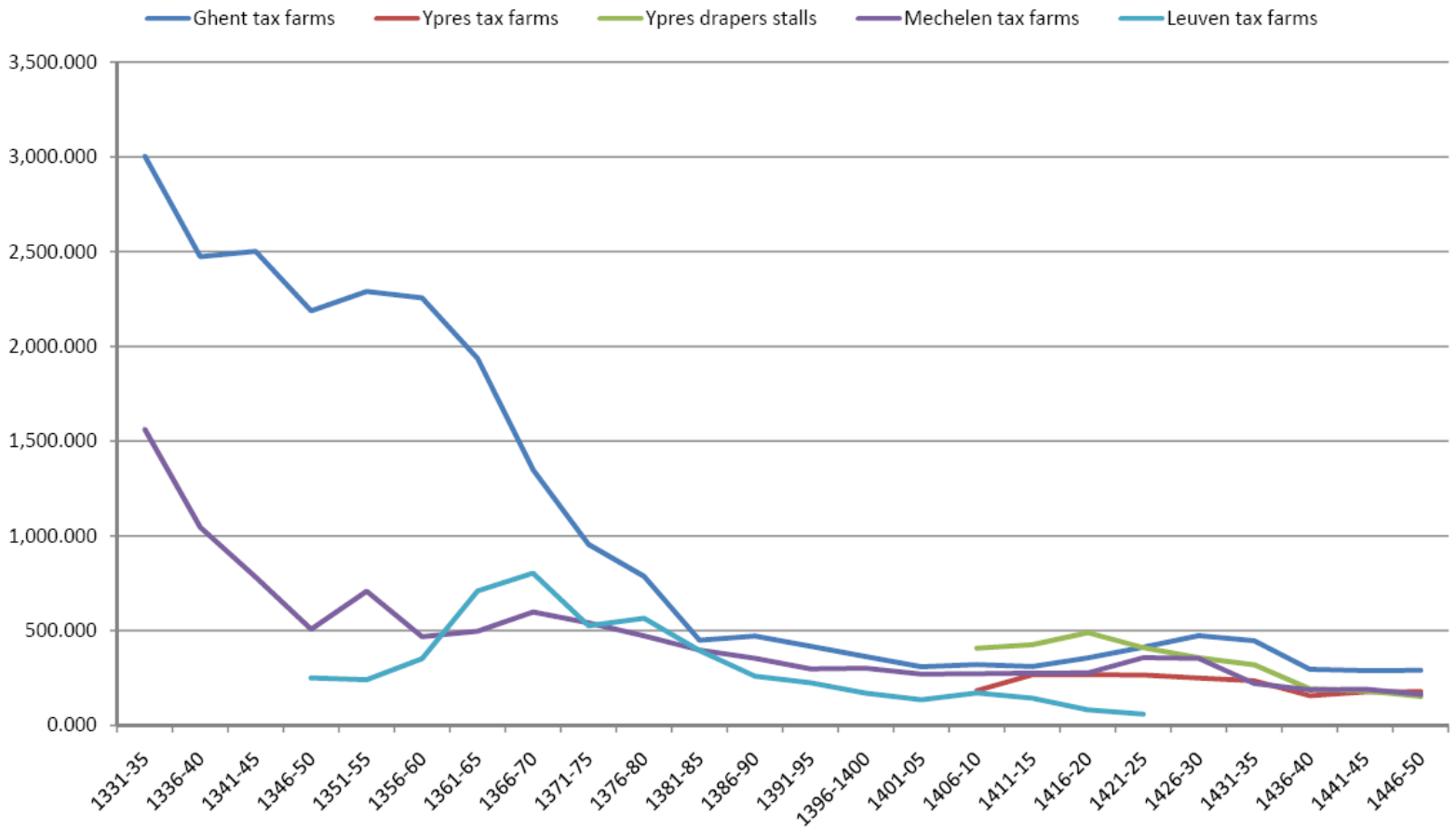


Total English & London Cloth Exports

Broadcloths, 1406-10 to 1546-50

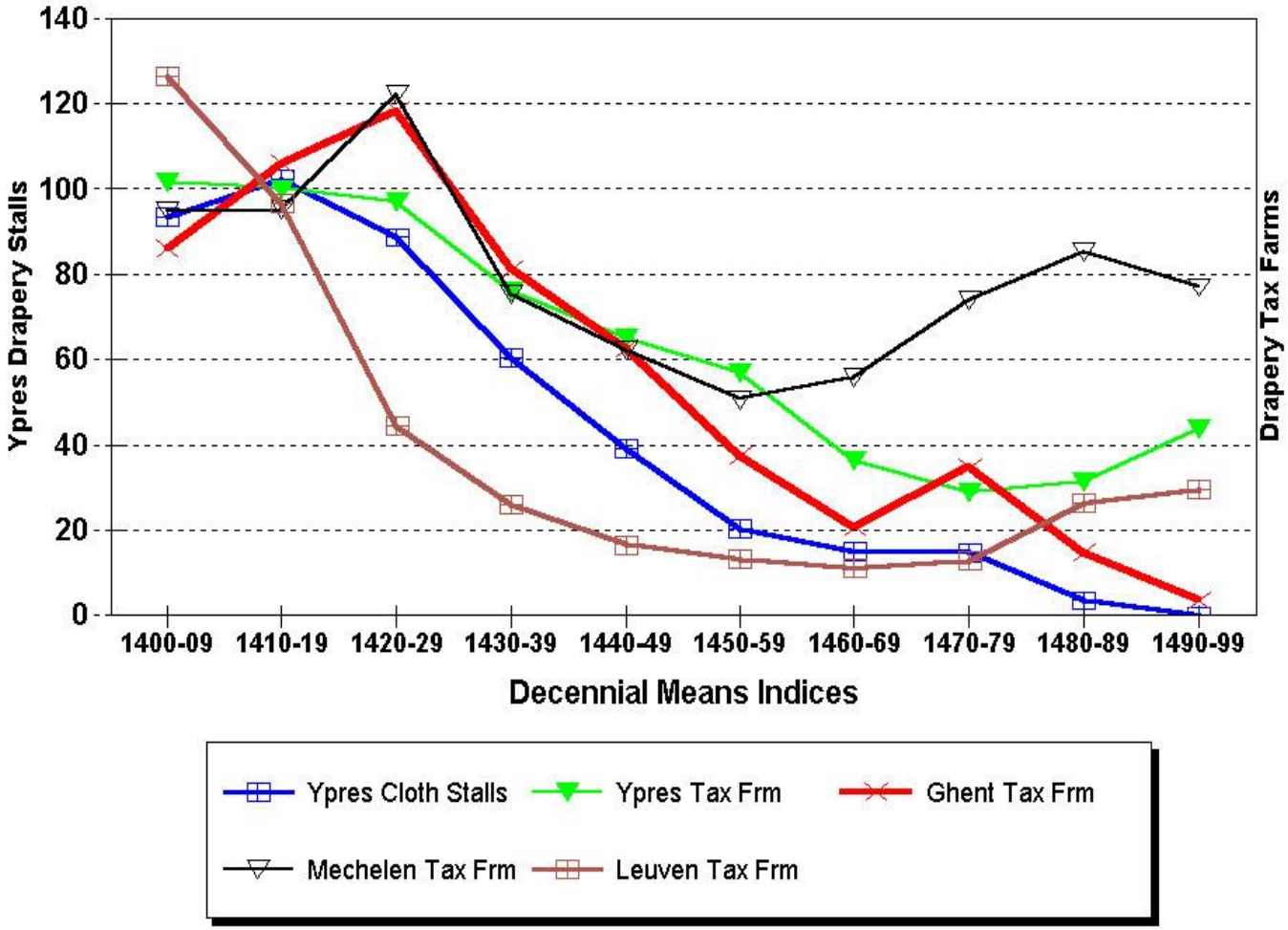


Production Indexes for the Woollen Draperies of Flanders and Brabant, in 5 year means 1331-35 to 1446-50



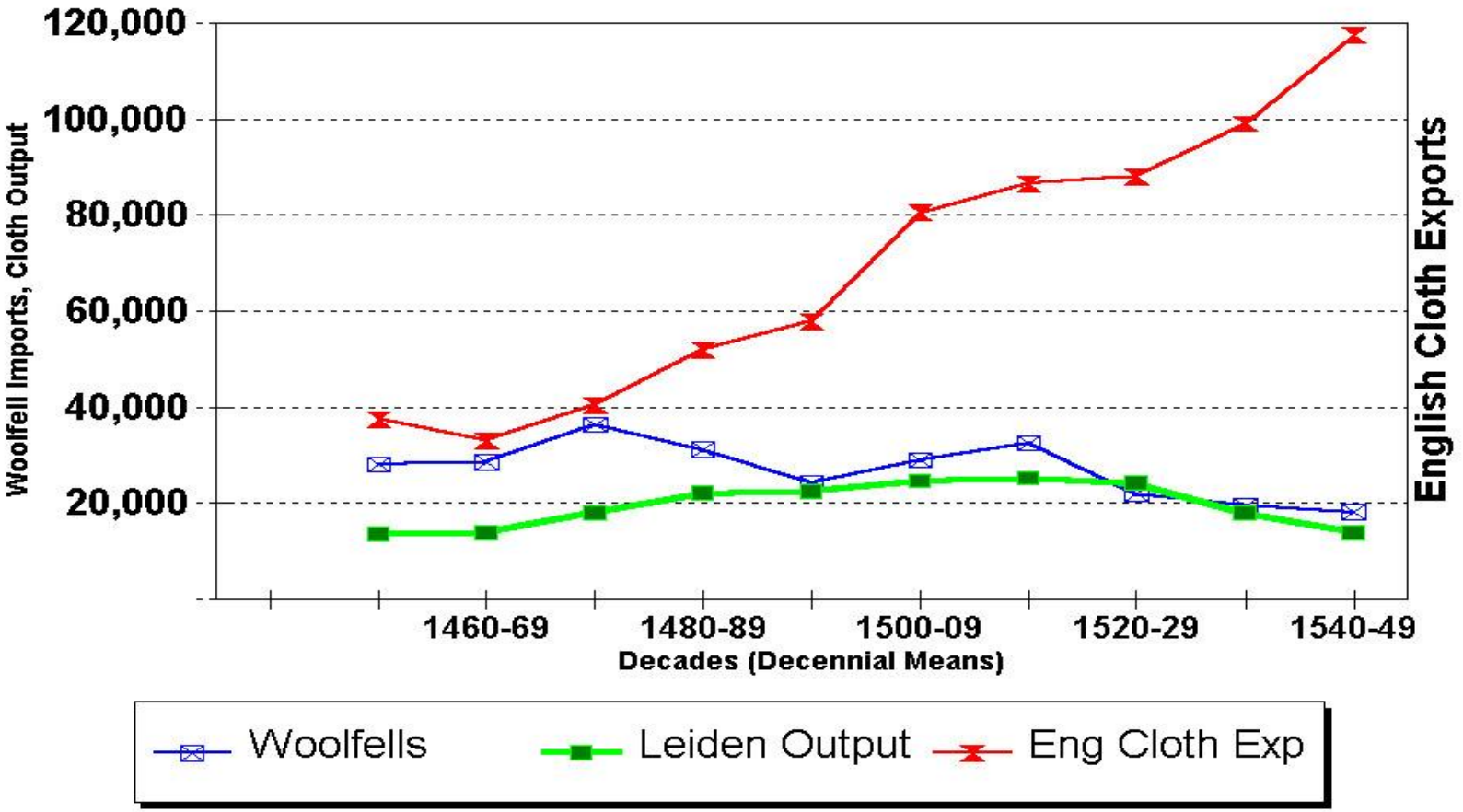
Flemish-Brabantine Cloth Outputs

Decennial Means, 1400-9 to 1490-9



Leiden & English Cloth, 1450-1550

Wool Imports and Leiden Cloth Ouputs



Old Draperies: Apogee & Decline - 3

- 2) **Early Tudor Enclosures: 1460s to 1540s**
- a) **early enclosures paralleled English cloth export trade boom** to Antwerp market: 1460s to 1540s
- b) **Enclosures → major expansion in** and improvement of pasture lands for sheep
- c) **Ultimate beneficiary were the New Draperies,** not Old Draperies: **better feeding + sheep breeding** (urban meat markets) → bigger sheep → **longer stapled fleeces** more suitable to worsteds than to woollens → New Draperies


ENCLOSURE, 1455–1607
8 - 9%
circa 5%
1 - 2½
100 Kms

Old Draperies: Apogee & Decline - 4

- 3) **Rural Cost Advantages for Old Draperies??**
- a) **Rural locations to escape urban guild restrictions and taxes?**
- - **No real evidence that urban guilds had ever imposed cost-raising restrictions,** while quality controls benefited cloth sales
- - **Rural industry, though never subjected to guild regulations, did become subjected to Parliamentary legislation**: 1464, 1552
- - **But at least rural sites had much lower taxes**

Old Draperies: Apogee & Decline 5

- b) **Cheaper rural labour?**
- i) **lower rural cost of living** → lower wages
- ii) **part-time supplementary farm labour** → lower wages
- iii) **Thirsk Thesis of Partible Inheritance** → with farm holdings subdivided by inheritance + rural bye-employment → lower wages,
- iii) **lower rural productivity also meant lower wages, but not lower labour costs**


RURAL AREAS
IDENTIFIED WITH THE
WOOLEN INDUSTRIES
ABOUT 1550
North Riding
West Riding
East Riding
Norfolk
Suffolk
Dorset
Sussex
Kent

Old Draperies: Apogee & Decline - 5

- 3) **Rural Cost Advantages for Old Draperies??**
- c) **Rural access to cheaper water power: fulling**
- i) **Fulling:** English cloth industry heavily oriented to water-powered mechanical fulling
- ii) **rural sites, with sparse populations** → lower opportunity costs for water-mill sites
- iii) **faster-flowing rural streams** → cheaper undershot water mills than in towns with sluggish rivers (using costly overshot wheels)

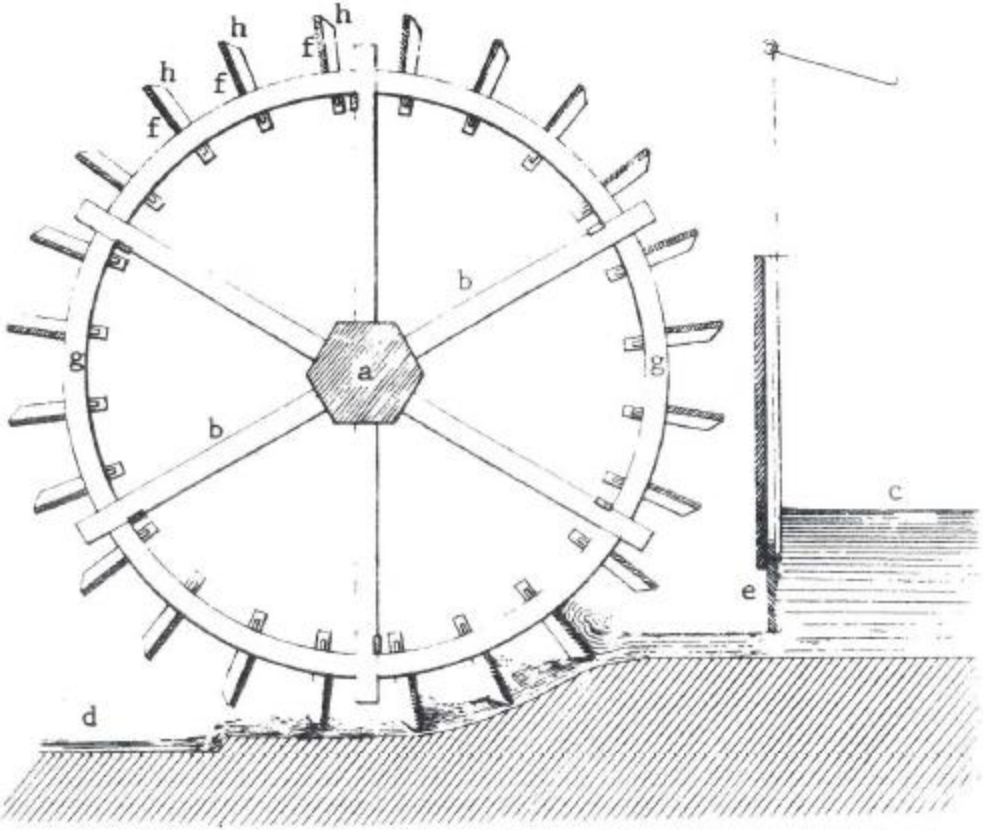


FIGURE 1–1. Undershot vertical water wheel. The principal components are (*a*) axle or shaft; (*b*) spokes or arms; (*c*) head race; (*d*) tail race; (*e*) sluice gate or chute, the device which regulates the admission of water onto the water wheel; (*f*) floats, floatboards, blades, or paddles; (*g*) rim (the circular built-up felloes to which the arms are mortised and the floatboards attached); (*h*) starts or supports, pieces of wood or metal projecting from the rims to which the floatboards or blades are secured.

Overshot Water Wheel: in the Luttrell Psalter ca. 1330-40

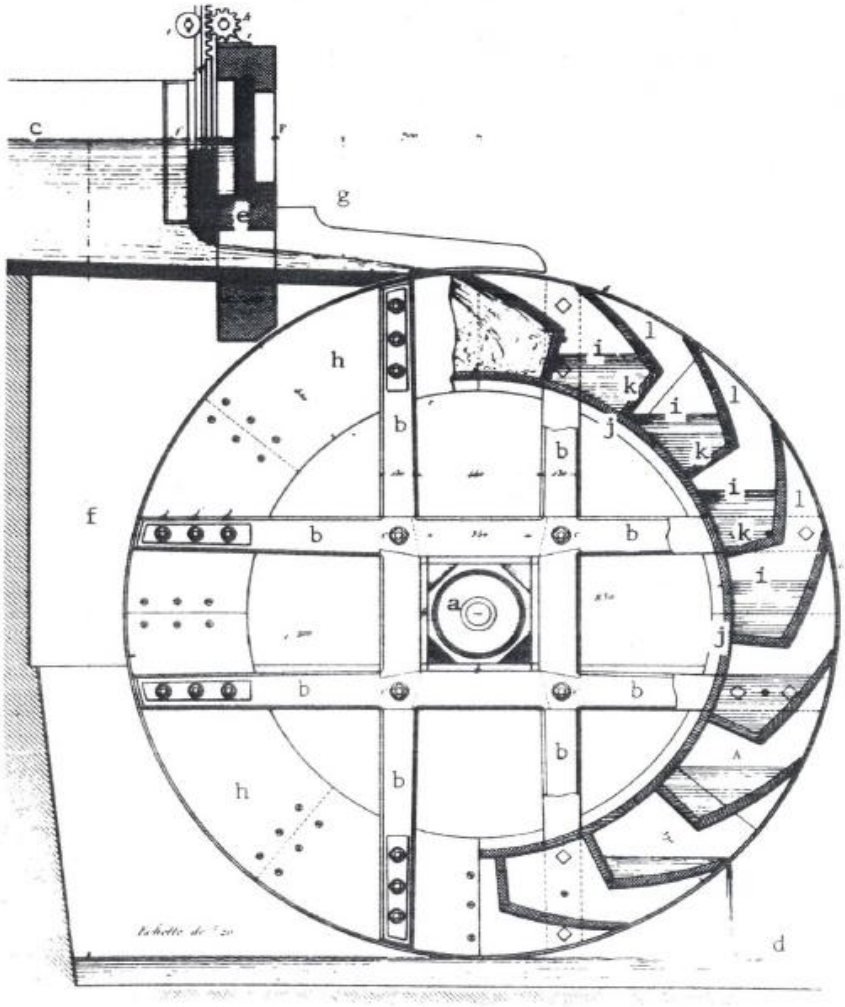
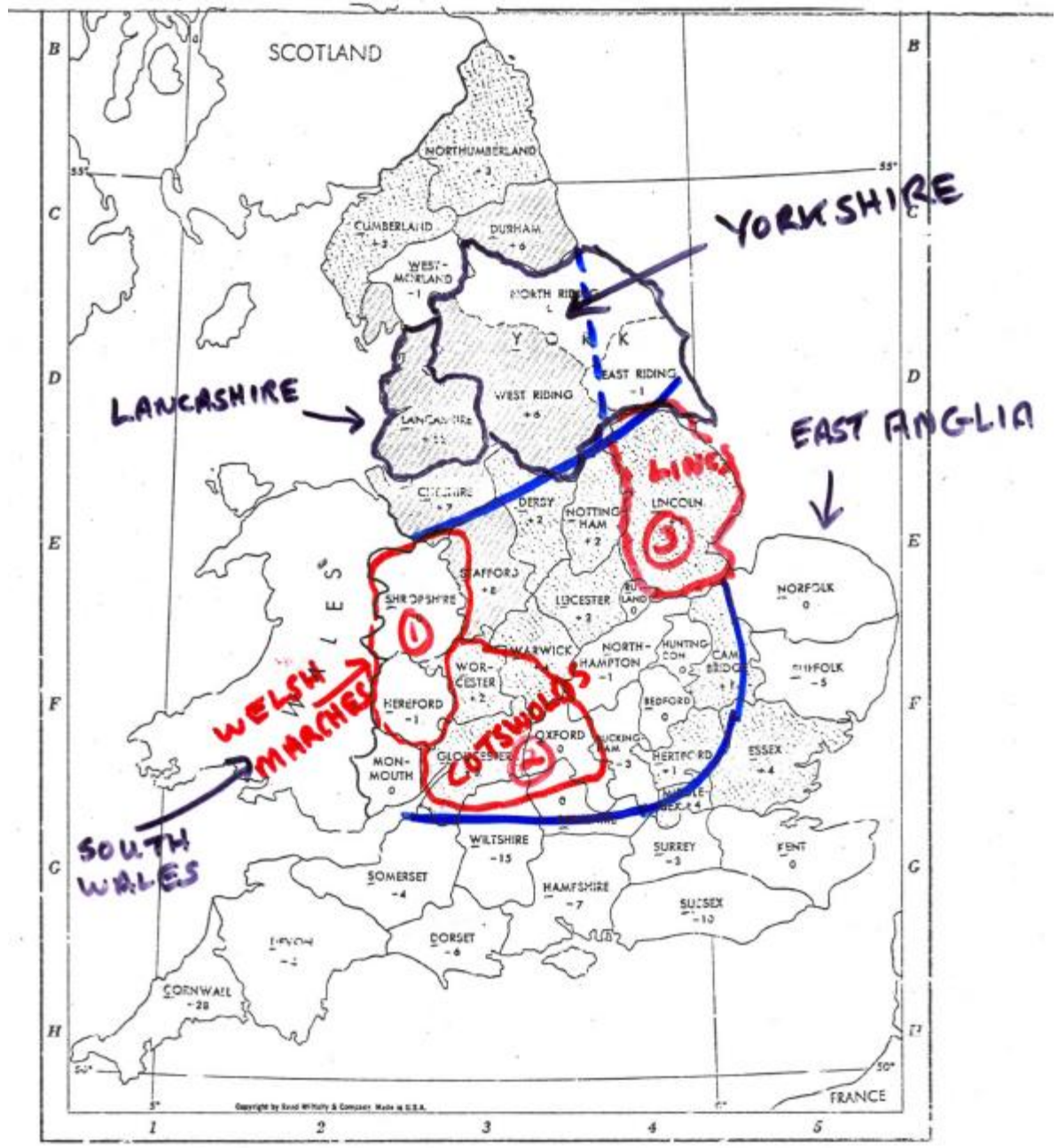


FIGURE 1–2. Overshot vertical water wheel. The principal components are (*a*) axle or shaft; (*b*) spokes or arms; (*c*) head race (flume); (*d*) tail race; (*e*) penstock or chute; (*f*) head or fall; (*g*) impact or velocity head, the portion of an overshot wheel's fall which provides velocity to the water prior to its entrance to the wheel; (*h*) rims or shrouds, the rings which form the sides of the buckets of overshot wheels (some undershot wheels may also have shrouds); (*i*) buckets, the peripheral compartments used to retain water on the working side of the overshot wheel; (*j*) soal or sole, the boards parallel to the shaft which form the inner enclosure of the buckets and to which the buckets are attached; (*k*) rising boards, boards radial to the shaft in overshot wheels, nailed to the soal and forming the bottom of the buckets; (*l*) bucket boards, boards which form the sloping, as opposed to the radial, component of buckets in some overshot wheels.

Old Draperies: Apogee & Decline 6

- 3) **Rural Cost Advantages for Old Draperies??**
- d) **Access to Raw Materials: wools** (see map): Yes: West Country cloth industry was adjacent to Cotswolds
- e) **Industrial Shift to Rural Locations exaggerated**: real importance only after the 1460s (see lecture notes)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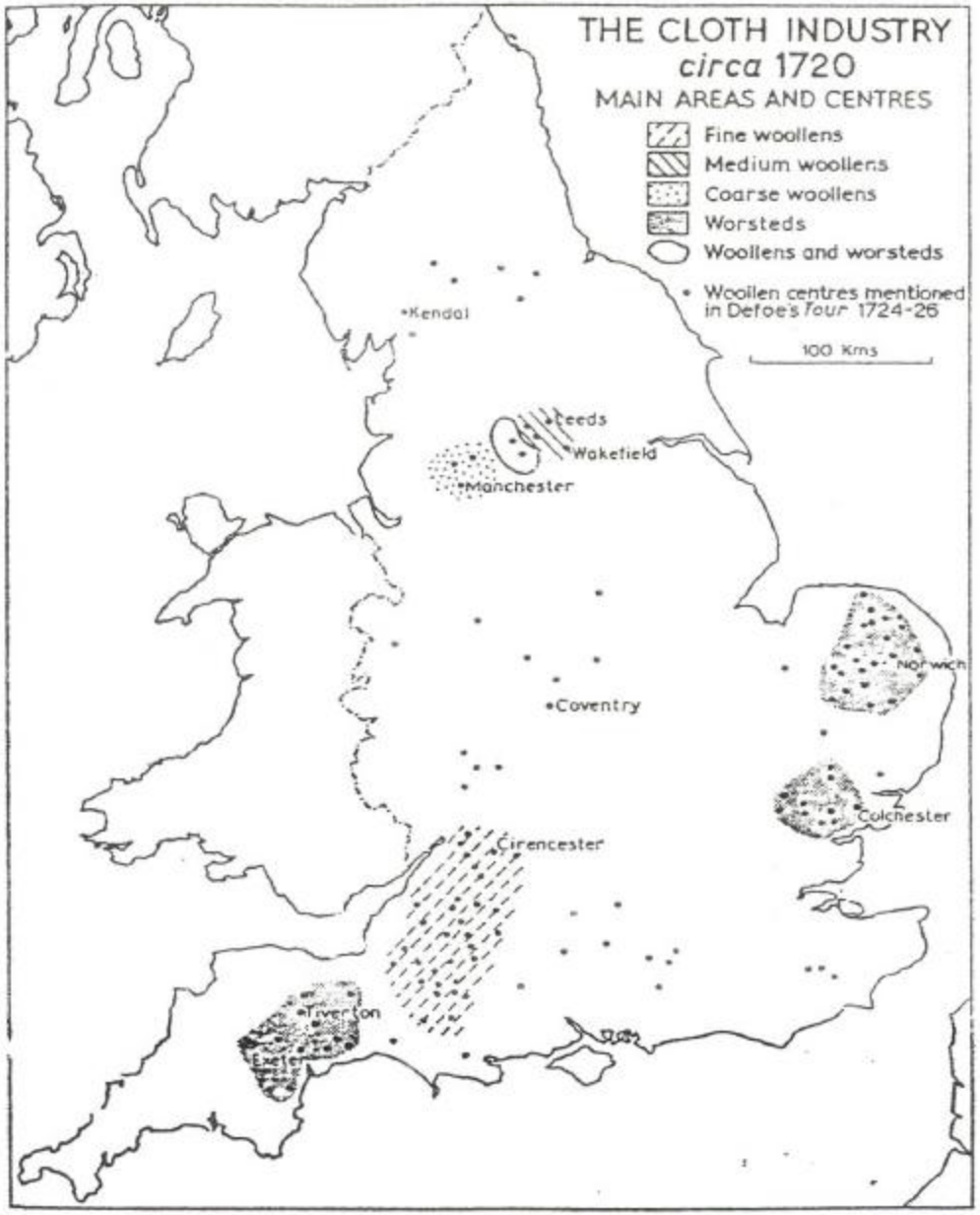
LANCASHIRE
CHESHIRE
DERBY
NOTTING-HAM
LINCOLN
STAFFORD
SHROPSHIRE
LEICESTER
RUTLAND
NORFOLK
WARWICK
NORTH-HAMPTON
HUNTING-DON
CAM-BRIDGE
SUFFOLK
WOR-CESTER
HEREFORD
BEDFORD
OXFORD
BUCKING-HAM
HERTFORD
ESSEX
MON-MOUTH
GLOUCESTER
WILTSHIRE
SURREY
KENT
SOMERSET
HAMPSHIRE
SUSSEX
DORSET
DEVON
CORNWALL
WALES
FRANCE
YORKSHIRE
LANCASHIRE
EAST ANGLIA
LINCS
WELSH MARCHES
COTSWOLDS
SOUTH WALES
1
2
3
4


THE CLOTH INDUSTRY
circa 1720
MAIN AREAS AND CENTRES
Fine woollens
Medium woollens
Coarse woollens
Worsteds
Woollens and worsteds
Woollen centres mentioned in Defoe's Tour 1724-26
100 Kms
Kendal
Leeds
Wakefield
Manchester
Coventry
Norwich
Colchester
Cirencester
Tiverton
Exeter

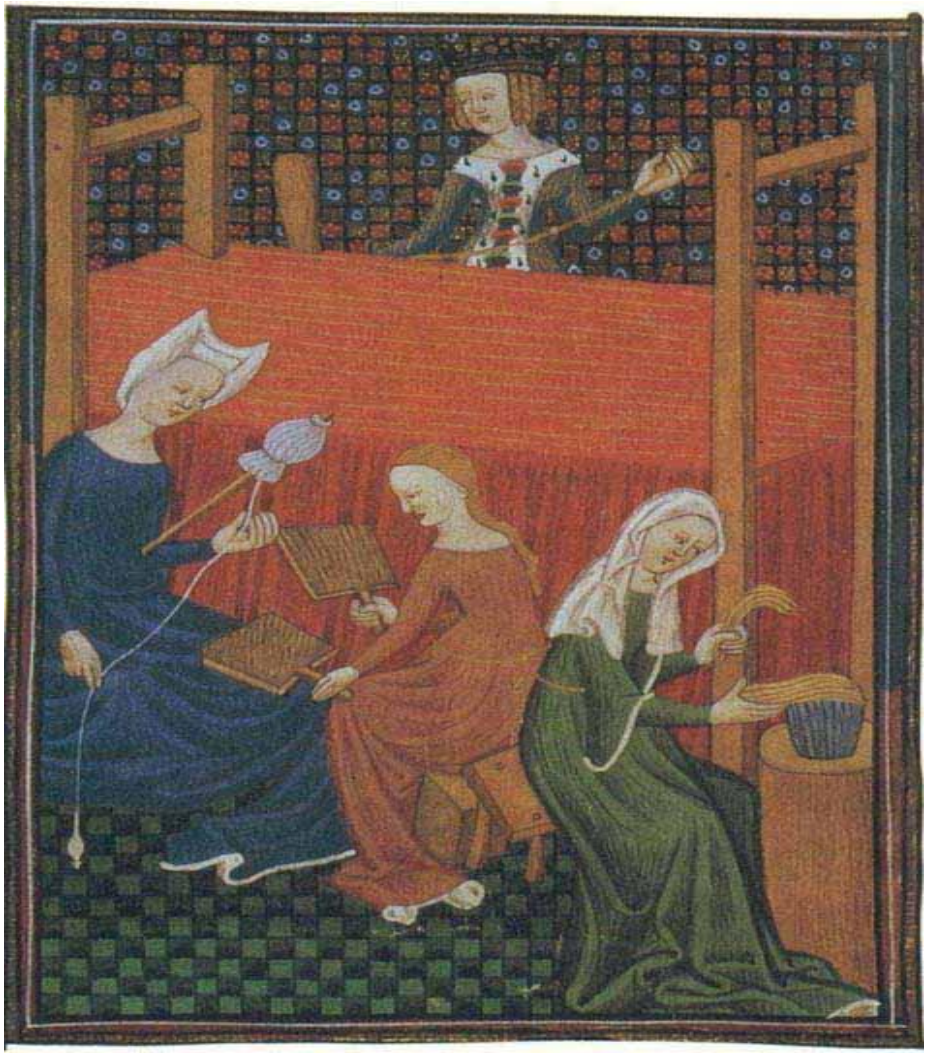
Old Draperies: Apogee & Decline - 6

- 4) **Economics of Putting-Out Systems:** Urban and Rural
- a) **English clothiers (drapers):**
- - organized cloth production: more mercantile than industrial capitalists
- b) **Textile Artisans:** chiefly rural, part-time agricultural workers, except for urban weavers, fullers, dyers
- i) **preponderance of women**: working in own homes, with their own tools
- ii) **worked for piece work wages:**
- - because unsupervised

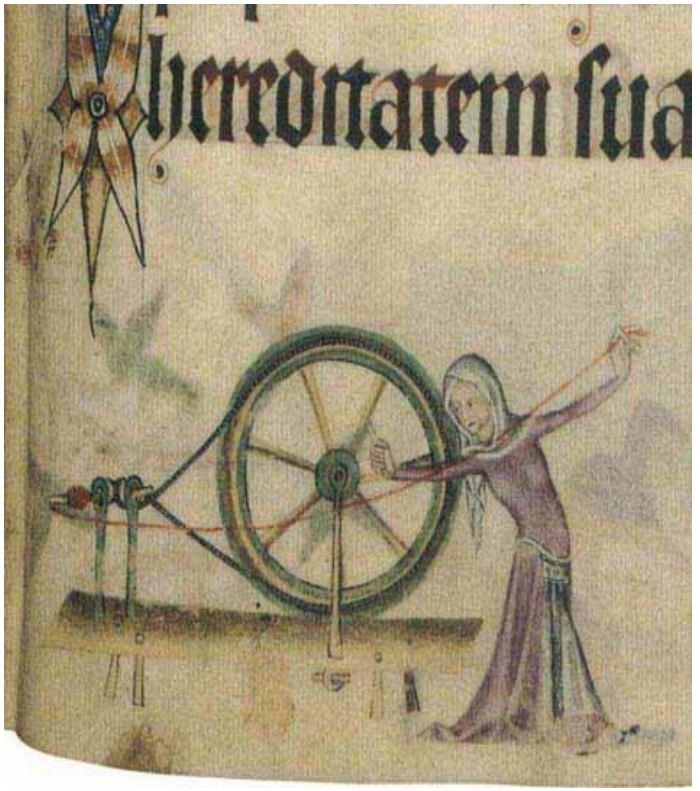
Old Draperies: Apogee & Decline 7

- 4) **Economics of Putting-Out Systems:** Urban and Rural
- c) **Fixed capital costs:**
- - chiefly born by the artisans themselves: using their own tools in their own homes: combs, cards, spinning wheels
- d) **Weaving Looms & Fulling mills**: the major exceptions

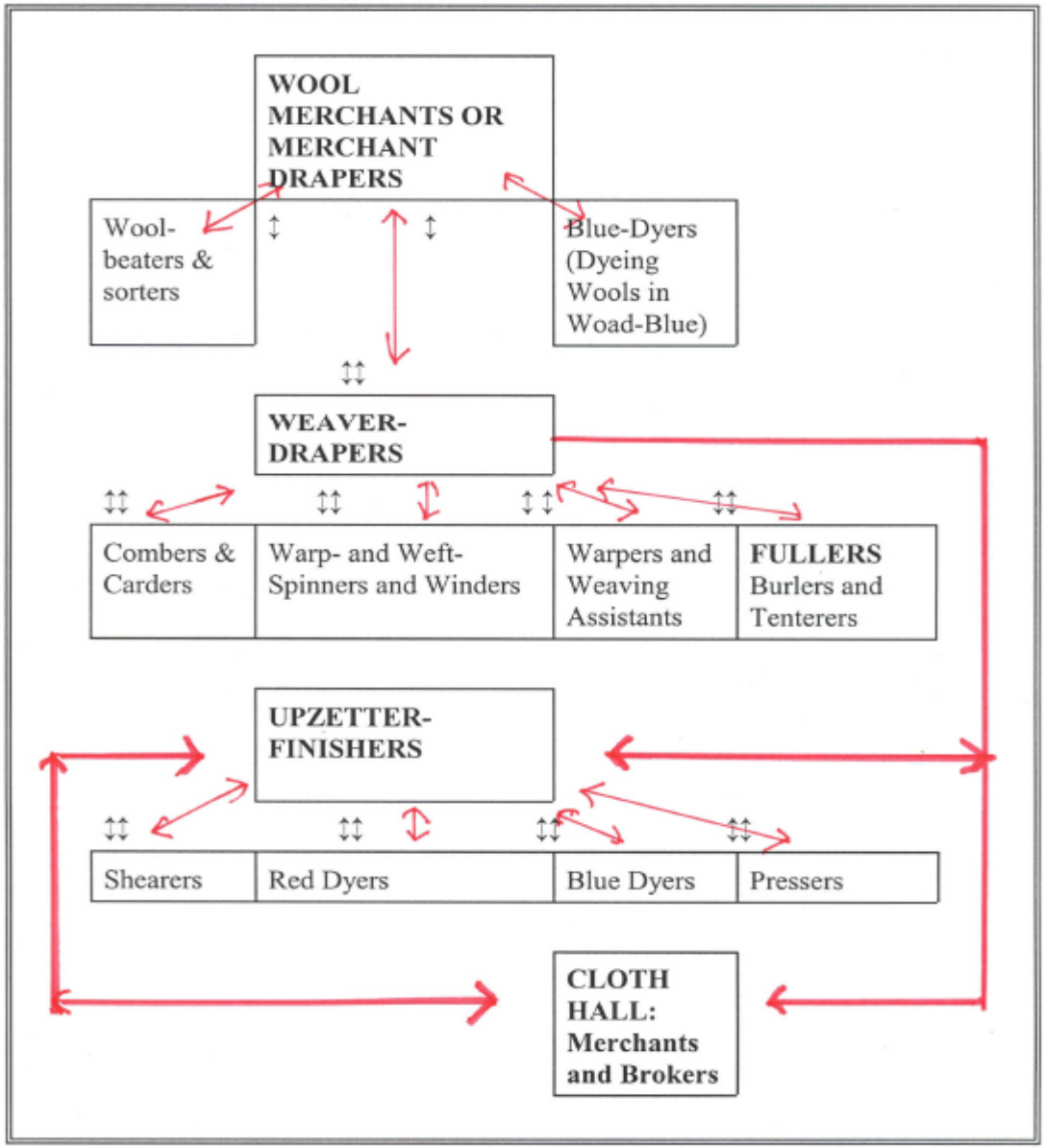
Medieval spinning, carding, combing



Medieval spinning at home



INDUSTRIAL ORGANIZATION AND 'PUTTING OUT' IN THE LATE-MEDIEVAL FLEMISH CLOTH INDUSTRY



Industrial Scale & Productivity

- 1) **Highly refined division of labour**: for export-oriented cloth production ➔ 30 specialized tasks
- 2) **But production very small-scale:**
- **highly labour intensive,** in scattered units:
- **rural locations** for wool preparation, combing, carding, spinning
- 3) **Productivity very low**:
- **standard broadcloths (24 by 1.75 yds)**: 2 weeks for weaving + additional week for cloth finishing, with labour of 30-35 persons (8 carders + 8 combers + 8 spinners + 2 warpers + 2 weavers, before finishing)
- - **clothier (drapers):** produced 20 – 25 broadcloths a year

Industrial Scale & Productivity - 2

- 4) **Mechanization of Woollens: to the 18th century**
- a) **water-powered fulling mills**: most important, from 12th-13th centuries
- b) **water-powered gig mills** (attached to fulling mills): for raising nap before shearing – strong resistance (quality concerns) in 15th & 16th centuries
- c) **Dutch Swivel Looms:** weaving 12 ribbons
- d) **Stocking Frame:** William Lee in 1590s
- e) **Rapid population growth → cheaper labour →** reduced incentives to mechanize production in 16th century

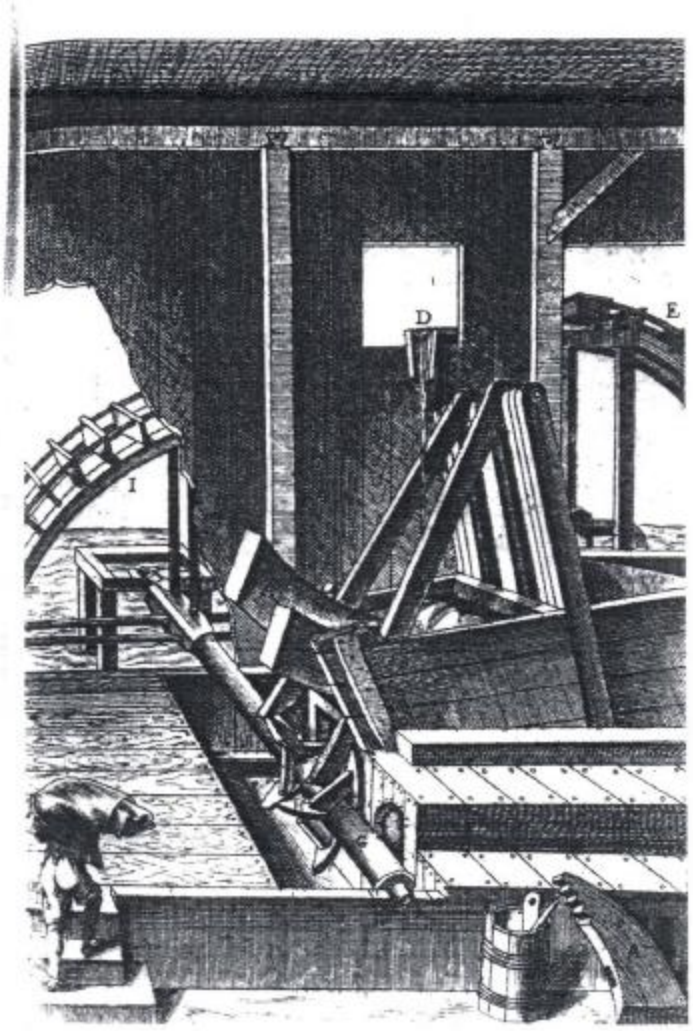
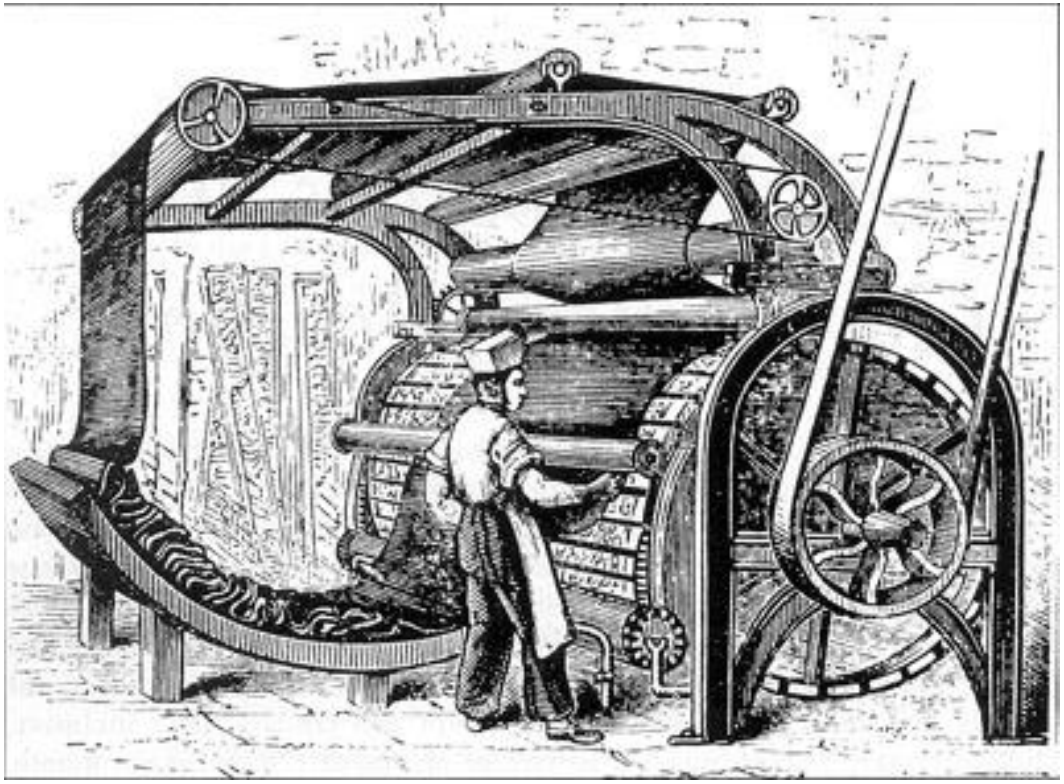
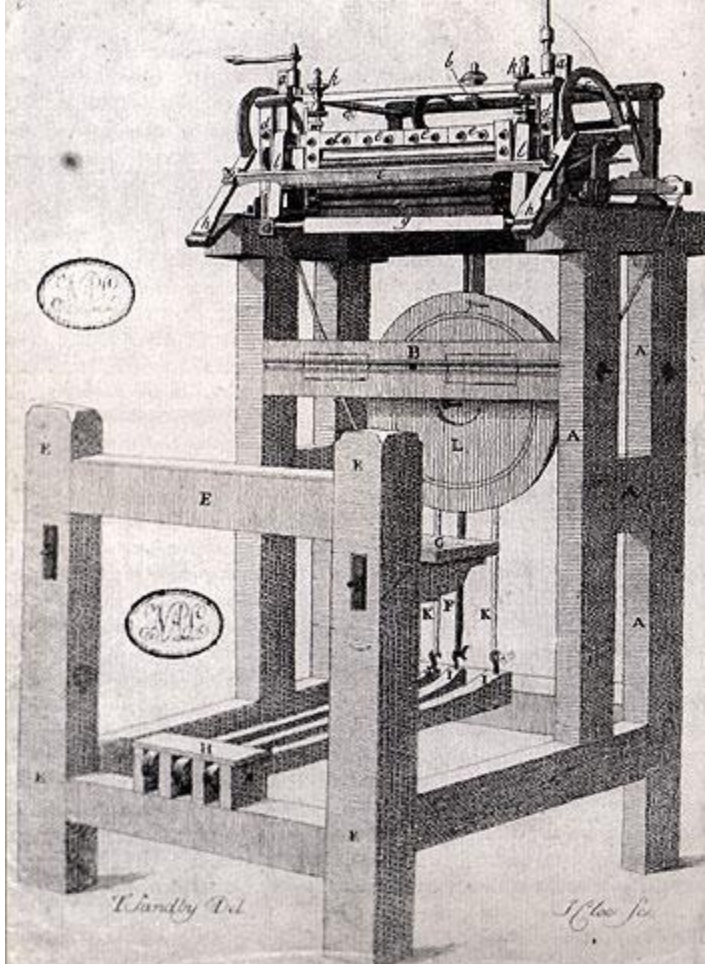


FIGURE 2–22. One of the earliest extant illustrations of a fulling mill, Zonca, 1607. The water wheel, *I*, the camshaft, *G*, the cams, *H*, and the recumbent trip-hammers, *A*, *B*, are visible. The earliest fulling mills may have used vertical trip-hammers instead of recumbent hammers.

Gig Mills: for Raising the Naps



THE STOCKING FRAME



Old Draperies: Apogee & Decline 1

- 1) **Apogee of Cloth Trade boom in early 1550s:** -
- - **in part the result of coinage debasements: 83% silver reduction** (by Henry VIII & Edward VI)
- - **revaluation of coinage in 1552** ➔ raised foreign exchange rates ➔ collapse of the Antwerp cloth trade
- - **1564: Spanish ban** on English trade to Antwerp
- - **1568: revolt of the Low Countries** against Spanish rule
- 2) **Renewed cloth trade boom, 1585 – 1614**:
- - coinciding with new wave of Enclosures

Old Draperies: Apogee & Decline 2

- 3) **Early 17th century disasters for English cloth trade:**
- a) **Cockayne Project: 1614 – 1617** (seen previously)
- b) **Thirty Years' War: 1618 – 1648**: afflicted English markets
- c) **Leiden's cloth industry revival** (Holland's **Oude Draperie**): 1620s

Decennial Mean Exports of Woollen Broadcloths from all English Ports, and from London, 1480-69 to 1620-29

Decade	Total Broadcloth Exports from All English Ports	Index: 1400-09 = 100	Broadcloth Exports from London	Index: 1400-09 = 100	London as percent of Total Exports
1480-9	51,931	155.0	35,533	296.3	68.4%
1490-9	58,006	173.1	38,768	323.3	66.8%
1500-9	80,996	241.7	49,247	410.7	60.8%
1510-9	86,148	257.1	61,036	509.0	70.9%
1520-9	88,667	264.6	66,673	556.0	75.2%
1530-9	98,998	295.4	80,736	673.2	81.6%
1540-9	123,653	369.0	109,365	912.0	88.5%
[a]1550-9	129,828	387.4	115,003	959.0	88.6%
1560-9			85,952	716.7	
1570-9			90,319	753.2	
1580-9			98,101	818.1	
1590-9			101,172	843.7	
[b]1600-9			108,464	904.5	
[c]1610-9			105,906	883.1	
[d]1620-9			89,637	747.5	
[e]1630-9			88,066	734.4	
[f]1640-9			86,924	724.8	

* Exports in terms of notional short broadcloths measuring 24 by 1.75 yds; 3 kerseys (18 by 1 yd) and 4 dozens (12 by 1 yd) reckoned as 1 short broadcloth.

Exports of Woollen Broadcloths (Short Cloths) from London by English Merchants, 1598 to 1640

Year	Number of Broadcloths Exported
1598	100,551
1601	100,380
1602	113,512
1603	89,619
1604	112,785
1606	126,022
1614	127,215
1616	88,172
1618	102,332
1620	85,741
1622	76,624
1626	91,000 (approximately)
1627	86,800 (approximately)
1628	108,021
1631	84,334
1632	99,020
1633	80,924
1640	86,924

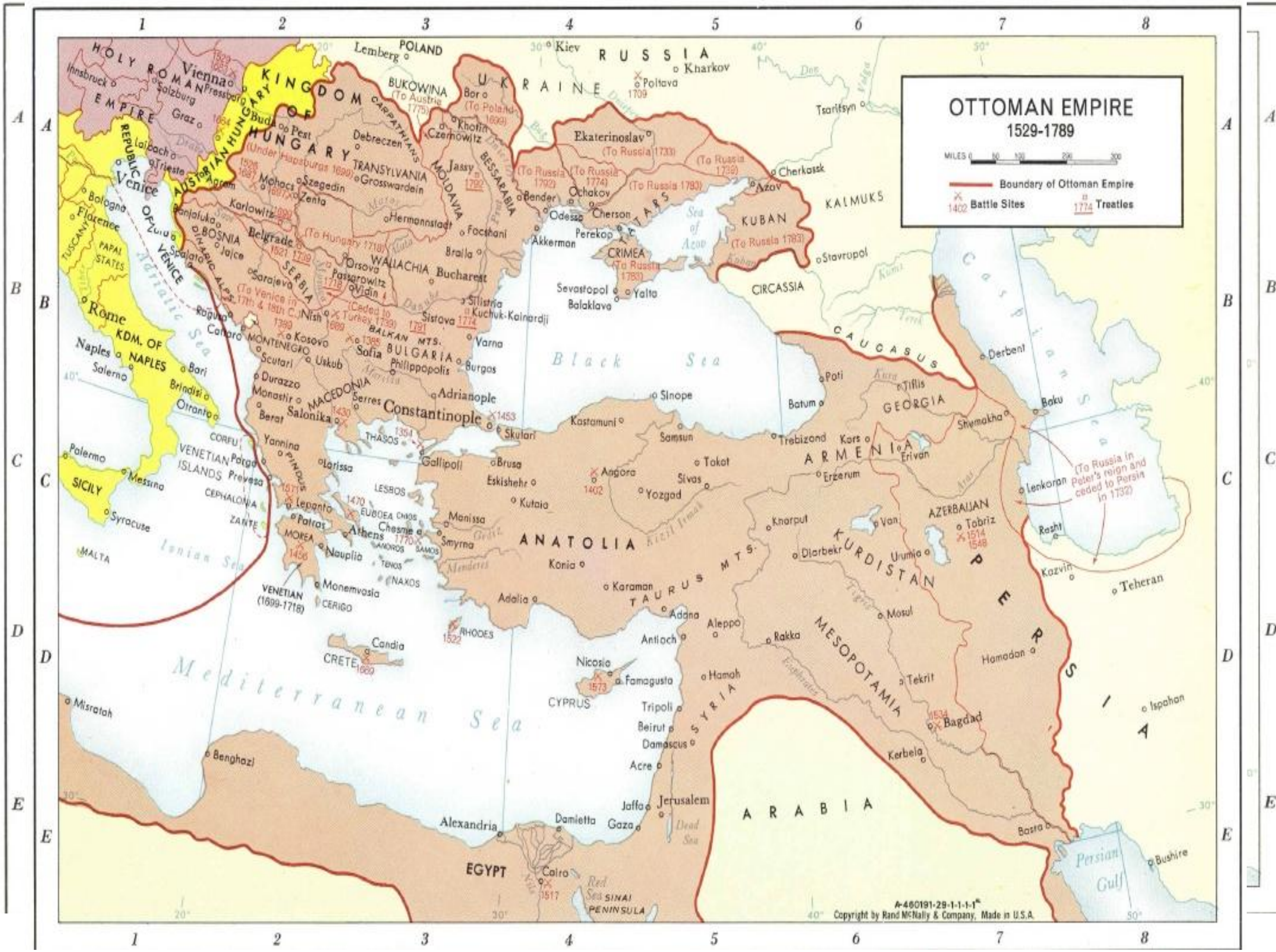
****

1 short broadcloth = 24 yards by 1.75 yards finished.

These statistics include cheaper, smaller cloths converted into notional broadcloths, for export-tax purposes, with the following ratios: 3 kerseys (18 yds by 1 yd) and 4 *straits* and *dozens* (each 12 yds by 1 yd) = 1 broadcloth.

Old Draperies: Apogee & Decline 3

- 4) **The Levant Company and English Successes**:
- - exports of new **Spanish Medley broadcloths**, using Spanish merino wools, 1620s
- - predominance of English Woollens in European Trade with the **Ottoman Levant**
- - **woollens** accounted for 74.2% of all merchandise trade in late 1660s (see table)
- - **English woollens**: 63.3 % of total woollens



OTTOMAN EMPIRE
1529-1789
MILES 0 50 100 200 300
Boundary of Ottoman Empire
1402 Battle Sites
1774 Treaties
HOLY ROMAN EMPIRE
Vienna
Innsbruck
Salzburg
Graz
Pressburg
KINGDOM OF HUNGARY
(Under Hapsburgs 1690)
AUSTRIAN HUNGARY
REPUBLIC OF VENICE
Venice
Laibach
Trieste
Agram
Buda
Pest
Mohacs
Szegedin
Zenta
Karlowitz
Debreczen
TRANSYLVANIA
Grosswardein
Hermannstadt
CARPATHIANS
POLAND
Lemberg
BUKOWINA
(To Austria 1775)
Czernowitz
Khotin
Bor
(To Poland 1699)
MOLDAVIA
BESSARABIA
Jassy
1792
Bender
Focshani
Braila
UKRAINE
RUSSIA
Kiev
Kharkov
Poltava
1709
Ekaterinoslav
(To Russia 1733)
(To Russia 1739)
(To Russia 1792)
(To Russia 1774)
(To Russia 1783)
Ochakov
Odessa
Cherson
Perekop
Akkerman
TATARS
Sea of Azov
Azov
Cherkassk
KUBAN
(To Russia 1783)
KALMUKS
Tsaritsyn
Don
Volga
Dnieper
Bug
CRIMEA
(To Russia 1783)
Sevastopol
Balaklava
Yalta
Stavropol
CIRCASSIA
Kuma
Terek
CAUCASUS
Derbent
Caspian Sea
Baku
Shemakha
GEORGIA
Tiflis
Poti
Batum
Kura
Bologna
Florence
TUSCANY
PAPAL STATES
Rome
KDM. OF NAPLES
Naples
Salerno
Bari
Brindisi
Otranto
Palermo
SICILY
Messina
Syracuse
MALTA
Adriatic Sea
Ionian Sea
Zara
Spalato
Banjaluka
BOSNIA
Jajce
DINARIC ALPS
Sarajevo
Ragusa
Cattaro
MONTENEGRO
Scutari
Durazzo
Belgrade
1521
1739
(To Hungary 1718)
SERBIA
Passarowitz
1718
Orsova
Vidin
WALLACHIA
Bucharest
Danube
Silistria
Kuchuk-Kainardji
Sistova
1791
1774
(To Venice in 17th & 18th C.)
Nish
(Ceded to Turkey 1739)
1689
Kosovo
1389
Sofia
1385
BALKAN MTS.
BULGARIA
Philippopolis
Uskub
Varna
Burgas
Adrianople
MACEDONIA
Serres
Monastir
Berat
Salonika
1430
Constantinople
1453
Skutari
THASOS
1354
Gallipoli
Black Sea
Sinope
Kastamuni
Samsun
Trebizond
Kars
ARMENIA
Erivan
Erzerum
Tokat
Sivas
Angora
1402
Yozgad
Brusa
Eskishehr
Kutaia
CORFU
Parga
VENETIAN ISLANDS
Prevesa
CEPHALONIA
ZANTE
Yannina
PINDUS
Larissa
LESBOS
Lepanto
1571
Patras
MOREA
1456
Athens
Nauplia
EUBOEA
CHIOS
Chesme
1770
SAMOS
ANDROS
TENOS
NAXOS
Monemvasia
VENETIAN (1699-1718)
CERIGO
Manissa
Smyrna
ANATOLIA
Kizil Irmak
Konia
Karaman
TAURUS MTS.
Adalia
Adana
Aleppo
Antioch
RHODES
1522
Candia
CRETE
1669
Nicosia
Famagusta
1573
CYPRUS
Mediterranean Sea
Misratah
Benghazi
Kharput
Diarbekr
Van
KURDISTAN
Urumia
AZERBAIJAN
Tabriz
1514
1548
Lenkoran
(To Russia in Peter's reign and ceded to Persia in 1732)
Resht
Kazvin
Teheran
PERSIA
Mosul
Rakka
MESOPOTAMIA
Tigris
Euphrates
Tekrit
1534
Bagdad
Hamadan
Ispahan
Hamah
SYRIA
Tripoli
Beirut
Damascus
Acre
Jaffa
Jerusalem
Dead Sea
Gaza
Damietta
Alexandria
EGYPT
Cairo
1517
Nile
Red Sea
SINAI PENINSULA
ARABIA
Kerbela
Basra
Persian Gulf
Bushire
A-460191-29-1-1-1-1
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TEXTILES AND OTHER WESTERN MERCHANDISE ENTERING SMYRNA (IZMIR), TURKEY, IN 1686 - 87

Merchandise	Value in Piastres	percent woollens by value	percent total textiles by value	percent total merchandise by value	sq metres of cloth
Woollens					
-Mahouts	67,500	4.28%	4.04%	3.18%	25,251
- Nims	150,000	9.51%	8.97%	7.06%	71,543
- Londrins	555,000	35.20%	33.20%	26.13%	318,729
- 'London'	796,950	50.55%	47.68%	37.52%	741,606
- other	7,160	0.45%	0.43%	0.34%	11880
subtotal	1,576,610	100.00%	94.32%	74.22%	1,169,009
Silk Fabrics					
Brocards	24,000		1.44%	1.13%	2,535
Damask	16,800		1.01%	0.79%	6,025
Satins	32,000		1.91%	1.51%	10,876
Tabis	1,800		0.11%	0.08%	1,307
sub-total	74,600		4.46%	3.51%	20,743
Bonnets	20,266		1.21%	0.95%	
Total Textiles	1,671,476		100.00%	78.68%	1,189,752

TEXTILES ENTERING SMYRNA (IZMIR), TURKEY, BY VALUE

in 1686 - 87

Merchandise	FRANCE	per-	ENGLAND	per-	HOLLAND	per-	VENICE	per-	LIVORNO	percent	Totals
	values in piastres	cent woollens	values in piastres	cent woollens	values in piastres	cent woollens	values in piastres	cent woollens	values in piastres	woollens	Values in piastres
Woollens											
-Mahouts			**67,500**	**4.28%**							67,500
- Nims			**150,000**	**9.51%**							150,000
- Londrins	15,000	0.95%			525,000	33.30%			15,000	0.95%	555,000
- 'London'	9,750	0.62%	**780,000**	**49.47%**					7,200	0.46%	796,950
- other	7,160	0.45%									7,160
subtotal	31,910	2.02%	**997,500**	**63.27%**	525,000	33.30%	0.00%		22,200	1.41%	1,576,610
Silk Fabrics											
Brocards							18,000		6,000		24,000
Damask							16,000		800		16,800
Satins									32,000		32,000
Tabis									1,800		1,800
sub-total							34,000		40,600		74,600
Bonnets	20,266										20,266
Total Textiles	52,176		**997,500**		525,000		34,000		62,800		1,671,476

The Rise of the New Draperies 1

- 1) **Rise & Expansion of the New Draperies**:
- **most significant industrial change** in Tudor-Stuart England: given importance of textiles
- a) **resurrection of an old English industry**, in two forms:
- i) **pure worsteds:** very light weight, coarse, cheap fabrics, as produced in Norfolk, in 13th & early 14th centuries
- ii) **hybrid worsted (warp) and woollen (weft fabrics)**: **stuffs** - based on **Hondschoote says from Flanders**: half way in weight and value between worsteds and woollens of Old Draperies

The Rise of the New Draperies 2

- 1) **Rise & Expansion of the New Draperies**:
- b) **Wide varieties of fabrics**: worsted + woollen wools + goats hair, cotton, linen, silk mixed with them
- c) **Names**: says, bays, serges, stuffs, bombasines, perpetuanas
- d) **Relatively cheap + light-weight:** compared to luxury woollens: see tables onscreen

THE WOOL-BASED TEXTILE INDUSTRIES IN ENGLAND

FEATURES:	THE OLD DRAPERIES: WOOLLENS	THE NEW DRAPERIES: WORSTEDS AND STUFFS
Wools for Warps and Wefts	Short-stapled, very fine, curly, scaly, soft wools: very costly. Originally English: Shropshire, Herefordshire, Cotswolds, Lincs.; later, with Spanish merino wools	Long-stapled, straight-fibred, coarse wools: relatively cheap; but in some hybrid or mixed fabrics, short-stapled wools were used for the weft. Some interwoven with goat's hair, silk, etc.
Wool preparation	After initial scouring, wools were oiled or greased (olive oil, butter)	Wools were left dry, ungreased, after scouring; but if short-stapled wools were used for the weft, they were oiled
Yarn preparation	wools were carded, warp and weft (though combed in medieval era)	wools were combed, at least for the warp; if short-stapled wools used for the weft, they were also carded
Spinning	carded wools were spun on the spinning wheel; in medieval era, combed warps were spun on the distaff or 'rock'; Saxony wheel with flyer in use by 16th century	combed wools originally spun with the distaff; but by the 16th century, the Saxony wheel was used for both warp and weft
Weaving	warp and weft yarns were woven on a broadloom with two weavers	yarns were more commonly woven on a single-weaver narrow loom
Fulling	When woven, the broadcloths were intensively fulled [usually at a water-powered fulling mill] to degrease the cloth, to felt and shrink the cloth by about half	Pure worsteds were not fulled (i.e., with dry worsted yarns for warp and weft); but hybrid fabrics with greased carded wefts were partially fulled, if only to degrease the cloth
Finishing	Fulled woollens were stretched on a tentering frame and subjected to preliminary napping; when dried renapped and shorn several times with large shears; and then dyed with costly dyes	No napping or shearing; woven cloths were subjected to simple bleaching and/or dyeing; and then calendared (pressed with steam irons); inexpensive dyes
Names	West Country, Suffolk, Essex broadcloths; later: Spanish medleys with Spanish merino wools	Worsteds, says, bays, serges, stuffs, bombazines, perpetuanas, honscots, ostades, etc. Mixed 'stuffs' with combed worsted warps and carded woollen wefts

warps: the foundation yarns stretched between the warp and cloth-beam rollers on the loom

wefts: the yarn, carried by a wooden shuttle, that is inserted between (above and below) groups of warps to effect the weaving.

The Dimensions and Compositions of Selected Flemish and English Woollens and Says, 1456 - 1576

DRAPERY	GHENT	ARMENTIERES	ENGLAND	HONDSCHOOTE	BERGUES-ST. WINOC
Name of Textile	Dickedinnen Five Seals	Oultreffin	Short Broadcloth: Suffolk, Essex	Small Double Say	Fine Narrow Say
Ordinance Date	1456-62, 1546	1510, 1546	1552	1571; 1576	1537
Wools Used	English: Fine March, Cotswolds, Berkshires	2/3 Spanish merino + 1/3 English: Cotswolds, Lindsey, Berkshires	English: short-stapled (unspecified)	Flemish, Scottish, Frisian, Pomeranian, Kempen	Flemish, Artesian
Warp Count	2066	1800	n.s.	1800	1400
Length on Loom	42.5 ells[a] = 29.75 m	42 ells [a] = 29.4 m	n.s.	40 ells [a] = 28.0 m	n.s.
Width on Loom	14.5 qtr ells = 2.5375 m	12 qtr ells = 2.10 m	n.s.	5.75 qtr ells = 1.006 m	n.s.
Weight on Loom	88 lb [b] = 38.179 kg	88 lb.[c] = 40.823 kg	n.s.	n.s.	n.s.
Length after Fulling	30 ells = 21.0 m	30 ells = 21.0 m	24 yards [e] = 32.22 ells= 22.555 m	36.75 ells = 25.725 m	40 ells = 28.0 m
Width after Fulling and/or Tentering	9.5 qtr ells= 1.6625 m	8 qtr ells = 1.400 m	7 qtr yds = 9.4 qtr ells = 1.645 m	5 qtr ells = 0.875 m	4 qtr ells = 0.700 m
Warps per cm	12.46	12.86	n.s.	20.60	20.0
Final Weight	51.0 lb [b] = 22.126 kg	52.0 lb [c] = 24.123 kg	64 lb. [d]= 29.030 kg	16.0 lb [d]= 7.257 kg	11 lb. [c] = 5.103 kg
Area in sq. m.	34.913 sq m	29.400 sq m	37.103 sq m	22.509 sq m	19.600 sq m
Weight: per sq metre in grams	633.8 g	820.5 g	782.4 g	322.4 g	260.4 g

Woollen and Worsted Textiles: Weights & Dimensions

TEXTILE AND PLACE	WOOLLEN ENGLAND Suffolk	WOOLLEN FLANDERS Ghent	WOOLLEN FLANDERS Armentières	WORSTED FLANDERS Hondschoote	WORSTED ENGLAND Essex
Name	Short Broadcloth	Dickedinnen Broadcloth	Oultreffin	Double Say	Single Bay
Date	1551	1456-62, 1546	1510; 1546	1571	1578
Length on Loom		32.54 yd	32.2 yd	30.6 yd	
Finished Length	24.0 yd	22.97 yd	23.0 yd	28.1 yd	34.0 yd
Width on Loom		2.8 yd	2.3 yd	1.1 yd	
Finished Width	1.8 yd	1.8 yd	1.5 yd	1.0 yd	1.8 yd
Area in sq yds	42.0 yd^2	41.3 yd	34.5 yd	26.9 yd^2	59.5 yd^2
Weight	60.0 lb.	48.8 lb	53.2 lb.	16.0 lb.	24.0 lb.
Weight per sq yd	1.43 lb.	0.85 lb	1.54 lb.	0.60 lb.	0.40 lb.
grams per sq metre	775	633.8	821	322	207

Prices of Ghent Dickedinnen Woollens, Mechelen Rooslaken Woollens, and Hondschoote Says, and the Daily Wages for an Antwerp Mason, 1535 - 1544: in pence and pounds groot Flemish

Year	Ghent Dicke-dinnen in £ groot	Mechelen Black Rooslaken in £ groot	Hond-schoote Single Says in £ groot	Hond-schoote Double Says in £ groot	No. Days of Mason's Wages to buy one Ghent Dicke-dinnen	No. Days of a Mason's Wages to buy one Hond-schoote Single Say	Antwerp Master Mason's Daily Wage in d groot	Value of Ghent Dicke-dinnen in Antwerp consumer-baskets	Value of Hond-shoote Single Says in Antwerp consumer-baskets	Value of Antwerp Basket of Consum ables in d. groot Flemish
1535	14.150	10.667			328.660		10.333	12.637		268.730
1536	14.250	10.667			310.910		11.000	11.497		297.470
1537	14.500	11.333			298.280		11.667	13.683		254.330
1538	14.500	11.333	0.967	2.278	274.730	18.320	12.667	11.775	0.785	295.530
1539	15.000	11.333	0.945	2.184	284.200	17.900	12.667	11.984	0.755	300.400
1540	15.000	11.333	0.835	1.961	284.200	15.820	12.667	12.365	0.688	291.130
1541	15.500	11.333	0.879	2.015	293.680	16.650	12.667	13.381	0.759	278.000
1542	14.500	11.333	0.838	2.005	274.730	15.880	12.667	11.853	0.685	293.600
1543	14.000	11.333	0.783	1.775	240.000	13.420	14.000	10.364	0.580	324.200
1544	14.000	11.333	0.908	1.942	240.000	15.570	14.000	9.571	0.621	351.070

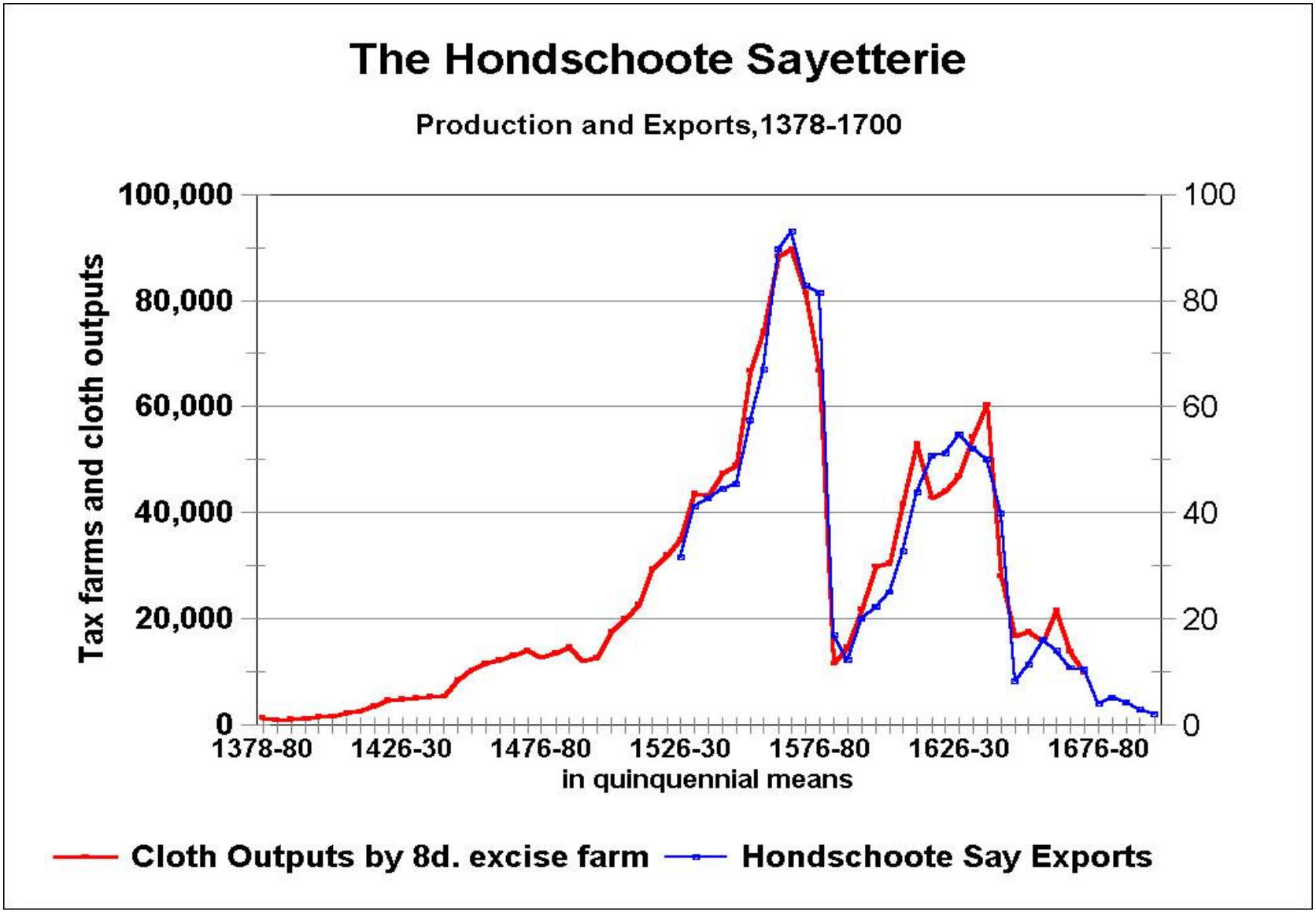
Average Prices of English Textiles, Recorded in Retailers' Inventories in pence (d) per yard, in current and constant values, 1578 - 1738

Constant values based upon the mean value of the price indices in the Phelps Brown & Hopkins 'Basket of Consumables' Index for 1660- 1738*

Type of Textile	1578-99: current d per yard	1578-99: constant d per yd	1600-40: current d per yd	1600-40: constant d per yd	1660-99: current d per yd	1700-38: current d per yard
Wool-Based						
Broadcloth	80	138	65	72	56	54
Kersey	32	55	37	41	21	25
Freize	10	17	14	15	22	21
Serge	24	41	22	24	24	19
Baize	21	36	31	34	18	10
Flannel	10	17	10	11	10	15
Stuffs	-	-	12	13	9	9
Linen-Cotton						
Fine Holland	48	83	42	46	41	32
Linen	14	24	20	22	11	13
Blue linen	-	-	12	13	10	10
Osnaburg	6	10	9	10	8	8
Fustian	18	31	12	13	8	10
Calico	16	28	12	13	12	24
Scotch cloth	-	-	15	17	13	10

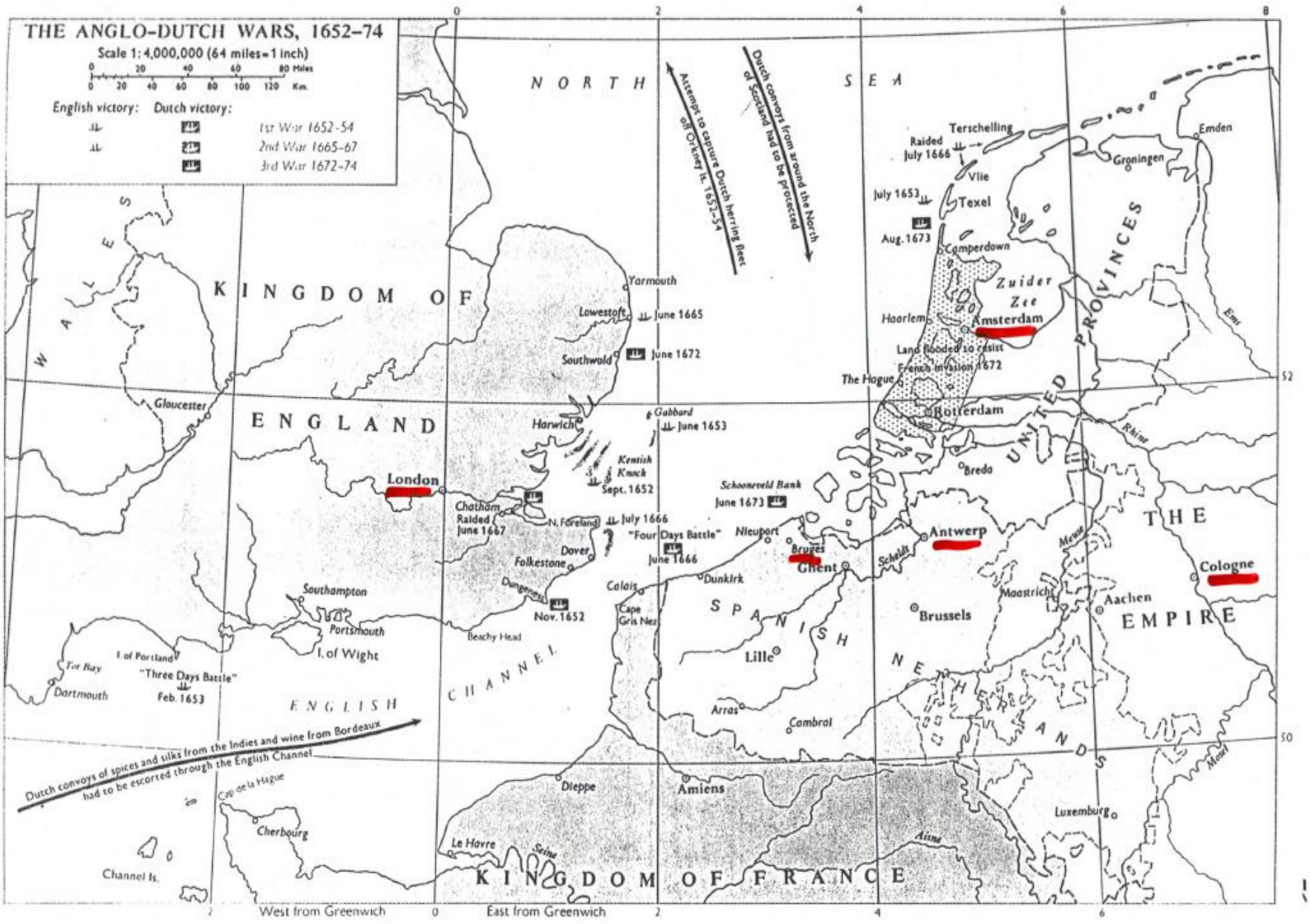
The Rise of the New Draperies - 3

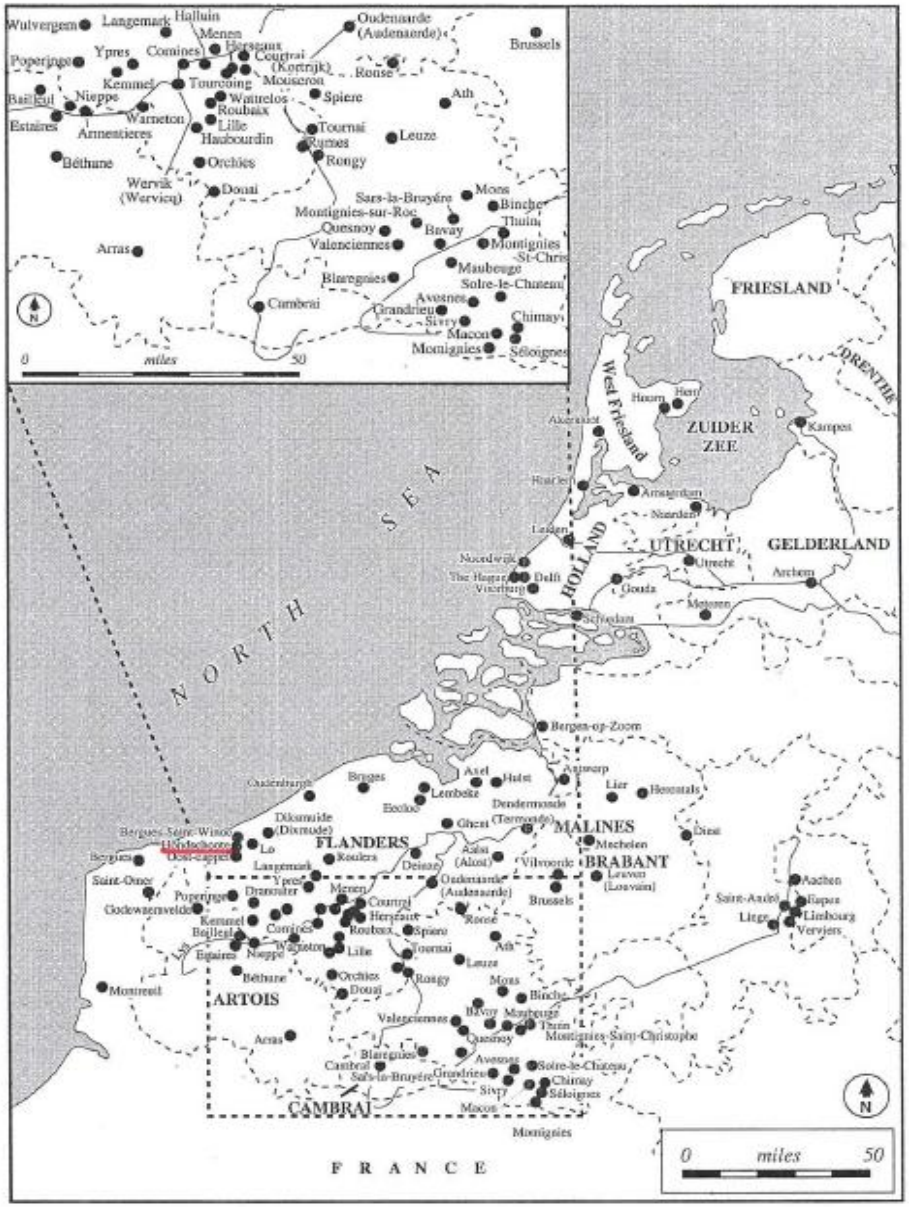
- 2) **Supply-Side Factors in Rise of the New Draperies**
- a) **Revolt of the Low Countries: 1568-1609:**
- - i) **Note: as English gained total victory in the Old Draperies** (woollens), southern Low Countries switched (comparative advantage) to worsted-style *sayetteries*, led by Hondschoote (as in the 13th century)
- ii) **Flemish became European leaders** in producing lighter weight, cheaper textiles by 1520s: says especially


The Hondschoote Sayetterie
Production and Exports,1378-1700
Tax farms and cloth outputs
100,000
80,000
60,000
40,000
20,000
0
100
80
60
40
20
0
1378-80
1426-30
1476-80
1526-30
1576-80
1626-30
1676-80
in quinquennial means
Cloth Outputs by 8d. excise farm
Hondschoote Say Exports

The Rise of the New Draperies - 4

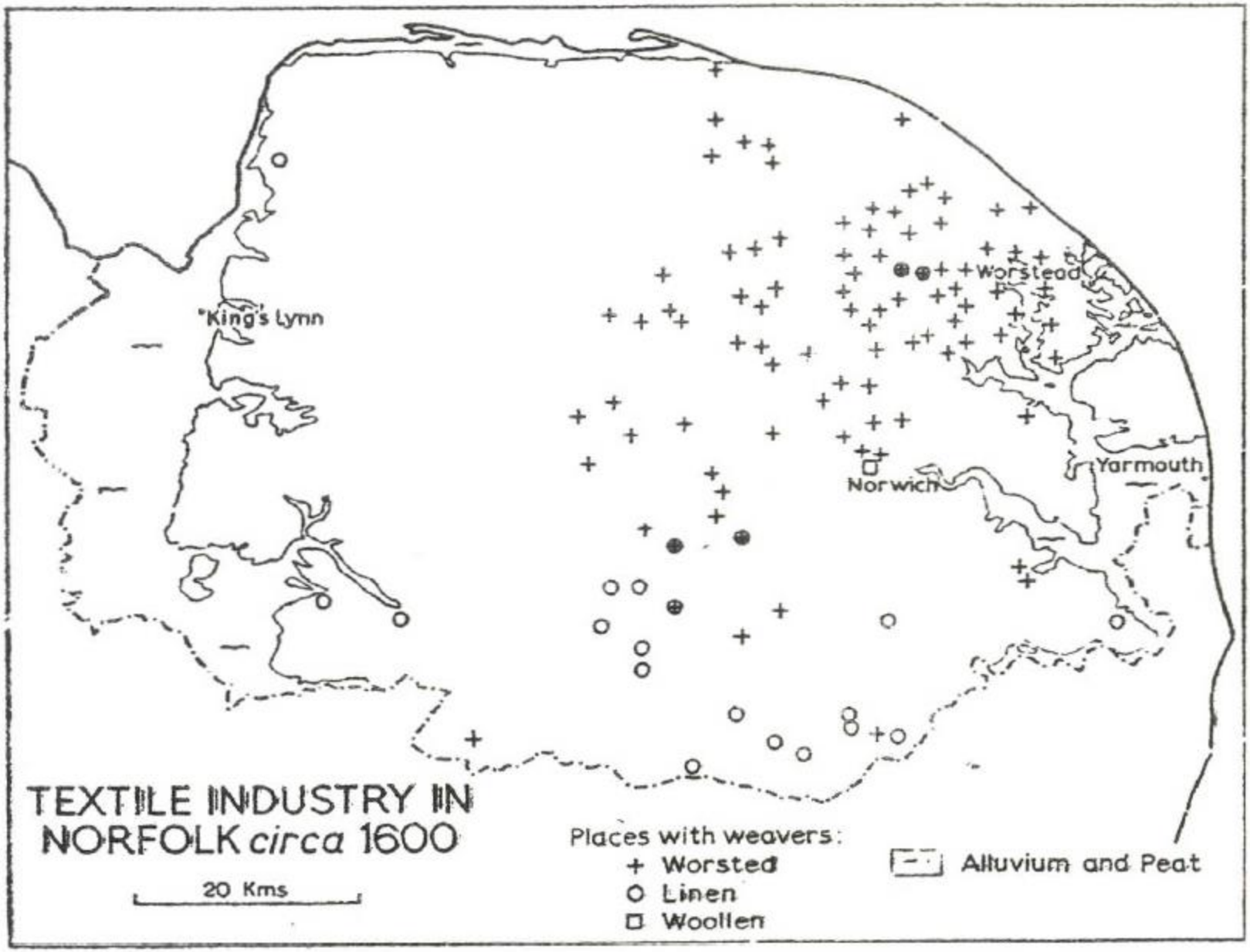
- a) **Revolt of the Low Countries: 1568-1609:**
- iii) **Revolt against Spanish rule** → brutal Spanish reconquest of Flanders → virtual destruction of Hondschoote and the sayetteries
- iv) **Flemish textile artisans fled as refugees**: north to Holland and west (across Channel) England: East Anglia, especially into Norfolk, ancient English home of the worsted industry
- v) **Note: this became a chiefly urban** textile industry


THE ANGLO-DUTCH WARS, 1652–74
Scale 1: 4,000,000 (64 miles = 1 inch)
0 20 40 60 80 Miles
0 20 40 60 80 100 120 Km.
English victory: Dutch victory:
1st War 1652-54
2nd War 1665-67
3rd War 1672-74
NORTH SEA
Attempts to capture Dutch herring fleet off Orkney Is. 1652–54
Dutch convoys from around the North of Scotland had to be protected
KINGDOM OF ENGLAND
WALES
Yarmouth
Lowestoft
June 1665
Southwold
June 1672
Gabbard
June 1653
Kentish Knock
Sept. 1652
Harwich
Gloucester
London
Chatham
Raided June 1667
N. Foreland
July 1666
"Four Days Battle"
June 1666
Dover
Folkestone
Dungeness
Nov. 1652
Calais
Dunkirk
Cape Gris Nez
Schooneveld Bank
June 1673
Nieuport
Bruges
Ghent
Antwerp
Southampton
Portsmouth
I. of Wight
I. of Portland
Beachy Head
Torbay
Dartmouth
"Three Days Battle"
Feb. 1653
ENGLISH CHANNEL
SPANISH NETHERLANDS
Lille
Arras
Cambrai
Brussels
Maastricht
Aachen
Cologne
EMPIRE
THE UNITED PROVINCES
Terschelling
Raided July 1666
Vlie
July 1653
Texel
Aug. 1673
Camperdown
Emden
Groningen
Zuider Zee
Haarlem
Amsterdam
Land flooded to resist French invasion 1672
The Hague
Rotterdam
Breda
Rhine
Ems
Meuse
Scheldt
Dutch convoys of spices and silks from the Indies and wine from Bordeaux had to be escorted through the English Channel
Cap de la Hague
Cherbourg
Channel Is.
Dieppe
Amiens
Le Havre
Seine
Aisne
Luxemburg
Moselle
KINGDOM OF FRANCE
West from Greenwich
East from Greenwich



MAP 1. The Low Countries, showing places referred to in the text

Map 2. East Anglia, showing places referred to in the text


King's Lynn
Worstead
Norwich
Yarmouth
TEXTILE INDUSTRY IN NORFOLK circa 1600
20 Kms
Places with weavers:
+ Worsted
O Linen
□ Woollen
Alluvium and Peat

The Rise of the New Draperies - 5

- 2) **Supply-Side Factors in Rise of the New Draperies**
- b) **Crises afflicting the Old Draperies, from 1614 →** shift of labour, capital, resources from Old to New Draperies
- c) **More entrepreneurial freedom in New Draperies:**
- - **escaped the parliamentary regulation** of Old Draperies, from 1552 [note: following crisis on Antwerp market]
- - **wide variety of fabrics**, colours, sizes, names **→** regulation became virtually impossible

The Rise of the New Draperies - 6

- d) **Much lower capital costs of entry:**
- - **used a far smaller, narrow loom**: much cheaper to build
- - **no fulling, tentering, napping (teaseling), or shearing**
- - **simpler production techniques** → lower skill levels

Capital Costs for a Norwich Weaver in the 'New Draperies' c. 1600

Item	Cost in Pounds Sterling	Percentage of Total
Fixed Capital: in 19 looms, warping mills, and other equipment	26.44	8.19%
Working Capital: Inventory of Yarns	129.58	40.16%
Working Capital: Inventory of Finished Cloths	166.67	51.65%
TOTAL CAPITAL	322.69	100.00%

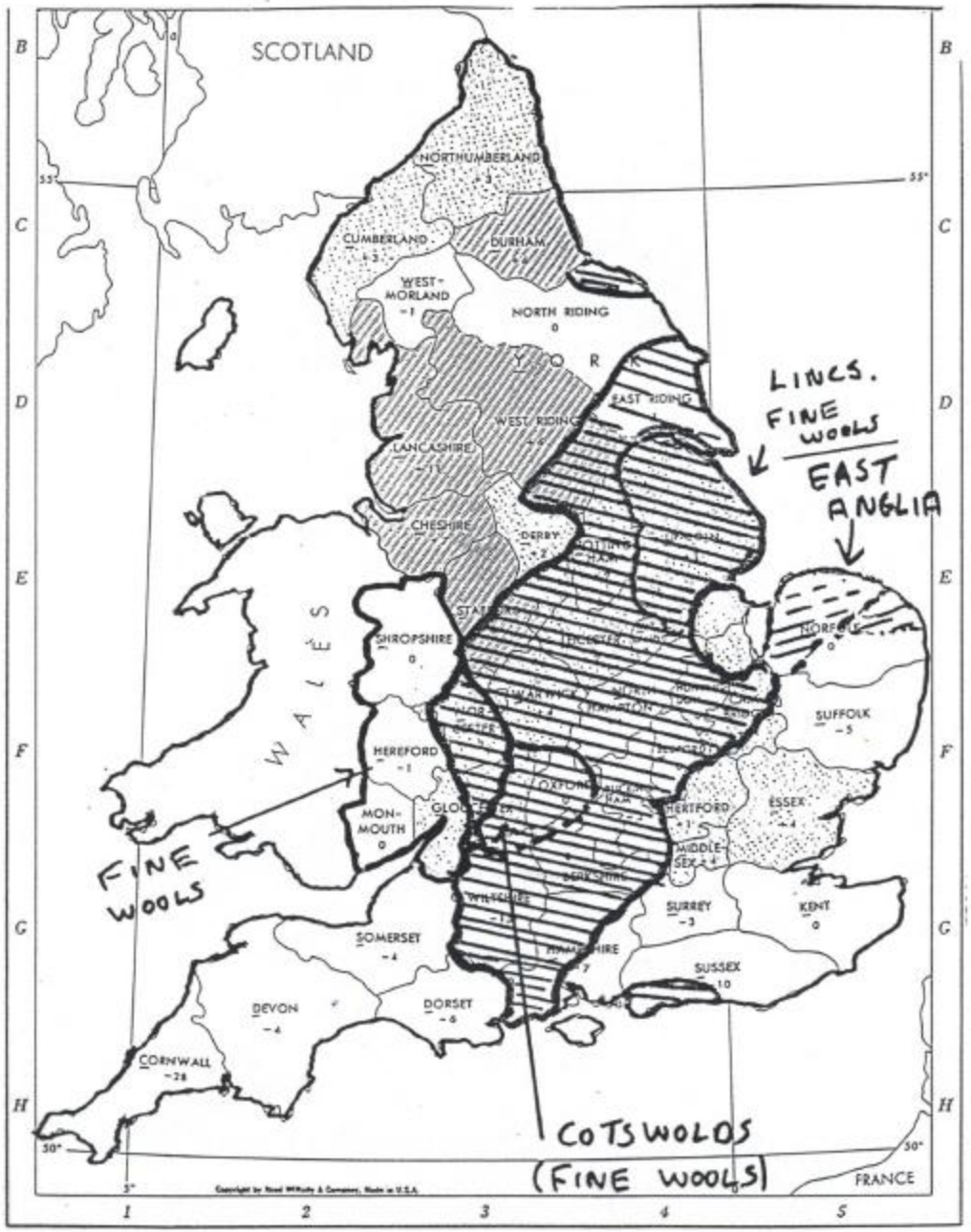
Source: Luc Martin, 'The Rise of the New Draperies in Norwich, 1550 - 1622', in Negley B. Harte, ed., *The New Draperies in the Low Countries and England, 1300 - 1800*, Pasold Studies in Textile History, Vol. 10 (Oxford: Oxford University Press, 1997), pp. 245-74.

The Rise of the New Draperies - 7

- 2) **Supply-Side Factors in Rise of the New Draperies**
- e) **Consequences of Tudor-Stuart Enclosures:**
- - **shift in wool production from fine, short-stapled wools (for woollens) to coarse, strong, long stapled wools (for worsteds)**
- i) **Peter Bowden environmental thesis**:
- - **that Enclosures provided much richer, year-round feeding for sheep,** especially in central Midlands ➔ bigger sheep ➔ longer and coarser fleeces
- - that fine, short-stapled fleeces came from small sheep: product of sparse feeding in chilly hills of Welsh Marches and Cotswolds

The Rise of the New Draperies - 8

- e) **Consequences of Tudor-Stuart Enclosures:**
- ii) **My Sheep Breeding thesis: that enclosures permitted sheep segregation** → and thus **selective breeding:** impossible on Common/Open fields, with communal flocks
- - **farmers were breeding much larger, fatter, meatier sheep** for the urban meat markets, with the same consequences


SCOTLAND
NORTHUMBERLAND
CUMBERLAND
DURHAM
WEST-MORLAND
NORTH RIDING
YORK
EAST RIDING
WEST RIDING
LANCASHIRE
CHESHIRE
DERBY
LINCS.
FINE WOOLS
EAST ANGLIA
NORFOLK
SUFFOLK
WALES
SHROPSHIRE
HEREFORD
MON-MOUTH
FINE WOOLS
HERTFORD
ESSEX
MIDDLE-SEX
SURREY
KENT
SUSSEX
SOMERSET
DEVON
DORSET
CORNWALL
COTSWOLDS
(FINE WOOLS)
FRANCE


ENCLOSURE, 1455–1607
8 - 9%
circa 5%
1 - 2½
100 Kms

The Rise of the New Draperies - 9

- 2) **Supply-Side Factors in Rise of the New Draperies**
- f) **technological advances in both land + sea transport + restoration of relative security in 16th century➔ falling transportation & transaction costs ➔** increased exports to Mediterranean basin + Spanish Americas
- - **mass-market warm zones ➔** more suitable for lighter, cheaper fabrics
- -N.B. **Reversal of negative macro-economic forces** that had restricted long-distance trade to higher, priced luxury fabrics in 14th & 15th centuries
- - **transport advances**: with revival of overland routes- professional wagon-transport companies + postal services; the Atlantic ships (carracks), etc. (as in previous lectures)

The Rise of the New Draperies - 10

- 3) **Demand-Side Factors in Rise of New Draperies:**
- a) **market changes:**
- i) **increases in European urbanization:** many more and much larger towns ➔ commercial scale economies in urban markets ➔ reduced transaction costs
- ii) **larger proportion of population engaged in market economies**: as labour released from agriculture
- iii) **less skewed wealth & income distributions** ➔ greater purchasing power
- b) **greater price and income elasticities of demand for cheaper textiles** ➔ greater capacity for market expansion

The Rise of the New Draperies - 11

- 3) **Demand-Side Factors in Rise of New Draperies:**
- c) **shifts in public fashion: preferring greater variety of colours and styles with the New Draperies** –
- all the more so since these products had lesser durability ➔ designed for quick fashion changes (experimentation): in contrast to luxury woollens, destined to last several lifetimes: with predominantly conservative colours (black, dark blue)
- d) **Levant Company: English commercial expansion into the Mediterranean,** with large warm-zone markets more suitable for lighter-weight textiles-
- **1640s**: 49% of textile exports from Old Draperies; 43% from New Draperies

The Composition of England's Export Trade, 1640 - 1701
Percentages of Total Export Values
Alternative Estimates:

Commodity	1640: London	1663-69: London	1699-1701: London	1699-1701: England
Woollens: Old Draperies	48.9%			29.0%
Worsteds: New Draperies	43.3%			39.7%
Total Wool Textiles	92.3%	74.2%	72.6%	68.7%
Other Manufactures	2.6%	10.9%	15.1%	12.1%
Foodstuffs		3.0%	5.0%	11.0%
Raw Materials	5.1%	11.9%	7.3%	8.2%

Source: C. G. A. Clay, *Economic Expansion and Social Change: England, 1500 - 1700*, Vol. II: *Industry, Trade, and Government* ((Cambridge and New York: Cambridge University Press, 1984), Table XIII, p. 144.

Exports of English Woollens and Worsteds in the Eighteenth Century

CLOTH TYPE	1700 percent	1720 percent	1775 percent	1790 percent
Woollens: Broadcloths	25.4%	28.2%	24.5%	41.5%
Woollens: Narrow Cloths: Kerseys, Dozens, Friezes, etc.	15.8%	14.7%	10.9%	9.0%
New Draperies: Bays, says, serges, stuffs, perpetuanas	58.8%	57.1%	64.6%	49.5%
Total	100.0%	100.0%	100.0%	100.0%
TOTAL VALUE in millions of £ sterling	£2.82	£3.22	£4.91	£5.79

The Rise of the New Draperies - 12

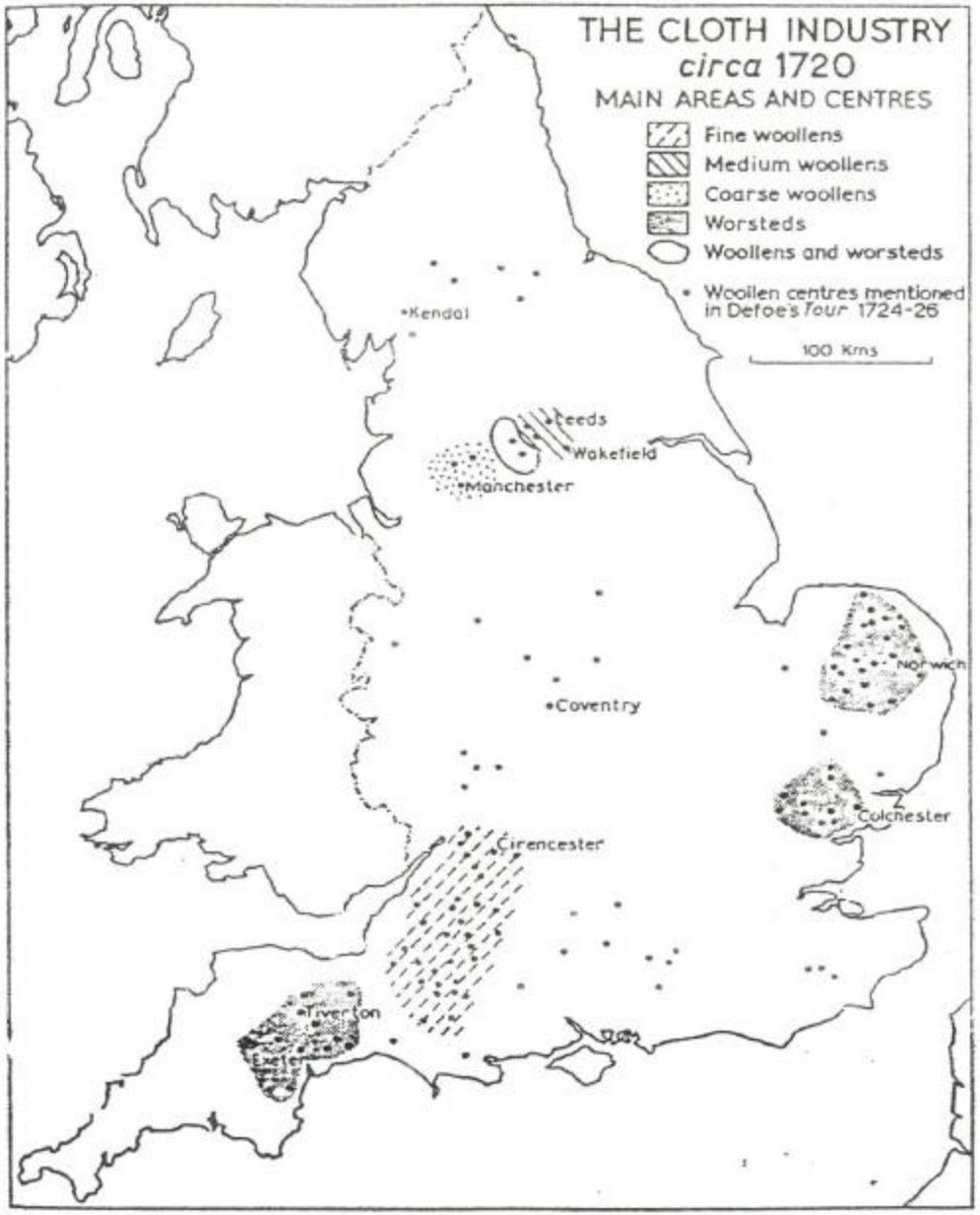
- 4) **Economic Importance of the New Draperies:**
- a) **Important by-product of Tudor-Stuart Enclosures**
- b) **Commercial (export) compensation** for decline of the Old Draperies
- c) **Important factor in English commercial expansion into warmer-climate zones:** Mediterranean and the Americas (but not Asia)
- d) **helped create or expand markets for the cotton industry of the Industrial Revolution**: in both income strata and geographic ranges (for lighter weight, cheaper textiles)

Origins of the Cotton Industry: Industrial Revolution 1

- 1) **Origins of the English cotton-fustians industry:**
- -a) **Historic origins: 10th– 11th century Egypt** (Cairo: al-Fustat district): Egyptian linen + Indian & Syrian cotton: spread into Italy and later into Flanders
- -b) **one of the 'New Draperies'**: that Flemish refugees introduced into later 16th-century England: first into East Anglia
- -c) **early 17th century: fustians industry migrated NE into Lancashire** + West Riding of Yorkshire + SW Scotland
- d) **advantages of new northern regions:**
- - better climate for spinning cotton: milder, moister
- - ample supplies of cheaper labour and clean water

Origins of the Cotton Industry: Industrial Revolution 2

- 2) **Technical Nature of Fustians:**
- a) **linen warp + cotton weft**:
- - **warps** as the strong foundation yarns on the looms;
- - **wefts** as softer, weaker yarns woven through the warps with shuttles
- b) **Indian calicoes**: evidently a **fustian** mixture of linen + cotton


THE CLOTH INDUSTRY
circa 1720
MAIN AREAS AND CENTRES
Fine woollens
Medium woollens
Coarse woollens
Worsteds
Woollens and worsteds
Woollen centres mentioned in Defoe's Tour 1724-26
100 Kms
Kendal
Leeds
Wakefield
Manchester
Coventry
Norwich
Colchester
Cirencester
Tiverton
Exeter

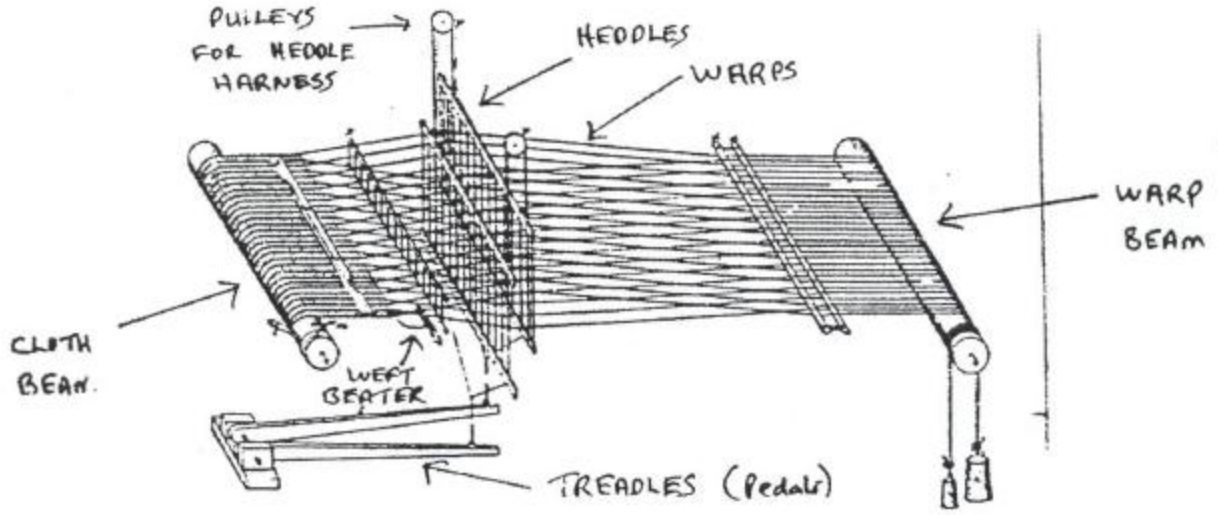


Fig. 87. Loom with pedals.

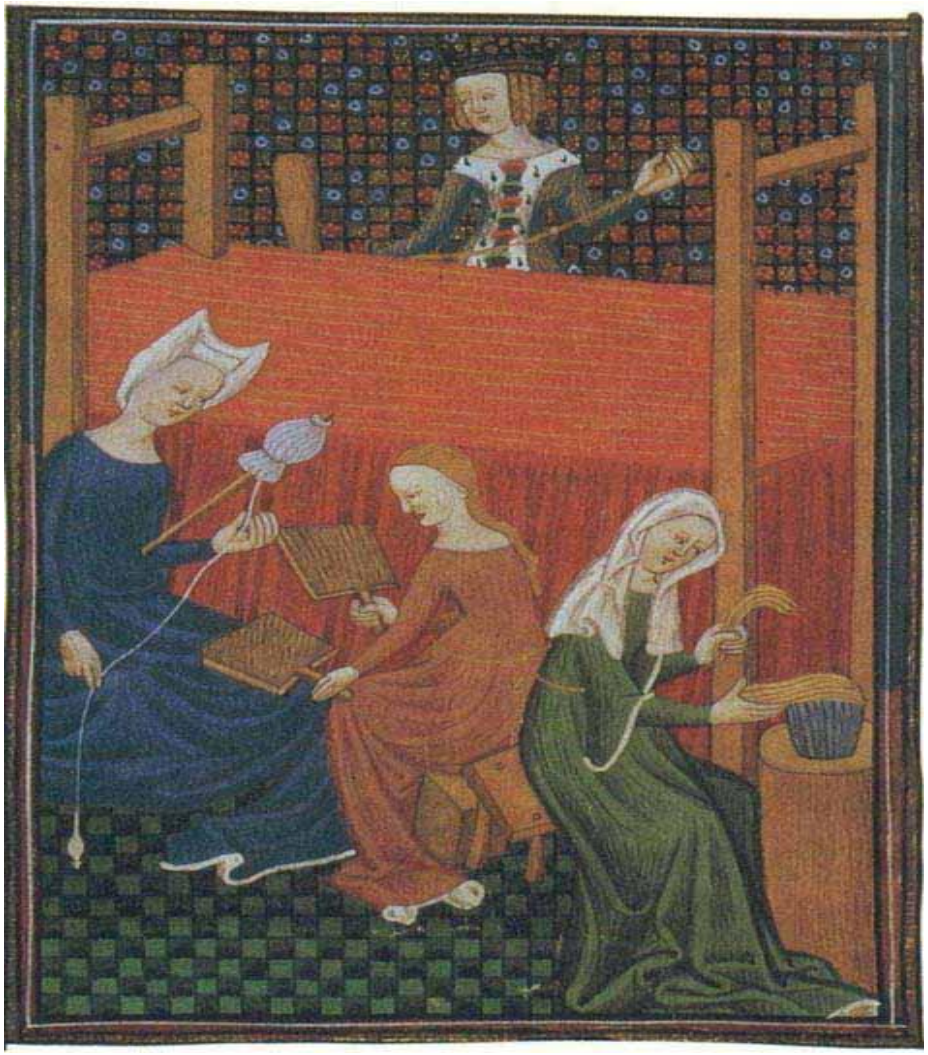
Origins of the Cotton Industry: Industrial Revolution - 2

- 3) **The Spinning Problem:**
- a) **Indian muslins:** **spun from all-cotton yarns**
- b) **Problem:** **why were Europeans unable to spin warp yarns from cotton?**
- i) **Spinning Wheel**: produced low-cost yarns (woollen, cotton) that were too weak to provide suitable warps
- - a three-fold productivity gain over the drop-spindle

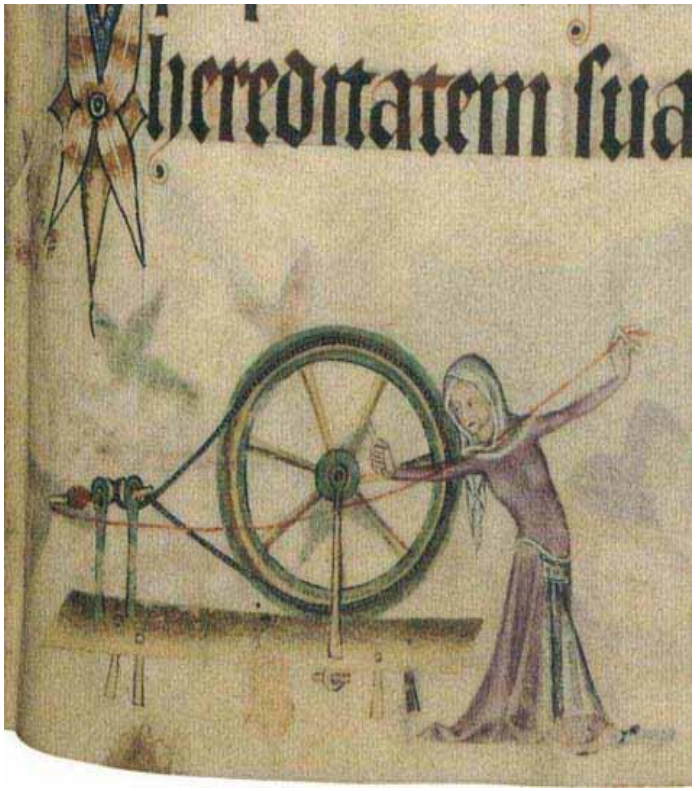
Origins of the Cotton Industry: Industrial Revolution - 3

- ii) **Historic drop-spindle:** used for several millennia
- - **produced yarns that were both strong and fine: the best**
- **- but at enormous labour costs, because of low productivity**
- **-** that meant wages too low for any early-modern West Europeans to accept [see table]

Medieval spinning, carding, combing



Medieval spinning at home



The Saxony Spinning Wheel (late 15th century)

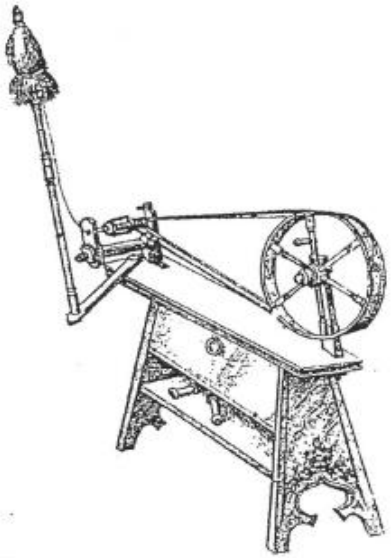
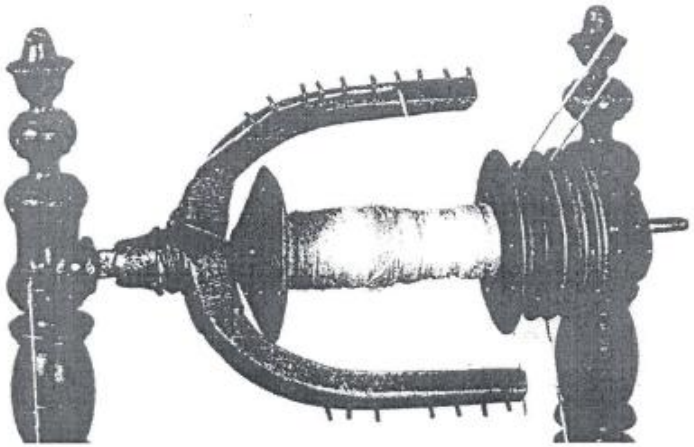


FIGURE 168—*Spinning-wheel with flyer illustrated in* Das Mittelalterliche Hausbuch, c *1480.*



26 Detail of the flyer mechanism showing a bobbin lead, doubled band drive.

Photograph: Crown Copyright, Science Museum, London

The Saxony Spinning Wheel: Dutch drawing, 1513

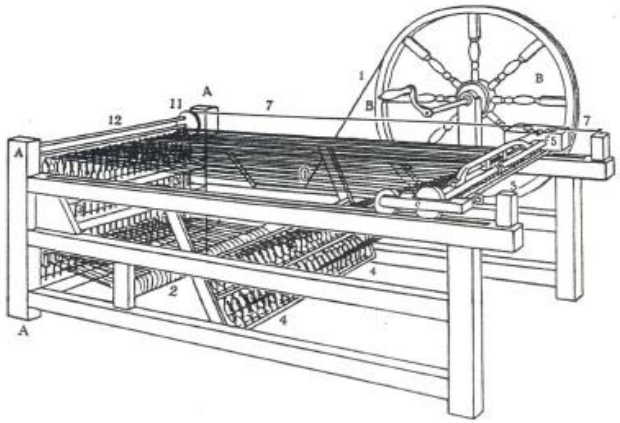
31 A young woman spinning, 1513. Engraving by Lucas van Leyden (1494?–1533).
Photograph: Cliché des Musées Nationaux

Spinning: Traditional Hand-Spinning and the Industrial Revolution

Number of Hours to Produce 100 lb. Cotton Yarn (100s)*

Indian Drop-Spindle Hand Spinners (18th century)	50,000+ hours
Crompton's original Mule (1779)	2,000
100-spindle Mule of 1798	1,000
Water-powered Mule of 1800	300
Robert's automatic steam Mule (1825)	135
Contemporary Machines (of 1972)	40

* 100s or 100 count = 100 hanks of cotton, 840 yards per hank, making up one pound (1 lb.) of yarn by weight, as the measure of yarn fineness [12d to the shilling (s)]



Spinning Jenny (Hargreaves) ↙

Fig. 14-1. Hargreaves's spinning jenny.

Water Frame (Arkwright) ↘

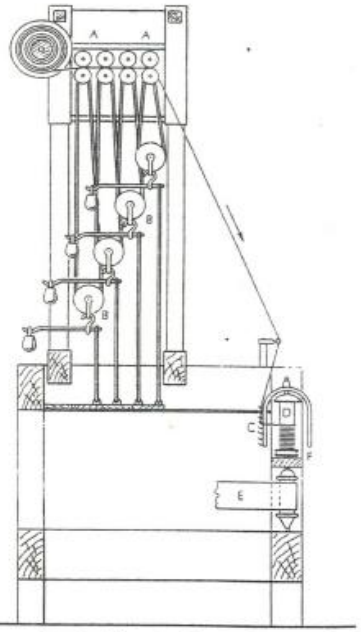


Fig. 14-2. Sectional drawing showing the principle of throstle or water frame.

Mule (Crompton) ↓

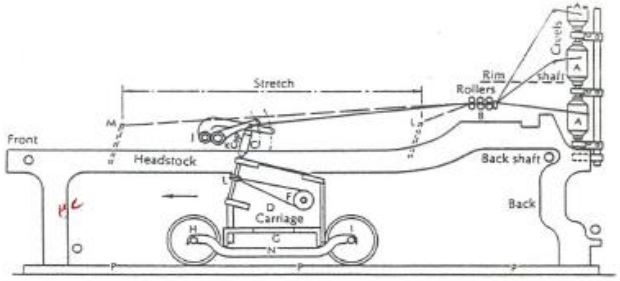


Fig. 14-3. Crompton's mule. The rovings held on the creels (A, A, A) were passed through the rolls below and thence to the spindles when the carriage was nearest the rolls (at L).

Origins of the Cotton Industry: Industrial Revolution - 3

- 4) **Markets for English Fustian Industries:**
- a) **English and Dutch East India Companies**: had brought in a flood of block-printed Indian calicoes & muslins → created a fashion revolution→ opposition from domestic English textile industries
- b) **Calicoes Act of 1721**: forbade the importation and wearing of all Indian textiles → gave English fustians industry (not woollen-worsted) captive English market
- c) **But English fustians industry could not capture any foreign markets** – could not compete with Indian textiles: not without the spinning inventions of the Industrial Revolution

Exports of Indian Calicoes and Muslins by the Dutch and English East India Companies, 1753 - 55, in pieces and rupees

Years	DUTCH EXPORTS		ENGLISH EXPORTS	
	No. of pieces	Value in Rupees	No. of pieces	Value in Rupees
1753-54	279,800	1,670,336	345,267	2,287,128
1754-55	226,432	1,328,188	381,543	2,660,520
Annual Mean	253,166	1,499,278	363,405	2,473,824

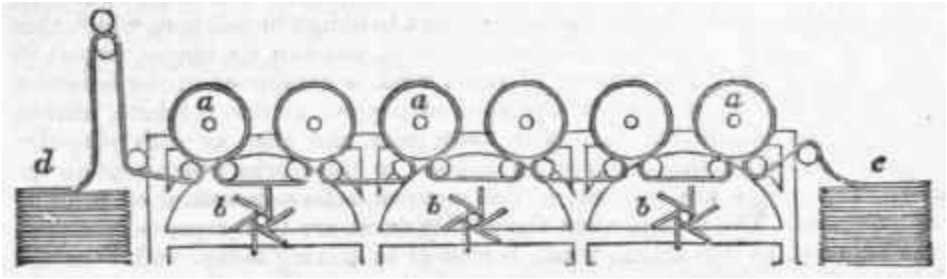
1 Indian rupee = 1.5 Dutch florins (guilders) = 2s 6d sterling (i.e., £1 = 8 rupees)

Percentage Shares of Different Categories of Indian Textiles Exported by the Dutch and English East India Companies, 1730 - 60

Textile Type	Dutch Textile Exports from India			English Textile Exports from India		
	1730s	1740s	1750s	1730s	1740s	1750s
Calicoes: Ordinary	46.40%	39.85%	55.69%	46.02%	30.60%	30.80%
Calicoes: Fine	14.99%	19.89%	12.66%	20.30%	22.49%	19.17%
Muslins	20.23%	26.22%	17.79%	24.44%	34.08%	39.26%
Silk Piece Goods	10.44%	10.08%	11.19%	3.18%	4.56%	6.36%
Mixed PieceGoods	7.94%	3.96%	2.67%	5.98%	7.88%	3.72%
Miscellan-eous				0.08%	0.39%	0.69%
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Calicoes

Calico Printing



Origins of the Cotton Industry: Industrial Revolution - 4

- 5) **Pre-Industrial Organization of the Cotton-Fustian Industry: 'Putting-Out' or 'Domestic System' of Production**
- a) **fusion of mercantile capitalism and peasant handicraft production**
- i) **clothier**: supplied or 'put out' the raw materials and credit and sold the finished product (woven cottons)
- ii) **peasant artisans**: worked in their own homes using their own tools: hence the term 'domestic system'
- - **predominantly women**, except for weaving
- b) **payments system: by piecework**: because & since artisans were never monitored

Origins of the Cotton Industry: Industrial Revolution - 5

- c) **spinning processes**
- (1) **warp yarns**: spun on **Saxony Wheel**, from combed linen fibres 'retted' from flax
- (2) **weft yarns**: spun on the **Great Wheel**, from carded cotton
- d) **weaving:** using narrow, single-weaver loom
- - took place in homes or work-sheds of the clothier, with hired assistants
- e) **finishing woven cotton cloths: bleaching [HCl] and block-printing**
- - after being bleached, woven fabrics were usually 'printed' rather than dyed

The Putting-Out System in the English 'Cotton' Fustian Industry

The Pre-Industrial Cotton-Fustian Industry: 'Domestic' System

THE MERCHANT CLOTHIER:
supplies raw materials (flax and raw cotton) and credit; and sells the woven cloths

⇓ ⇑

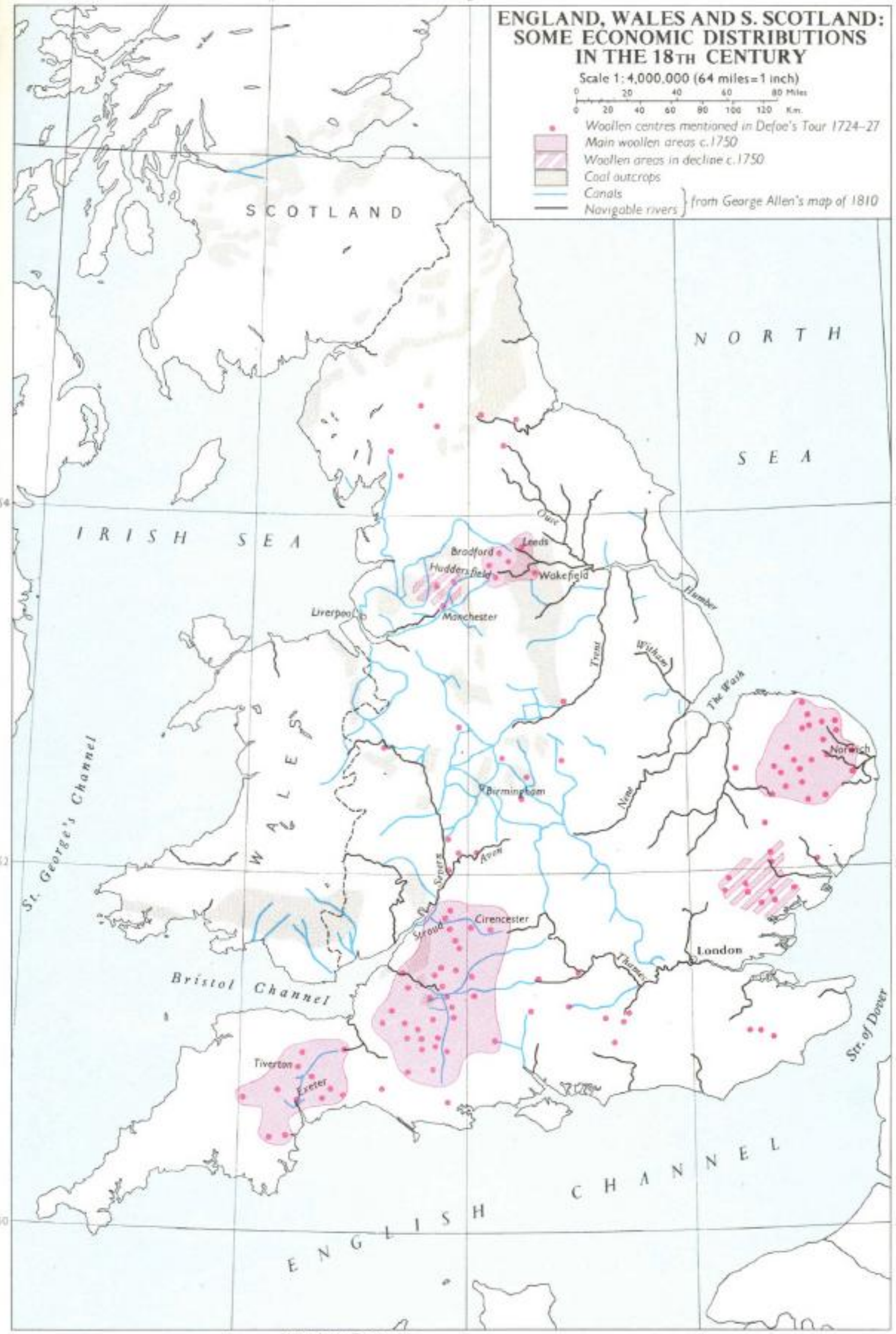
The Master Weaver: puts raw materials out for processing into yarns and then weaves yarns into fustian cloths

↕ ↕ ↕ ↕

Flax Combers (Retting and Combing)	Cotton Carders	Flax Spinners (Linen Warp Yarns)	Cotton Spinners (Cotton Weft Yarns)

Ratio of Workers:

about 10 each of combers and carders, warp and weft spinners, per master-weaver, who hired at least one weaving assistant.


ENGLAND, WALES AND S. SCOTLAND: SOME ECONOMIC DISTRIBUTIONS IN THE 18TH CENTURY
Scale 1: 4,000,000 (64 miles=1 inch)
Woollen centres mentioned in Defoe's Tour 1724–27
Main woollen areas c.1750
Woollen areas in decline c.1750
Coal outcrops
Canals
Navigable rivers
from George Allen's map of 1810
SCOTLAND
NORTH SEA
IRISH SEA
WALES
St. George's Channel
Bristol Channel
ENGLISH CHANNEL
Str. of Dover
Leeds
Bradford
Huddersfield
Wakefield
Liverpool
Manchester
Birmingham
Norwich
Cirencester
Stroud
London
Tiverton
Exeter
Ouse
Humber
Trent
Witham
The Wash
Nene
Severn
Avon
Thames
West from Greenwich

INDUSTRIAL REVOLUTION IN ENGLAND 1750-1850

Values of Cotton and Woollen Exports

1796 to 1860 in thousand pounds st