BRILL

JOURNAL OF THE ECONOMIC AND SOCIAL HISTORY OF THE ORIENT 69 (2026) 1–53

JESHO

brill.com/jesh

"The 72 Kinds": *The Cloth Classic*, the Jiangnan Cotton Finishing Sector, and the Expansion of Cotton Dyeing in the Qing Dynasty

Rachel Silberstein | ORCID: 0000-0001-8346-3147
Co-Convenor, Arts of China module, SOAS-Alphawood Asian Art Programme, School of Oriental and African Studies (SOAS), London
rs141@soas.ac.uk

Received 8 April 2025 | Accepted 6 November 2025 |
Published online 25 March 2026

Abstract

Though the topic of commercialization in the Qing dynasty cotton industry has been subject of much scholarship, little attention has been given to the improvements of finishing and dyeing in Jiangnan cottons over the course of this period. Using *The Cloth Classic*, a late eighteenth-/ early nineteenth-century cloth merchants' compendium, this paper investigates the material basis and technical processes producing the "72 kinds" of cloth with particular focus on the expansion of the numbers of dye colors. It argues that three primary factors enabled this expansion: intensified use of certain dyestuffs and mordants; growing deployment of the "set dyeing" technique; and dyeworks color specialization. All three factors would have contributed to economic growth and improved living standards for those who could afford dyed cloth's higher cost. However, in being enabled by the embodied expertise of the dyer and the middleman, and the organizational structure of the cotton finishing sector, rather than cost-cutting innovations or new materials, all three factors also reveal inherent restrictions to the Jiangnan cotton sector's competitiveness.

Keywords

Cotton Industry – Finishing Sector – Dye technology – Dyestuff trade – Handicraft knowledge – Embodied skill

Published with license by Koninklijke Brill BV | DOI:10.1163/15685209-12341666
© RACHEL SILBERSTEIN, 2026 | ISSN: 0022-4995 (print) 1568-5209 (online)
This is an open access article distributed under the terms of the CC BY 4.0 license.

Introduction

In the 1879 edition of the local gazetteer of Chuansha, a county in Songjiang prefecture, the "Local Products" section described the range of cotton fabrics produced: "there are so many different kinds they are popularly referred to as the '72 kinds'".[1] These words are frequently quoted by historians, for they suggest extensive quality variations, which are argued to have derived from commercialization in the Qing cotton industry.[2] But surprisingly little attention has been devoted to the variations themselves: What exactly were the material basis and technical causes enabling the "72 kinds" of cottons?

The appearance of colored, fashionable cottons might seem akin to the Qing silk industry's turn to cheaper silk products to meet the demands of merchant classes and other urbanites, and thus a question for material culture history, but art and textile historians have largely ignored its development, partly because so little cotton fabric survives compared to silk.[3] Instead, questions around cotton textile consumption has been considered primarily by economic historians in the context of standard of living debates: for example, Kenneth Pomeranz's claim, in his influential book, *The Great Divergence*, that "Chinese textile consumption stacked up quite well against Europe's in the mid to late eighteenth century,"[4] was based on the per capita quantity of fiber (produced and consumed) per person in Jiangnan, the wealthiest part of China. However, basing the comparison of Chinese and European textile consumption upon fiber quantities, rather than cloth qualities, leaves important issues outstanding: most critically for the question of the "72 kinds," it omits the contribution of the finishing sector, a key contributor to the growth of global textile markets from the sixteenth century onwards.[5] In early modern England, it was the dyeing, calendaring, pressing, and packing stages—which unlike weaving, were

1 (Guangxu) *Chuansha ting zhi* (1879), juan 4, "Wuchan": 602. Some of this content is reproduced from H. Chu, *Mumian pu*, in *Xuxiu siku quanshu*, vol.977 (1810, Reprinted Shanghai: Shanghai guji chubanshe, 2002).

2 F. Xing et al, "Cloth Processing in Suzhou and Songjiang". In *Chinese Capitalism, 1522–1840*, ed. X. Dixin and W. Chengming (London: Palgrave Macmillan UK, 2000): 215.

3 R. Silberstein, *A Fashionable Century: Textile Artistry and Commerce in the Late Qing* (Seattle: University of Washington Press, 2020).

4 K. Pomeranz, *The Great Divergence: China, Europe, and the Making of the Modern World Economy* (Princeton: Princeton University Press, 2000): 138–142; K. Pomeranz, "Standards of Living in Eighteenth-Century China: Regional Differences, Temporal Trends, and Incomplete Evidence". In *Living Standards in the Past: New Perspectives on Well-Being in Asia and Europe*, ed. R. C. Allen et al (Oxford: Oxford University Press, 2005): 23–54, 37.

5 D. Mitchell, "'Good hot pressing is the life of all cloth': dyeing, cloth-finishing and related textile trades in London, 1650–1700". In *Occupational Titles and their Classification: the*

often sited in London—that helped adapt products to the demands of overseas customers. These stages contributed substantial value (around 20–40%) to the woolen cloth made in regional centers and they were central to expanding product variety in textiles, something recent scholarship has underlined as being just as important to improving early modern living standards as classic Industrial Revolution innovations like the spinning jenny.[6] The importance of product variety suggests parallels between Jiangnan and early Industrial Revolution Britain, yet little study has been undertaken into the expansion of volume and variety of cotton products in Qing China.

To what extent was the Qing cotton industry adding extra value to cotton cloths? The finishing sector has been claimed as key to allowing Jiangnan, the most developed cotton-producing region, to maintain its success in long-distance trade markets after other provinces developed their own weaving industry for basic cloths by the mid-Qing.[7] And several textual sources suggest that cotton dyeing in the Qing period did indeed expand. In a section entitled "Changes in dye colors," one 1631 gazetteer text from Songjiang, the center of Jiangnan's cotton industry, identified more than twenty new colors.[8] It followed discussion of new types of cotton cloth that were now available, suggesting that these shades became more accessible, an intriguing idea in relation to debates about both the extent of commercialization in the cotton industry and standards of living in mid-Qing China.

Though the spread of cotton, and its displacing and supplementing of earlier clothing fibers like hemp (麻), ramie (苧), and puereria (葛), brought cheaper, comfortable, and durable fabrics to ordinary people, most people in China consumed cotton on a subsistence basis: basic weaves, produced at home in small

Case of the Textile Trade in Past Times, ed. H. Diederiks and M. Balkestein (St Katharinen, Max-Planck-Institute für Geschichte, 1995): 153–175.

6 J. Styles, "Product Innovation in Early Modern London." *Past & Present* 168 (2000): 124–169; M. Berg, "In pursuit of luxury: Global History and British Consumer Goods in the Eighteenth Century." *Past & Present* 182 (2004): 85–142; B. Lemire, *Fashion's Favorite: The Cotton Trade and the Consumer in Britain, 1660–1800* (New York: Oxford University Press, 1992); G. Riello, *Cotton: The Fabric that made the Modern World* (Cambridge: Cambridge University Press, 2013).

7 L. Hanchao, "Arrested development: cotton and cotton markets in Shanghai, 1350–1843," *Modern China* 18.4 (1992): 468–99, 493; X. Xu, 'Yapian zhanzheng qian Zhongguo mian fangzhi shougongye de shangpin shengchan (Jiangsu renmin chubanshe, 1981): 99; T. Yu and K. Huang, "Ming Qing Jiangnan zhibu jishu de lilunhua", *Gugong xuekan* 4 (2008): 560–575, 563.

8 (Chongzhen) *Songjiang fu zhi* (1631): 7.186a.

quantities.[9] An estimated 600 million bolts of cotton were produced each year. Assuming a population of around 400 million in the early nineteenth century, this would allow for about 1.5 bolts per person, a figure conforming to estimated minimum consumption, enough to make a jacket and pant set.[10] About half of those 600 million bolts were produced by rural households for their own use, but the other half, 300 million bolts of cotton, are thought to have come onto the market each year.[11] Most would have circulated in local markets; but Jiangnan, the most renowned cotton producing region, comprising the eight prefectures of Suzhou, Songjiang, Changshu, Zhenjiang, and Jiangning (all Jiangsu province); Hangzhou, Jiaxing, and Huzhou (all Zhejiang province), was different. Its annual production has been estimated at 45 million bolts, the bulk of which would have entered long-distance trade.[12] This cloth represents a non-elite market that appears to expand over the Qing period, yet, given how little of this dyed and finished cotton cloth survives, how can we write its material history? As Chen and Peng's recent review of Qing consumption history observes, the absence of quantitative consumption data obstructs answers to the question of whether economic growth led to improved living standards: their conclusion that "ordinary people's consumption bundles expanded in quality, quantity, and diversity" has hardly been matched by material culture histories evidencing this expansion for consumer items like ceramics, books, or clothing.[13] Histories of Qing consumption remain undeveloped, especially in regard to the textile consumption of urban, market-oriented populations.

In this paper, I investigate the nature and causes of the development of cotton finishing, and its impact on consumption through the material insights offered in *The Cloth Classic* (布經), an undated manuscript written in the late eighteenth century / early nineteenth century by a cloth merchant, likely from the Songjiang region.[14] A manual filled with advice for those in the cotton

9 K. Chao, *The Development of Cotton Textile Production in China* (Harvard University Press, 1977): Chap.1; W. Cheng, *History of Textile Technology in Ancient China* (New York: Science Press, 1992): 435, 437.

10 X. Xu, *Jiangnan tubu zhi* (Shanghai: Shanghai Classics Press, 1981): 193–4; B. Li, An *Early Modern Economy in China* (Cambridge University Press, 2021): 520–2; F. Xing, "Qingdai Jiangnan nongmin de xiaofei". *Zhongguo jingjishi yanjiu* 3 (1996): 91–8.

11 F. Xing et al, "Cloth Processing in Suzhou and Songjiang": 174–5.

12 F. Xing, "Growth of Commodity Circulation". In *Chinese Capitalism, 1522–1840*, ed. D. Xu and C. Wu (London: Palgrave Macmillan UK, 2000): 171–2.

13 Z. Chen and K. Peng, "Production, Consumption, and Living Standards." In *The Cambridge Economic History of China*, ed. D. Ma and R. von Glahn (Cambridge University Press, 2022), Vol. 11, Chap.18: 676–709, 677, 707; J. Huang, *Minsheng yu jiaji: Qingchu zhi minguo shiqi Jiangnan jumin de xiaofei* (Shanghai, Fudan daxue chubanshe, 2009).

14 Anon, *Bu jing* (n.d.) Anhui Provincial Library ms.

industry, written by those responsible for guiding cotton fabrics through their various marketing paths, it is one of three similar works that have drawn the interest of several scholars.[15] Yu Tongyuan and Huang Kangjian have used it to evidence the development of systematic understanding of weaving structures and techniques.[16] Chiu Pengsheng has explored the legal and economic structures through which Suzhou's cotton merchants organized and marketed their products.[17] Finally, Jacob Eyferth has argued that *The Cloth Classic*'s "mercantile epistemologies" used the "merchant-manager's" "sensory skills" to control and coordinate handicraft production processes, an idea we will return to.[18] However, in addition to these issues of technology, marketing, and management, *The Cloth Classic* also has much to tell us about material and commercial changes to the finishing processes. In particular, its 68 recipes for different cotton dye colors—many more than earlier compilations of dye recipes—undermine claims that societies with indigenous cotton production like China could only dye indigo blues or tannin browns due to the difficulties of dyeing cellulosic cottons and ramies, unlike proteinaceous silks and woolens.[19] Here, by positioning *The Cloth Classic* within the development of the Jiangnan cotton industry and by highlighting the material basis of these

15 The Anhui library manuscript version features the most detailed sections on cloth dyeing and is the version used here. The two other works are Fan Tong, *Bajing bajuan* (1751); Anon, *Bu jing yaolan er juan* (1755). For an overview of the different works, see Eyferth, "Skilled Vision as a Management Technique: The Cloth Classic and its instructions for cloth buyers," paper presented *Workshop on Text and Labor in Asian Handwork*, Chicago (2016). B. Li's short study ("Qing dai ranzhi chuanzhu Bu jing kao: "Qing dai ranzhi zhuanzhu Bu jing kao". *Dongnan wenhua* 1 (1991): 79–86) dated the Anhui version to 1795–1850 period due to the frequent mentions of yarn spun using iron ingot spindles (鐵錠), which made a finer, tighter yarn, but was not widely used until post-Qianlong period; the inclusion of "foreign blue" (洋藍), either imported indigo or Prussian blue dye imported by the EIC and private traders from around 1775 onwards (see R. Silberstein, "Threads of Commerce and Consumption: the Qing Foreign Trade in Silk, Cotton, Fur, and Wool, 1644–1860.") In *The Oxford Handbook of the China Trade*, ed. R. Gardella and F. Grant (Oxford University Press, forthcoming); and finally the use of a regional silver ingot (元絲), common to pre-Daoguang period (1820–50) Zhejiang and Jiangsu.

16 T. Yu and K. Huang, "Ming Qing Jiangnan zhibu jishu de lilunhua." *Gugong xuekan* 4 (2009): 560–575.

17 P. Chiu, "18 shiji Su-Song mianbuye de guanli jiagou yu falü wenhua." *Jianghai Xuekan* 2 (2012): 143–57.

18 J. Eyferth, "Skilled Vision as a Management Technique".

19 The lack of affinity between the alkaline nature of plant fibers and acidic nature of most natural dyes inhibited the formation of permanent bonds. See J. Han and A. Quye, 'Dyes and Dyeing in the Ming and Qing Dynasties: Preliminary Evidence Based on Primary Sources of Documented Recipes,' *Textile History* 49.1 (2018): 44–70, 51; E. Phipps, "Global Colors: Dyes and the Dye Trade: from the Sixteenth to the Eighteenth Century." In *The*

developments, I establish the extent of the finishing sector and the causes of its expansion. We begin with an overview of the finishing sector, the range of different cloth types, and the role of merchants, before examining *how* the cotton dyers widened the range of colors so dramatically. I argue that three primary factors enabled this growth: intensified use of certain dyestuffs and mordants, growing deployment of the "set dyeing" technique, and color specialization amongst the dyeworks. Though these three factors would have contributed to economic growth and improved living standards for those who could afford dyed cloth's higher cost, in being enabled largely by dyers and middlemen expertise, rather than cost-cutting innovations or new materials, all three reveal inherent restrictions to the Jiangnan cotton sector's competitiveness.

Gender and the Development of the Cotton Finishing Sector

Though it is often used to speak for the entire Qing period, the Chuansha gazetteer text with which we began was actually written in 1876 and some of the cloth types it mentions are specific to a post-Treaty Port market, one in which aniline dyes and foreign machine-woven yarn had entered.[20] However, much of the cotton sector remained unchanged from earlier in the Qing. Most steps of cotton production were still rural household activities and the vast majority of Jiangnan's estimated 45 million bolts were woven by women and girls in villages and market towns and sold to brokers and middlemen. These tasks of ginning, bowing, spinning, sizing the warp, warping the loom, and weaving are visually represented in a woodblock print genre known as the "Ten Tasks of Women" (Fig. 1).[21] Perhaps produced for motivational or valorizing purposes, images like this highlight gender as a crucial determinant of labor and productivity in the cotton sector, something well demonstrated in the Chuansha text:[22]

Interwoven Globe: Worldwide Textile Trade 1500–1800, ed. A. Peck (New York: Metropolitan Museum of Art, 2013): 28–45, 132.

20 On post-Taiping markets, A. Feuerwerker, "Handicraft and Manufactured Cotton Textiles in China, 1871–1910." *The Journal of Economic History* 30.2 (June 1970): 338–78.

21 Men did sometimes participate in cotton production, depending on how the household determined the best allocation of labor. See Y. Wang, "Women Till and Women Weave: Rice, Cotton, and the Gendered Division of Labor in Jiangnan." *Late Imperial China* 45.1 (2025): 1–40.

22 B. Li, *Agricultural Development in Jiangnan: 1620–1850* (New York: St. Martin's Press, 1998): 143–151; B. Li and J. Van Zuide, "Beyond the Great Divergence?: Comparing the Yangzi

Regarding cloth made from cotton: that which is densely woven and narrow is called "small cloth" (小布), also known as "reed cloth" (扣布), or "middle loom cloth" (中機布). Cloth which is slightly wider is known as "large cloth" (大布), or "standard cloth" (標布). Cloth with a length of 16 *chi* is called "pingshao" (平梢), that of 20 chi is called "set piece" (套段).[23] A kind of thin cloth (希布) that is slightly wider comes in two kinds: "single knot" (單扣) and "double knot" (雙扣). That which is woven from purple flower (cotton) is called "purple flower cloth" (紫花布), those woven from blue and white yarn are called "snowy inside blue cloth" (雪裏青布), "willow branch cloth" (柳條布), "reed mat patterned cloth" (蘆席紋布), "spiral patterned cloth" (斗紋布), and "twill patterned cloth" (斜紋布). That woven from the warp and weft of many colors is called "bean patterned cloth" (豆子花布).

FIGURE 1 "Images of Spinning and Weaving" (*Fangzhi tu* 纺织图), Fengxiang county, Shaanxi 凤翔县(陕西), Qing dynasty, woodblock print, 23 × 31cm, after Wang Shucun王树村, *Zhongguo minjian nianhua shi tulu, shang* 中国民间年画史图录 (A Catalogue of Chinese Folk Woodblock Prints) (Shanghai: Shanghai renmin meishu chubanshe, 1991), Vol. 1, p. 161, no. 160

Delta and the Netherlands at the Beginning of the Nineteenth Century," *The Journal of Economic History* 72.4 (2012): 956–989.

23 1 *chi* 尺= 14″.

It is following this list that the "72 kinds" line is used to summarize the range, though it is of course hyperbolic: only fourteen kinds are actually listed.[24] But more interesting than the numerical exaggeration is the following qualification, stating: "All of these kinds come from women's work." And it continues by describing three more varieties of cotton cloth *not* made by women:

> If made by dying and scraping with a knife to make a napped cloth like a (Tibetan) *pulu* (woolen fabric), it is known as "scraped nap cloth" (刮絨布). That which uses a great stone to press it is known as "calendered cloth" (踏光布). That which uses paper piled in layers like a printing block with the pattern on top and uses lime mortar to print the design is called "printed cloth" (印花布), and it was originally called "medicine spot cloth" (藥斑布). These three kinds are all made by the dyeworks and are transported to markets by merchants: they are not women's work.[25]

The text's distinction between those cloths produced by women in the home and those produced by professional workshops revolves around the finishing tools—knife, stone, block—used in the only stage of cotton production neither done by women, nor done in the home. Instead, these steps took place in sometimes quite large-scale urban workshops, many located in Suzhou.

Finishing workshops for dyeing and calendering first began during the Ming dynasty (1368–1644) in the Songjiang area, especially Jijing 機泾 and Zhujing 洙泾 around Wuhu 蕪湖 which became known for its starching and dyeing expertise.[26] But during the late sixteenth and early seventeenth centuries a

24 It was common for the "wuchan" or "tuchan" section of a local gazetteer to list different kinds of locally produced cloth, but the Chuansha text contains an unusually large number of different kinds. The hyperbolic 72 thus conveys a genuine expansion in the late Qing period, that continues into the early 20th century. Similar lists are seen in (Republican) *Wuxian zhi*, juan 51 (1933) or Xu Weinan's 徐蔚南 list of Shanghai regionally-produced cotton fabrics in *Shanghai mianbu* (Shanghai: Shanghai Bowuguan congshu, 1936): 4–5. The four main types being "reed cloth" 扣布 (also known as "small cloth" 小布, "small head cloth" 短头布); *Xibu* 希布 (subcategorized into *Dongxi* 东希, *Xixi* 西希, *Longxi* 龙希); *Biaobu* 表布 (*Dabu* 大布); and *Gaoli bu* 高麗布; as well as "middle loom cloth" 中机, "set cloth" 套布 (subcategorized into *Dongtao* 东套, *Beitao* 北套, *Jiatao* 加套, *Nianba tao* 廿八套), *Baisheng* 白生 (小標), "reed patterned cloth" 蘆文布, "willow branch cloth" 柳條布, "Checked cloth" 格子布, "Spiral patterned cloth" 斗文布, and "Nankeens" 紫花布. The basis for these types was mostly dimensions and producer location, and most are similar to those listed in the Guangxu text.

25 (Guangxu) *Chuansha tingzhi*, p.602.

26 Y. Song, *Tiangong kaiwu* (Reprinted Shanghai: Shijie shuju, 1637/1936), *juan shang*: 42, "Cloth clothing"; G. Gu, *Xiaoxia xiangqi zhaichao* (1785, Reprint Shanghai: Shangwu yinshu guan, 1916–21), *Zhong juan*, "Furong tang".

time of rapid expansion for Jiangnan textiles, Suzhou gained a reputation for finishing: producers of silk fabrics and threads in Huzhou, Chengze, and Puyuan, and producers of cotton fabrics and yarn in Songjiang, Taicang, and Changshu alike sent their products to Suzhou for processing.[27] As the larger Songjiang cloth merchants (布號) moved there to access a center for textile sales, the finishing sector grew to considerable scale.[28]

Exactly what scale is hard to pin down, and we lack reliable numbers for labor numbers which would allow us to extrapolate the output of the finishing shops relative to total cloth output.[29] A Wanli period (1572–1620) memorial described Suzhou dyeworks as having more than several thousand dyers, but we do not know what proportion dyed cotton and what proportion silk.[30] Workshops were likely fiber-specialized and cotton cloth was dyed in the cloth, rather than in the yarn. This differed from silk fabrics, whose dyers either worked with the "raw goods" (生货) lighter-weight silks which were woven and then dyed, or the "cooked goods" (熟货) silks whose yarn was first dyed and then woven.[31]

The numbers of Suzhou calenderers also grew apace, totalling "no less than 10,000" according to a 1720 guild stele.[32] Calendering (踹布) involved repeatedly pounding the fabric with a heavy stone to give it a smooth and glossy sheen. It required a set of three tools: a heavy stone (元寶石, 踹布石), which was positioned on a wooden roller (木滾) that the calenderer's pedipulating tread rolled back and forth upon the cloth, which was set upon the trough-like

27 Xing et al, "Cloth processing in Suzhou and Songjiang": 171–2.

28 D. Li, "Guanyu Yapian zhanzheng qian SuSong diqu mianbu ranchuaiye de shengchan guanxi," *Xueshu yuekan* 12 (1987): 1–8, 1–2.

29 Xu Xinwu found that a dyer could dye 20–30 bolts of small cloth (20 *chi* long) a day (*Jiangnan tubu shi*) (Shanghai: Shanghai Classics Press, 1981: 377), but *The Cloth Classic* says that a dyer working with pale colors could dye 50 bolts a day. Dyeing productivity per day or bolt is hard to calculate because unlike the discrete task of calendering, dyeing involved several repeated steps (boiling the dyestuff, soaking the cloth, rinsing the cloth, wringing the cloth, hanging it out to dry). For the many steps involved and the long hours worked by the dyers, see Xu, *Jiangnan tubu shi*: 377; C. S. Hsiung and W. G. Sewell, "General Survey of Dyehouses in Chengtu." *Journal of the Society of Dyers and Colourists* 55.8 (1939): 416–8, 416.

30 Li, "Guanyu Yapian zhanzheng qian SuSong diqu mianbu": 1, citing *Ming shi lu*, juan 361.

31 Y. Wang et al, "Qingdai zhiranju ranse fangfa ji secai." *Lishi dang'an* 2 (2011): 125–7; Hsiung and Sewell, "General Survey of Dyehouses in Chengtu": 416; X. Chen, *Zhongguo fengjian wanqi de shangpin jingji* (Hunan: Hunan remin chubanshe, 1989): 109–110.

32 Li, "Guanyu Yapian zhanzheng qian SuSong diqu mianbu": 6, citing Zhejiang Governor Li Wei 李卫 (July 25, 1730), *Yongzheng zhupi yuzhi* 雍正朱批谕旨, ce no.42, p.77.

hollow of a stone base plate (石板).[33] When this finishing technique began is debated and early methods of using stone to impart a sheen may have existed.[34] But use of the three-part set does not seem to emerge until the Ming—the earliest written account is Song Yingxing in the mid-seventeenth century—and it provided an important technology, not just for adding shine, but also for making the material smooth and tight.[35] Unlike dyeing and printing where, as shall be seen, innovations did occur, no major modifications were made to calendering technology between the late Ming and late Qing.[36] The records of calenderer numbers combined with evidenced productivity of calenderers allow for approximate estimates for the quantity of cloth being processed by these workers. If we suppose a 270-day work-year and productivity of 11 bolts per day, 10,000 workers could calender 29,700,000 bolts. Supposing a 210-day work-year would result in 23,100,000 bolts.[37] Given that not all cloth was calendered, these conjectured productivity figures of 23–30 million bolts per year seem realistic for Jiangnan's estimated annual production of 45 million bolts.[38]

33 R. P. Hommel, *China at Work: An Illustrated Record of the Primitive Industries of China's Masses, Whose Life is Toil, and Thus an Account of Chinese Civilization* (Boston: MIT Press, 1969): 191. European calendering used a large mangle box, pulling rollers over on a flat bed, operated either with horsepower (English model) or a man-powered treadmill (Dutch model). See Mitchell, "'Good hot pressing is the life of all cloth'".

34 Cheng, ed. *History of Textile Technology*: 342; Yu and Huang, "Ming Qing Jiangnan zhibu jishu de lilunhua," p.567. Calendering is distinct from "fulling cloth" (搗衣), a processing step recorded in many Tang and Song poems whereby ramie or silk cloth was pounded with a wooden mallet to soften the fibers, stiff from weaving or washing. Silk fabrics were also calendered (Hsiung and Sewell, "General Survey of Dyehouses in Chengtu": 418).

35 Song, *Tiangong kaiwu*: 42. "Cloth clothing"; Chu, *Mumian pu*: 16.

36 Xing et al, "Cloth Processing": 215; Chao, *The Development of Cotton Textile Production*: Chap. 3.

37 Li Bozhong assumes 270 days per year (*An Early Modern Economy*: 101, n89). Allen et al. assume 250 days of work per year ("Wages, prices, and living standards in China, 1738–1925: in comparison with Europe, Japan, and India." *The Economic history review* 64. S1 (2011): 8–38, 26). Pomeranz assumes 210 day of work per year, which seems more appropriate given the contingent nature of wage labor in this period (*The Great Divergence*: Appendix E).

38 Not all cloth was calendered: if darker shades were calendered, the color would be lost, and so apparently, it was mainly pale colored cloth that was calendered. Similarly, bleached cloth was only minimally smoothed. (Wu and Xu, "Su Song mianbu jiagongye Zhong de ziben zhuyi mengya": 403). There were 3 kinds of calendering: double-faced (双面光), single-faced (单面光), flat-shine (平光) (Xu, *Jiangnan tubu shi*: 376). Timovsky's account of the 1820–1 Russian mission to Beijing described six different qualities of cotton cloth sold in Beijing. The price for a 14 *chi* length of dressed *Kitaika* was 1.6–1.7 *taels*, compared to 1 *taels* for the same length, undressed (Timkowski (E. F. Timovsky), *Travels of the Russian Mission through Mongolia to China* (London, Longman, 1827): 175–6). "Dressed" likely describes calendering, so, leaving aside the fact that Timovsky was clearly being charged foreigner prices, evidently it was possible to purchase uncalendered cloth.

FIGURE 2 Qiu Ying 仇英, "Along the River at Shangming" (*Qingming shanghe tu* 清明上河圖), Detail showing Dyeshop (*Ran fang* 染坊), after Shan Guolin 单国霖 ed., *Zhang Zeduan, Qiu Ying "Qing ming shang he tu" shi huo jie du* 張擇端, 仇英 "清明上河图" 釋惑解讀 (An Explanation and Interpretation of Zhang Zeduan and Qiu Ying's Along the River at Shangming) (Beijing: Wenwu chubanshe, 2020), p. 7

Originally the finishing shops combined dyeing and calendering, as visualized in an image of a dyework (染坊) from Qiu Ying's (1494–1552) version of the Song dynasty urban scroll, *Along the River at Shangming*, updated to depict Ming-period Suzhou (Fig. 2). A calenderer treads away, steadied by the wooden frame, while another worker hangs out the dyed cotton on high scaffolds in front of the shop. But during the early eighteenth century, the dyers and the calenderers gradually separated.[39] The dyeworks moved away from the western Chang Gate's Shang and Xiatang streets, where the silk and cotton shops

39 B. Duan and Q. Zhang, *Suzhou shougongye shi* (Nanjing: Jiangsu Guji Chubanshe, 1986): 60.

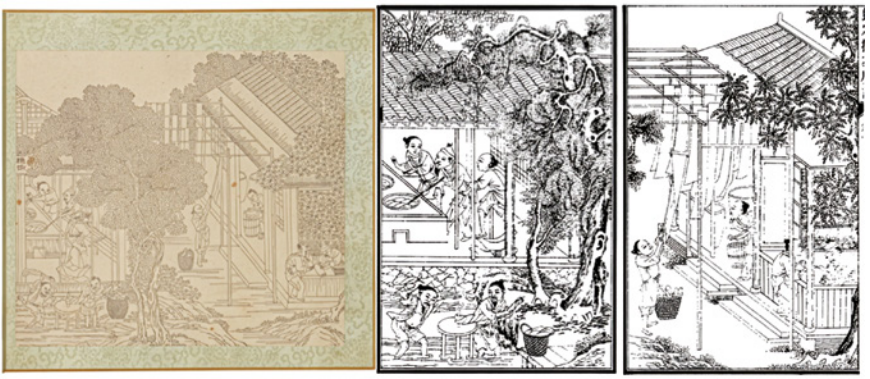

FIGURE 3 Fang Guancheng 方觀承, "An Imperially Inscribed Illustrated Guide to Cotton" (*Yiti mianhua tu* 御題棉花圖), woodblock print, ca. 1765, no. 16. "Dyeing cloth" (*Lianran* 練染)

were located, to the Suzhou suburbs around Tiger Hill.[40] Natural dyers required a lot of water and the move was likely to gain access to the waterway: mid-Qing sources describe how their presence caused environmental degradation, filling the Shangtang to Tiger Hill riverway with "blue, red, black, purple." In 1737, local residents petitioned against the dyeworks on the grounds that they were polluting the water supply and harming both crops and the Tiger Hill scenic spot, leading the authorities to ban the dyeworks from the area; thereafter the dyeworks moved to Lou Gate (northeast), with the calenderers still sited in Shangtang.[41] Despite this separation, later visualisations of cloth finishing continued to place the two together, whether elite prints like Fang Guancheng's (1698–1768) *Imperially Inscribed Illustrated Guide to Cotton*, prepared for submission to the emperor in the mid-eighteenth century (Fig. 3), or vernacular prints like "The Gods Mei and Ge" (Fig. 4) depicting a busy dyework watched over by the dyer's guild gods, Mei Fu 梅福 and Ge Hong 葛洪.[42] The continued framing of calendering and dyeing together reflected understandings of cloth finishing as men's work, unlike the preceding steps of cloth-making.

40 (Qianlong) *Changzhou xian zhi*: juan 11.

41 Jiangsu sheng bowuguan ed. *Jiangsu sheng Ming Qing yilai beike ziliao xuanji* (Xinhua shudian, 1959): 60; H. Dunstan, "Official thinking on environmental issues, and the State's Environmental Roles in Eighteenth-Century China." In *Sediments of Time: Environment and Society in Chinese History*, ed. M. Elvin and T. Liu (New York: Cambridge University Press, 1998): 585–614, 609.

42 Q. Li, *Zhongguo hangye shen* (Taibei Xian zhonghe shi: Yunlong chubanshe, 1996): *shang juan*, 255–8.

FIGURE 4 Anon, "The Gods Mei and Ge" (*Mei Ge xianweng* 梅葛仙翁), National Library of China 中国国家图书馆. http://catalog.digitalarchives.tw/item/00/12/50/d8.html (downloaded 2025/10/16)

Types of Cotton Fabric

Though the Chuangsha gazetteer text is hyperbolic, there were certainly many kinds of cotton cloth, and sorting the multitude of names and types is challenging.[43] One sympathizes with the seventeenth-century editor of the *Songjiang Gazetteer* who threw up his hands: "the list is inexhaustible."[44]

43 Chao, *The Development of Cotton Textile Production*: 22.
44 (Chongzhen) *Songjiang fu zhi* (1631): 6.10b.

Still, the work of Nishijima Sadao and Fan Jinmin has enabled detailed analysis and, when read alongside other local gazetteer "local products" listings, it becomes apparent that the Chuansha text's cloths were categorised by both kind and market.[45]

There were three basic criteria by which cotton fabrics were distinguished: dimension, quality, and patterning. Cotton cloth dimensions had initially been a matter of state control, but after the mid-Ming single-whip tax reforms, the cloth collected by the government was converted to silver and measurements stopped being a concern for tax purposes.[46] However, as long-distance markets for cloth expanded, cloth dimensions began to be standardized in order to satisfy different marketing region's specifications. Thus, "standard cloth" (also known as "large cloth"), a Jiangnan cloth that the early Qing Songjiang writer Ye Menghzu describes being sold to the north (Shanxi, Shaanxi, and Beijing) in considerable quantities, measured 20 *chi* in length, 1.2 *chi* in width, and weighed 18–20 *liang*.[47]

However, it is evident that there were many variations of dimension. This description, from a late Qing local gazetteer of Jiangsu's Wujin and Yanghu counties, is typical:

> "Wide cloth" has a width of 1 *chi*, 8–9 *cun*, and it comes from the villages around Wujin. "Shop cloth" has a width of 1 *chi*, 3 *cun*, and a length of 3 *zhang*, 6 *chi*; that called "Western shop" is fine, and it comes from the

45 N. Sadao, "The Formation of the Early Chinese Cotton Industry." In *State and Society in China: Japanese Perspectives on Ming-Qing Social and Economic History*, ed. L. Grove and C. Daniels (Tokyo: University of Tokyo Press, 1984); J. Fan, "Ming Qing Jiangnan shangye de fazhan" (Nanjing daxue chubanshe, 1998). The following discussion is based on a survey of the following gazetteers: (Zhengde) *Songjiang fuzhi* (1512): juan 5; (Chongzhen) *Songjiang fuzhi* (1631): juan 6; (Qianlong) *Pinghu xianzhi* (1745): juan 1; (Qianlong) *Baoshan xianzhi* (1746): juan 4; (Qianlong) *Jinshan xianzhi* (1751): juan 17; (Qianlong) *Nanhui xianzhi* (1751): juan 15; (Qianlong) *Jinshan xianzhi* (1752): juan 17; (Qianlong) *Louxian zhi* (1788): juan 11; (Jiaqing) *Zhuli xiaozhi* (1813): juan 4; (Daoguang) *Suzhou fuzhi* (1824): juan 18; (Guangxu) *Chuansha tingzhi* (1879): juan 4; (Guangxu) *Wujin Yanghu Xianzhi* (1879): juan 2; (Guangxu) *Jiading Xianzhi* (1882): juan 8; (Tongzhi) *Suzhou fuzhi* (1882): juan 20. Also M. Ye, *Yue shi bian* (17th century, Reprint, Shanghai: Shanghai guji chubanshe, 1981): juan 7.

46 T. Wang, "Lun Ming Qing shiqi Jiangnan mianzhi ye de laodong." *Zhongguo jingji shi yanjiu* 2 (1993): 91–98, 91–2, n3; H. Zurndorfer, "Cotton Textile Manufacture and Marketing in Late Imperial China." *Journal of the Economic and Social History of the Orient* 54 (2011): 701–738.

47 M. Ye, *Yue shi bian*: juan 7.

> villages around Yanghu. "Menzhuang" cloth has a width of 9 *cun*, and a lengthy of 2 *zhang*, 2 *chi*, it comes from the villages around north Wujin[48]

The diversity of dimensions suggests local markets serving smaller marketing radiuses. Consider Zhang Chunhua's distinction between different cloths in his *Seasonal Folk Songs of Shanghai*: "Fine cloths are known as "pointed" and have names like "Dragon Glory point" and "Seven Treasures point". "Dragon Glory" is the name of my town. Seven Treasures is now under the jurisdiction of Qingpu." But he noted, "That cloth *which travels far* is known as 'Standard cloth': in Shaanxi and Shanxi provinces, branches have been set up in Yiguang to collect them, and they are called 'sitting branches'."[49] Zhang's identification of commercial cloth that "travels far" highlights the need to distinguish between different markets, something obscured by the "72 kinds" nomer. Many cloth types did not get traded beyond local or provincial borders, hence the great number of localized names which did not achieve more widespread repute, and hence the lack of standardization: widespread circulation served to standardize dimensions. Liu Xiusheng's study of local products listings in local gazetteers showed that in the eight provinces where cotton weaving was common, 423 out of 529 counties produced cotton cloth (70.6%), and therefore were self-sufficient without need to import cloth from outside. Of those 423 counties, 332 (78.5%) produced "commercial cloth" (商品布), and 122 (37.9%) of those exported their cloth. As he observed, the fact that such a large proportion of the population did not need to turn to the market for their cloth must have limited the growth of the Qing cotton industry.[50]

One of the best illustrations of which cotton fabrics did achieve national circulation are the signs found in the sixth *Qianlong Southern Inspection Tour* scroll, produced by Xu Yang (ca. 1712–after 1779), between 1764 and 1768 (Fig. 5). The cotton shops use marketing language like "true-blue" (真青) and "extra-long" (放长) to promote their wares: "(Our store) buys and sells cotton fabric, and dyes fabrics in true-blue, crimson, and sand-green, weaving extra-long textiles and selling homespun cloth from Chongming," "We dye cloth in all kinds of bright colors for customers," "Our cloth store dyes cloth in true-blue, extra-long bolts of standard cloth, reed cloth and shuttle cloth".[51]

---

48 (Guangxu) *Wujin Yanghu Xianzhi*: juan 2, *tuchan*, 43 (1879) edition, reproduced Xu, *Jiangnan tubu shi*: 545–6. 1 *zhang* = 10 *chi*. 1 *chi* = 10 *cun*.

49 C. Zhang, *Hucheng suishi quge* (Shanghai: Shanghai zhanggu congshu, 1936): 19. My italics.

50 X. Liu, "Qingdai mianbu shichang de bianqian." *Zhongguo shehui jingjishi yanjiu* 2.2 (1990): 54–61, 56.

51 See Silberstein, *A Fashionable Century*: Appendix 2, for a list of the translated shop signs.

FIGURE 5 Xu Yang, "The Qianlong Emperor's Southern Inspection Tour" (*Qianlong Nanxun tu* 乾隆南巡圖), Scroll Six: Entering Suzhou along the Grand Canal. dated 1770. Handscroll; ink and color on silk, 27 1/8 × 784 1/2 in. (68.8 × 1994 cm). Metropolitan Museum of Art, Purchase, The Dillon Fund Gift, 1988 (1988.350a-d). Detail showing "Our cloth store dyes cloth in true-blue, extra-long bolts of *biaobu*, *koubu* and *suobu* cloth" (本號加染真青，加長標扣梭布，布行)

Though not a documentary record, the signs highlight those types of cloth which *did* achieve national repute, allowing them to be marketed to different regions: the aforementioned wide "standard cloth"; the narrower "reed cloth" (also known as "small cloth"); and "shuttle cloth" (梭布).[52]

All three of these were higher-quality cloths, with quality determined by both weave and quality of yarn. The signs do not mention lower-quality cloths like "middle loom" (中機), a thinner cloth that became an important product for Songjiang manufacturers selling to the south, following the decline of "standard cloth" sales to the north.[53] Nor do they mention the cloths sold to overseas markets: nankeens (紫花布), a high-quality cloth sold to European

52 On "reed cloth", see X. Ke, *Qing bai lei chao* (Shanghai: Shangwu yinshuguan, 1917): "wupin lei," 85. On "shuttle cloth", see Chao, *The Development of Cotton Textile Production*: 49.

53 Lu, "Arrested Development": 485; Zurndorfer, "Cotton Textile Manufacture": 713–4; Z. Zhang, *Shanghai: cong kaifa zouxiang kaifang, 1368–1842* (Kunming, 1990).

and American consumers through Canton; or *Kitaika*, a more costly calendered cloth, and *Daba*, a cheaper, coarser cloth, sold to Russian markets through Kiakhta.[54]

In general, cotton fabrics like "three-shuttle cloth" (also known as "three yarn cloth" 三紗布, "flying flower cloth" 飛花布, "Maiden Ding cloth" 丁娘子布) or "eyebrow knit cloth" (眉織布) that gained a reputation for higher quality appear to have done so on the grounds of finer yarn and weaving rather than color or pattern. The patterned cloth types included in the Chuansha text were achieved through weaving—either with single color or dyed yarn—and printing. Cotton weavers used the single person-operated horizontal treadle looms, rather than the two person-operated drawlooms that patterned silks, so patterned weaves were created by adding more treadles and harnesses.[55] In his early nineteenth-century treatise on cotton-making, *Mumian pu* 木棉譜, Chu Hua (fl.1784) described the finest cloth, "Flying flower cloth" (飛花布, also called "Maiden Ding cloth" 丁娘子布), which was produced in Sanlintang 三林塘. He highlighted three woven variations: diagonal patterns known as "twill weave" (斜紋); overlapping-rhombus pattern (方勝紋) known as "square pattern" (整文); and raised rib patterns known as "Goryeo cloth" (高麗布).[56]

Cloth was also patterned by weaving with dyed yarn to create colored checks and stripes. The "snowy inside blue cloth" (雪裏青布) and "bean patterned cloth" (豆子花布) listed in the Chuansha text as being produced in the home are both examples of this. It is possible that they were using imported Western machine-spun yarns, the large influx of which contributed to this period's expansion of cloth types: neither cloth type features in gazetteers or literary descriptions prior to the turn of the nineteenth century, suggesting they might represent a late Qing-early Republic aesthetic.[57]

Finally, printing (印花布) was also used to pattern cotton cloth, providing an important route to pattern and color for those who couldn't afford the more

54 Nankeens were made from a higher quality cotton variety that was harder to grow and yielded half the crop making it more expensive. 60 million bolts of nankeens were exported from Canton between 1736–1833, and rose from 0.38 taels (p/bolt) in 1772 to 0.5–0.6 taels in the late eighteenth century, sometimes reaching 0.7–0.8 taels in the early nineteenth century, once the Americans become dominant buyers. See Silberstein, "Threads of Commerce and Consumption".

55 Chao, *The Development of Cotton Textile production*: 71.

56 Chu, *Mumian pu*: 14. The term Goryeo cloth originally described a finely-woven ramie cloth imported from Korea as early as the Song period. But it later became a more general term for imported high-quality cotton cloth and was also produced in imitation in Jiangnan. See Y. Sun, "Ming Qing shiqi de "Gaoli bu."" *Gudai wenming* 4 (2023): 134–141.

57 Xu, *Jiangnan tubu shi*: 584.

expensive silk fabrics. The lack of records and surviving objects has impeded fuller investigation of cotton-printing traditions during the Ming and Qing dynasties but they included tie-dye (绞缬), wax-resist (蜡缬), clamp-resist (夹缬) and ash-resist (灰缬) techniques.[58] The Chuansha text specifies printing as a workshop activity, and during the early Qing, Suzhou cotton cloth printers (苏印) became renowned for their printing. Jiangsu and Zhejiang rural workshops specialized in the technique of resist-paste stencil-printed cloth (绞花布), also known as "medicine spot cloth" (药斑布), where resist pastes of plant ashes or lime, glue, and alum were applied to the cloth through a wooden stencil, before submerging the cloth in an indigo vat to create a blue and white printed design. Also, though very few examples survive, it is evident that woodblocks were also used to print designs of multiple colors on cloth, something also described by Chu Hua.[59]

Notably, though the Chuansha gazetteer text lists "printed cloth", along with "scraped nap cloth" and "calendered cloth" as marketed by merchants, the *Cloth Classic* largely focuses on dyed cloth, rather than patterned cloth, perhaps because higher volume could be achieved there. The innumerable local names highlight the difference between local, national, and international markets. Naming was concerned with recognition: Jiangnan's textile producers could only sell throughout China if they could achieve product repute. Some products—"standard cloth" or nankeens did achieve this through reliable quality, consistent coloring, and standardized measurements. But the wide range of measurements points to the importance of understanding some of these styles in terms of local products produced for local markets. Of course, the absence of evidence is not evidence of absence, but it is suggestive, especially in contrast with silk fabrics where more sources reveal marketing of color, weave, or producer across long-distance marketing regions.[60] For cotton, it is much harder to argue that those cloths that did achieve national or international circulation gained their reach through pattern or fashion. To understand why this should be, we turn to the merchant and their branding strategies.

58 On printed cottons see Chu, *Mumian pu*: 14; K. Tsang, *Touched by Indigo: Chinese Blue-and-White Textiles and Embroidery* (Toronto: Royal Ontario Museum, 2005); Xu, *Jiangnan tubu shi*: 584; S. Wu and Z. Tian, *Zhongguo ranzhi shi* (Shanghai: Shanghai renmin chubanshe, 2019): 257–260, 296–299.

59 For a rare example of cotton cloth wrappers (包袱) woodblock-printed in several colors and collected in 1857 Shanghai, see R. Silberstein, "The Material Lives of Ordinary People" (National Museums Scotland).

60 Silberstein, *A Fashionable Century*: 71, 74, 91–100.

The *Zihao* Merchant and the Finishing Workshops

The cotton industry featured various types of merchants, including "guest merchants" (客商) from outside the Jiangnan region, and local brokers (牙行) who purchased the cloth produced in villages and market towns.[61] The wealthiest and most dominant merchant groups were from Shanxi and Huizhou, and during the early seventeenth century, some were reputed to possess capital of 10,000 taels of silver, which purchased 50,000 bolts per year, meaning average prices of 0.2 taels.[62] Jiangnan's cotton cloth output roughly doubled between the sixteenth and eighteenth centuries, from around 20 million to 45 million bolts, and we lack reliable information on the level of capitalization in the latter period, but this output does indicate the potential numbers involved: if purchasing at this highest level of 50,000 bolts a year (and obviously most would not have done), Jiangnan's output would have supported 900 merchants.[63] In order to compete, some merchants opened stores in Suzhou, outside Chang Gate, as described in a mid-eighteenth-century text that emphasizes their associations with finishing stages: "The cotton brands are commonly called *zihao* (字號). Their shops are situated around Chang Gate; their bleaching and dyeing is excellent."[64] To distinguish their cloth in national markets, the *zihao* sent the cloth to dyeworks who returned the cloth with the brand name printed upon each bolt's loomhead (機頭). Unlike silk where we have several extant branded silk lengths, as well as examples of branded packaging paper or advertisements, to my knowledge, none of these branded cotton lengths survive.[65] The main textual evidence comes from a tale by Xu Zhongyuan, describing how Wang Yimei, one of the renowned Xinan merchants (新安汪氏) from Huizhou and Anhui, paid the tailors (衣工) to use his Yimei branded

61 X. Xu, "Ming Qing mianbu shangren ziben leixing fenxi" (Shanghai: Shanghai shehuikexueyuan chubanshe, 1999): 165–194.

62 Ye, *Yue shi bian*: juan 7. On the development of these different commercial figures and groups, see P. Chiu, "Shiba shijiu Su-Song mianbuye de guanli jiagou yu falü wenhua." *Jianghai Xuekan* 2 (2012): 143–57; Lu, "Arrested development"; B. K. L. So, "Overseas Trade and Local Economy in Ming and Qing China: Cotton Textile Exports from the Jiangnan region". In *Trade and Transfer across the East Asian 'Mediterranean'*, ed. A. Schottenhammer (Wiesbaden: Harrassowitz Verlag, 2005): 163–84; Zurndorfer, "Cotton Textile Manufacture".

63 On changes in cotton output and prices from the late Ming to late Qing, see Li, *Agricultural Development*: 109; C. Wu, *Wu Chengming ji* (Beijing: Zhongguo shehui kexue chubanshe, 2002): 206–7, Table 14.

64 (Qianlong) *Yuanhe xian zhi*元和县志 (1740), juan 16, comp. in Xu, *Jiangnan tubu shi*: 370.

65 For examples of branded packaging for silks, see Silberstein, *A Fashionable Century*: Chap. 3.

cotton cloth (益美字號). The tailors, being greedy for small profits, praised the cloth's beauty, and soon the market was crowded with those purchasing Yimei cloth. The calculated sales were one million bolts, with a profit of 100 *wen* per bolt. In ten years, Wang became rich and prosperous, and his cloth was sold "throughout the world".[66] Though it is often described as a novel, the text is a collection of anecdotes, and Wang Yimei's Cloth (汪益美布匹) clearly existed: it is included in guild steles as well as in Suzhou scholar Gu Zhentao's list of branded products. Still, his case merited inclusion in a book entitled *Jottings about Unusual Events* primarily as a tale of savvy marketing, and though it may be argued that names like Wang Yimei's cloth functioned as brand names, their usage is inconsistent.[67] The lack of surviving branded cotton cloth makes it difficult to know how or whether they used motifs or color, or whether the brands were more of a guarantee of quality for a particular grade of cloth. The legislative evidence for *zihao* brand names suggests only names were used, rather than signs or symbols: "Da Yuan Brand's cloth" or "Yong Sheng Brand's cloth".[68] From the late seventeenth century onwards, several stone stele inscriptions evidence efforts by Songjiang and Suzhou textile guilds to prohibit fraudulent brand names.[69] Such inscriptions served as a primary medium for recording and disseminating guild activities, and regulations sought to prevent names that infringed upon another *zihao*'s name by duplicating a character from the name. This endeavor resulted in Songjiang's Hall of Elegant Weavings Guild

66 Xu Zhongyuan, *Sanyi bitan:* In *Biji xiaoshuo daguan* (1828, Reprint, Chongqing chubanshe, 1926) *ce* 12: juan 3, 19, "Cloth Profits" (布利).

67 Wang Yimei appears in a guild dated to KX 32 (1693) (Jiangsu sheng bowuguan ed. *Jiangsu sheng Ming Qing yilai beike ziliao xuanji*: 36); Z. Gu, *Wumen biaoyin, fuji* (1943, Reprint, Nanjing: Jiangsu Guji Chubanshe, 1999): 351–2. See translations in Silberstein, *A Fashionable Century*: Appendix 2, Table D.

68 Hamilton and Lai, "Jinshi Zhongguo shangbiao yu quanguo dushi shichang". Here the *xingke tiben* theft cases are informative. In one case, Zhang A'yun and his accomplices stole 587 bolts of indigo-blue cloth, detailed as follows: "Fuxing Brand Gate low cloth, 57 bolts; Double blue cloth, 1 bolt; Dayuan Brand Bottom Gate cloth, 47 bolts; Double blue cloth, 2 bolts; Gate blue cloth, 80 bolts; Precious blue cloth, 392 bolts; Yongsheng Brand Double blue cloth, 6 bolts; 2 bolts of Kingfisher blue cloth for clothing". After stealing the bolts and 12.5 taels of dye money (染錢), the thieves were accused of pawning the cloth in various portions (for an average of 0.18 *taels* per bolt). 福興號門底布57疋, 雙藍布1疋 , 大元號們底布47疋, 雙藍布2疋,們青布80疋, 寶藍布392疋, 永盛號雙藍布6疋, 衣著翠藍布2疋. First Historical Archives, 02-01-007-021344-0014. I thank You Wang for sharing this example with me.

69 For examples, see Chiu, "Shiba shijiu Su-Song mianbuye"; Xu, "Ming Qing mianbu shangren ziben leixing fenxi": 172.

(綺藻堂布业公所) establishing a systematic list of cotton brand names (牌譜) to control their use in 1825.[70]

Zihao numbers seem to have peaked around the late Kangxi-Yongzheng period when 76 were recorded in 1697.[71] But a later gazetteer of 1761 described the *Zihao* as follows:

> Su cotton is famous throughout the land, those engaged in this business are based around Chang Gate on Upper and Lower Tang streets and they are called *zihao*: each (production stage) has a specialist: bleaching (漂布), dyeing (染布), inspection (看布), and sales (布行). Often several tens of families depend upon a single *zihao* for their livelihoods, so only those with money can engage in this trade.[72]

This is an important passage, for it outlines the different production stages involved, though unfortunately not with much precision. The *zihao* financed the dyehouse's capital requirements of cloth, dyestuffs, and workers by providing the cloth and paying a per-piece "wine fee", to be divided among the workers after the master dyer or boss had taken 20–30%. Late Qing Shanghai dyers interviewed by historian Du Li in the 1950s described how *zihao* representative calculated the processing fee in terms of dyestuff and labor per piece with the dyework. A middleman figure known as *Baotou* was responsible for preparing the equipment, tools, laborers, and location, providing firewood and rice, and controlling the laborers, mostly single men, who came into Suzhou from poorer regions in Northern Jiangsu or Anhui to sell their labor and had a reputation for unruliness.[73] *The Cloth Classic* also attests to this system: it

70 The "Qizao Tang buye zonggong suo paipu" is partially reproduced in Xu, *Jiangnan tubushi*: 362; X. Zuo, *Zhongguo jindai shangbiao jianzhi* (Shanghai: Xuelin chubanshe, 2003): 122–3.

71 J. Fan, "Qingdai Jiangnan mianbu zihao tanxi" (Nanjing, Nanjing daxue chubanshe, 2002).

72 (Qianlong) *Chongxiu Yuanhe xian zhi* (1761): juan 10, *fengsu*.

73 Xu, "Ming Qing mianbu shangren ziben leixing fenxi": 192; Xing et al, "Cloth Processing in Suzhou": 223–7; Li, *An Early Modern Economy in China*: 100. Their necessary strength to engage in the physically-demanding processing of cloth, together with the fact that they were single and without local families, seems to have given them a group consciousness, and a propensity to strike: of the 19 labor disputes recorded in Suzhou steles, 10 involved the calenderers and 5 involved the dyers, many concerned with the use of low-quality silver currency to pay wages. See Chiu, "Shiba shijiu Su-Song mianbuye": 156, n.30; also Y. Liu, "Shilun Qingdai Suzhou shougongye hanghui." *Lishi yanjiu* 11 (1959): 21–46, 37–8. Li, "Guanyu Yapian zhanzheng qian SuSong diqu mianbu": 3; C. Dietrich, "Cotton Culture and Manufacture." In *Economic Organisation in Chinese Society*, ed. W. E. Wilmott. (Stanford: Stanford University Press, 1972): 109–135, 130–1; On the *Baotou*, see the account

provides the information required to calculate processing fees and negotiate the dyeing contract ("General Principles of the Dye Workshop" 染坊總决), price lists for dyeing different lengths of cotton, broken down into dyestuff and labor costs, as well as "Market Prices for Dyes and Bleaches" and "Amounts of dye materials needed for dyeing all kinds of assorted colors per one hundred bolts of cloth".

This last section provides a breakdown of the dyeing costs for "extra-long Beijing blue cloth" showing that dyeing this basic indigo cloth cost 0.08 taels per bolt, including labor, dyestuffs, and water.[74] Though this information is helpful in indicating how much value dyeing added, it is of course a single observation and the changing price of cotton fabrics over the course of the Qing dynasty is a larger question beyond the remit of this paper.[75] Evidently there were sizable differences depending on the cloth quality: one 1631 Songjiang gazetteer listed a cotton cloth tax quota for fine cloth at 0.61 taels per bolt and coarse cloth rate at 0.3 taels per bolt.[76] However it is hard to find examples where one can com-

by Zhejiang Governor Li Wei 李卫. July 25, 1730 in *Yongzheng zhupi yuzhi* 雍正朱批谕旨, ce no.42, reproduced in Li, "Guanyu Yapian zhanzheng qian SuSong diqu mianbu": 6.

74 The text reads: "(To dye cloth) extra-long Beijing blue, the dyeing costs are 0.08 taels (8 *fen*) per bolt. The dyer's labor is 0.004 taels (4 *li*) per bolt, for the *bajiao* soaking and rinsing process, 4 cycles (*shuang*) altogether requires 10 *shao* of good vat water (*gang shui*) and this vat water costs 0.005 taels (5 *li*) of dye silver per *shao*, while the foot water (*jiao shui*) costs 0.002 taels (2 *li*) per *shao*. The silver used for the dyes should be reckoned according to the *yuansi* standard at a rate of 9 mace, 3 candareens to the tael, and the silver used for indigo is reckoned according to the *yuansi* standard at 8 mace, 8 candareens to the tael." 加長京青，染價每疋八分，匠工每疋四厘,扒脚，四爽約共好缸水十梢，其缸水每梢合染銀五厘，脚水每梢二厘。其染銀合元絲九三兑，靛銀元絲八八兑。*Yuansi* 元絲 referred to a type of commercial tael used in the Jiangnan region (I thank Matthew Lowenstein for help with this term) (*Bu jing*, "General Principles of the Dye Workshop" (染坊总决)). Assuming 50 bolts a day, 0.004 *taels* per bolt would mean a daily wage of 0.2 *taels* per day, including food. Subtracting 20% for rent and other expenses would mean 0.16 *taels* per day, substantially more than the calenderers received in 1772 (see Allen et al, "Wages, prices, and living standards in China": 10–11), reflecting the higher skill premium of dyeing.

75 That so little work has been done on textile prices, despite their importance in the market, second only to grain in commodity value, is perhaps explained by their challenges. Cloth prices appear in different units: bolts (匹), lengths (丈), and inches (尺), as well as in both copper (文) and silver (两) denominations. Sometimes cloth types are specified, sometimes not. Sometimes prices are detailed by year and place, sometimes by reign period, and sometimes neither time nor place is specified. Wu Chengming provides a good overview of basic cotton cloth prices in *Wu Chengming ji*: 205–209.

76 Sadao, "Early Chinese Cotton Industry": 53, n.122, citing (Chongzhen) *Songjiang fu zhi* (1631), 11:34a–37b.

pare the price of white and dyed cotton cloth at a specific time and place. Thus far, I have found only three examples: In late Qianlong (ca. 1790) Shandong, fish white cloth (鱼白布) cost 44 *wen* per chi, while deep blue cloth (深兰布) cost 58 *wen* per chi, a 1.3 markup for indigo-dyeing.[77] In 1812 Jiangsu, the approved purchase price for cotton cloth required by the Qing government was set at 0.14 taels per *zhang* for white shuttle cloth (白梭布), and 0.16 taels per *zhang* (10 *chi*) for shuttle cloth (梭布) of various colors, a 1.14 markup for colored cloth.[78] In Daoguang period (1820–50) Shandong, white bleached cloth (白漂布) cost 1200 *wen* per bolt and indigo-dyed cloth (青布) cost 1800 *wen* per bolt, a 1.5 mark-up for indigo-dyeing.[79] Moreover, nearly all the prices for dyed cloth are for indigo-dyed cloth, and there are few instances of a non-indigo cloth prices: red cloth cost 60 *wen* per *chi* in 1840, which would make it 1200 *wen* per bolt (assuming 20 *chi* per bolt), around 0.83 taels, over twice the cost of standard cloth, though this Daoguang-period price may be unrepresentative.[80] Still, if we assume a retail price of indigo-dyed cloth as 0.6 taels, then the dyeing costs of 0.08 taels represented 13%.

It might have been supposed that those cotton merchants who could invest in dyeworks and thus assert more control over these costs could create added value and so raise prices, an idea expressed concisely in *The Cloth Classic*: "Of all those hopeful of running a cotton brand business (*zihao*), only in the dyeshop can unlimited profit be extracted."[81] However the extent to which *zihao* directly invested in dyeworks is much debated. As one of the few places in the Qing textile industry where labor was concentrated in larger centralized production units, the finishing sector was of considerable interest to "Sprouts of Capitalism" historians who viewed the cloth-processing industry as the location of "embryonic capitalism". But there is little evidence of *zihao* merchants using capital to control raw materials or regulate the production pace: rather merchants made their profits outside the production process by circulating goods in markets.[82]

77 M. Huang, *Qingshi zhiyao* (Jinan: Shandong Qilu Press, 1990): 439.

78 Li, *An Early Modern Economy*: 174, citing *Qinding gongbu junqi zeli*, juan 44. During the late Ming and early Qing, the government was likely the biggest customer of blue cloth, purchasing thousands of bolts each year. Government prices were usually lower than market prices. See Duan and Zhang, *Suzhou shougongye shi*: 59.

79 Huang, *Qingshi zhiyao*: 439.

80 Li, *An Early Modern Economy*: 333, citing (Tongzhi) *Shanghai xian zhi*, juan 30.

81 *Bu jng*, "Kan maotou dalue zongyao" (看毛頭大畧總要).

82 Zurndorfer, "Cotton Textile Manufacture": 724; Xing et al, "Cloth Processing in Suzhou and Songjiang"; Li, "Guanyu Yapian zhanzheng qian SuSong diqu mianbu": 6.

Even if the *zihao* did not directly manage dyeworks, their capital provisions still exerted control: for large orders, the dyeworks owner borrowed funds from the *zihao* to purchase the dyestuffs and pay the workers, to be repaid after the cloth finishing was completed.[83] Unlike spinning and weaving tools (spinning wheels, spools, looms) which were simple, inexpensive, and widely accessible to weaving households; finishing equipment, which included dye vats, bamboo drying racks, stoves, and calendering sets, as well as space to dry the cloth, would have required some investment.[84] Du Li's interview with the wife of the owner of Wang Xiangxing Dyeing Workshop (王祥興染坊), which began in late Jiaqing period Songjiang, described a medium size shop with 17 craftsmen, 30 dyeing and bleaching vats, and 3 sets of calendering tools.[85] The main capital outlay were the calendaring stones, dye vats, craftsmens' pay, and the dyestuffs.[86] A small indigo dyehouse might have needed just one or two employees, but larger workshops employed several dozen workers. But there appears to have been little long-term contracting or formal ties between artisan and merchant: when business was booming, the workshop would hire dyers or calenderers; when business was slow, the craftsmen did not work. Hence the "wine-fee" style contracts where the merchant provided the funds for specific contracts using contingent, short-term labor.

Regulatory steles also suggest that many *zihao* did not invest in finishing workshops. Of the 63 signed dyeing businesses who signed a 1720 stele, only 18 (29%) were operated by *zihao* cloth merchants.[87] Instead it seems that most *zihao* preferred to subcontract work out to the cloth dyers and calenderers, rather than directly invest in their business. Xu Xinwu's investigations found

83 These calculations were done three times per year. Li, "Guanyu Yapian zhanzheng qian SuSong diqu mianbu": 3.

84 Some looms were marketed: Xu Family looms 机徐家布机 of Huangdu town 黄渡镇 in Qingu county were especially famous. (Xianfeng) *Huangdu zhenzhi* 黄渡镇志: juan 2, wuchan, 17, reproduced in Xu, *Jiangnan tubu shi*: 48.

85 Xing, "Cloth Processing in Suzhou and Songjiang": 223. Most dyeworks recorded in Xu Xinwu's compilation of historical sources had 20–30 workers (*Jiangnan tubu shi:* 370).

86 Li, "Guanyu Yapian zhanzheng qian SuSong diqu mianbu": 3; Xing et al, "Cloth Processing in Suzhou and Songjiang": 224; Hsiung and Sewell, "General Survey of Dyehouses in Chengtu": 416. On the cost of the stones, see Xu, *Jiangnan tubu shi*: 371; Song, *Tiangong kaiwu:* 42. "Cotton clothing". A single dye vat would have cost around one *shi* of rice—around 2 month's salary for a farm worker.

87 Since most of the steles related to calendering and dyeing are signed by cotton merchants (布商), and this 1720 (KX 59) stele, "染业呈請禁止犯詳文碑" is signed by *zihao* dyeworks (字号染坊), the names can be cross-referenced to determine which dyeworks were also cotton merchants (*Jiangsu Sheng Ming Qing yilai beike ziliao xuanji*: 58–60). See Li, "Guanyu Yapian zhanzheng qian SuSong diqu mianbu": 4.

that by the late Qing, most of the large *zihao* had set up their own dyeworks and some certainly did earlier: Fan Jinmin gives the example of one Wanfu *zihao* (萬孚字号), who appears twice on the steles, and operated the Golden Mansion Dyework (金宅染坊). Initially he sent the cloth out for dyeing, but poor-quality colors hampered sales, and so he opened his own dyework.[88] But equally, as the number of dyeworks expanded, sending one's cloth outside to dye perhaps became easier and cheaper than running a dyework yourself. To understand why this should be, note the follow-up line from *The Cloth Classic*, that the reason why the dyehouse was the most profitable stage: "Of all those hopeful of running a cotton brand business (*zihao*), only in the dyeshop can unlimited profit be extracted. *And the source of this lies entirely in examining the cloth*." The skill to examine the cloth and thus determine the most appropriate finishing path for that cloth was the expertise of the so-called "cloth-examining friend" (看布朋友), the middlemen employed by the *zihao* to go to market towns to inspect, purchase, and transport cloth to the workshops to be dyed and calendered.[89] It is the cloth-examining friend's knowledge that is represented in *The Cloth Classic*, and as will be shown, the expansion of dye colors was predicated upon this knowledge. Or, as *The Cloth Classic* put it, "The person who inspects the white cloth is the backbone of the *zihao*."[90]

Expanding the Color Options

As visualized in Fig. 4, the dyers' guild gods were Mei Fu and Ge Hong, both historical figures associated with alchemy who were also worshipped by the papermakers, medicine, and pharmacy guilds. The sectors shared the use of pigments and vats, and a reliance on unpredictable substances for which it was desirable to appeal to gods to control; and all grew, in part, due to increased understanding of materials and the expansion of dyestuff trade.[91]

These dyestuff materials were originally, and to some degree continued to be, rooted in local ecosystems. The "sand green" color mentioned in Suzhou's shop signs was derived from the bark and leaves of a green wood produced

88 Xu, "Ming Qing mianbu shangren ziben leixing fenxi": 191; Fan, "Qingdai Jiangnan mianbu zihao tanxi": 92–3.

89 Also known as "cloth masters" (布师), or "master merchants" (贾师).

90 *Bu jing*, "General Principles for the *Zihao* Examining White Cloth".

91 Li, *Zhongguo hangye shen: shang juan*: 255–8; Tsang, *Touched by Indigo*: 13. Xu, *Jiangnan tubu shi*: 374, 377; Cheng, *History of Textile Technology*: 97–103, 310–20, Han and Quye, "Dyes and Dyeing in the Ming and Qing Dynasties": 58. Fan and Jin, *Jiangnan sichou shi yanjiu* (Beijing: Nongye Chubanshe, 1993): 386.

in south Wujin and Yanghu.[92] Similarly Li Dou's investigation of Jiangnan dyers in *The Pleasure Boats of Yangzhou* listed numerous examples of dyes that derived their name from producer place name or locally-grown dyestuffs: "Huai'an red" (淮安紅), "Mianyang blue" (沔陽青), "Chao blue" (潮藍), or "Sui blue" (睢藍).[93] Thus, the kind of specialist techniques evidenced in *The Cloth Classic* are best understood as emerging from what Alka Raman in a study of Indian indigo-dyeing describes as a "synergy between the local environment, raw materials, and artisanal skills".[94] However *The Cloth Classic* also shows how Jiangnan dyers were also being supplied with dyestuffs from further off places, demonstrating the impact of expanded trade on Qing cotton dyers.

This is certainly the case for indigo. The huge amounts of indigo needed by Jiangnan dyers meant that local supply was insufficient, nor was it as good quality as that of Fujian. *The Cloth Classic* describes several different indigos, including Jianning 建宁, the most renowned of the Fujian indigos, as well as Jiangxi, Hubei, Hunan, and Zhejiang, "rural indigo," and "foreign blue".[95] However, *The Cloth Classic* suggests more widespread increased usage of certain dyestuffs through expanded trade. Figure 6 shows a detail from a rare early eighteenth-century Suzhou woodblock print, depicting the commercial heart of Suzhou just at the point where the finishing sector was starting to take off. The detail shows a dye material shop, "Sappanwood, Alum, Gallnut, and Cork Tree Trade" (蘇木，礬，培，黃柏行). It is interesting that the sign singles out these dyestuffs, for three of them also appear in a section on key dyestuffs in *The Cloth Classic*. This section, entitled "Various Locations for Sourcing Dyestuffs" (各樣顏色道路地名), outlines the best locations for sappanwood, pagoda bud, Chinese cork tree, and safflower (also the mordant, green alum) with different qualities listed and local names specified. Along with (Sichuan) gallnut (川棓, *Melaphis chinensis*), these dyestuffs were the most commonly used in *The*

92 (Guangxu) *Wujin Yanghu xian zhi*武進陽湖縣志, juan 2, tuchan, p.43 (1879) edition, reproduced Xu, *Jiangnan tubu shi*: 545–6. This claim seems dubious given the universal lack of a single, light-stable natural green dye, see Han and Quye, "Dyes and Dyeing in the Ming and Qing Dynasties": 55.

93 D. Li, *Yangzhou hua fang lu* (1793, Reprint, Beijing: Zhonghua Shuju, 1960): juan 1, p. 30, 'The Jiangnan dyeworks'.

94 A. Raman, "Before Arsenic: Recovering a Forgotten Indian Technique of Painting with Indigo and its Implications for Knowledge Transfer," *Technology and Culture* 66.2 (2025): 509–534.

95 *Bu jing*, n.p. "Renowned indigo-producing places in Jiangxi" (江西出靛道路地名); On indigo, see E. Watson, *The Principal Articles of Chinese commerce* (*import and Export*), *with a Description of the Origin, Appearance, Characteristics, and General Properties of Each Commodity* (Statistical Department of the Inspectionate General of Customs, 1930).

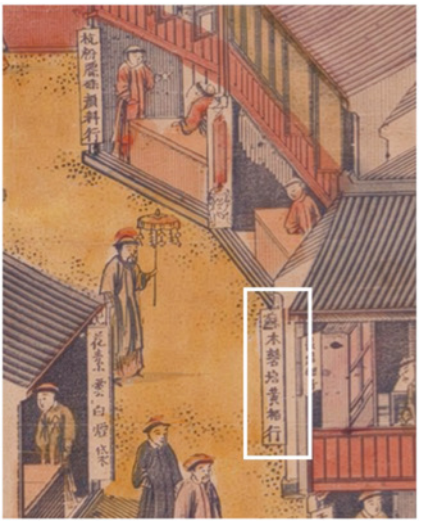

FIGURE 6
Baohuixuan zhuren, "Chang Gate of Gusu" (*Gusu Changmen tu* 姑蘇閶門圖), 1734, Woodblock print with hand colouring, Umi-Mori Art Museum, Hiroshima, Japan. Detail showing "Sappanwood, Alum, Gallnut, and Yellow Cypress Shop" (*Sumu, Fan, Bei, Huangbo hang* 蘇木，礬，培，黃柏行)

Cloth Classic.[96] Indeed, although 21 substances are mentioned in total, these five dyestuffs are by far the most commonly used, as shown by **Table 1** which lists the dyestuffs used for the 68 colors listed in *The Cloth Classic*.[97] Gallnut, pagoda bud, sappanwood, Chinese cork tree, and safflower were used in 24, 18, 17, 9, and 7 of the recipes respectively.

The intensified use of certain dyestuffs is interesting for considering to what extent the Qing textile sector was sourcing raw materials from outside China, for example through the *Nanyang* trade with Southeast Asia or the Canton trade with Europe. In fact, most of the six dominant dyestuffs highlighted in *The Cloth Classic* came from within China.[98] The alum mordant, Ferrous sulphate (青礬), came from Shandong and Henan. Gallnut came from Zhejiang, Henan, Shanxi, Sichuan, and Shandong. Chinese cork tree (黃柏, *Phellodendrum*), used to dye yellows, beiges, and browns, was sourced from Sichuan. Pagoda bud (槐米, *Sophora japonicus*), used to dye yellows, was sourced from Jiangxi. Safflower (紅花, *Carthamus tinctorius*), a red dye, was sourced from Zhejiang,

96 The recipe for "Capital red" (京紅) calls for "southern gallnut" (南倍).

97 On Sichuan as a renowned dyestuff producer, see Sewell et al, "The Natural Dyes of Szechuan, West China", *Journal of the Society of Dyers and Colourists* 55.8 (1939): 412–415, 412. There are an additional six bleaching recipes.

98 *Bu jing*, n.p. "Place names and sources for all kinds of colors" (各樣顏色道路地名). Basic information on all these dyestuffs can be found in Watson, *The Principal Articles of Chinese Commerce*. Fan Jinmin briefly outlines the dyestuff trade in *Ming Qing Jiangnan shangye* (82–3). For an early Republican account of dye sources, see Z. Chi et al, *Beiping shi gongshangye gaikuang* (Beiping: Beiping shi shehuiju, 1982): 291–2.

TABLE 1 Recipe lists of Dyestuffs, Mordants, and Additives listed in the Bu Jing (ca.1780–1850)

	Dye name		"Dyed on the foot of"	White alum	Green alum	(Sichuan) Gallnut	Guang-dong ash-lye	Pagoda bud	Sappan-wood	Chinese cork tree	(Sichuan) Safflower
				白礬	青礬	川棓	廣灰	槐米	蘇木	黃柏	川紅花
	Number of recipes using		**16**	**30**	**26**	**24**	**22**	**18**	**17**	**9**	**7**
1	Capital red	京紅		3		8	0.5		60		
2	Brown	棕色		3	4 *liang*	7	0.5		18		
3	Purple sandalwood	紫檀		3	4 *liang*	7	0.5		18		
4	Sauce colour	醬色		3	3.5	7	0.5		18		
5	Iron colour	铁色		3	4.5	7	0.5		18		
6	Autumn colour	秋色		8	6.5	3	0.5		3		
7	Eaglewood	沉香		8	5	4	0.5	33			
8	Medium shine	中明		8	6	4	0.5	30			
9	Round eyes	圓眼		8	6	3	0.5	25			
10	Tea-leaf green	茶葉綠		8	3	3	*	20			
11	Ink green	墨綠	True blue	5	4	4		25			
12	Aqua green	水綠	Moon white								
13	Bean green	豆綠	Deep trea-sure blue	7			0.5	25			
14	Willow green	柳綠	Dark moon white	7			0.5	25			
15	Official green	官綠	Treasure stone blue	7			*	25			
16	Oil green	油綠	Kingfisher blue	8	5		*	30			
17	Melon green	瓜綠	Green moon white	*				25			
18	Capital green	京綠	Double blue	6		3		30			
19	Bright green	明綠	Dark moon white	3		3	*	25			
20	Bamboo green	竹綠	Dark moon white								

	Chinese burberry	Smoked Plum	Raw charcoal ashes	Alkali	Vat liquor	Tur-meric	Acorn	Orchid petals	Plum bark	Hemp oil	Winter Reed	Beijing Glue	Ink	Cin-nabar	Rice-straw ash lye
	蘆米	烏梅	生炭灰	明碱	缸汁	姜黄	象斗	斛皮	梅皮	蔴油	冬芦泥	京膠	墨	硃硃	稻柴灰水
	7	7	7	6	6	5	4	4	2	2	1	1	1	1	1
					*										

TABLE 1 Recipe lists of Dyestuffs, Mordants, and Additives listed in the Bu Jing (ca.1780–1850) (*cont.*)

	Dye name		"Dyed on the foot of"	White alum	Green alum	(Sichuan) Gallnut	Guang-dong ash-lye	Pagoda bud	Sappan-wood	Chinese cork tree	(Sichuan) Safflower	
				白礬	青礬	川棓	廣灰	槐米	蘇木	黃柏	川紅花	
	Number of recipes using		**16**	**30**	**26**	**24**	**22**	**18**	**17**	**9**	**7**	
21	Goose yellow	鵝黃										
22	Gold yellow	金黃		7			水					
23	Guest yellow	客黃		6				25				
24	Apricot yellow	杏黃		5					4			
25	Bright yellow	明黃										
26	Ox wool	牛羰			9	8						
27	Mouse fur	鼠毛			6							
28	Bronze	古銅			3	5	*	3				
29	Foreign yellow	蕃黃		5				20				
30	Red ink	硃墨			5	4						
31	Duck green (Materials missing)	鴨綠										
32	Blood tooth	血牙							1			
33	Preserved egg	松花						15		25		
34	Seedling colour	秧色								20		
35	Chestnut shell	栗殼			3		*					
36	Eagle back	鷹背			6.5	0.5						
37	Sheep wool	羊羰			6	0.5						
38	Sandalwood apricot	檀杏								6		
39	Blue lotus	青蓮	Pale moon white		5				8			
40	Shell colour	殼色										
41	Camel wool	駝羰			6	4	*					
42	Pale pink purple (lotus)	藕合	Fish belly white	5					8			
43	Lotus flower	荷花								5		

	Chinese burberry	Smoked Plum	Raw charcoal ashes	Alkali	Vat liquor	Tur-meric	Acorn	Orchid petals	Plum bark	Hemp oil	Winter Reed	Beijing Glue	Ink	Cin-nabar	Rice-straw ash lye
	蘆米	烏梅	生炭灰	明碱	缸汁	姜黄	象斗	斛皮	梅皮	蔴油	冬芦泥	京膠	墨	硃砂	稻柴灰水
	7	7	7	6	6	5	4	4	2	2	1	1	1	1	1
												s			
	30														
						9									
						10									
							3								
	4														
	3														
					*										
					*										
							60								
								8							
								8							
								8							

TABLE 1 Recipe lists of Dyestuffs, Mordants, and Additives listed in the Bu Jing (ca.1780–1850) (*cont.*)

	Dye name		"Dyed on the foot of"	White alum	Green alum	(Sichuan) Gallnut	Guang-dong ash-lye	Pagoda bud	Sappan-wood	Chinese cork tree	(Sichuan) Safflower	
				白礬	青礬	川棓	廣灰	槐米	蘇木	黃柏	川紅花	
	Number of recipes using		**16**	**30**	**26**	**24**	**22**	**18**	**17**	**9**	**7**	
44	Lychee branch	荔枝		3	3·5	7			20			
45	Sandstone	沙石			6				8	6		
46	Wildflower	野花	Fish belly white	5					6			
47	Rose purple	玫瑰紫		4					30			
48	Swallow tail blue	燕尾青	Teasure stone blue	5					9			
49	Paper money grey	阡張灰			1	1 + 4 *liang*						
50	True crimson black	真硃墨										
51	Eastern shine	東方亮		"For pale shades, dilute the vat liquor with water to make the dye bath."								
52	Fish belly white	魚肚白		"For pale shades, dilute the vat liquor with water to make the dye bath."								
53	Grape blue	蒲萄青	Dark king-fisher blue	5								
54	Shrimp colour	蝦子色	Fish belly white	6								
55	Begonia red	海棠紅									5	
56	Pale rose	銀紅									25	
57	Bright pink	水紅									20	
58	Shiny red	亮紅									15	
59	Crimson	大紅									200	
60	Double red	雙紅									100	
61	Peach red	桃紅									100	
62	Glue blue	膠青										

Chinese burberry	Smoked Plum	Raw charcoal ashes	Alkali	Vat liquor	Tur-meric	Acorn	Orchid petals	Plum bark	Hemp oil	Winter Reed	Beijing Glue	Ink	Cin-nabar	Rice-straw ash lye
蘆米	烏梅	生炭灰	明碱	缸汁	姜黄	象斗	斛皮	梅皮	蘇油	冬芦泥	京膠	墨	硃砂	稻柴灰水
7	7	7	6	6	5	4	4	2	2	1	1	1	1	1
*						8								
														*
												30 ingots (錠)	0.5	
		浅色缸汁參水做												
		缸汁參水做												
	16	1 *dou*, 1 *jin*												
	16	6 *dou*												
	9	5 *dou*												
	6	1 *dou*												
	15 15	7 *dou* 5 *dou*			10 *liang* 8 *liang*									
	15	4 *dou*			5 *liang*									
											5			

TABLE 1 Recipe lists of Dyestuffs, Mordants, and Additives listed in the Bu Jing (ca.1780–1850) (*cont.*)

	Dye name		"Dyed on the foot of"	White alum	Green alum	(Sichuan) Gallnut	Guang-dong ash-lye	Pagoda bud	Sappan-wood	Chinese cork tree	(Sichuan) Safflower	
				白礬	青礬	川棓	廣灰	槐米	蘇木	黃柏	川紅花	
	Number of recipes using		**16**	**30**	**26**	**24**	**22**	**18**	**17**	**9**	**7**	
63	Deep black	黑揿			7	5		4				
64	Deep red	紅揿			6	4.5		3				
65	Eggplant flower	茄花			1.5	2						
66	Purple flower	紫花										
67	Autumn rose	秋瑰										
68	Rice color (beige)	米色										
69	East Road straw bleaching	刍漂东路					4					
70	West Road straw bleaching	刍漂西路					4.5					
71	Pinghu straw bleaching	刍漂平湖					5					
72	East Road white bleaching	漂白东路					6					
73	West Road white bleaching	漂白西路					7					
74	Pinghu white bleaching	漂白平湖					7					

Notes: Recipes have been reordered to show groupings of the same dyestuffs and to show which dyestuffs were most commonly used.

* = listed, but no quantity provided.

All measurements in jin unless specified otherwise.

1 jin斤 = 0.5kg. 1 dou斗 = 100 liters. 1 liang 兩 = 37.3 grams.

Chinese burberry	Smoked Plum	Raw charcoal ashes	Alkali	Vat liquor	Tur-meric	Acorn	Orchid petals	Plum bark	Hemp oil	Winter Reed	Beijing Glue	Ink	Cin-nabar	Rice-straw ash lye
蘆米	烏梅	生炭灰	明碱	缸汁	姜黃	象斗	斛皮	梅皮	蘇油	冬芦泥	京膠	墨	硃硃	稻柴灰水
7	7	7	6	6	5	4	4	2	2	1	1	1	1	1
4								30	4 *liang*					
6								8	1 *liang*, 4 *qian*					
										15				
				*										
						3	8							
			5											
			6											
			7											
			6											
			7											
			8											

Henan, Shaanxi, Shandong, and Sichuan, with the latter province being especially renowned. The only exception was sappanwood (蘇木, *Ceasalpinia sappan*), an important source for red and yellow shades, which had long been a trade good in the inter-Asian maritime trade: *The Cloth Classic* specified supplies from Zhejiang, but also Luzon (Manila) in the Philippines, and Siam.[99]

Moreover, though certainly some dyestuffs became obsolete, and others became more popular, in general, when one compares the dyestuffs, mordants, and additives listed in the earlier *Exploitation of the Works of Nature* of 1637 and late eighteenth-century *The Cloth Classic* (**Table 2**), the absence of new substances is quite striking.[100] This comparison is not a perfect one. *Exploitation* covers both silk and cotton, whereas *The Cloth Classic* only contains recipes for cotton. *Exploitation* also includes several different kinds of indigo, whereas indigo is not listed as an ingredient in *The Cloth Classic's* recipes, for reasons we shall see shortly. All the same, it is apparent that there is no dramatic expansion of the numbers of different types of dyestuffs in the later work. Instead, it seems that the greater number of colors in *The Cloth Classic*, 68 against 25 in the earlier work, is being achieved through an intensified use of the above dyestuffs, and most especially, an intensified use of mordants.

Alum mordants were used to fix the dye to the fiber to form an insoluble colored compound, and they were vital for cotton dyeing.[101] In addition to mordanting, alums were used together with sappanwood and pagoda bud to brighten the color; or with tannin dyes like gallnut, lotus-seed shell, and chestnut bud to darken.[102] *The Cloth Classic* used both "white or clear alum" (明礬, 白礬, Potassium aluminium sulphate) and "green alum" (青礬, Ferrous sulphate) extensively. 30 recipes (44%) use clear alum and 26 (38%) use green alum. Moreover, 12 (18%) use the two alums together, something not done in *Exploitation*.[103] For example, "Lychee color" (荔枝) required 7 *jin* of gallnut

99 On sappanwood, see G. Souza, "Convergence between Divergence: Global Maritime Economic History and Material Culture," *International Journal of Maritime History* XVII.1 (2005): 17–27.

100 On obsolete dyes, see Han and Quye, "Dyes and Dyeing in the Ming and Qing Dynasties": 56.

101 On alum as fundamental to the success of cotton dyers throughout Asia, see Chen, "The Craft of Color: The Craft of Color and the Chemistry of Dyes: Textile Technology in the Ryukyu Kingdom, 1700–1900" *Technology and Culture* 63.1 (2022): 87–117.

102 Han and Quye, "Dyes and Dyeing in the Ming and Qing Dynasties": 60.

103 Watson described green alum as impure sulphate of iron obtained by roasting iron pyrites (*The Principal Articles of Chinese Commerce*: 308). Wells Williams described clear alum as white vitriol, whose crystals were called green alum (*Chinese Commercial Guide*

TABLE 2 Dyestuffs, Mordants, and Additives listed in the *Tiangong kaiwu* (1637) and the *Bu Jing* (ca. 1780–1850)

Substance (English term)	Substance (Chinese term)	*Type*	*Tiangong kaiwu*	*Bu jing*
Acorn (*Quercus acutissima, Quercus wutaishanica*)	象斗	Dyestuff		*
Amaranth (*Amaranthus*)	藍蓝，小蓝，小叶寥蓝	Dyestuff	*	
Chestnut (*Castanea mollissima*)	栗殼	Dyestuff	*	
Chinese Bayberry (*Myrica rubra*)	杨梅	Dyestuff	*	
Chinese Burberry (*Berberis Amerensis*)	蘆米，蘆木	Dyestuff	*	*
Gallnut (*Melaphis chinensis*)	五倍子，川棓	Dyestuff	*	*
Smoked Plum (*Prunus mume*)	烏梅，梅皮	Dyestuff	*	*
Lotus shell (*Nelumbo nucifera*)	蓮子殼	Dyestuff	*	
Pagoda bud (*Sophora japonica*)	槐，槐米，槐花，槐子	Dyestuff	*	*
Safflower (*Carthamus tinctorius*)	川紅花	Dyestuff	*	*
Sappanwood (*Caesalpinia sappon*)	蘇木	Dyestuff	*	*
Smoketree (*Cotinus coggygria*)	黃栌	Dyestuff	*	
Turmeric (*Curcuma longa*)	姜黃	Dyestuff		*
Winter reed	冬芦泥，芦荻	Dyestuff		*
Chinese Corktree (*Phellodendron amurense, Phellodendron chinense*)	黃檗，黃柏	Dyestuff	*	*
Chinese indigo (*Polygonum tinctorum*)	萼蓝	Dyestuff	*	
Indigo (*Indigo tinctoria*)	木蓝， 吴蓝， 槐蓝	Dyestuff	*	
Assam indigo or Chinese rain bell (*Strobilanthes cusia*)	马蓝	Dyestuff	*	
Woad (*Isatis tinctoria*)	菘藍， 茶蓝	Dyestuff	*	
Orchid petals (*Dendrobium*)	斛皮a	Dyestuff		*
Alkali[b]	明碱c	Additive	*	*
Hemp stalks	麻稿	Additive	*	
Iron sand	鐵砂	Additive	*	
Soap	皂	Additive	*	
Soybean liquid	豆漿水	Additive	*	

a Huang Songhua thinks this is a mistaken reference and should refer to Elm bark 榆皮.
b Alkalis included potash, soda, lithia, ammonia.
c *The Cloth Classic* details two kinds: *Matai jian* 馬台碱 and *Yingzhou jian* 應州碱.

TABLE 2 Dyestuffs, Mordants, and Additives listed in the *Tiangong kaiwu* (1637) and the *Bu Jing* (*cont.*)

Substance (English term)	Substance (Chinese term)	*Type*	*Tiangong kaiwu*	*Bu jing*
Lit. Beijing Glue, possibly Chinese green (綠膠)[d]	京膠，膠水	Additive	*	*
Rice-straw ash-lye	稻灰，稻柴灰水	Additive	*	*
Raw charcoal ashes	生炭灰	Additive		*
Guangdong ash-lye[e]	廣灰	Additive		*
Hemp oil	蔴油	Additive		*
Green alum or vitriol (*Ferrous sulphate*)	青礬	Mordant	*	*
White or clear alum (*Potassium alum*)	白礬,明礬	Mordant	*	*
	Total substances mentioned		**25**	**19**

d See Watson, *The Principal Articles*, p. 185.

e A strong alkaline solution made by leaching plant ash.

SOURCES: ANON, *BU JING* (N.D.) ANHUI PROVINCIAL LIBRARY MS; SONG YINGXING, *TIANGONG KAIWU*, JUAN SHANG, ZHANG SHI, PART 7, "ZHUSE ZHILIAO"; JING HAN AND ANITA QUYE, "DYES AND DYEING IN THE MING AND QING DYNASTIES"; ZHAO FENG, "TIANGONG KAIWU ZHANGSHI PIANZHONG DE RANLIAO HE RANSE"; ERNEST WATSON, *THE PRINCIPAL ARTICLES OF CHINESE COMMERCE*; ONLINE WRITINGS OF HUANG SONGHUA 黃荣华.

(川棓) and 20 *jin* of sappanwood (蘇木), together with 3 *jin* of clear alum and 3.5 *jin* of green alum.

Aside from dyeing, alum had numerous industrial uses in this period: it was used in clarifying water, as an astringent, as an emetic, to make baking powders, and to size and whiten paper. Found in many provinces, it became a substantial trade good in the Country trade—a "proto-industrial raw material" shipped from Canton to Indian port cities near textile centers.[104] Its low price

Consisting of a Collection of Details and Regulations Respecting Foreign Trade with China, Sailing Directions, Tables, &c. (Office of the Chinese Repository, 1856): 263).

104 According to *Exploitation*, alum was mostly sourced from Shanxi and Jiangsu, as well as from Hunan and Fujian. Other sources mention Ganhui, Hunan, and Zhejiang where the alum shale was found. The price tripled from 0.6 to 2 *taels* per picul between 1700 and the 1820s. Souza estimates 5–10,000 piculs were exported per year at the beginning of the eighteenth century, and up to 40,000 piculs by the end. Souza, "Country Trade and Chinese Alum: Country Trade and Chinese Alum: Raw Material Supply in Asia's Textile Production in the Seventeenth and Eighteenth Centuries," *Revista da Cultura* 11 (2004): 136–153, 151; Williams, *Chinese Commercial Guide*: 263; Watson, *The Principal Articles of Chinese Commerce*: 307.

made for good profit margins, at least earlier on, and its weight made it good ballast. But by the late eighteenth century, higher purchase prices in China and lower sales prices in India led to squeezed profit margins. Theoretically this would have led to higher prices for the Jiangnan dyers too, though one account commented that "the supply is literally inexhaustible" and it remains unclear how far Canton prices impacted Jiangnan markets.[105]

So while the dyestuff trade is an important factor in explaining the expansion of colors, there is no dramatic increase in new dyes, especially not when compared to the far more impactful influx of new dyestuffs like cochineal or indigo within the European dye industry. Neither cochineal nor Prussian blue are mentioned in these recipes, though by this point the European traders had been attempting to sell both for some time in Canton. A superficial reading would see this as indicating resistance to new products, which after all required learning new techniques, and perhaps this was a factor. However, evidence elsewhere shows that Chinese manufacturers were quick to copy viable trade products, for example in the late 1820s, a Canton manufacturer developed a substitute dye for Prussian blue (which was popular in painting), terminating European imports and following an import substitution dynamic seen elsewhere in the China trade.[106] And a more likely explanation for the lack of adoption of foreign dyestuffs was the higher cost of imported dyestuffs like cochineal.[107] But there is also a more interesting observation here: *The Cloth Classic* evidences expanded product variety, not through the European model of innovation which dominates early modern histories of consumption, in which new processes to achieve color variety are motivated by exposure to new products, but rather through using existing dyestuffs and mordants more intensively.

Indeed, the new colors were being created largely through the expanded use of the "set dyeing" (套染) technique. This practice of combining different dyes and mordants in varying quantities to create colors of varying tones was not

105 Imperial Maritime Customs, *Reports on Trade at the Ports of Shanghai, Canton, Swatow, Amoy, Ningpo, Hankow, Kiukiang, Chefoo, and Newchawang for the year 1862* (Shanghai: Imperial Maritime Customs' Press, 1865–1882): 58 (Ningpo).

106 *Bu jing*, n.p.; W. Milburn, *Oriental Commerce: Containing a Geographical Description of the Principal Places in the East Indies, China, and Japan, with Their Produce, Manufactures, and Trade* (Black, Parry & Company, 1813): 2.479; Chen, "The Craft of Color": 101–102; K. Bailey, "A Note on Prussian Blue in Nineteenth-Century Canton." *Studies in Conservation* 57.2 (2012): 116–21; Phipps, "Global colors: dyes and the dye trade".

107 Souza estimated cochineal cost 50–80 times other red dye materials, including sappanwood, in 18th-century Amsterdam ("Convergence before Divergence": 24).

new but it does seem to have developed particularly in the eighteenth century.[108] Thus as seen in **Table 1**, many of the new shades were created from recipes combining one, two, three or even four dyestuffs, but modulating the qualities to create different shades. For example, pale rose, bright pink, and shiny red were all made from the same combination of safflower, smoked plum, and Guangdong ash-lye: all three shades were effectively the same recipe, but by adjusting the quantities, dyers could create the three different shades of red. This technique is also seen in *Exploitation* but to a lesser degree: like *The Cloth Classic*, *Exploitation* lists "Crimson" (大紅), "Lotus red" (蓮紅), "Peach red" (桃紅), "Silver red" (銀紅) and Water Red as requiring safflower, smoked plum, and alkali water or rice-straw ash-lye. (*The Cloth Classic* also incorporates turmeric for the "Crimson" and "Peach Red".) And *Exploitation* creates "Moon White" (月白) and "Grass White" (草白) from a combination of indigo (靛) and amaranth (莧藍), which is not done in *The Cloth Classic*. But *The Cloth Classic* uses set dyeing to create a set of purples (brown, purple sandalwood, sauce color, iron color, and autumn color using varying quantities of clear alum, green alum, gallnut, and sappanwood); a set of greens (medium shine, round eyes, and tea-leaf green using varying quantities of clear alum, green alum, gallnut and pagoda bud), and many other examples shown in **Table 1**. Thus, the cotton dyers' increased usage of the "set dyeing" technique effectively doubled the number of variations.[109]

Equally important here however was the increasing specialization of the dyeworks.[110] While both Qiu Ying and Xu Yang depict an array of colors (Fig. 2, Fig. 4) as a means of representing Suzhou's flourishing dyeworks, several sources record workshops specializing in certain colors due to specific dyestuff requirements. Chu Hua divided the dyeworks into blue, red, bleaching, and miscellaneous.[111] For example, the inset workshop scene of Figure 4 specifies it is a red workshop, like one described in a Shanghai bamboo ballad poem: "Crimson dyestuffs have specialist dyers, they are called the red workshops, and their colors make bright stuffs. (Whether) silk or cotton thread, yarn, and fabric, all will become as splendidly colored as the rosy clouds."[112] This color

108 *Bu jing*, n.p. "A list of the amounts of dyestuffs needed to dye one hundred bolts of cloth in assorted colors" (染各樣襍色每百疋試用顏料數目).

109 Han and Quye, "Dyes and Dyeing": 63–64.

110 Li, "Guanyu Yapian zhanzheng qian SuSong diqu mianbu": 3; Duan and Zhang, *Suzhou shougongye shi*: 62.

111 Chu, *Mumian pu*: 14.

112 R. Qin, *Shanghai xian zhuzhici* (Shanghai: Shanghai guji chubanshe, 1989): juan 3, p.146, 'Red dyeworks'.

specialization on the part of dyeworks meant merchants could subcontract out different dyeing stages, especially to the indigo workshops.

As noted earlier, *The Cloth Classic* lists 68 dye recipes. Though the term is conventional amongst dye historians, "recipe" is something of a misnomer here: it is less a recipe and more a shopping list, for there are no instructions, nor, more importantly, is sequencing provided. Instead, the recipe simply lists the quantities of materials required. So for example, "bright green" (明祿), was made by combining moon white fabric with 25 *jin* of pagoda bud, 3 *jin* of gall-nut, 3 *jin* of clear alum and Guangdong ash-lye.[113] But this recipe, along with 15 others, a quarter of the recipes, calls for the use of pre-dyed cloth (lit. "on the foot of" 脚地), all of which are variations of indigo-dyed cloth: "moon white" (月白), "treasure blue" (寶藍), "true blue" (真青), "kingfisher blue" (翠藍), "double blue" (双藍), "fish belly white" (魚肚白). The recipes for these colors are not provided in *The Cloth Classic* and indeed there would be no need to do so, because they are all variations of indigo-dyed cotton.

This development of using indigo-dyed cloth as the basis for dyeing other colors is one of the key features distinguishing *The Cloth Classic* from earlier dyeing texts. Alongside the more intensive use of key dyestuffs and mordants and the expansion of set dyeing, it is the main factor enabling the new cotton colors. Indigo is unique among cotton dyestuffs in being a "substantive color", able to permanently fix onto the cloth without a mordant and instead relying on multiple immersions in the dye vat to build up layers. Indigo workshops (青布, 蓝布) dominated the dye sector, producing the blue-dyed cloth that clothed many Chinese during this period, some of which was taken to larger dyeworks for further processing to turn into shades of green and purple. For example, one Qianlong period (1735–96) gazetteer records how, "Cloth from outside Waigang (a market town in Songjiang) is called "Gang chen", and it is dyed in pale colors; these are vivid and popular, and other places cannot achieve such (shades), therefore the Suzhou merchants all open shops in the town to buy this cloth."[114] Suzhou had a thriving business in indigo-dyed cloth, another trade said to partially compensate for its loss of northern markets.[115]

The reliance on indigo explains *The Cloth Classic's* careful attention to differences between different indigo, as well as the "cloth-examining friend's" skills in examining these shades of blue dyed cloth. It includes sections such as: "Methods for examining blue cloth," "Secret words on examining green-blue and

113 *Bu jing*, n.p. "A list of the amounts of dyestuffs needed to dye one hundred bolts of cloth in assorted colors" (染各樣襍色每百疋使用顏料數目).

114 (Qianlong) *Xu Waigang zhi*, juan 4, *wuchan*, comp. in Xu, *Jiangnan tubu shi*: 60.

115 Liu, "Qingdai mianbu shichang": 57.

moon white (cloth)." As one section puts it: "The dyed cloth (lit. the darkness/lightness) of each cotton brand is not the same." "Each is distinctive: whether (called) sun and moon, moon white, moon blue; whether called kingfisher blue, precious blue, pale kingfisher; or capital blue, capital kingfisher; or light treasure, light blue, buddha blue, capital blue; or duck blue and light blue. All these colors are different, and so the person examining the cloth must have their own appropriate method for examining each color."[116] The focus on the merchant's skills in evaluating these different shades of blue reflects both their dominant position in clothing color and dyers' use of them to create other colors.

This text corroborates Eyferth's attention to "mercantile epistemologies", which he defines as the development of a commercial discourse that deployed sensory analysis to establish quality measures.[117] He quotes an example from the two-chapter *Bu Jing Yaolan* on how to assess dyed cloth: "Bring along a true color sample to compare. The quality of the daylight is important; an overcast sky is best. White clouds in the sky make the cloth appear brighter; red clouds give it a reddish hue. Always rely on your sample."[118] Many such instructions can be found, often seeking to manage sensory bias in one's evaluations: "The cloth-examining friend needs to adjust to the circumstances, and cannot maintain his own ideas, or listen intimately to other people's words." Only then could an objective basis for quality judgements be established; otherwise, "If you only look partially at the color of cloth and insist on talking about it, how is it different from peeping at a leopard through a tube or looking at the sky from the bottom of a well?"[119] In this pre-industrial age in which large trading networks were conducted on the basis of amassing hundreds of thousands of bolts produced in dispersed locations by disparate weavers, this discourse speaks to the importance of the cloth-examining friend in standardizing the inherently individual. Perhaps most significantly, in the absence of mercantile capital seeking to more closely control household production and in the absence of innovation at the household level, this middleman's skill facilitated the Qing cotton industry's distinctive production structure in which all woven

116 Anon, *Bu jing yaolan erjuan*: 581–599.

117 Eyferth, "Skilled vision as management". Eyferth's emphasis on mercantile epistemologies may be compared to Mark Elvin's argument for commerce as a substitute for management in "The High-Level Equilibrium Trap: The Causes of the Decline of Invention in the Traditional Chinese Textile Industries." In *Economic Organization in Chinese Society*, ed. W. E. Willmott (Stanford University Press, 1972).

118 *Bu Jing yaolan er juan*: 594.

119 *Bu jing*, "General principles on Matching Cloth" (配布总论).

products could be matched to a suitable market outcome: liaising between product and demand to avoid waste.[120]

Conclusion

The Cloth Classic attests to the expansion of clothing colors that began in the early Qing, providing an important example of what improved living standards of the Qing period looked like to a non-elite consumer. It demonstrates three main factors enabled greater number of cotton colors: intensive use of key dyestuffs and mordants, the use of set dyeing, and the reliance on pre-dyed fabrics supplied by specialist dyers within the sector. All three represent improvements in the dye sector that potentially produced economic growth and improved living standards for those who could afford their higher costs, but equally, all three came from within the production system, effectively achieved by people doing more with what they had, rather than being stimulated by new products or techniques, and were thus akin to the intensified use of agricultural techniques that increased yield allowing per-capita consumption to be maintained despite increased population.

The Cloth Classic's account of developing dye techniques in the Qing cotton sector is instructive in three main respects. First, it presents an alternative model of expanded product variety to the European model, in which new products are created through the encounter with global trade, stimulated by new manufacturing techniques, raw materials, or markets.[121] Instead of technological innovation or centralized production, the creation of added value and manufacturing growth seen in *The Cloth Classic* was achieved largely on the basis of embodied expertise of the dyer and the "cloth-watching friend" responsible for moving the cloth from household to workshop to market. Yet, as Bertucci shows so neatly in regard to the failed transfer of a silk reeler from Piedmont, Italy to Georgia, Colonial America, an individual artisan's embodied skill was worthless without the legal and sociotechnical systems that validated it.[122] These systems—what Bertucci terms the "social fabric" that grounded the artisan's embodied expertise—were just as critical as craft skill in enabling

120 On these possible finishing paths, see Eyferth, "Skilled vision". I am grateful to Jacob Eyferth for discussion on this point.

121 Berg, "In Pursuit of Luxury".

122 P. Bertucci, "Spinners Hands, Imperial Minds: Migrant Labor, Embodied Expertise, and the Failed Transfer of Silk Technology across the Atlantic," *Technology and Culture* 62.4 (2021): 1003–1031.

the Jiangnan cotton sector to find ways to satisfy consumer demand for better, more colorful cloth. Indeed, this case study of cotton dyeing highlights the importance of organizational change and specialization in understanding how the textile industry developed over the Qing period. Both the separation of the dyers and the calenderers and the division of dyeworks into certain colors resulted from commercial complexification that increased the number of participants in the finishing sector, at both the higher processing levels of the Suzhou workshops and the lower-level indigo dye workshops, with the cloth-examining friend's expertise mediating to find new possibilities for color.

Second, and relatedly, this model of creating product variety suggests future research avenues for resolving the conundrum implicit in the history covered in this paper: If, as shown China's cotton textile consumption complexified through the Qing period, how do we explain its backward position relative to global producers in the early nineteenth century?[123] After all, theoretically, valued-added improvements would have allowed those producers who focused upon "styles, colors and fashion trends" to earn greater profits than those who worked with middle-grade cloth.[124] Yet this would suggest expanding market demand, which is not well-evidenced. Instead, Songjiang appears to undergo decline from the mid-Qing, even before the Opium Wars and the incursion of industrially produced cloth from Britain, America, and Russia.[125] We know that much of this was due to shifts within the domestic cotton market, whereby Jiangnan lost its earlier markets for standard cloth as new provinces produced their own. To some degree Jiangnan could move up the chain to higher-end cloth, but when read with other evidence on pricing, *The Cloth Classic* suggests that markets for higher-value cloth were limited, and may well have become harder to reach by the late eighteenth century, when real buying power fell, and "prospects for profitable diversification" lessened.[126] Jiangnan's cotton finishing sector was circumscribed by these limitations, but it was also hampered by the lack of technical innovation that might have provided its producers the ability to compete on grounds other than its array of colors. In this respect, more work needs to be done to understand how far the socioeconomic and cultural systems of craft knowledge revealed in *The Cloth Classic* fostered

123 Silberstein, "Threads of Commerce and Consumption".

124 Pomeranz, "Women's Work and the Economics of Respectability": 247, n.31; Fan, *Ming Qing Jiangnan shangye de fazhan*: 69.

125 Liu, "Qingdai mianbu shichang". Notably sales of printed cloth also appear to have declined over the mid-late Qing (Xu, *Jiangnan tubu shi*: 374).

126 K. Deng and P. O'Brien, "Nutritional Standards of Living Nutritional Standards of Living in England and the Yangtze Delta (Jiangnan), circa 1644–circa 1840: Clarifying Data for Reciprocal Comparisons," *Journal of World History* 26.2 (2015): 233–267, 254.

gatekeepers who potentially obstructed the absorption of new knowledge that did not align with existing local paradigms.[127]

Nonetheless and finally, *The Cloth Classic* highlights the importance of material culture scholarship in reconstructing accounts of developments in craft technologies and their impact on the living standards of ordinary people. The material lives of non-elites are often overlooked in Chinese material culture history which remains particularly enthralled to art historical paradigms of elite and imperial consumption. But *The Cloth Classic* reminds us that material culture can be studied even in the absence of the historical object, and it calls for more attention to the many Qing mercantile texts which offer informative, materially attuned insights into little-known developments in consumption history. The new systems of coloring cotton cloth that emerged in the mid-Qing depended on the development of this commercial discourse, but so too does our ability to reconstruct a material culture regime whose objects often did not survive.

Acknowledgments

This paper began life as a presentation at the 2021 *Colour of Clothes* conference, and I thank the organizers, Giorgio Riello, Ulinka Rublack, and Maria Hayward; as well as BuYun Chen who generously shared sources. Material from the paper was also presented at the Association of Asian Studies' Annual Conference (2023), as well as invited talks at the British Museum conference on nineteenth-century China, Princeton University, and the University of Chicago. I would like to thank all these organizers, especially Dora Ching, Jacob Eyferth, Jessica Harrison-Hall, Sue Naquin, and Chenghua Wang. I also thank Lucille Chia, Kent Deng, Ken Pomeranz, Tom Rawski, and You Wang for their input on earlier drafts, and Dong Ye 冬野 for helping me understand the different Songjiang cotton types. Finally, I thank the JESHO editor and two anonymous reviewers for their questions, comments, and suggestions, all of which improved the final article.

Bibliography

(Chongzhen, 1631) *Songjiang fu zhi* 松江府志 (Suzhou prefecture gazetteer)
(Chongzhen, 1631) *Songjiang fuzhi* 松江府志

127 Raman, "Before Arsenic".

(Daoguang, 1824) *Suzhou fuzhi* 苏州府志
(Guangxu, 1879) *Chuansha ting zhi* 川沙廳志 (Chuansha sub-prefecture gazetteer)
(Guangxu, 1879) *Chuansha tingzhi* 川沙廳志
(Guangxu, 1882) *Jiading Xianzhi* 嘉定縣志
(Guangxu, 1879) *Wujin Yanghu xianzhi* 武进阳湖县志
(Jiaqing, 1813) *Zhuli xiaozhi* 珠里小志卷
(Qianlong, 1746) *Baoshan xianzhi* 寶山縣志
(Qianlong, 1753) *Changzhou xian zhi* 長洲縣志 (Changzhou district gazetteer)
(Qianlong, 1761) *Chongxiu Yuanhe xian zhi* 重修元和縣志
(Qianlong, 1751) *Jinshan xianzhi* 金山縣志
(Qianlong, 1752) *Jinshan xianzhi* 金山縣志
(Qianlong, 1788) *Louxian zhi* 娄县志
(Qianlong, 1791) *Nanhui xian xin zhi* 南汇县新志
(Qianlong, 1751) *Nanhui Xianzhi* 南匯县志
(Qianlong, 1745) *Pinghu xianzhi* 平湖县志
(Tongzhi, 1882) *Suzhou fuzhi* 苏州府志
(Zhengde, 1512) *Songjiang fuzhi* 松江府志

Allen, Robert C. et al. 2011. Wages, prices, and living standards in China, 1738–1925: in comparison with Europe, Japan, and India. *The Economic History Review* 64/1: 8–38.

Anon. 1997. *Bu jing yaolan er juan*布经要览二卷 (*The Essentials of the Cloth Classic in Two Chapters*) (1755); *Siku Quanshu: Siku weishou shujuan kan* 四库未收书辑刊. Beijing chubanshe. *ji* no.10, *ce* no.12: 581–599.

Anon. ca. 1780–1850. *Bu jing* 布经 (*The Cloth Classic*). Anhui manuscript.

Bailey, Kate. 2012. A Note on Prussian Blue in Nineteenth-Century Canton. *Studies in Conservation* 57/2: 116–121.

Berg, Maxine. 2004. In Pursuit of Luxury: Global History and British Consumer Goods in the Eighteenth Century. *Past & Present* 182: 85–142.

Bertucci, Paola. 2021. Spinners' Hands, Imperial Minds: Migrant Labor, Embodied Expertise, and the Failed Transfer of Silk Technology across the Atlantic. *Technology and Culture* 62/4: 1003–1031.

Bowen, H. V., *The East India Company: Trade and Domestic Financial Statistics, 1755–1838* dataset.

Chen BuYun. 2022. The Craft of Color and the Chemistry of Dyes: Textile Technology in the Ryukyu Kingdom, 1700–1900. *Technology and Culture* 63/1: 87–117.

Chen Xuwen 陈学文. 1989. *Zhongguo fengjian wanqi de shangpin jingji* 中国封建晚期的商品经济 (China's late feudal commodity economy). Hunan: Hunan remin chubanshe.

Cheng Weiji, ed. 1992. *History of Textile Technology of Ancient China*. NY: Science Press.

Chi Zehui 池澤匯 et al. 1982. *Beiping shi gongshangye gaikuang* 北平市工商业概况 (Overview of Commerce and Industry in Beiping). Beiping: Beiping shi shehuiju.

Chiu Pengsheng 邱澎生. 2012. "Shiba shijiu Su-Song mianbuye de guanli jiagou yu falü wenhua" 十八世纪苏松棉布业的管理架构与法律文化 (The management structure and legal culture of the Suzhou and Songjiang cotton cloth industry in the 18th century), *Jianghai Xuekan* 2: 143–157.

Chiu Pengsheng 邱澎生. 2002. "You fang liao dao gongchang: Qingdai qianqi Suzhou mianbu zihao de jingji yu falu fenxi" 由放料到工厂; 清代前期苏州棉布字号的经济与法律分析 (From putting out to factory: an analysis of the legal and economic background of Suzhou's cotton trademarks during the early Qing), *Lishi yanjiu* 75: 75–87.

Chu Hua 褚華. ca. 1810/2002. *Mumian pu* 木棉谱 (Treatise on Cotton), in *Xuxiu siku quanshu*, vol. 977. Reprinted Shanghai: Shanghai guji chubanshe.

de Graaf, Judith J Hofenk. 1969. *The Colourful Past: origins, chemistry and identification of natural dyestuffs*. Amsterdam: Central Research Laboratory for Objects of Art and Science.

Deng, Kent, and Patrick O'Brien. 2015. Nutritional Standards of Living in England and the Yangtze Delta (Jiangnan), circa 1644–circa 1840: Clarifying Data for Reciprocal Comparisons. *Journal of World History* 26/2: 233–267.

Dietrich, Craig. 1972. Cotton Culture and Manufacture in Early Ch'ing China. In *Economic Organisation in Chinese Society*, ed. W. E.Wilmott. Stanford: Stanford University Press: 109–135.

Du Li 杜黎. 1987. Guanyu Yapian zhanzheng qian SuSong diqu mianbu ranchuaiye de shengchan guanxi 关于稿片战争前苏松地区棉布染瑞业的生产关系 (On the pre-Opium War period Su and Song regions cotton cloth dyeing industry production structures), *Xueshu yuekan* 12: 1–8.

Duan Benluo 段本洛 and Zhang Qifu 張圻福. 1986. *Suzhou shougongye shi* 蘇州手工業史 (History of Suzhou Handicraft Industry). Nanjing: Jiangsu Guji Chubanshe.

Dunstan, Helen. 1998. Official Thinking on Environmental Issues and the State's Environmental Roles in Eighteenth-Century China. In *Sediments of Time: Environment and Society in Chinese History*, ed. Mark Elvin and Liu Ts'ui-jung. New York: Cambridge University Press: 585–614.

Elvin, Mark, 1972. The High Level Equilibrium Trap: The Causes of the Decline of Invention in the Traditional Chinese Textile Industries. In *Economic Organization in Chinese Society*, ed. W. E. Willmott. Stanford: Stanford University Press.

Eyferth, Jacob. 2016. Skilled Vision as a Management Technique: The Cloth Classic and its instructions for cloth buyers. Paper presented *Workshop on Text and Labor in Asian Handwork*, Chicago.

Fan Jinmin 範金民 and Jin Wen 金文. 1993. *Jiangnan sichou shi yanjiu* 江南絲綢史研究. Beijing: Nongye Chubanshe.

Fan Jinmin 范金民. 2002. Qingdai Jiangnan mianbu zihao tanxi 清代江南棉布字号探析 (An investigation into the Qing dynasty Jiangnan cotton zihao), *Lishi yanjiu* 历史研究 1: 88–98.

Fan Jinmin 范金民. 1998. *Ming Qing Jiangnan shangye de fazhan* 明清江南商业的发展 (The Development of Jiangnan Commerce during the Ming and Qing). Nanjing, Nanjing daxue chubanshe.

Fan Tong 范铜. 1751/1997. *Bu jing ba juan* 布经八卷 (*The Cloth Classic in Eight Chapters*), in *Siku Quanshu: Siku weishou shujuan kan* 四库未收书辑刊. Beijing chubanshe. *ji* no.3, *ce* no. 30: 82–110.

Fang Xing 方行. 1996. Qingdai Jiangnan nongmin de xiaofei 清代江南農民的消貪 (Rural Consumption in Qing Dynasty Jiangnan). *Zhongguo jingjishi yanjiu* 3: 91–98.

Fang Xing 方行. 1987. Lun Qing dai qianqi mian fangzhi de shehui fengong 论清代前期棉纺织的社会分工 (On the divison of labor in early Qing cotton spinning and weaving), *Zhongguo jingji shi yanjiu* 1: 79–94

Fang Xing et al. 2000. Cloth Processing in Suzhou and Songjiang. In *Chinese Capitalism, 1522–1840*, ed. Xu Dixin and Wu Chengming. London: Palgrave Macmillan UK: 213–227.

Fang Xing et al. 2000. The Growth of Commodity Circulation and the Rise of Merchant Organisations. In *Chinese Capitalism, 1522–1840*, ed. Xu Dixin and Wu Chengming. London: Palgrave Macmillan: 165–183.

Feuerwerker, Albert. 1970. Handicraft and Manufactured Cotton Textiles in China, 1871–1910. *The Journal of Economic History* 30/2: 338–278.

Forbes, Robert Bennet. 1844. *Remarks on China and the China Trade*. Boston: Samuel N. Dickinson.

Fu Yiling 傅衣凌. 1957. *Mingdai Jiangnan shimin jingji shitan* 明代江南市民经济试探 (Exploratory essay on the urban economy of the Jiangnan area during the Ming dynasty). Shanghai Renmin Chubanshe.

Gu Gongxie 顾公燮. 1785/1916–21, *Xiaoxia xiangqi zhaichao* 消夏闲记摘钞. Reprint Shanghai: Shangwu yinshu guan.

Gu Zhentao 顧震濤. 1843/1999. *Wumen biaoyin* 吳門表隱 (Little known facts about Suzhou). Reprint, Nanjing: Jiangsu Guji Chubanshe.

Hamilton, Gary, and Lai Chi-Kong. 1986. Jinshi Zhongguo shangbiao yu quanguo dushi shichang 近视中国商标与全国都市市场 (Trademarks and the National Urban Market in Late Imperial China), *Proceedings of the Conference on Regional Studies of Modern China*. Taipei: Academica Sinica.

Hommel, Rudolf P. 1969. *China at Work: An Illustrated Record of the Primitive Industries of China's Masses, Whose Life is Toil, and Thus an Account of Chinese Civilization*. Boston: MIT Press.

Hsiung, C. D. and W. G. Sewell. 1939. General Survey of Dyehouses in Chengtu. *Journal of the Society of Dyers and Colourists* 55/8: 416–418.

Huang Jingbin 黄敬斌. 2009. *Minsheng yu jiaji: Qingchu zhi minguo shiqi Jiangnan jumin de xiaofei* 民生与家计: 清初至民国时期江南居民的消费. Shanghai, Fudan daxue chubanshe.

Huang Miantang 黄冕堂. 1990, *Qingshi zhiyao* 清史治要 (Matters of Governance in Qing History). Jinan: Shandong Qilu Press.

Imperial Maritime Customs. 1865–1882. *Reports on Trade at the Ports of Shanghai, Canton, Swatow, Amoy, Ningpo, Hankow, Kiukiang, Chefoo, and Newchawang for the year 1862*. Shanghai: Imperial Maritime Customs' Press.

Jiangsu sheng bowuguan ed. 1959. *Jiangsu sheng Ming Qing yilai beike ziliao xuanji* 江蘇省明清以來碑刻資料選集 (A selection of Ming and Qing period stele inscriptions from the Ming and Qing period). Xinhua shudian.

Jing Han & Anita Quye. 2018. Dyes and Dyeing in the Ming and Qing Dynasties in China: Preliminary Evidence Based on Primary Sources of Documented Recipes. *Textile History* 49/1: 44–70.

Kang Chao. 1977. *The Development of Cotton Textile Production in China*. Boston: Harvard University Press.

Lemire, Beverly. 1992. *Fashion's Favorite: The Cotton Trade and the Consumer in Britain, 1660–1800*. New York: Oxford University Press.

Li Bin 李斌. 1991. Qing dai ranzhi zhuanzhu Bu jing kao 清代染织专著"布经"考 (A Study of the Qing dynasty dyeing and weaving work, *The Cloth Classic*), *Dongnan wenhua* 1: 79–86.

Li Bozhong. 1998. *Agricultural development in Jiangnan, 1620–1850*. New York: St. Martin's Press; London: Macmillan Press.

Li Bozhong. 2021. *An Early Modern Economy in China*. Cambridge: Cambridge University Press.

Li Dou 李鬥. 1793/1960. *Yangzhou hua fang lu* 揚州畫舫錄 (*The Pleasure Boats of Yangzhou*). Reprint, Beijing: Zhonghua Shuju.

Li Qiao 李喬. 1996. *Zhongguo hangye shen* 中國行業神 (Chinese Guild Gods). Taibei Xian zhonghe shi: Yunlong chubanshe.

Li Bozhong and Jan Luiten van Zanden. 2012. Beyond the Great Divergence? Comparing the Yangzi Delta and the Netherlands at the Beginning of the Nineteenth Century. *The Journal of Economic History* 72/4: 956–989.

Liu Xiusheng 刘秀生. 1990. Qingdai mianbu shichang de bianqian yu Jiangnan mianbu shengchan de shuailuo 清代棉布市场的变迁与江南棉布生产的衰落 (Changes in the Qing dynasty cotton fabric market and the decline of Jiangnan cotton), *Zhongguo shehui jingjishi yanjiu* 2.2: 54–61.

Liu Yongcheng 劉永成. 1959. Shilun Qingdai Suzhou shougongye hanghui 試論清代蘇州手工業行會 (A Tentative Discussion on Qing period Suzhou Handicraft industry guilds), *Lishi yanjiu* 11: 21–46.

Lu Hanchao. 1992. Arrested Development: Cotton and Cotton Markets in Shanghai, 1350–1843. *Modern China* 18/4: 468–499.

Milburn, William. 1813. *Oriental Commerce: Containing a Geographical Description of the Principal Places in the East Indies, China, and Japan, with Their Produce, Manufactures, and Trade*. London: Black, Parry & Company.

Mitchell, David. 1995. 'Good hot pressing is the life of all cloth': dyeing, clothfinishing and related textile trades in London, 1650–1700. In *Occupational Titles and their Classification: the Case of the Textile Trade in Past Times*, ed. H. Diederiks and M. Balkestein. St Katharinen, Max-Planck-Institute für Geschichte: 153–175.

Phipps, Elena. 2013. Global Colors: Dyes and the Dye Trade from the Sixteenth to the Eighteenth Century. In *The Interwoven Globe: Worldwide Textile Trade 1500–1800*, ed. Amelia Peck. New York: Metropolitan Museum of Art: 28–45.

Pomeranz, Kenneth. 2005. Standards of Living in Eighteenth-Century China: Regional Differences, Temporal Trends, and Incomplete Evidence. In *Living Standards in the Past: New Perspectives on Well-Being in Asia and Europe*, ed. Robert C. Allen et al. Oxford: Oxford University Press: 23–54.

Pomeranz, Kenneth. 2005. Women's Work and the Economics of Respectability. In *Gender in Motion*, ed. Bryna Goodman and Wendy Larson. Lanham, MD, Rowman and Littlefield: 239–263.

Pomeranz, Kenneth. 2000. *The Great Divergence: China, Europe, and the Making of the Modern World Economy*. Princeton: Princeton University Press.

Qin Rongguang 秦荣光. 1989. *Shanghai xian zhuzhici* 上海縣竹枝詞 (Shanghai County Bamboo ballads). Shanghai: Shanghai guji chubanshe.

Raman, Alka. 2025. Before Arsenic: Recovering a Forgotten Indian Technique of Painting with Indigo and its Implications for Knowledge Transfer. *Technology and Culture* 66/2: 509–534.

Riello, Giorgio. 2013. *Cotton: The Fabric that made the Modern World*. Cambridge: Cambridge University Press.

Sadao, Nishijima. 1984. The Formation of the Early Chinese Cotton Industry. In *State and Society in China: Japanese Perspectives on Ming-Qing Social and Economic History*, ed. Linda Grove and Christian Daniels. Tokyo: University of Tokyo Press.

Sewell, W. G. et al. 1939. The Natural Dyes of Szechuan, West China. *Journal of the Society of Dyers and Colourists* 55/8: 412–415.

Silberstein, Rachel. Threads of Commerce and Consumption: the Qing Foreign Trade in Silk, Cotton, Fur, and Wool, 1644–1860. In *The Oxford Handbook of the China Trade*. ed. Robert Gardella and Fred Grant. Oxford: Oxford University Press, forthcoming.

Silberstein, Rachel. 2026. The Material Lives of Ordinary People. National Museums Scotland website.

Silberstein, Rachel. 2020. *A Fashionable Century: Textile Artistry and Commerce in the Late Qing*. Washington: University of Washington Press.

So, Billy K. L. et al. 2005. Overseas Trade and Local Economy in Ming and Qing China: Cotton Textile Exports from the Jiangnan region. In *Trade and Transfer across the East Asian "Mediterranean"*, ed. Angela Schottenhammer. Wiesbaden: Harrassowitz Verlag: 163–184.

Song Yingxing 宋应星. 1637/1936. *Tiangong kaiwu* 天工开物 (Exploitation of the Works of Nature). Reprinted Shanghai: Shijie shuju.

Souza, George Bryan. 2005. Convergence between Divergence: Global Maritime Economic History and Material Culture. *International Journal of Maritime History* XVII. 1: 17–27.

Souza, George Bryan. 2004. Country Trade and Chinese Alum: Country Trade and Chinese Alum: Raw Material Supply in Asia's Textile Production in the 17th and 18th Centuries. *Revista da Cultura* 11: 136–153.

Sun Yumiao 孙雨苗. 2023. "Ming Qing shiqi de "Gaoli bu" 明清时期的 "高丽布," *Gudai wenming* 4: 134–141.

Styles, John. 2000. Product Innovation in Early Modern London. *Past & Present* 168: 124–169.

Timkowski, George (Egor F Timovsky). 1827. *Travels of the Russian Mission through Mongolia to China and residence in Peking in the years 1820–1821*. London, Longman. 2 vols.

Tsang, Ka Bo. 2005. *Touched by Indigo: Chinese Blue-and-White Textiles and Embroidery*. Toronto: Royal Ontario Museum.

Wang Yehong 王业宏 et al. 2011. Qingdai zhiranju ranse fangfa ji secai 清代织染局染色方法及色彩 (Dyeing Methods and Colors in the Qing dynasty Weaving and Dyeing Bureau), *Lishi dang'an* 2: 125–127.

Wang Tingyu 王廷元. 1993. Lun Ming Qing shiqi Jiangnan mianzhi ye de laodong shouyi ji jingying xingtai 论明清时期江南棉织业的劳动收益及其经营形态, *Zhongguo jingji shi yanjiu* 2: 91–98.

Watson, Ernest. 1930. *The Principal Articles of Chinese Commerce* (*import and Export*), *with a Description of the Origin, Appearance, Characteristics, and General Properties of Each Commodity*. Shanghai: Statistical Department of the Inspectionate General of Customs.

Wells Williams, Samuel. 1856. *A Chinese Commercial Guide Consisting of a Collection of Details and Regulations Respecting Foreign Trade with China, Sailing Directions, Tables, &c*. Office of the Chinese Repository.

Wood, William W. 1830. *Sketches of China: with Illustrations from Original Drawings*. Philadelphia: Carey & Lea.

Wu Chengming 吴承明 and Xu Xinwu 许滌新. 1985. "Su Song mianbu jiagongye Zhong de ziben zhuyi mengya" 苏松棉布加工业中的资本主义萌芽 (Sprouts of

Capitalism in the Suzhoua dn Songjiang cotton processing industry). In *Zhongguo ziben zhuyi de mengya* 中国资本主义的萌芽, ed. Wu Chengming 吴承明 and Xu Xinwu 许滌新. Beijing: Renmin chubanshe.

Wu Chengming 吴承明. 2002. *Wu Chengming ji* 吴承明集 (Collected Papers of Wu Chengming). Beijing: Zhongguo shehui kexue chubanshe.

Wu Shusheng 吴淑生 and Tian Zicheng 天自乘. 2019. *Zhongguo ranzhi shi* 中国染织史. Shanghai: Shanghai renmin chubanshe.

Xu Ke 徐珂. 1917. *Qing bai lei chao* 清稗類鈔 (Categorized anthology of Petty Matters from the Qing period). Shanghai: Shangwu yinshuguan.

Xu Weinan徐蔚南. 1936. *Shanghai mianbu* 上海棉布 (Shanghai cotton textiles). Shanghai: Shanghai Bowuguan congshu.

Xu Xinwu 徐新吾. 1999. "Ming Qing mianbu shangren ziben leixing fenxi" 明清棉布商人资本类型分析, in *Zhongguo jingji shiliao kaozheng yu yanjiu* 中国经济史料考证与研究 (Textual study of and research into historical materials on the Chinese economy): Shanghai: Shanghai shehuikexueyuan chubanshe: 165–194.

Xu Xinwu 徐新吾. 1981. *Jiangnan tubu shi* 江南土布史 (A History of Jiangnan Homemade Cotton Cloth). Shanghai: Shanghai Classics Press.

Xu Xinwu 徐新吾. 1981. *Yapian zhanzheng qian Zhongguo mian fangzhi shougongye de shangpin shengchan yu ziben zhuyi mengya wenti* 鸦片战争前中国棉纺织手工业的商品生产与资本主义萌芽问题 (The question of commercialization and sprouts of capitalism in the pre-Opium war period Chinese cotton handicraft industry). Nanjing: Jiangsu renmin chubanshe.

Xu Zhongyuan 许仲元. 1828/1996, *Sanyi bitan* 三异笔谈 (Jottings about unusual things). In *Biji xiaoshuo daguan*. Chongqing chubanshe. *ce* 12.

Ye Mengzhu 葉夢朱. 17th century / 1981. *Yue shi bian* 閱世編. Reprint, Shanghai: Shanghai guji chubanshe.

Yu Tongyuan 余同元 and Huang Kangjian 黄康健. 2009. "Ming Qing Jiangnan zhibu jishu de lilunhua" 明清江南织布技术的理论化 (The Rationalization of Weaving Technology in Jiangnan in the Ming and Qing Dynasties), *Gugong xuekan* 4: 560–575.

Zhang Chunhua 张春华. 1936. *Hucheng suishi quge* 沪城岁事衢歌 (Seasonal Folk Songs from Shanghai). Shanghai: Shanghai zhanggu congshu.

Zhang Lüping 张履平, comp., 1777. *Kunde baojian* 坤德寶鑒 (Precious Mirror of Feminine Virtues). Yuxiutang 遹修堂 edition.

Zhang, Zhongmin. 1990. *Shanghai: cong kaifa zouxiang kaifang, 1368–1842* 上海：从开发走向开放 (Shanghai from its Development to its Opening). Kunming.

Zhao Feng. 1981. Tiangong kaiwu Zhangshi pianzhong de ranliao he ranse《天工开物》彰施篇中的染料和染色 (Dyestuffs and Dye Colors in the Zhangshi section of *Exploitation of the Works of Nature*), *Nongye kaogu* 農業考古 1: 354–358.

Zhiwu Chen and Kaixiang Peng. 2022. Production, Consumption, and Living Standards. In *The Cambridge Economic History of China*, ed. Debin Ma and Richard von Glahn. Cambridge: Cambridge University Press. vol. 11, Chap.18: 676–709.

Zuo Xuchu 左旭初. 2003. *Zhongguo jindai shangbiao jianshi* 中国近代商标简史 (A Short History of Chinese Branding). Shanghai: Xuelin chubanshe.

Zurndorfer, Harriet T. 2011. Cotton Textile Manufacture and Marketing in Late Imperial China and the 'Great Divergence.' *Journal of the Economic and Social History of the Orient* 54: 701–738.