Writing the rich economic history of the South Asian textile industry: Spinners in early modern South India

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Introduction

The South Asian textile industry, particularly the industry in South India, offers one of the richest bodies of data on early modern and modern labour and commerce in the world. But too often our analyses of textile production and commerce rely primarily on large aggregate figures, such as counts of cloth pieces or looms, which produce only partial and unfocused views of the industry and its role in South Asian society. This paper is founded on a fundamental methodological thesis: the analysis of *micro*-economic data yields much richer *macro*-economic conclusions than the study of large scale aggregate figures alone.

This paper begins by describing the research and analytical methodologies for examining micro-economic data on textile production – asking basic questions, counting threads, and converting to a single set of weights, measures and currencies. Second, it demonstrates this methodological approach by examining the economics of spinning in early modern South India, based on archival Dutch and English Company records from the 17th and 18th centuries. This analysis is able to comprehend the costs, labour, wages and incomes of spinners and their households in striking specificity; and it shows the central role of spinning within the overall structure of the textile industry. Third this close study of textile production enables us to explore broader conclusions about the complex structure of the industry, household incomes, and gender contributions to labour and wages. Finally, the paper moves from small to large scale by examining the data on the total size of the South Indian

textile industry, multiplying the detailed, small scale structure that I will demonstrate. The result is a richly detailed macro-economic representation of the structure of textile production. By counting threads and carefully examining the fabric of the early modern textile industry, we can both identify the detailed economics of daily life and write a rich economic history of South Asia.

Methodology

The methodologies adopted in this analysis of the textile industry are important. We began by asking basic questions: who produced or marketed what, where, for how much? The early modern documentation of the textile industry answered those questions in extraordinary detail. My second core methodology was to use every bit of the data contained in the early modern cloth to understand the labour of those who produced it. A wide variety of textiles were produced in early modern South India. By carefully examining the dimensions, thread counts, quality and motifs in those cloths, we can understand a great deal about the labour and labourers who made the cloth. I call this careful analysis of the cloth 'counting the threads'.[1] The last crucial methodology came in analyzing the answers to the basic questions that we began with. I have painstakingly converted the complex array of 17th and 18th century currencies, weights and measures into metric units and a single currency, the pagoda. This enables us to better understand each of the stages of textile production and commerce and to comprehend the entire structure of the South Indian textile industry in an unprecedented manner.

[1] I owe an immense debt to Maureen F. Mazzaoui, who told me that I had to 'count the threads'. It took me many weeks in the archive before I understood the value of that advice. The full fruit of 'counting the threads' was not borne until I had analyzed all of that data.

The fundamental understanding of the textile industry begins by asking basic questions. Who produced or marketed textiles? What activities did they perform? Where? For how much? The answers to these questions are documented in remarkable detail in the early modern Dutch and English East India Company records. They are frankly an unparalleled and under utilized source. Many of the scholars who use the Company archives often eschew these basic, detail oriented questions in favour of the political or other social issues contained in Company sources. In doing so, we overlook the core occupation of the European trade sources in South Asia – which was undoubtedly textile procurement – and we miss a vast treasury of data on the shape of a major sector of the early modern economy and society. Moreover, it is also important to ask these questions of the entire textile industry. Studies of weavers, cloth merchants and textile trade abound, but fewer scholars have utilized the detailed evidence on spinners, washers or commercial agriculture. For that reason, this paper will focus on my analysis of spinners for detailing my methodological argument here.[2] By carefully identifying and examining the answers to these basic questions we are able to understand the social, economic, geographic structures of the textile industry. This detailed information provides a fundamental understanding of the kinds of decisions individuals, households and communities made: the economics of daily life.

'Counting the threads' has proved a crucial analytical methodology. Not all of the stages of production are described in detailed narrative reports or letters during the early modern period. The spinners and the spinning process for example are very rarely described in any detail. In

[2] My dissertation details the entire production process from commercial agriculture to cloth finishing. See Ian C. Wendt, "The Social Fabric: Textile Industry and Community in Early Modern South India" (Ph.D. diss., University of Wisconsin – Madison, 2005).

addition, it is often difficult to understand how the stages of textile production connect to one another. Cotton was sold in candies; thread was sold in bundles; cloth pieces had diverse thread counts and dimensions; bales or packs of cloth contain different numbers, sizes and weights of cloths. To fully understand and connect all of this diverse data, and thus to really understand textile production, one must pay close attention to the information contained within the cloth. By pulling the cloth apart and counting the threads, quite literally, we can understand much more about the processes of the textile industry. A textile, carefully examined and understood, tells us a great deal about the people and labour necessary to produce it.

Cloth dimensions, thread counts, cloth weight, and cloth quality are the keys to unlocking the labour that produced a textile. The thread count, when combined with the dimensions of a cloth, reveals the minute details of the labour of the spinner, warper and weaver. One can calculate the exact fineness, total thread and total labour in a cloth. By counting the threads, one can discern the amount of spinning, warping and weaving required to produce the cloth. The weight of the cloth is a final key to understanding the economics of textile production. The weight of a cloth can demonstrate the amount of cotton consumed, the value of a spinner's labour, and the value added through the entire process from cotton to cloth. The quality of a cloth is also informative. Plain cloth, patterned or printed cloth, coarse or fine cloth, good quality cloth versus damaged, torn or holed cloth all reveal information about the people, activities and circumstances involved in producing a piece of fabric. Closely examining the cloth, taking it seriously as a historical artefact, produces an additional trove of knowledge about the textile industry and its society.

Instead of making minute examinations of the cloth, much scholarship shows the inverse methodology of using aggregate measures

to make broad generalizations. But aggregate cloth counts or counts of bales in the hold of a ship ignore the diversity of early modern textiles and textile production, and they fail to comprehend the labour and society that produced that cloth. A bale of cloth is just a number if it sits. But just as a piece of cloth can be minutely examined, a bale or pack of textiles can be carefully analyzed to illustrate the numbers of people, the volumes of labour, and the structure of the society that produced and marketed it.

Our final methodology was to analyze all of the data on textile production in a unified set of weights and measures. Asking basic questions of the massive documentation of the textile industry quickly results in an overwhelming amount of information: information describing bales, cloths, dimensions, thread counts, sorts and varieties, prices and more prices. Unfortunately, that data is described in numerous weights, measures and coinages. The result is bewildering. As alluded to above, cotton was sold in candies, bhaars and maunds; cloth was measured in cobidos, els, astas, yards and inches; and packs or bales of cloth came in varying sizes and counts. Similarly, coinages in use by the VOC and EIC included pagodas, fanams, dubs, cash, rupees, annas, guilders or flourins, pounds, etc. Moreover, these units and the conversion rates between them varied geographically and temporally. Without belabouring the matter, it may be said that the situation was more complicated than represented here. The analytical work of making these conversions is significant.

It is therefore understandable that no author to date has united the entire process under a single set of weights and measures. The existing scholarship contains breaks in unit measures within their descriptions of the production chain that even an expert cannot resolve. It is common to find an author using several currencies – pagodas, fanams and rupees – in the same paragraph, let alone across chapters, without providing specific

conversion rates. The same is true of weights or other measures. The result is that economic data cannot be compared or understood on any aggregate level. In all of the analysis that follows, lengths, distances, weights and other measures are converted to metric units: meters, kilometres, kilograms, metric tons, etc.[3] The coinage used throughout this dissertation is the pagoda, with subsidiary coinages like fanams and dubs being converted to a decimal proportion of a pagoda.

The pagoda was the most common coin in South India during the 17th and 18th centuries. (There was actually a variety of pagodas used across South India through the full period, but we need not subject the reader to an analysis of conversion scales.) One pagoda was a significant sum in the early modern economy. For the sake of reference, a pagoda was roughly equivalent to 3 ½ rupees in the late 18th century. A poor household often earned about one pagoda per month, which constituted a modest, but subsistence income. During the 18th century, a mud brick house was worth from 7 to 30 or more pagodas, a modest brick house was worth from 40 to 150 pagodas.[4] A thatched hut was valued at 10 pagodas or less. Fine brick homes inhabited by wealthy merchants or minor nobles or officers were worth hundreds or even thousands of pagodas.[5] A cow or buffalo or bullock was worth about one pagoda, while a locally bred horse was worth 6 pagodas.[6] An imported horse would have been much more. For the sake of comparison, in the late 18th century a common piece of long cloth (33 meters long and 1 meter wide) was worth 2 or more pagodas; and a fine piece of long cloth was worth as much as 10 pagodas.

[3] The 'acre' and the 'inch' are the only exceptions. The inch is particularly difficult to escape because thread counts are measured by the inch.
[4] Tamil Nadu Archives (TNA), Madras Public Department Consultations (PDC), vol 103A (1770), 165-9.
[5] Fort St. David Consultations (FSDC) (1712.07.24), p42; TNA, South Arcot District Records, vol 66, (1768.02.05), 22; PDC vol 104B (1773.01.16), 772.
[6] FSDC (1725.02.23), pp17-20.

(As a broad rule of thumb, one pagoda was perhaps equivalent to 1000 or more of today's dollars in the contemporary world economy.)

Hopefully, the benefits derived from the ability to describe the entire process in metric measurements using a single currency will be apparent to the reader below. Because the original measurements were not perfectly standardized, varying regionally and chronologically, their conversion to meters or kilograms is not perfectly precise. But every effort has been made to be accurate and standardized in conversion. The author is aware of valid criticism to standardizing all weights and measures, particularly making metric conversions. This process simplifies complex unit relations, results in small inaccuracies, removes a layer of historical language, and possibly creates an anachronistic sense of standardization. But a reader cannot possibly be expected to know and compute the changing relationships between early modern weights, measures and coinages. The fundamental benefit of using a single set of units of measurement throughout the process, beyond immediate clarity for the reader, is the ability to compare the labour, wages and profits of each producer, merchant or consumer. It enables a higher order of analysis across the full textile industry, resulting in both more meaningful, specific knowledge of each stage of the process as well as a comprehensive idea of the shape and structure of the textile industry.

The economics of spinning[7]

As we will demonstrate, spinning occupied the central position in the production of cloth in early modern South India. It required the greatest amount of labour, employed the most producers or labourers, and provided

[7] This section of the paper is adapted from a portion of the second chapter of my dissertation. See Wendt, 53-66.

the largest single contribution to the overall value of most textiles. Elsewhere I have made a detailed analysis of the social organization, economic circumstances, and geographic organization and location of spinning in South India. In this paper we will focus on the economic aspects of spinning.[8]

The most basic understanding of spinning value and wages would be to subtract the cost of the cotton from the value of a given unit of thread and to divide that by the time spent to spin it. There are some complications to this formulation. First, some of the cotton was wasted during the spinning process. Early modern accounts of cotton 'wastage' during spinning vary from slightly below 10% to just over 20%.[9] A fair rule of thumb seems to be that 15% of the cotton was lost while spinning common thread. Cotton prices are another complication. They varied significantly over the late 17th and 18th centuries. We will address this by examining a wide range of cotton commodity prices alongside numerous thread prices.

A further complication comes from trying to determine the general range of spinner productivity, or how much thread a spinner could produce in a day or month. Our early modern observers were not personally expert in spinning. Spinning was a common activity that they took some notice of within the context of their travels or their textile procurement. Their observations of productivity and spinning wages or time-value were not detailed, but they do provide us with a range of productivity. In 1789, English merchants in Ganjam reported that a spinner could card and spin

[8] For a full analysis of these various aspects of spinning in South India see Wendt, 43-83.

[9] TNA, PDC 160B, 395; Andhra Pradesh State Archives (APSA), Godavari District Records, vol 847, 158; Francis Buchanan, *A Journey from Madras through the Countries of Mysore, Canara and Malabar*, vol. 3 (London: 1807), 317; also John A.C. Boswell, *A Manual of the Nellore District* (Madras: Government Press, 1873), 292.

4.1 kg of cotton into 3 kilograms of thread in thirty days.[10] In 1798 Benjamin Branfill, the Collector in Rajahmundry, noted that an expert spinner could spin a maund (11.4 kg) of cotton into coarse thread in two months.[11] Fine thread took much longer; the finest taking 18 to 24 months. Another observer in Godavari District noted the same figure of two months for 11.4 kg of cotton.[12] Buchanan noted that a woman working full time could spin 0.2 kilograms of the coarsest thread per day.[13] Finally, Elijah Hoole observed a group of spinners, who produced between 0.085 and 0.128 kilograms of thread per day.[14] If we calculate 25 working days per month and an average amount of cotton wastage, it seems likely that a skilled spinner could produce in the range of 3.0 to 5.0 kilograms of coarse thread per month, working full time. Fine thread produced in a month amounted to a much smaller weight. In addition, less skilled spinners also spun more slowly, producing less thread per day or month.

There are a variety of sources from the late 17th and late 18th centuries that enable us to understand the weight of cotton and thread in certain textiles. Coarse thread was usually used in cloths with up to 14 punjams or 1680 threads in the warp. These cloths had thread counts up to 40 threads per inch. Given the textiles whose weights were recorded in the documentation of the textile industry, particularly common cloths like long cloths, salampuris and parcalles, we may calculate a broad range of spinning productivity with some confidence. The monthly produce of between 3.0 to 5.0 kilograms of coarse thread noted above was equivalent

[10] TNA, PDC 160B (1789.12), 395.
[11] APSA, Godavari District Records, vol 847, 158.
[12] Prasannan Parthasarathi*, The Transition to a Colonial Economy: Weavers, Merchants and Kings in South India (Cambridge:2001)*, 60.
[13] Buchanan, vol 3, 317.
[14] Elijah Hoole, *Personal Narrative of a Mission to the South of India from 1820 to 1828* (London: Longman, Rees, Orme, Brown and Green, 1829), 156-7 cited in Parthasarathi, 60.

to between 60,000 and 100,000 meters of coarse thread.[15] This rate corresponds to between 300 and 500 meters per hour, or five to eight meters per minute. Again, this assumes that an expert spinner worked full time for a month. This was enough thread for between one half and one entire piece of coarse long cloth, or between one and two coarse salampuris.

There is evidence that spinners were probably accustomed to producing one kind of thread, only varying from this if there was a special need. For example, in the late 18th century the English often procured thread of certain counts in the same villages year after year, while other communities provided thread of other counts for other cloth varieties.[16] Since fine thread spinners were among the most practiced and expert spinners, it is fair to estimate that they produced lengths of thread at a rate similar to that of coarse spinners. If so, 60,000 to 100,000 meters of common or middling thread used in middling cloth, with thread counts of 50 to 60 threads per inch, would weigh between two and three kilograms. That quantity of middling thread produced 1.0 and 1.5 salampuris or 40% to 70% of a middling long cloth; the same length (60-100km) of very fine thread, with a thread count of 90 or more, would weigh about 1.0 and 1.5 kilograms, and would be enough for 0.5 and 1.0 fine salampuri or between 25% and 40% of a fine long cloth.[17] This information is summarized in Table 1.

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[15] See Appendices 2.2 and 2.3 for notes on the weights of various 17th and 18th century cloths, and how those relate to total thread. See also VOC 1472, (1689.06) ff407-426; FSDC (1726.07.18), 24; TNA, PDC 160B (1789.12.15), 395, 397-8; PDC 183B (1793), p1873; South Arcot District Records, vol 105 (1799), 24-5, 42-6; *Baramahal Records*, Section 4 – Products, 59.

[16] TNA, PDC 106B, 1012, 1023-4, 1037, 1040, 1132.

[17] See Appendices 2.2 and 2.3. See also VOC 1472, (1689.06) ff407-426; FSDC (1726.07.18), 24; TNA, PDC 160B (1789.12.15), 395, 397-8; PDC 183B (1793), p1873; South Arcot District Records, vol 105 (1799), 24-5, 42-6; *Baramahal Records*, Section 4 – Products, 59.

Table 1 – Spinner Productivity (per month of full-time labour)

	thread count (per inch)	length of thread	thread weight	Monthly Production	
				salampuris	long cloth
Coarse thread: Full-time	Up to 40	60,000 – 100,000 m	3.0 to 5.0 kg	1 to 2	½ to 1
Half-time		30 – 50 km	1.5 to 2.5 kg	½ to 1	¼ to ½
Middling thread: Full-time	50 to 60	60 – 100 km	2.0 to 3.0 kg	1 to 1 ½	40% to 70%
Half-time		30 – 50 km	1.0 to 1.5 kg	½ to ¾	20% to 35%
Fine thread: Full-time	90 or more	60 – 100 km	1.0 to 1.5	½ to 1	25% to 40%
Half-time		30 – 50 km	0.5 - 0.75 kg	¼ to ½	13% to 20%

Early modern spinners were aware of the fineness of the thread they produced. They used a fairly simple device called a reel for winding the thread onto a skein and determining the thread's quality.[18] Weavers knew exactly how much thread of what quality was required for a piece of cloth. There is ample evidence that counting threads was a common calculus made by spinners and weavers in producing cloth. Spinners were aware of the volume and quality of their production. The conversion from cotton and thread weight to thread length is crucial to our understanding of the comprehensive economics of textile production. It enables us to understand the labour of the spinner, to relate the volume of cotton to the amount of labour performed by the warper or weaver, and to understand the value added to the cloth by a whole variety of textile producers.

Spinning labour fluctuated with the seasons and the agrarian calendar. In general, very little spinning was performed during the periods

[18] Dorothy K. Burnham, *Warp and Weft: A Textile Terminology* (Toronto: Royal Ontario Museum, 1980), 106.

of highest demand for agrarian labour. During the harvest, very little spinning whatsoever was performed. The dry months following the harvest when there was little other work was the season when spinners produced the most thread. In years when crops failed myriad agrarian households turned to spinning to produce some family income.[19] The seasonality of spinning is comparable to the seasonality of most agrarian work, from ploughing to harvesting to cotton cleaning. Therefore, spinning productivity was complicated by the fact that during some seasons of the year spinning was a part-time activity and during others it was a nearly full-time activity. The seasonal and part-time nature of spinning meant that the actual annual or monthly productivity of a spinner was in most cases only a portion of the full-time quantities above. The fact that not all spinners were as skilled as the spinners used for the figure above also lowered actual average productivity.

As we move forward, we will describe spinning wages and incomes both in terms of full-time and half-time productivity. Full-time figures will be based on the productivity range from 60 to 100km per month. Part-time figures will be based on productivity of 30 to 50km per month. Full-time spinners would have included households that specialized entirely in thread production, such as those in the pariah spinning villages, or widow households that depended entirely on spinning for their livelihood. Nevertheless, most spinners produced thread only part-time, so the half-time figures are appropriate. The two sets of figures serve to define a range of spinning wages and incomes.

In order to understand the value added by spinning cotton into thread, we will compare cotton and thread commodity prices from the late 17th and 18th centuries. Table 2a contains a summary of thread prices per kilogram parallel to prices for cleaned cotton from the same periods noted

[19] *Baramahal Records*, Section 4 – Products, 59; Buchanan, vol 1, 379.

in Table 2.4 describing cotton prices. High cotton prices correlated strongly with high thread prices.[20]

Table 2a – Thread and Cotton Prices[21]

	Thread (pagodas per kg)			Cotton, Clean
	Common	Coarse	Fine	(pa/kg)
average of all prices	0.267	0.243	0.495	0.09
17th century average	0.243	0.206	0.494	0.08
17th century high range	above 0.3		above 0.7	above 0.11
17th century high	0.414		0.817	0.125
17th century middle range	0.2 - 0.3	0.14-0.32	0.3 – 0.7	0.05 - 0.09
17th century low range	below 0.2		below 0.3	0.038 - 0.05
17th century low	0.1		0.25	0.038
18th century average	0.31	0.28	0.497	0.096
18th century high range	above 0.35		above 0.6	above 0.11
18th century high	0.41		0.815	0.198
18th century middle range	0.25 - 0.35	0.14-0.32	0.4 - 0.6	0.08 - 0.11
18th century low range	below 0.25		below 0.4	0.05 - 0.08
18th century low	0.127		0.312	0.053

By subtracting both the cotton cost and the 10% to 20% wasted cotton from the thread prices, we arrive at average values or wages for producing one kilogram of thread.[22] Averages and middle ranges wages per kilogram for common, coarse and fine thread are shown in Table 2b. Spinning one kilogram of coarse thread required a fraction of the time

[20] For a few conditions that gave rise to exceptions to this correlation, see Wendt, 74-80.

[21] See Wendt, Appendices 1.2 and 2.1, 356-8, 360-2, for details and sources. In Table 2.6 the thread is categorized as 'common', 'coarse' and 'fine'. The Dutch and English Companies traded most in fine and middling range textiles. The coarse cloths purchased by the Companies were generally somewhat finer than the coarse cloths sold in local markets. Therefore, we have relatively few descriptions of thread prices for truly coarse threads, and for that reason the column describing 'coarse' thread in the table contains fewer figures. There is significant pricing overlap between 'common' and 'coarse' in the table and the underlying commodity prices that produced it.

[22] Spinning fine thread resulted in more waste than coarse thread. So I have calculated 10% waste for coarse thread, 15% waste for common thread, and 20% waste for fine thread.

required for fine thread. Therefore an average range of the monthly wage is calculated by multiplying the spinner's labour value for one kilogram of thread by the number of kilograms she could produce by spinning full-time for one month. Ranges for monthly wages are also shown in Table 2b.

Table 2b – Spinning wages, or labour value

Wage for one kilogram of thread			
	Common	Coarse	Fine
Average of all prices	0.163 pa	0.136 pa	0.387 pa
17th century average	0.151 pa		0.398 pa
17th century middle range	0.143 – 0.197 pa	0.085 – 0.221 pa	0.24 – 0.592 pa
18th century average	0.20 pa		0.381 pa
18th century middle range	0.158 – 0.224 pa	0.052 – 0.119 pa	0.304 – 0.468 pa
Wage for one month full-time labour			
	Common (2-3 kg)	Coarse (3-5 kg)	Fine (1-1.5 kg)
Average of all prices	0.327 – 0.49 pa	0.409 – 0.681 pa	0.387 - 0.581 pa
17th century average range	0.302 – 0.453 pa		0.398 - 0.596 pa
18th century average range	0.40 – 0.60 pa		0.381 - 0.572 pa

These wage or labour value figures provide a very useful set of figures to understand the range of values that spinners received for their labour, depending on what kind of thread they produced. These figures are averages and moderate ranges, and do not describe the full range of high and low figures that could have been generated from the commodity pricing data.

In order to provide a closer examination of the economics of spinning, let us examine some extraordinarily detailed records of selected textiles contracted for and purchased by the Dutch in the late 17th century in Devanampatnam and Nagapattinam. Table 3a contains the detailed data describing the quality, weight, length, and cost of the thread in nineteen different cloths from these two textile production and commercial centres.

Table 3a – Thread in selected Devanampatnam and Nagapattinam Textiles, 1689

textile variety	thread count	Cloth size	total thread length	thread weight	total thread cost	thread cost per kilogram
DEVANAMPATNAM	(per inch)	($meters^2$)	(meters)	(kg)	(pagodas)	(pa/kg)
bethilles (raw)	46.0	13.4	48,572.9	0.966	0.400	0.414
large gordel chindes (base cloth)	50.0	17.1	67,592.4	1.818	0.567	0.312
coarse guinee cloths (raw)	50.2	34.3	139,903.2	5.000	1.019	0.204
coarse salampuris (raw)	50.2	14.8	58,759.3	1.875	0.413	0.220
large tape sarassas (base cloth)	51.5	16.7	68,031.4	1.818	0.539	0.296
comiters (base cloth)	53.2	16.9	71,103.7	1.818	0.582	0.320
coarse parcalles (raw)	53.2	7.6	31,850.5	0.909	0.213	0.234
Baftas (raw)	53.2	15.5	65,178.4	1.989	0.425	0.214
small tape sarassas (base cloth)	58.7	12.5	58,155.8	1.591	0.447	0.281
bethilles Oetisaal	59.8	16.7	79,004.2	0.966	1.013	1.048
fine guinee cloths	82.7	34.3	230,428.8	4.091	2.750	0.672
fine salampuris	82.7	14.8	96,780.1	1.591	1.244	0.782
fine parcalles	82.7	7.6	49,545.3	0.795	0.650	0.817
textile variety	thread count	Cloth size	total thread length	thread weight	total thread cost	thread cost per kilogram
NAGAPATTINAM	(per inch)	($meters^2$)	(meters)	(kg)	(pagodas)	(pa/kg)
coarse guinee cloths (raw)	50.2	35.3	139,903.2	5.000	1.088	0.218
coarse salampuris (raw)	50.2	14.8	58,759.3	1.932	0.400	0.207
coarse parcalles (raw)	53.2	7.6	31,850.5	1.023	0.238	0.232
fine guinee cloth	88.6	35.3	246,888.0	4.091	2.700	0.660
fine salampuris	88.6	14.8	103,693.0	1.591	1.225	0.770
fine percalles	88.6	7.6	53,084.2	0.795	0.613	0.770

The textile varieties are sorted according to their thread fineness in ascending order. Guinee cloths, salampuris, parcalles, and bethilles were among the most common plain cloths produced for European merchants. Sarassas and gordel chindes were painted cloths. The sarassa and gordel chinde cloths noted here were the base cloths which were later painted and cut into smaller finished cloths. A close examination of this data tells a lot about the quality, quantity and value of the thread in these cloths. The thread counts show us that none of these cloths were particularly coarse,

most of them being middling or fine cloths. None were superfine cloths. The smallest of the cloths in this list, the coarse parcalles, contained almost 32 kilometres of thread in 7.6 square meters of cloth. The largest, fine guinee cloth (or long cloth) contained nearly 250 kilometres of thread in 35 square meters of cloth. The total value of the thread was determined both by its fineness and its volume. The thread for fine guinee cloth, or long cloth, cost 2.7 pagodas, a hefty sum. Superfine thread for a long cloth cost two or three times more.

Table 3b contains an analysis of the labour value in the thread based on the thread prices and a range of cotton prices from the late 17th century. Based on our survey of cotton prices from the period, the average price of cleaned cotton was 0.0799 pagodas per kilogram; the low price was 0.05 pa/kg and the high price was 0.11 pa/kg. Table 3b calculates the range of wages or labour values for the thread in each cloth by subtracting these cotton prices plus cotton wastage from the thread cost. It calculates the spinning wage per 10,000 meters by dividing the spinning wage for the whole cloth by the amount of thread in the cloth. Finally, it calculates the percentage of the value of the spinning labour as a proportion of the thread value, or in other words, the value added by the spinner to the cleaned cotton through the spinning process.

Table 3b – Spinning wages or labour values in selected Devanampatnam and Nagapattinam Textiles, 1689

textile variety	spinning wage per kg			spin wage per 10,000 m			labour value in thread		
DEVANAMPATNAM	average	low	high	average	low	high	average	low	high
bethilles (raw)	0.322	0.288	0.357	0.0641	0.0572	0.0709	77.8%	69.5%	86.1%
large gordel chindes (base)	0.220	0.185	0.254	0.0592	0.0499	0.0684	70.5%	59.4%	81.6%
coarse guinee cloths (raw)	0.119	0.077	0.146	0.0400	0.0276	0.0523	54.9%	37.9%	71.8%
coarse salampuris (raw)	0.128	0.094	0.163	0.0409	0.0298	0.0519	58.2%	42.5%	73.9%
large tape sarassas (base)	0.205	0.170	0.239	0.0547	0.0454	0.0639	69.0%	57.3%	80.6%
comiters (base cloth)	0.228	0.193	0.262	0.0583	0.0494	0.0671	71.3%	60.5%	82.0%
coarse parcalles (raw)	0.142	0.107	0.176	0.0405	0.0306	0.0503	60.7%	45.9%	75.4%
Baftas (raw)	0.122	0.087	0.156	0.0372	0.0266	0.0477	57.0%	40.8%	73.1%
small tape sarassas (base)	0.189	0.154	0.223	0.0517	0.0422	0.0611	67.3%	55.0%	79.5%
bethilles Oetisaal	0.956	0.922	0.991	0.1169	0.1127	0.1211	91.2%	87.9%	94.5%
fine guinee cloths	0.580	0.546	0.615	0.1030	0.0969	0.1091	86.3%	81.2%	91.4%
fine salampuris	0.690	0.655	0.724	0.1134	0.1077	0.1191	88.2%	83.8%	92.6%
fine parcalles	0.725	0.691	0.760	0.1164	0.1109	0.1220	88.8%	84.5%	93.0%
	spinning wage per kg			spin wage per 10,000 m			labor value in thread		
NAGAPATTINAM	average	low	high	average	low	high	average	low	high
coarse guinee cloths (raw)	0.126	0.091	0.160	0.0449	0.0326	0.0572	57.8%	41.9%	73.6%
coarse salampuris (raw)	0.115	0.081	0.150	0.0379	0.0265	0.0492	55.6%	38.9%	72.2%
coarse parcalles (raw)	0.140	0.106	0.175	0.0451	0.0339	0.0561	60.4%	45.5%	75.2%
fine guinee cloth	0.568	0.534	0.603	0.0941	0.0884	0.0998	86.1%	80.8%	91.3%
fine salampuris	0.678	0.644	0.713	0.1040	0.0987	0.1093	88.1%	83.6%	92.5%
fine parcalles	0.678	0.644	0.713	0.1016	0.0964	0.1068	88.1%	83.6%	92.5%
AVERAGES[23]									
coarse-middling cloths	0.171	0.136	0.205	0.048	0.038	0.058	63.4%	49.6%	77.1%
fine cloths	0.653	0.619	0.688	0.105	0.100	0.111	87.6%	82.9%	92.2%

The data contained in these four tables enable us to make a variety of conclusions about the value of spinning labour, and how that varied between coarse, middling and fine thread production. Based on both the commodity prices for cleaned cotton and thread as well as the main productivity ranges in Table 1 we concluded in Table 2b that spinning common thread a woman or man earned between 0.327 and 0.49 pagodas per month working more or less full-time. A half-time spinner of coarse thread earned 0.16 to 0.25 pagodas in a month. More skilled spinners capable of spinning fine thread earned between 0.387 and 0.581 pagodas

[23] Averages do not include bethilles Oetissal, whose price seems exceptional.

per month of full-time labour. Half-time spinners of fine thread earned 0.195 to 0.291 pagodas.

The 17th and 18th century wage ranges varied slightly from the overall range. The detailed figures for cloths from Devanampatnam and Nagapattinam in Table 3b substantiate this range. The average wage range for the coarse to middling cloths calculates to between 0.342 and 0.615 pagodas for two to three kilograms of thread (0.17 to 0.31 pagodas per month, half-time); the average range for fine thread is higher, from 0.653 up to 1.032 pagodas for 1.0 to 1.5 kg (0.33 to 0.51 pagodas half-time). If we calculate based on thread length, 60 to 100km per month, we find a comparable range. Sixty to one hundred kilometres of coarse to middling thread spun in one month was worth 0.288 to 0.58 pagodas (0.144 to 0.29 pagodas half-time); the same length of fine thread was worth 0.63 to 1.11 pagodas (0.32 to 0.55 pagodas half-time). These documents serve to give us a good sense of the middle ranges of the value of spinning labour. Table 4 contains the average ranges for all of the above labour value and income data.

Table 4 – Summary of monthly spinning incomes

	Full-time monthly income		Half-time monthly income	
	Average	Range	Average	Range
Coarse thread	0.44 pa	0.32 – 0.56 pa	0.22 pa	0.16 – 0.28 pa
Fine thread	0.73 pa	0.56 – 0.91 pa	0.37 pa	0.28 – 0.45 pa

The data on the percentage of value contributed by the spinner to the thread refers to the amount of the thread's value that was added by the spinner above the value of the cleaned cotton. It clearly shows that as a spinner invested time and labour into spinning finer thread in contrast to coarse thread, the value of the labour as a percentage of the total cost of

the thread increased markedly. Of the total value of the thread for the coarse to middling plain cloths in Table 2.7b, between 50% and 77% was made by the spinner. By contrast, between 83% and 92% of the value of fine cloths was added by the spinner. Clearly, the poorest spinners could best afford to spin fine thread, because they could invest a great deal of time into a small amount of cotton and realize a large income. The commodity values in Table 2a can be used to calculate a similar range.[24]

Spinning labour also contributed a major portion of the total wholesale value of a piece of cloth. In the finest cloths, this was particularly true. Of the total value of a fine plain cloth, like a fine guinee cloth (long cloth) or fine salampuri, approximately 70% to 75% of its value was the cost of the thread. That meant that the spinner's labour contributed 61% to 66% of the total value of a piece of fine cloth. The spinner's contribution to common or middling cloths was slightly lower. The thread constituted about 60% to 70% of the value of common or middling plain cloths.[25] The spinner's contribution was from 38% to 44% of the total value. Patterned, dyed and painted cloths had many other labour inputs by dyers, which served to lower the spinners' proportion. Nevertheless, it is clear that spinners contributed the largest single volume of labour to plain cloths, and for fine cloths they even contributed the majority of the value. Weavers, washers, dyers and others continued to add to a textile's value. Other professional artisans' wages for their monthly labour was generally higher than spinners' incomes. Spinners were quite poor. But in aggregate, spinners contributed the largest proportion of total labour and value to most cloths.

[24] See also TNA, PDC 160B, 397-8; *Baramahal Records*, Section 4 – Products, 82, 109-110.
[25] These figures include only production costs, and exclude profits to cloth merchants. VOC 1472 (1689), ff407-26; TNA, PDC 160B, (1790), 401-3.

Spinners were central to textile production, and the historiography does not recognize their role or value. Clearly, the methodologies for examining microeconomic details yield rich data on the entire textile industry. By asking and answering basic questions, examining thread counts, cloth dimensions and commodity prices, we have shown the economics of 17th and 18th century spinning labour. We move on to examine the ways this data can contribute to a much richer macroeconomic description of the early modern textile industry.

The shape, structure and size of the textile industry

How did spinning labour and wages contribute and relate to the textile industry as a whole? We have only demonstrated the methods used to analyze spinning productivity and wages. But each stage of textile production can be analyzed in similar detail. Though such analyses are beyond the scope of the present examination, we may still proceed to the broader conclusions that can be made when such comprehensive analyses have been performed. Elsewhere, I have made a thorough analysis of the structure of the early modern South Indian textile industry by comparing wages, labour volumes, value added, household incomes, and gender contributions to household incomes.[26] Given our focus on spinning and its contribution to the textile industry, let us observe the contributions that spinners made to several household types that participated in textile production. Table 5 utilizes the calculations of monthly and annual wages for the various forms of textile production labour to comprehend total household incomes and gender contributions to

[26] Wendt, section 5.3, 325-348.

income for families in which spinning was a prominent form of labour. For the full table, refer to my dissertation.[27]

Table 5 – Labour, income and gender in households participating in textile production

Households	Monthly		Annual		Female labour
	range	moderate	range	moderate	Pagoda / percent
Landless Labourer **Cultivator** (5 acres of others' land)				10.5+ pa	5.5+ pa / 52%
Cultivator labour + cotton cleaner + part-time spinner	Seasonal 0.4-0.66 pa 0.15-0.35 pa	Seasonal 0.25 pa	5.6-7.3 pa	6.5 pa 1.0+ pa 3.0 pa	1.5 pa 1.0+ pa 3.0 pa
Small Landed **Cultivator** (5 acres)				13.3 pa	5.5+ pa / 41%
Cultivator labour + profit + cotton cleaner + part-time spinner	Seasonal 0.4-0.66 pa 0.15-0.35 pa	Seasonal 0.25 pa	5.6-7.3 pa 2.5-3.35 pa	6.5 pa 2.75 pa 1.0+ pa 3.0 pa	1.5 pa 0 1.0+ pa 3.0 pa
Professional Spinner	0.45-1.05 pa	0.75 pa	5.4-12.6 pa	9.0 pa	33%- 50%- 100%
1 spinner labour full-time + 1 spinner labour half-time	0.3-0.7 pa 0.15-0.35 pa	0.5 pa 0.25 pa	3.6-8.4 pa 1.8-4.2 pa	6.0 pa 3.0 pa	
Weavers					
Weaver with 1 loom	0.77-1.59 pa	1.16 pa	9.3-19.1 pa	13.9 pa	5.3 pa / 38%
Warping + part-time spinner + Weaving labour + Weaving profit	0.13-0.27 pa 0.15-0.35 pa 0.33-0.65 pa 0.16-0.32 pa	0.19 pa 0.25 pa 0.48 pa 0.24 pa	1.6-3.2 pa 1.8-4.2 pa 3.96-7.8 pa 1.9-3.8 pa	2.3 pa 3.0 pa 5.8 pa 2.8 pa	2.3 pa 3.0 pa
Weaver without own loom	0.61-1.27 pa	0.92 pa	7.4-15.2 pa	11.1 pa	5.3 pa / 48%
Warping + part-time spinner + Weaving labour no profit	0.13-0.27 pa 0.15-0.35 pa 0.33-0.65 pa 0	0.19 pa 0.25 pa 0.48 pa 0	1.6-3.2 pa 1.8-4.2 pa 3.96-7.8 pa 0	2.3 pa 3.0 pa 5.8 pa 0	2.3 pa 3.0 pa

For the purposes of Table 5, the wage range for part-time spinning was simplified to between 0.15 and 0.35 pagodas per month. Compare this to the summary of monthly spinning incomes on Table 4 above. The moderate figure was 0.25 pagodas per month. Based on these

[27] Wendt, Table 5.5, 342.

calculations, part-time spinning contributed about 3 pagodas annually to cultivating households. This represented between 23% and 30% to the household income of poor cultivators. Since women in these households also worked by weeding, picking and cleaning cotton, the total female contribution to household income was nearly half of all annual income.

There were early modern households that depended entirely on spinning for their income. Some of them were widow households, and others were married families who specialized entirely in spinning in intensive textile production regions. If the members of such a household – women, men, or children – were capable of producing the equivalent of one full-time and one half-time amount of thread, they could earn cash for their labour of between 5.4 and 12.6 pagodas annually. This was a small, but living wage in the 17th and 18th centuries. If the household members could spin more, their income would rise. Such a household would be poor. In years of drought, cotton crop failure, famine or war they would be subject to hunger, flight and possible starvation. In a spinning household, female labour contributed between one third and all of the household income.

Finally, the women in early modern weaving households commonly spun. If the women of the household spun the equivalent of one half-time spinner, they contributed between 1.8 and 4.2 pagodas annually, or a moderate figure of 3 pagodas. This was between 22% and 27% of total household income and could be realized in cash. The female members of weaving households also prepared the warps for the loom. The total female contribution to household income was between 38% and 48%, or nearly one half.

Clearly, spinning was a prominent portion of the textile industry that contributed significantly to the household incomes of a variety of textile producing families. [Relate to Parthasarathi.[28]]

We can understand how spinning related to the broader structure of the textile industry in a variety of ways: in relation to the production of a given piece of cloth or a specific type of bale of cloths, or in relation to the wages of other textile producers or textile producing households. One fascinating method for understanding the structure of the textile industry is in terms of how many labourers and households were involved in supporting the production of a single loom.

[28] Prasannan Parthasarathi, "Rethinking Wages and Competitiveness in the Eighteenth Century: Britain and South India" *Past and Present* 158, (Feb 1998), 79-109.

Table 6 – Labour and Households supporting a single loom annually (late 18th century)

	production	characterization	# households	# male	# female
Cultivators			3 – 4		
Plowing, sowing	~ 5 ½ acres land[29]	Male, seasonal		3 – 4	
Weeding, picking	~ 609 kg cotton w/ seed[30]	Mixed, seasonal		3 – 4	3 – 4
Cotton cleaners	~152 kg cleaned cotton[31]	Female, seasonal			3 – 4
Total Cultivators			3 – 4	3 – 4	3 – 4
Spinners	~132 kg thread ~3,100 km thread[32]	Female, some male ~ Half-time	5 +	1 – 2	5 – 8
Weavers	~810 sq m /yr		1		
Warping	~48 salampuris or ~24 long cloths[33]	Female, part-time			1+
Weaving		Male, full-time		1+	
Total Weavers			1	1+	1+
Washers	0.6 pack salampuris or 1.2 packs long cloth[34]	~ 1 month labor Mixed male-female	1	1	1
Merchants		Male	1/10 merchnt	1/10	
TOTAL			10+	6 – 8	10 – 14

As illustrated in Table 6 (based on late 18th century cloth production figures), a single fully employed loom produced approximately 810 square meters of cloth annually, or about 48 salampuris per year or 4 per month. That cloth required 3100 kilometres of thread and 152 kilograms of cotton fibre produced on 5 ½ acres of land. Thus three to four households cultivated, harvested and cleaned the cotton. Five to nine spinners,

[29] Average 28 kg cleaned cotton per acre productivity, and average cultivating family produced cotton on about 1.5 acres per year, see Wendt, 44.
[30] The ratio of cotton with seed to cleaned cotton fibre is about 4:1.
[31] Average wastage of cotton during spinning was 15% or more.
[32] Calculated based on dimensions, average weight of thread, and thread length in major 18th century textiles, see Wendt, Appendix 3.2, 375-380.
[33] Calculated based on average monthly productivity for plain cloth looms (=at least 65 sq m per month), see Wendt, Appendix 3.2, 375-380.
[34] 1 pack of common salampuris contained 80 pieces; 1 pack of common long cloth contained 20 pieces.

primarily female, from at least five households produced thread for every active loom. Both the male and female members of a weaving household contributed labour for warping and weaving in their household. One loom's production was insufficient to employ a washing family full-time in finishing new cloth. There were probably ten weavers for every washer devoted to commercial finishing. But in every village in early modern South India dhobis, or washers, cleaned cloth over and over again as people used them, and so there may have been a rough parity between cloth weavers and cloth washers. Finally, some fractional number of merchants, estimated at one tenth, was employed in marketing the cloth from one loom.

Therefore, a single loom required some labour from and contributed some income to at least 10 households and between 16 and 22 individuals. Table 6 demonstrates that professional, full-time, male labour constituted a small minority of the labour involved in textile production. Spinners – part-time, non-professional labourers – were the largest single group. Women (~65%) and agrarian labourers (~85%) constituted large majorities of all textile producers.

From this view of the textile industry based on the production of a single loom, we can now extrapolate upward to the size and structure of the textile industry in an entire region. One of the most common ways early modern European merchants quantified the size of textile production was to count the looms in a village or region. Viewed alone, a loom count informs us of the approximate number of weavers or weaving households in a region. But given our understanding of the large number of women and men involved in supporting a single loom, we can demonstrate a much larger and more complex society from the evidence of loom counts.

During the late 17th century the Dutch surveyed and/or estimated the numbers of looms and weavers in several regions along the Coromandel

Coast. Nearly a century later, the English made surveys of their own. None of these sets of loom counts can be viewed as comprehensive. They focused on regions around major market towns, particularly along the coast, where the East India Companies collected the bulk of their cloth. The Dutch in particular noted significant fluctuations in numbers of weavers, as they moved or perished due to various disruptions in the late 17th century. Given those qualifications, Table 7 contains a summary of the major regions where the Dutch and English surveyed looms during the late 17th and late 18th centuries. The table is organized regionally, from south to north.

Table 7 – Loom Counts in early modern South India

Region	**looms**	**survey by**	**year(s)**	**sources**
Madurai/Tirunelveli/Ramnad				
Madurai Coast	**~7000 (up to 12,000)**	VOC/ Dutch	1677, 1683, 1694	VOC 1329, ff1262-73; VOC 1383, f562v; VOC 1543, f629.
Tirunelveli/Ramnad	**6096**	EIC/ English	1793	TNA, PDC 182A, pp863-4; TNA, PDC 183, p1883.
Southern Coromandel				
Nagapattinam/ Thanjavur	**3479**	VOC	1684	VOC 1581, pp89-166; VOC 1355, ff2002-4
Cuddalore	**1500**	EIC	1768, 1802	TNA, South Arcot vol 110, p4; South Arcot, vol 66.
Madras/ Jaghir	**2100**	EIC	1771	TNA, PDC, vol 106B, 1068-1121.
Northern Coromandel				
Masulipatnam region	**4139**	EIC	1786-87	APSA, Masulipatnam, vol 2837, 18-20; Masulipatnam, vol 2838, 37-40.
Godavari region	**3090**	EIC	1802	APSA, Godavari, vol 944A, 643-5; Godavari, vol 946A, 61-6.
Vishakhapatnam	**?**			
TOTAL	**21,300**			

Some regions were not surveyed at all. Even along the coast, the absence of a broad estimate of looms for Vishakhapatnam is striking. The first and second loom counts of the Maruai/ Tirunelveli region cover much the same area. The other loom counts by the Dutch and English each surveyed separate major production centres and regions. Therefore, the total number of looms surveyed during the early modern period was approximately 21,300 looms. By way of comparison, Conrad Specker's figures from English District surveys of looms in the Madras Presidency between 1819 and 1844 are universally higher by two to four times on a region by region basis. If an average sum of all looms were calculated from Specker, the number would be approximately 95,000 looms.[35] Even if we removed the inland districts – where the Dutch and English Companies had little or no commercial contact – from Specker's total, the number would be approximately **60,000 looms.

There are a few possible reasons for such marked differences. The most likely reason is that during the 17th and 18th centuries the East India Companies probably undercounted because they had limited powers and access to only a small proportion of all weavers and looms along the coastal plain. If so, this is a powerful demonstration of the limited extent of the East India Companies even at the end of the 18th century. Second, the 19th century figures may be an over count of looms. I cannot evaluate Specker's sources or analysis, but this possibility does not seem to explain the volume of the discrepancy. The final possibility is that the textile industry grew markedly during the early 19th century. This seems very unlikely as it contradicts of generations of historiography. But the rise in looms counted certainly calls into question the notion that the textile industry in South India was in marked decline in the early 19th century.

[35] Konrad Specker, "Madras Handlooms in the Nineteenth Century," *Indian Economic and Social History Review* 26/2 (1989): 131-166.

We could examine the nature and implications of these loom counts at length. But our purpose here is to understand the structure and size of the textile industry in greater detail. Thus, let us proceed with the early modern figure of 21,300 looms, recognizing that it probably captured less than half of all looms along the Coromandel coastal plain. 21,300 weavers or weaving households is an interesting figure. But it only represents a fraction of the total textile industry. As we demonstrated in Table 5, a single loom was supported by a multitude of labourers and households. Table 8 multiplies the size of the textile industry by 21,000 to give us an estimate of the total size and structure of the early modern textile industry.

Table 8 – Total size and structure of the early modern textile industry, based on early modern loom counts

	production	characterization	# households	# male	# female
Cultivators Plowing, sowing Weeding, picking Cotton cleaners	 ~ 115,500 acres land ~ 12,800 metric tons of cotton w/ seed ~3,192 m tons cleaned cotton	 Male, seasonal Mixed, seasonal Female, seasonal	~75,000	 ~75,000 ~75,000	 ~75,000 ~75,000
Total Cultivators			~75,000	~75,000	~75,000
Spinners	~2,772 m tons thread ~65 million km thread	Female & male ~ Half-time	~105,000 +	~21,000 to ~42,000	105,000 to 168,000
Weavers Warping Weaving	~17 million sq m cloth per year, equal to ~1,150,000 salampuris or ~515,000 long cloths	 Female part-time Male, full-time	~21,000	 ~21,000+	 ~21,000+
Total Weavers			~21,000	~21,000+	~21,000+
Washers	14,400 packs salampuris 25,800 packs long cloth	~ 1 month labour Male & Female	~21,000	~21,000	~21,000
Merchants		Male	~2,100	~2,100	
TOTAL			~224,000+	~140,000 – ~160,000	~222,000 – ~285,000

As noted at the beginning of this section, loom counts were just one method of examining the size of the textile industry. These figures can also be checked against total exports, cotton cultivation estimates or other aggregate figures. Such calculations are beyond the scope of this paper, though my research pursues these methods elsewhere. Any of these methods will produce incomplete estimates, for the same reasons noted above. Large aggregate figures from early modern sources are always partial estimates. But that is precisely why starting with the micro or fine structure of textile production is crucial. By aggregating loom counts from

up and down the Coromandel Coast and combining them with our comprehensive analysis of textile production, we can show that the textile industry contributed to the household labour and income of no less than 224,000 households in early modern South India. Between 362,000 and 445,000 individuals earned some cash income through producing cloth. Based on these estimates, early modern commercial agriculture in cotton covered no less than 115,000 acres of land. It produced 12,800 metric tons of cotton annually. Spinners spun 65 million kilometres of thread. Weaving households produced about 17 million square meters of cloth equivalent to 14,000 packs of salampuris or 26,000 packs of long cloth.

Since the loom count we used was probably an under-representation of the total number, these figures are a baseline. If we were to apply the 19th century loom figures from Specker, there would be at least one million people employed in commercial agriculture, cotton cleaning and spinning, weaving, washing and trading of cloth. The majority of these people were women and part-time or seasonal agrarian labourers. The largest single group was female spinners: 168,000 of them by our estimate. Full-time professional artisans, like weavers, dyers, washers and merchants, were crucial to the textile industry; but they were a minority of all labourers.

Conclusion

Scholars have studied the production and trade in textiles in early modern South India for more than thirty years. Weavers and merchants have been the most prominent protagonists.[36] Each of these studies has

[36] See J.J. Brennig, "Textile Producers and Production in Late Seventeenth-Century Coromandel." *Indian Economic and Social History Review* 23, no. 4 (1986): 333-356; Potkuchi Swarnalatha, "The World of the Weaver in the Northern Coromandel, 1750-1850" (Ph.D. diss., University of Hyderabad, 1991); Parthasarathi, *Colonial Economy*.

contributed to our understanding of the early modern processes of production and commerce, the structures of the textile industry, and the society of weavers and cloth merchants in South India. This paper has argued that a methodological focus on microeconomic data and analysis can further enrich our understanding of the textile industry and South Indian economy and society generally. In order to illustrate this methodology, we have focused on spinning, which is an often overlooked and yet central component of the textile industry.

At the microeconomic level, the paper made a close analysis of the economics of spinning. Direct observations of spinners' labour and wages were extremely scarce in early modern historical sources. But the East India Companies documented a wide range of data on cloth quality in the late 17th and 18th centuries. By utilizing thread counts, cloth dimensions, and cotton and thread commodity prices we can comprehend spinning labour, productivity and wages in great detail. By relating spinning labour to the entire textile industry we were able to understand the structure of the textile industry more broadly. Spinning labour and wages contributed directly to the household incomes of many textile producing households. Cotton cultivators, specialized spinner households, and weaver households are some prominent examples of families wherein spinning contributed approximately one quarter of all household income. In connection with spinning, women's labour often contributed between one third and one half of all household cash income.

This microeconomic analysis of the fine structure of the textile industry can be extended to the macroeconomic level. First we studied the structure of the overall textile industry by examining the volumes and varieties of labour and households necessary to support a single loom. A loom required labour by producers and merchants involved in commercial agriculture, cotton cleaning, spinning, weaving, washing and commerce.

Then, by aggregating loom counts from across South India, we were able to multiply the small scale structure of textile production to appreciate the full breadth and scale of the textile industry. By combining micro and macroeconomic analysis, we can transform aggregates like loom counts or counts of cloth pieces or bales in ships into a complex representation of the society of textile production and commerce. From 21,300 looms counted by the Dutch and English in the 17th and 18th centuries, we extrapolated a society of hundreds of thousands of female and male, agrarian and artisan, professional full-time and seasonal or part-time textile producers. Other aggregates from cloth counts or cotton quantities can be expanded through other analytical examinations. As this kind of research progresses, all of these analyses will combine to give us an increasingly rich account of the structure of the textile industry and its contributions to early modern South Asian economy and society.

The size and shape of this industrial structure is truly exciting. It demonstrates the scope and extent of textile production and commerce in the early modern world. The textile industry cut across boundaries that too often divide our historiographic landscapes: rural and urban, commercial and agrarian, coastal and inland. Textile production and commerce formed material connections between the agrarian, artisan and commercial spheres of South Asian society. Global networks of credit extended from Europe and broader Asia into ports, markets centres, local fairs, and villages across South India – from the Coromandel coastal plain to the cotton fields of the Deccan Plateau. Gold, silver and copper coins as well as credit and promissory notes flowed through the hands of Company merchants and officers to brokers to head weavers or heads of other artisan communities and thence into the hands of weavers, dyers, and eventually even spinners. Huge volumes of cotton, thread and cloth flowed in reverse directions through production networks.

This paper has demonstrated how the analysis of the micro-economics of spinning contributes directly to a broad and rich understanding of wages, household incomes, and the structure of the textile industry. Spinning wages, just a fraction of a pagoda, represented significant contributions to household incomes for households from a wide range of textile producers. Furthermore, spinning was part of a broader textile structure necessary for supporting the production of every single loom in early modern South India. In aggregate, those looms provide us evidence of a broad and diverse society of producers and merchants numbering in the hundred of thousands. Too often our study of textile industry is content to count bales or measure trade, which misses the breadth, extent and complexity of the society and economy of textile industry. At its root therefore, this paper makes a methodological argument – the analysis of *micro*-economic data yields much richer *macro*-economic conclusions than the study of large scale aggregate figures alone.

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