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HOW much of the increased consumption of machine-made cotton yarn and cloth in nineteenth- and twentieth-century China represented a net increase in the total consumption of cotton goods? What part of the increment merely denoted a shift of the source of supply from rural handicraft to factory production—in Shanghai and Tientsin and, in the form of imports, in overseas mills? These questions, of course, are only part of the more inclusive problem of the effects of expanding foreign trade and the beginnings of domestic industrialization upon the agricultural sector in modern China. The most important household handicraft in rural China was, however, the spinning and weaving of cotton. An examination of its fate, while it will not dispose entirely of the larger problem, is a critical step toward that end.

Were rural handicrafts, as many Chinese historians before and after 1949 have asserted, undermined by imported manufactured goods?[1] This claim derives ultimately from Karl Marx who wrote in 1853, with reference to the origins of the Taiping Rebellion, that "In China the spinners and weavers have suffered greatly under this foreign competition [that is, the importation of English cottons], and the community has become unsettled in proportion."[2] While Marx's picture of China in the 1850's, before imported cotton goods had any significant effect, appears to be a transposition to China of perhaps an equally implausible analysis of contemporary Indian conditions, is his suggestion nevertheless valid for a later period, say from the 1870's, by which time textile imports had become an important factor in the Chinese economy?

Is it possible, on the other hand, that the importation of foreign

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[1] See, for example, Fan Pai-ch'uan, "Chung-kuo shou-kung-yeh tsai wai-kuo tzu-pen-chu-i ch'in-ju hou ti tsao-yü ho ming-yun" (the fate of Chinese handicraft industry after the incursion of foreign capitalism), *Li-shih yen-chiu* (historical studies), No. 3 (1962), 88-115.

[2] "Revolution in China and in Europe," *New York Daily Tribune*, June 14, 1853, reprinted in Dona Torr, ed., *Marx on China* (London: Lawrence & Wishart, 1951), p. 3.

manufactures directly or indirectly stimulated the development of some handicraft branches—enough perhaps to compensate for the destruction of others? If rural handicrafts were damaged, did not new urban handicraft production grow up in the shadow of foreign commerce and factory industry in the treaty ports? And even within the rural handicraft sector, were not some branches fortunate while others foundered?

The admitted scarcity of quantitative data has tended to limit analysis of these matters to the accumulation and weighing of quotations—from the contemporary record by less ideological practitioners, from the Marxist "classics" by others. Following a brief description of the cotton textile handicraft industry in late-Ch'ing China, of the trade in imported cotton goods, and of the beginnings of domestic manufacture of yarn and cloth, I shall attempt to derive several quantitative alternatives, and to choose among them one which seems best to portray the fortunes of cotton textile handicrafts during the last four decades of the Ch'ing dynasty. It is possibly presumptuous, in the absence of reliable information about the size of the raw cotton crop in nineteenth- and even in twentieth-century China to quantify the developments I shall describe. If, however, the aim is not exact measurement of the shares of handicraft, domestic manufactured, and imported yarn and cloth in the consumption of the Chinese population in a specific single year, but rather the construction of plausible alternatives which are representative respectively of the decades 1871-1880 and 1901-1910, then the task, while still speculative, is not impossible.

HANDICRAFT TEXTILES, IMPORTED COTTON GOODS, AND DOMESTIC MANUFACTURES

From the Yuan dynasty onward, cotton culture and manufacture had spread rapidly in China, cotton cloth becoming the principal daily article of clothing for all except the very wealthy. While cotton cultivation was fairly widely distributed, the principal producing areas in the nineteenth century were the Yangtze valley provinces. It was in this region that cotton handicrafts were most concentrated and highly developed. Large areas in the Yangtze delta were better suited to growing cotton than food crops, and, in the relatively humid climate of Kiangsu, yarn of greater tensile strength and evenness could be spun. From Kiangnan (that is, the area south of the lower reaches of the Yangtze river) and the dis-

tricts around Shasi in Hupei, for example, large quantities of baled raw cotton and woven piece goods were carried by water and on the backs of porters to Manchuria and North China, to Szechwan via the Yangtze, to Yunnan and Kweichow in the southwest, and to the southern coastal provinces. It was more profitable for Kiangnan peasants to concentrate their productive resources on growing cotton and on weaving (and of course on the spinning required by that weaving) rather than to spin themselves all the cotton that they grew. Thus spinning by rural households for their own consumption with supplies from the Yangtze valley provinces and with local raw cotton was carried on to varying degrees throughout China. And locally woven cloth supplemented that which came from Hupei and Kiangnan.

But only in the major cotton producing areas had the handicraft production of cotton textiles developed into a major industry serving other than an immediate local market. From the weaving districts in southern Hupei, for example, cloth was brought by peasant weavers or petty merchants to the daily piece goods market in Shasi. The wholesale merchants who purchased in this market graded the cloth by quality and stamped each grade with a well known "chop" (that is, trademark) which was accepted as a guarantee of quality in the markets of Yunnan and Kweichow to which the goods were sent. Cloth from Hupei reached northern Yunnan via Szechwan, first by water on the Yangtze and its tributaries, then on the backs of porters who carried loads as large as 117 pieces of cloth weighing 220 pounds, and then by pack animal on the Yunnan mountain roads. Kweichow was reached mainly via Hunan employing the Tung-t'ing lake and the Yuan river which flows into it. This was not, by contemporary standards, a petty trade either in size or in the distances traversed. As late as 1895, by which time radical changes in the structure of the handicraft cotton industry were already in train, more than 200,000 bales of raw cotton and 300,000 bales of piece goods were being imported annually into Szechwan largely from Hupei. And some 3,200,000 pieces of cloth were reaching northern Yunnan each year from Shasi.[3] Similarly, China south of Amoy, North China, and Manchuria were supplied mainly from Kiangnan. Moreover, substantial quantities of hand-woven cotton

[3] *Report of the Mission to China of the Blackburn Chamber of Commerce, 1896-7* (Blackburn: The North-East Lancashire Press, 1898), F. S. A. Bourne's Sec., pp. 35, 74.

cloth were exported from Canton to England and the United States. Until 1831 England purchased more "nankeens" (that is, cloth manufactured in Nanking and other places in the lower Yangtze region) each year than she sold British-manufactured cloth to China.

Spinning and weaving in the cotton regions for the most part were carried on by individual rural households, to a small extent on a near full-time basis but more often in addition to the production of food crops upon which the family was chiefly dependent. Yarn was either spun in the household, or obtained in exchange from the merchants who purchased the cloth which the peasants wove. The income from textile handicrafts formed a larger part of the total income of poorer farmers with the smallest farms than it did of the more affluent. Preparation of the warp prior to weaving, for example, was commonly undertaken in small peasant households to supplement meagre agricultural incomes. For the cotton regions as a whole, however, maintenance of the minimum living standards of the dense rural population was critically dependent upon the market for raw cotton and cloth. The calendering and dyeing of cotton cloth tended to be concentrated in market towns and cities which also were the distributing centers for the finished product. These finishing processes were often controlled by the larger cloth merchants and carried out by hired labor, usually paid on a piece-work basis, in "handicraft workshops" owned by these merchants or, as in Soochow, by intermediary "operating agents" (*pao-t'ou*) to whom the workers paid a monthly fee from their piece-work earnings for the use of the plant and equipment. In general, before the last quarter of the nineteenth century the cloth merchants exercised no similar direct control over the weaving of the cloth which was, as I have stated, usually executed on their own account by peasant households. In the urban areas handicraft manufacture was still under relatively strict gild supervision; the individual master craftsmen and not the "handicraft workshop" was the dominant form of industrial organization.

The very unusual compradore, Cheng Kuan-ying, offered one version of the changes which occurred in the cotton textile handicraft industry in the second half of the nineteenth century:

> Cotton is grown in the coastal regions, and spun into yarn and woven into cloth. In addition to supplying local needs, the cloth and yarn were shipped in considerable quantities to the western and northern provinces. But when foreign yarn and cloth began to be imported, the population responded to

their lower prices and high quality and one after another bought and used them. Thus half of the profits of spinning and weaving in the southern provinces was usurped. Now, in the treaty ports and the cities and towns of the interior, only twenty or thirty percent of the people wear native cloth while seventy or eighty percent wear foreign cloth.[4]

Foreign merchants and consular officials in late nineteenth-century China would have been amused to read Cheng's warnings to his countrymen; their reports in contrast were full of repeated complaints about the difficulty of penetrating the Chinese market, especially in the interior provinces. The mercantile community pointed particularly to restrictions on foreign residence in the interior and to the burden of the likin transit tax. The more perceptive of the consuls recognized that the strength of the handicraft weaving industry was the principal obstacle to clothing every Chinese in Lancashire cottons.

Cheng Kuan-ying and the foreigners in the treaty ports, in fact, shared the truth between them. Foreign imports of cotton yarn and cloth began to increase significantly after the 1858-1860 treaties opened additional treaty ports, including three on the Yangtze. This growth was facilitated by the newly gained right to inland steam navigation in China, by the transit pass system which permitted foreign goods to pay an additional one-half of the import duty in lieu of likin, and by the opening of the Suez Canal in 1869 which lowered shipping costs from Europe. Table 1 shows the annual quantity and value of cotton goods imports for the period 1871-1910. Cotton yarn and piece goods in 1871 made up about one-third of China's imports by value. While in succeeding years they fluctuated around that proportion of total imports, from the 1880's until 1920, the peak year, imported cotton manufacturers grew by leaps and bounds. The quantity of yarn imports increased 24 times—from 97,451 to 2,363,000 piculs—if the average annual amounts for the two decades 1871-1880 and 1901-1910 are compared. After 1913 a decline began as domestic machine-spun yarn progressively replaced imported yarn. While cotton piece goods imports exceeded yarn in value in every year except 1898, 1899, and 1903, their growth—a twofold increase between 1871-1880 and 1901-1910, from 11,463,010 to 21,442,000 pieces—was not nearly so spectacular. The importation of piece goods did, however, continue to grow into

[4] Cheng Kuan-ying, *Sheng-shih wei-yen* (warnings to a prosperous age), (14 chüan, 1895), VII, 20a-b.

the 1920's and was only cut sharply when the Nanking government regained tariff autonomy. Ironically, the very success of yarn imports in the last four decades of the Manchu dynasty, which had a critical effect upon the structure of China's cotton textile handicrafts, indirectly came to be the major obstacle to the equally rapid development of cloth imports.

The average values per picul of imported yarn and per piece of imported cloth given in Table 1 indicate a falling trend in yarn prices from the mid-1870's until almost the end of the century. Cloth prices also declined in the 1870's but began to rise again in the late 1880's and rose more sharply than the later increase in yarn prices. The major factor behind the appearance of cheaper yarn was the entry into the Chinese market on a large scale of the products of Bombay spinning mills which replaced the more expensive English yarn. From the 1890's Indian yarn was supplemented by increasing inflows of machine-spun yarn from Japan. While the price decline was gradual, in the case of yarn it extended over some two decades. It is all the more significant in that over the whole period 1871-1910 the gold value of the Haikwan tael was itself steadily falling.

While imported machine-spun yarn was becoming cheaper, the price of Chinese raw cotton was rising. This price increase was a consequence of large exports of raw cotton to Japanese mills from the early 1890's onward, while the cotton crop increased little if at all before the spectacular growth of the modern textile industry in China during and after World War I. This failure to increase output was primarily due to the limited capacity of a fragmented and technologically backward argicultural sector to respond quickly to export demand. "The most curious feature in connection with the native cotton industry," reported a mission to China from Blackburn in Lancashire in 1896-1897, "is the high price of the raw material in comparison with other agricultural produce."[5] Increasingly the handicraft weaver turned to imported machine-spun yarn, at least for his warp and sometimes for the weft as well.

In the 1870's and 1880's South China, Kwangtung in particular, was the main market for imported yarn, absorbing over half of the total. This proportion, however, fell steadily to about a fifth of total yarn imports. By the 1890's two regions, (1) North China and Manchuria, and (2) the middle and upper Yangtze valley provinces of Anhwei, Kiangsi, Hupei, Hunan, and Szechwan, together with

[5] *Blackburn Report*, Neville and Bell's Sec., p. 212.

TABLE 1
QUANTITY AND VALUE OF COTTON YARN AND CLOTH IMPORTS, 1871-1910

	Yarn			*Cloth*		
	1,000 piculs[a]	*1,000 Haikwan taels*[b]	*Average value per picul (Haikwan taels)*	*1,000 pieces*[c]	*1,000 Haikwan taels*[b]	*Average value per piece (Haikwan taels)*
1871	70	1,877	26.81	14,439	24,877	1.72
1872	50	1,372	27.44	12,241	21,435	1.75
1873	68	3,130?	46.03?	8,989	16,202	1.80
1874	69	1,969	28.54	9,763	16,301	1.67
1875	91	2,747	30.19	10,720	17,315	1.62
1876	113	2,839	25.12	11,870	17,377	1.46
1877	116	2,841	24.49	11,117	15,959	1.44
1878	108	2,521	23.34	9,158	13,509	1.48
1879	138	3,191	23.12	12,772	19,409	1.52
1880	152	3,648	24.00	13,561	19,735	1.46
1881	172	4,228	24.58	14,931	21,818	1.46
1882	185	4,505	24.35	12,159	18,201	1.50
1883	228	5,242	22.99	11,500	16,805	1.46
1884	261	5,584	21.39	11,229	16,557	1.47
1885	388	7,871	20.20	15,706	23,623	1.50
1886	383	7,869	20.55	14,041	21,181	1.51
1887	593	12,591	21.23	15,267	24,457	1.60
1888	683	13,496	19.76	18,664	30,942	1.66
1889	679	13,019	19.17	14,275	23,116	1.62
1890	1,081	19,392	17.94	16,561	25,629	1.55
1891	1,211	20,984	17.25	17,601	32,307	1.84
1892	1,304	22,153	16.99	16,359	30,555	1.87
1893	982	17,863	18.19	12,498	27,275	2.18
1894	1,160	21,397	18.45	13,343	30,708	2.30
1895	1,132	21,209	18.74	13,437	31,865	2.37
1896	1,621	32,010	19.75	18,919	47,233	2.50
1897	1,571	34,430	21.92	16,914	44,233	2.62
1898	1,959	39,295	20.06	15,524	38,324	2.47
1899	2,745	54,941	20.01	19,419	48,524	2.50
1900	1,488	30,187	20.29	15,964	45,419	2.85
1901	2,273	49,012	21.56	16,688	50,640	3.03
1902	2,448	54,794	22.38	22,958	72,752	3.17
1903	2,738	67,736	24.74	19,272	60,884	3.16
1904	2,281	59,516	26.09	18,704	64,568	3.45
1905	2,554	67,209	26.32	35,760	114,244	3.19
1906	2,541	65,141	25.64	28,734	87,587	3.05
1907	2,273	57,515	25.30	18,193	61,401	3.37
1908	1,823	46,173	25.33	16,906	64,725	3.83
1909	2,406	62,464	25.96	21,196	74,827	3.53
1910	2,282	62,831	27.53	17,013	67,852	3.99

[a] Piculs or *tan* of 133.33 lbs.

[b] The Haikwan tael was first used in 1874; 1871-1873 values are the estimated equivalents in Hk. taels of values given in local taels in the customs returns.

[c] Of varying sizes, but commonly 40 yards long and 36 inches wide; cotton items measured in dozens or yards—perhaps 1 or 2 percent of the total in square yards—rather than pieces are not included here.

Source: Yang Tuan-liu and Hou Hou-pei, *Liu-shih-wu nien lai Chung-kuo kuo-chi mao-i t'ung-chi* (Statistics of China's foreign trade during the last sixty-five years), (Nanking, 1931), pp. 20, 46; China Maritime Customs, *Decennial Reports . . . 1922-1931*, I, 113, 182.

Yunnan and Kweichow, were each receiving about 30 percent of the total and thus constituted the major markets for imported yarn. The Kiangnan area, where cotton handicrafts were concentrated, absorbed annually about 10 percent of yarn imports with large fluctuations from year to year. It is evident that the principal markets for imported machine-spun yarn were those regions where cotton growing and handicrafts were least developed.[6] Cheap imported yarn made possible the economical development of handicraft weaving in districts which previously had purchased cloth or relatively expensive raw cotton from Kiangnan or Hupei. Marginal handicraft spinning declined, and cloth, woven locally with warps of imported yarn and wefts of domestic handspun, competed with pure handspun cloth and foreign piece goods in such areas as Szechwan for example, where it was reported that "Indian cotton yarn is killing what little local cultivation of cotton there was, and, when woven, is encroaching on home-spun cloths and to a much less degree on imported grey shirtings."[7]

The most obvious consequence of the increasing inflow of foreign yarn was thus a geographical dispersion of the handicraft weaving industry which in the first half of the nineteenth century had been concentrated in the major cotton growing provinces. While the older weaving centers were hurt at first, in order to compete in their former markets they too had to adopt machine-made yarn. From the late 1890's Japanese yarn began to be used in large quantities for warp threads in the Shasi and Hankow areas. Although imported yarn did not win a large market there, Kiangnan handicraft weavers in the early twentieth century became the major purchasers of the output of the growing cotton mills of Shanghai. The adoption of machine-made yarn, moreover, strengthened the handicraft weaving industry as a whole. Cloth produced with a mixture of imported and handspun yarn was particularly suited in price and durability to the contemporary Chinese market. Spinning and weaving for household consumption with domestic raw cotton continued to be important in many areas of rural China, but a significant part of spinning for the market was displaced first by imported yarn and then by machine-made yarn from Chinese- and foreign-owned mills in the treaty ports.

[6] Koyama Masaki, "Shinmatsu Chūgoku ni okeru gaikoku menseihin no ryunyū" (the inflow of foreign cotton goods in the late Ch'ing), *Kindai Chūgoku kenkyū* (studies of modern China), IV (1960), 1-108, gives a detailed account, region by region, of the market for imported cloth and yarn.

[7] *Blackburn Report,* F. S. A. Bourne's Sec., pp. 5-6.

Between 1890 and 1911, twenty-nine cotton spinning mills were established in China. Of this number, twenty-one were originally undertaken by Chinese official and private investors, three were in the beginning joint Sino-foreign ventures, and five were foreign-owned firms. The first Chinese mill, the Shanghai Cotton Cloth Mill, had been planned by Li Hung-chang's subordinates as early as 1878, was officially approved in 1882, but did not begin operating until 1890. One of the first foreign mills established after the Treaty of Shimonoseki sanctioned foreign manufacturing in the treaty ports was the British-owned Laou-Kung-Mow Cotton Spinning and Weaving Co. which opened in 1897. Several of the Chinese and Sino-foreign mills were taken over by foreign investors before the end of the dynasty, so that of the twenty-eight mills operating in 1911, eighteen were Chinese-owned, two were Sino-foreign, and eight were foreign (England and Japan, three each; the United States and Germany, one each). Fifteen of the twenty-eight and all of the foreign and Sino-foreign mills were located in Shanghai. Before World War I these cotton mills concentrated almost entirely upon the spinning of yarn; relatively little cloth was produced by machine-looms. Estimates differ in detail as to the actual number of spindles and looms in operation in 1911: approximately 500,000 Chinese-owned and 230,000 foreign-owned spindles and 2,300 Chinese-owned looms indicates the general order of magnitude.[8]

While weaving continued to be primarily an individual household handicraft, in some areas by the turn of the century other forms of industrial organization had appeared. These changes were facilitated by the supply of cheaper machine-made yarn and also by improved foot treadle wood looms and iron-gear looms introduced from Japan which increased the weaver's daily output. The proximity of the Shanghai spinning mills, for example, encouraged the establishment of urban weaving shops which were important consumers of machine-made yarn before the modern mills themselves expanded their weaving capacity in the 1930's. One estimate records the establishment of 142 handicraft weaving workshops in the period 1899-1913, 69 of these in Kiangsu where they were supplied with Shanghai-made yarn, 15 in Shantung, 14 in Chihli

[8] Yen Chung-p'ing, *Chung-kuo mien-fang-chih shih kao* (history of the Chinese cotton textile industry), (Peking: K'o-hsüeh, 1955) [hereafter cited as *Textile Industry*], is the best single account of the development of China's modern textile industry.

(Hopei), 9 in Szechwan, 7 each in Shansi, Fukien, and Kwangtung, 6 in Hupei, 4 in Manchuria, 3 in Chekiang, and 1 in Kweichow. Table 2 indicates the size and equipment of these establishments.

TABLE 2
CAPITAL, LOOMS, AND WORKERS IN 142 HANDICRAFT WEAVING WORKSHOPS ESTABLISHED 1899-1913

	Total	*Average*	*Largest Workshop*	*Smallest Workshop*
Capital ($Ch.)[a]	660,220	9,854	70,000	200
Number of looms[b]	3,307	89	360	12
Number of workers[c]	14,972	156	1,264	5

[a] Data given for 67 workshops.
[b] Data given for 37 workshops.
[c] Data given for 96 workshops.

Source: P'eng Tse-i comp., *Chung-kuo chin-tai shou-kung-yeh shih tzu-liao (1840-1949)* (Materials on the history of handicrafts in modern China, 1840-1949), 4 vols., (Peking: San-lien, 1957), II, 369-76.

A *verlag*-type of weaving, in which cloth merchants put-out yarn to rural weavers some of whom had abandoned their farming and wove for a piece-work wage the patterns stipulated by their merchant employer, also developed in a number of places alongside rural weavers who wove on their own account. No data are available to indicate the actual extent of this putting-out system, some notable examples of which were in Kaoyang and Paoti in Chihli, Wei-hsien in Shantung, and Hsia-shih in Chekiang. In the first three of these four examples, putting-out developed fairly rapidly from the first decade of the twentieth century until the mid-1920's, flourished especially during and immediately after World War I, but declined sharply thereafter. Rural weaving of this type was an inherently precarious occupation for those who could no longer rely on agricultural income as a cushion against fluctuating demand in an industry which produced for a non-local market but lacked the modern organization and financial facilities to respond to inevitable change.

The main reason for the much slower growth of cloth than of yarn imports was the extent and strength of the handicraft weaving industry which, as I have stated, was increased by the adoption of machine-made yarn. Relatively little imported cloth was used in rural areas; its principal sale was to the wealthier craftsmen and merchants in the cities and towns. The British consul in Amoy reported in 1886:

It is well known already that the many millions of lower-class Chinese toiling and moiling throughout the 18 provinces, and in huge territories beyond them, do not wear foreign-made cloths, but homespun. Ask a Chinaman why this is, and he tells you that the poor wear suits of native cotton, because such clothing lasts three, four, or five times as long as foreign cloth, because it wears less easily, and because it is much warmer in winter. Why is it warmer? Because, he says, the yarn of which the native fabric is made is quite different from the foreign, and warmer by nature. While, therefore, the well-to-do merchant is wearing out three or four suits of handsomely finished *yang-pu*, the mechanic, the field-hand, the porter, and the boat-man are and must be content with one suit of coarser but, in fact, better material.[9]

And the combination of a machine-made warp with a handspun weft made an even better cloth to compete with foreign piece goods. "No doubt the common shirtings are being superseded by native cloth woven by hand from imported yarn," the Blackburn mission acknowledged, "and for this there seems no help."[10]

While not all students of China's modern economic history will agree in detail with the foregoing description of the late-Ch'ing cotton textile industry, I do not believe that the dissent would be very vigorous. I have, on the other hand, not yet attempted to answer the questions with which this paper began; nor, in the absence of quantities with which to weigh my qualitative statements, have I been able to develop fully the significance of possibly substantial economic changes for the argricultural sector and for the individual peasant producer within it. Even though the data problems are enormous, an attempt must be made to measure the dimensions of the changes experienced by the handicraft textile industry during the last four decades of the Ch'ing dynasty.

Three types of data are used in the estimates that follow. The first are limited, but relatively reliable, measures of which I have used the average figures for the years 1871-1880 and 1901-1910 as approximate indicators of the situation at the beginning and the end of the period under consideration: quantity of imports of raw cotton, yarn, and cloth; quantity of exports of raw cotton and handicraft cloth; number of spindles and looms in operation in mills (Chinese- and foreign-owned) in China. Probably less reliable, but still derived from a careful search of contemporary sources, are

[9] *Report on the Native Cloths in Use in the Amoy Consular District* (Great Britain: Foreign Office, 1886), Miscellaneous Series, No. 19, p. 4.
[10] *Blackburn Report*, F. S. A. Bourne's Sec., p. 36.

data of a second type: estimates of the annual production of yarn or cloth per spindle or loom in Chinese mills; estimates of the length, width, and weight of representative handicraft cloth; estimates of the yarn consumed by each square yard of manufactured and handicraft cloth; and the conversion factors for translating "pieces" and yards of imported cloth into yards and square yards respectively. The third type of data, essential but admittedly conjectural, consists of assumptions about the size of China's population at the beginning and end of the period 1871-1910, and similar assumptions about the size of the cotton crop and possible trends in per capita consumption of cotton cloth. The derivation and degree of reliability of each datum used will be indicated for each step of the demonstration.

I begin by assuming three possible figures for the average annual production of ginned cotton in China for the two decades 1871-1880 and 1901-1910, namely, 5 million, 6 million, and 7 million *tan* or piculs of 133.33 lbs. each. The reasons for using these figures and not larger or smaller ones, together with some comments about which of them was most likely to have been the actual output of raw cotton, I shall for the moment defer. These questions can be discussed more adequately somewhat later in this analysis. Because the 1901-1910 decade presents a more complex picture than 1871-1880—in the later period, but not in the earlier, mills in China were producing machine-spun yarn and machine-woven cloth—I shall first estimate the output of handicraft and mill yarn and the consumption of yarn by handicraft and mill looms for an average year in 1901-1910. Similar calculations for 1871-1880 are somewhat easier .

COTTON YARN PRODUCTION AND CONSUMPTION FOR AN AVERAGE YEAR IN THE TWO DECADES 1871-1880 AND 1901-1910

Table 3 shows these estimates for 1901-1910 for each of the three assumed levels of raw cotton production. Apart from the size of the raw cotton export surplus (line 2) and cotton yarn imports (line 10), for which the basic source is the Imperial Maritime Customs, *Reports and Returns of Trade,* the other data in Table 3 were derived as follows.

(Lines 4 and 11). Mill raw cotton consumption is, of course, the product of the number of spindles in operation and the consumption

TABLE 3
THREE ALTERNATIVE ESTIMATES OF COTTON YARN PRODUCTION AND CONSUMPTION FOR AN AVERAGE YEAR IN THE DECADE 1901-1910
(*tan* OR PICULS OF 133.33 LBS.)

	A	*B*	*C*
Assumed raw cotton production	5,000,000	6,000,000	7,000,000
Average raw cotton export surplus	− 680,133	− 680,133	− 680,133
Total raw cotton supply	4,319,867	5,319,867	6,319,867
Mill raw cotton consumption	−1,241,220	−1,241,220	−1,241,220
Available for other uses	3,078,647	4,078,647	5,078,647
Consumption for wadding	−2,500,000	−2,500,000	−2,500,000
Available for handicraft spinning	578,647	1,578,647	2,578,647
5 percent waste in spinning	− 28,932	− 78,932	− 128,932
Output of handspun yarn	549,715	1,499,715	2,449,715
Average cotton yarn imports[a]	2,363,000	2,363,000	2,363,000
Mill yarn production	+1,055,040	+1,055,040	+1,055,040
Total machine-spun yarn supply	3,418,040	3,418,040	3,418,040
Machine-loom yarn consumption	− 61,427	− 61,427	− 61,427
7.5 percent of total machine-spun yarn supply for knitting and other uses	− 256,353	− 256,353	− 256,353
Machine-spun yarn available for handicraft weaving	3,100,260	3,100,260	3,100,260
Handicraft weaving yarn consumption (output of handspun yarn plus above)	3,649,975	4,599,975	5,549,975

[a] Re-export of yarn was negligible.
Sources: See text.

per spindle. There are several conflicting estimates of the number of spindles in Chinese mills. H. D. Fong, for example, lists seven estimates, and himself suggests an average of 722,719 spindles for the years 1902-1910.[11] Other approximations are similar; for example, Tai Lu-ch'en gives 720,104 as an average for the years 1906-1909.[12] Estimates in this range, however, are probably too high because they generally do not distinguish spindles planned or ordered from spindles actually installed and operating. The best available figures

[11] H. D. Fong, *Cotton Industry and Trade in China*, Nankai Institute of Economics, Industry Series, Bulletin No. 4 (2 vols.; Tientsin: Chihli Press, 1932), II, 10.

[12] Tai Lu-ch'en, "Chung-kuo fang-chih yeh chin k'uang" (the recent situation of China's textile industry), *Chung-tung ching-chi yüeh-k'an* (Chinese eastern railway monthly economic journal), 8.5 (1932), reprinted in Ch'en Chen, comp., *Chung-kuo chin-tai kung-yeh shih tzu-liao* (materials on the history of Chinese modern industry), (4 vols.; Peking: San-lien, 1957-1961, and Tokyo: Daian, 1966 reprint), IV, 201 [hereinafter cited as *Modern Industry*].

for 1901-1910 were carefully compiled by Yen Chung-p'ing from contemporary reports; his data give an annual average of 633,645 operating spindles for this decade.[13]

The output of yarn per spindle depends, among other things, on the quality of the raw cotton spun, the skill of the operatives, the type of machinery in use, the counts of yarn spun, and the number of days worked per year. In general, operatives in Chinese mills in the early twentieth century had minimum skills, and the cotton spun was a mixture of short-fibered domestic cotton and longer-fibered imports from India and the United States. These circumstances, and the structure of demand for the yarn spun, favored the production of heavier counts of yarn. In the years under consideration, 16-count yarn, followed by 14-, 12-, and 10-count, accounted for nearly all of the output of Chinese mills.[14] By the 1930's or earlier, mills in China were, of course, spinning the finer counts which progressively replaced imported yarn. A careful field study made in 1932-1933 found 20-count yarn to be the most important product of Shanghai mills, while 16-count was dominant outside of Shanghai. The average count for all mills surveyed was 17.[15]

From data in the Wang and Wang survey just referred to, which describe spinning machinery installed in Chinese mills between 1889-1906 and thus likely still to be in operation in 1901-1910, it is

[13] Yen Chung-p'ing, *Textile Industry,* p. 368 and pp. 341-67.

[14] Contemporary reports on yarns spun incude the following: (a) Seven Chinese- and foreign-owned mills in Shanghai, 1908: 16-count yarn made up 60 percent of the output; 14-, 10-, and 12-count were progressively less important in that order. Tōa Dōbunkai, comp., *Shina keizai zensho* (China economic series), (12 vols.; Osaka: Maruzen, and Tokyo: Tōa Dōbunkai, 1907-1908), XI, 420. (b) Hupei Weaving Mill, 1908: 16-count, 70 percent; 14- and 15- count, 10 percent. *Ibid.,* XI, 425. (c) Hupei Spinning Mill, 1908: mainly 14-count. Ch'en Chen, *Modern Industry,* III, 290-91. (d) Predecessor of Heng-feng Spinning Mill, ca. 1904-1909: 16-count, and 10-, 12-, 14-, and some 20-count. Shanghai Economic Research Institute, Academy of Sciences, and Economic Research Institute of the Shanghai Academy of Social Sciences, comps., *Heng-feng sha-ch'ang ti fa-sheng fa-chan yü kai-tsao* (the origin, development, and transformation of the Heng-feng Spinning Mill), (Shanghai: Jen-min, 1959), pp. 17, 19, 20. (e) Ewo Spinning and Weaving Co., Ltd., 1907-1908: the average count of yarns produced was 15.5. Arnold Wright, ed., *Twentieth Century Impressions of Hongkong, Shanghai, and Other Treaty Ports of China* (London: Lloyd's Greater Britain Publishing Co., 1908), p. 573; *North-China Herald* (Shanghai), November 13, 1909, pp. 370-72. (f) Six Shanghai mills, ca. 1911: mainly 12- and 14-counts. Chang Ch'ien, *Chang Chi-tzu chiu-lu* (nine records of Chang Chi-tzu), (6 vols.; Taipei: Wen-hai reprint, 1965), III, 1331-33. (g) Naigaiwata Spinning Mill, 1912: 16-count. Nishikawa Kiichi, *Men kōgyō to menshi mempu* (the cotton industry and cotton yarn and cloth), (Shanghai: Nippondō, 1924), p. 371.

[15] Wang Tzu-chien and Wang Chen-chung, *Ch'i-sheng Hua-shang sha-ch'ang tiao-ch'a pao-kao* (report of a survey of Chinese cotton mills in seven provinces), (Shanghai: Commercial Press, 1935), pp. 20, 34, 35 [hereafter cited as *Cotton Mills].*

possible to calculate the theoretical maximum output of yarn per spindle for a 24-hour period as follows: 10-count, 2.2 lbs.; 16-count, 1.2 lbs.; 20-count, 0.98 lbs.[16] Using these maxima as a check on the accuracy of contemporary reports, I have derived twenty apparently reliable pre-1912 estimates of yarn output. These estimates are almost exclusively for 16- and 14-count yarn and include several instances of multiple reports, at different times or by different observers, for the same mill.[17] The unweighted average of these estimates is 0.8795 lbs. per spindle per 24-hour day. This seems a not unreasonable figure for 1901-1910 in the light of 1915 estimates for output of 16-count yarn which average 0.9287 lbs.,[18] and further estimates for 1928-1929 which give a range of 0.90 to 1.09 lbs.[19]

It is known that cotton mills in China in this period did not always work the standard two 12-hour shifts per day, nor did they operate every day of the year. But how many hours did they operate? The only precise answer that I have found to this question is a detailed report for six foreign-owned Shanghai mills in 1912, which shows them to have worked during that year hours equivalent to an average of 247 days.[20] There is no evidence that 1912 was a typical year for the Chinese textile industry, and similarly no indication to the contrary. The product of 247 days × (let us say) 0.90 lbs. yarn gives an average annual product per spindle of 222 lbs. When compared

[16] *Ibid.*, pp. 149, 151, 154.

[17] (a) Laou-kung-mao Mill, Shanghai, 1897: 1.0 lb. Imperial Maritime Customs, *Decennial Reports on the Trade, Navigation, Industries, etc., of the Ports Open to Foreign Commerce in China and on the Conditions and Developments of the Treaty Port Provinces, 1892-1901* (2 vols.; Shanghai: Statistical Department of the Inspectorate General of Customs, 1904-1906), I, 515. (b) T'ung-i-kung Mill, Hangchow, 1900: 0.73 lbs. Wang Ching-yü, comp., *Chung-kuo chin-tai kung-yeh shih tzu-liao, ti-erh-chi, 1895-1914 nien* (materials on the history of modern Chinese industry, second collection, 1895-1914), (2 vols.; Peking: K'o-hsüeh, 1957), II, 691 [hereafter cited as *Modern Industry*]. (c) T'ung-chiu-yuan Mill, Ningpo, 1896-1900: 0.75 lbs. *Decennial Reports . . . 1892-1901*, II, 64-65. (d) Heng-feng Spinning Mill, Shanghai, 1904-1909: 0.82 lbs.; 1909-1910: 0.70 lbs. *Heng-feng sha-ch'ang ti fa-sheng fa-chan yü kai-tsao*, pp. 12, 19. (e) Ewo Spinning and Weaving Co., Ltd., Shanghai, 1907: 0.52 lbs. (possibly this figure is for a 12-hour shift?). Wright, ed., *Twentieth Century Impressions*, p. 573. (f) Seven Shanghai mills, 1908: 0.89 lbs. *Shina keizai zensho*, XI, 419-20. (g) Six Shanghai mills, ca. 1911: 1.062 lbs. Chang Ch'ien, *Chang Chi-tzu chiu-lu*, pp. 1331-33. (h) Naigaiwata Spinning Mill, Shanghai, 1911-1912: 0.84 lbs. Wang Ching-yü, *Modern Industry*, I, 371.

[18] Ralph M. Odell, *Cotton Goods in China*, Department of Commerce, Bureau of Foreign and Domestic Commerce, Special Agents Series, No. 107 (Washington: G. P. O., 1916), pp. 162-70.

[19] Arno S. Pearse, *The Cotton Industry of China and Japan* (Manchester: International Association of Master Cotton Spinners' and Manufacturers' Association, 1929), pp. 175-80.

[20] *North-China Herald*, March 8, 1913, p. 692.

with an average per spindle output of 247 lbs. in 1930, at which time the mills were clearly operating more hours per year than in 1901-1910,[21] 222 lbs. appears to be a reasonably typical figure for the decade under consideration. For 633,645 spindles the average annual production of yarn for 1901-1910 would be 140,669,190 lbs., or 1,055,040 *tan* of 133.33 lbs. each.

Because of wastage in machine spinning, especially in the relatively inefficient new Chinese mills, the weight of yarn produced will account for only 85 percent of the raw cotton consumed.[22] Total raw cotton consumption by spinning mills in China for a typical year in this decade would then come to 1,241,220 *tan*.

(Line 6). Large quantities of cotton were used by the Chinese population of all classes for wadding in winter cotton garments, quilts, etc. There is no reliable information about the quantities consumed for this purpose. Yen Chung-p'ing cites four twentieth-century estimates and offers one of his own.[23] These all apparently employ a population base of 400,000,000—now acknowledged as much too low—for the 1930's. I have used 2.5 million *tan*, the average of the estimates just referred to, as an approximation of raw cotton consumption for wadding for the decade 1901-1910 when China's population was perhaps 425,000,000. (Population estimates are discussed below.) If two-thirds of that number required warm winter clothing, an annual consumption of 2.5 million *tan* would provide a little more than a pound of cotton per capita—a possible figure, at least. For 1871-1880, because the population was less, on the order of 350,000,000, I use a proportionately smaller 2 million *tan*.

(Line 8). Cotton wastage in handicraft spinning was less than in machine spinning. Yen Chung-p'ing suggests 5 percent, and I follow him in this.[24]

(Line 13). The consumption of domestic and imported cotton yarn by machine looms in Chinese mills depends on the number of

[21] H. D. Fong, *Cotton Industry*, I, 90-91. While the Ewo mill is reported to have spun 271 lbs. of yarn per spindle in 1908 (*North-China Herald*, November 13, 1909, pp. 370-72), it should be noted that in 1912, and probably in other years, it operated more days than the average mill.

[22] Yen Chung-p'ing, *Textile Industry*, p. 308, estimates 10 percent wastage for the 1930's. Data in Chang Ch'ien, *Chang Chi-tzu chiu-lu*, III, 1331-33, suggest 14 percent for Shanghai mills (which were more efficient than others) in 1911; and in Wang and Wang, *Cotton Mills*, pp. 15 and 21, 10-11 percent for 1932.

[23] Yen Chung-p'ing, *Textile Industry*, p. 308.

[24] *Ibid.*

looms in operation, the type of cloth woven, and the production per loom. As in the case of spindles, there is some disagreement as to the number of operating looms during the decade 1901-1910. The higher estimates—for example, an average of 4,655 for 1906-1909[25]—appear to be in part retrospective, assigning to the founding year of a mill looms not installed until a later time. The best data, again, are those assembled by Yen Chung-p'ing, which give a 1901-1910 average of 2,046 looms.[26] There are, however, more likely omissions in Yen's estimate of the number of operating looms than was the case with his estimate of spindles. I shall, therefore, use the figure of 2,100 looms as representative of the 1901-1910 decade.[27]

While the largest single product of Chinese mills in the 1930's was 12-lb. shirtings, followed by 14- and 16-lb. sheetings,[28] at the beginning of the century their output was predominantly 14- and 16-lb. sheetings, with a much smaller production of lighter drills and shirtings.[29] The weaving sections of these mills were more likely than the spinning sections to operate a single shift per day. Imported textiles and especially handicraft cloth woven with machine-spun yarn apparently left little room in the potential market for the cloth woven by the Chinese mills. Before its lease to a private operator in 1902, the government-owned Hupei Weaving Mill which was equipped with nearly one-half of the total machine looms in China, operated rather fitfully. The daily output per loom for one shift ranged from 0.6 to 0.9 pieces of 14- to 16-lb. sheetings, 40 yards in length, and nominally 36 inches wide.[30] In the first decade of the twentieth century, however, the Hupei Mill's operations im-

[25] Ch'en Chen, *Modern Industry,* IV, 201.

[26] Yen Chung-p'ing, *Textile Industry,* p. 368 and pp. 341-67.

[27] H. D. Fong, *Cotton Industry,* I, 80, estimates 1,826 looms in 1895. Odell, *Cotton Goods,* p. 157, suggests 2,100 for 1896, and 4,564 for 1915. Yen Chung-p'ing's figures for 1896 and 1915 are 1,800 and 4,002 looms respectively.

[28] Wang and Wang, *Cotton Mills,* pp. 21-22, 45-46.

[29] The following are samples of reports on the weight of cloth woven: (a) All Chinese mills, 1888-1911: mainly 14-lb. sheetings, followed by 16-, 18-, 12-, and 11-lb. cloth in that order. Ch'en Chen, *Modern Industry,* IV, 283. (b) Shanghai Cotton Cloth Mill, 1891: 14-lb. sheetings "suitable for use by Chinese." Sun Yü-t'ang, comp., *Chung-kuo chin-tai kung-yeh shih tzu-liao, ti-i-chi, 1840-1895 nien* (materials on the history of modern Chinese industry, first collection, 1840-1895), (2 vols.; Peking: K'o-hsüeh, 1957), II, 1065. (c) Hupei Weaving Mill (which was equipped with 1,000 of the 2,100 total looms), 1904: mainly 15-lb. sheetings. Wang Ching-yü, *Modern Industry,* II, 580-81. (d) Chinese mills as a whole, 1915: 14- to 16-lb. sheetings most important, followed by 13- and 14-lb. drills. Odell, *Cotton Goods,* pp. 162-74.

[30] *Decennial Reports . . . 1892-1901,* I, 305, Wang Ching-yü, *Modern Industry,* II, 573, 578.

proved, and its production per loom rose to about 1.0 piece per working day. In 1903, it wove at the rate of 333 pieces per loom per annum.[31] An overall estimate of an average of 300 pieces per loom per year for the decade 1901-1910 for all of China's looms therefore seems not unreasonable.[32]

If Chinese mills in the 1930's producing mainly 12-lb. cloth consumed 11.2 lbs of yarn per piece,[33] assuming the same ratio, the average 14-lb. cloth of 1901-1910 required 13 lbs. of machine-spun yarn per piece. The product of 2,100 looms × 300 pieces × 13 lbs. is a total yarn consumption of 8,190,000 lbs. or 61,427 *tan.*

(Line 14). In his estimate of yarn and cloth output for the 1930's, Yen Chung-p'ing assumed that 15 percent of the available machine-spun yarn was consumed by knitting and other purposes apart from the weaving of cotton textiles. Except that it was much less important at the beginning of the century than thirty years later, no data are available on the knitting consumption of yarn in the 1901-1910 decade.[34] I have arbitrarily used one-half of Yen's figure, namely

TABLE 4
THREE ALTERNATIVE ESTIMATES OF COTTON YARN PRODUCTION AND CONSUMPTION FOR AN AVERAGE YEAR IN THE DECADE 1871-1880
(*tan* OR PICULS OF 133.33 LBS.)

	A	*B*	*C*
Assumed raw cotton production	5,000,000	6,000,000	7,000,000
Average raw cotton import surplus	+ 139,348	+ 139,348	+ 139,348
Total raw cotton supply	5,139,348	6,139,348	7,139,348
Consumption for wadding	−2,000,000	−2,000,000	−2,000,000
Available for handicraft spinning	3,139,348	4,139,348	5,139,348
5 percent waste in handicraft spinning	− 156,967	− 206,967	− 256,967
Output of handspun yarn	2,982,381	3,932,381	4,882,381
Average cotton yarn imports	+ 97,451	+ 97,451	+ 97,451
Yarn available for all uses	3,079,832	4,029,832	4,979,832
3 percent of above for knitting and other uses	− 85,270	− 113,770	− 142,270
Handicraft weaving yarn consumption	2,994,562	3,916,062	4,837,562

Sources: See text.

[31] *Shina keizai zensho,* XI, 425; Wang Ching-yü, *Modern Industry,* II, 582.

[32] In 1930, when many weaving mills were working two shifts, the average production per loom in Chinese-owned mills was 447 pieces. H. D. Fong, *Cotton Industry,* I, 92.

[33] Yen Chung-p'ing, *Textile Industry,* p. 307.

[34] George E. Anderson, *Cotton-Goods Trade in China,* Department of Commerce, Bureau of Manufactures, Special Consular Reports—No. 44 (Washington: G. P. O., 1911), pp. 25-26.

TABLE 5
ESTIMATES OF AVERAGE ANNUAL COTTON YARN PRODUCTION AND IMPORTS
(*tan* OR PICULS OF 133.33 LBS.)

	Domestic Mills		*Imports*		*Handicraft*		*Total*	
	tan	*percent*	*tan*	*percent*	*tan*	*percent*	*tan*	*percent*
1871-1880								
Alternative A	—	—	97,451	3.16	2,982,381	96.84	3,079,832	100.0
Alternative B	—	—	97,451	2.42	3,932,381	97.58	4,029,832	100.0
Alternative C	—	—	97,451	1.96	4,882,381	98.04	4,979,832	100.0
1901-1910								
Alternative A	1,055,040	26.60	2,363,000	59.55	549,715	13.85	3,967,755	100.0
Alternative B	1,055,040	21.45	2,363,000	48.05	1,499,715	30.50	4,917,755	100.0
Alternative C	1,055,040	17.98	2,363,000	40.27	2,449,715	41.75	5,867,755	100.0
1934-1935	8,141,100	83.00	[a]	—	1,650,000	17.00	9,791,100	100.0

[a] By the 1930's imported yarn had been almost entirely replaced by the output of Chinese mills. In 1934 and 1935 there was an average yarn export surplus of ca. 242,000 *tan*.

Sources: For 1934-1935, Yen Chung-p'ing, *Chung-kuo mien-fang-chih shih kao,* p. 309 (original quintals converted into *tan*); for 1871-1880 and 1901-1910, Tables 3 and 4.

7.5 percent, for 1901-1910 and a further reduction to 3 percent for 1871-1880.

Table 4 presents three alternatives for the decade 1871-1880 derived in the same manner as Table 3 for 1901-1910. Table 5 compares the sources of cotton yarn available for consumption in the three alternative estimates for each of the two decades under consideration, and also records Yen Chung-p'ing's similar estimate for 1934-1935. The nature and significance of the changes which occurred between 1871-1880 and 1901-1910 in both spinning and weaving will be discussed later in this paper.

COTTON CLOTH PRODUCTION AND CONSUMPTION FOR AN AVERAGE YEAR IN THE TWO DECADES 1871-1880 AND 1901-1910

Cloth produced within China during both decades came primarily from handicraft sources, both part- and full-time peasant weavers and handicraft workshops in the medium and large urban centers as I have already indicated. Only a very small part of the handicraft cloth was exported. Imports of cloth, primarily from England, Japan, and the United States, contributed a significant share to consumption, but were never able to take as much as a quarter of the market from handicraft textiles. Table 6 shows the relative shares in consumption, in yards and square yards of cloth, of each of these sources as derived from the six alternative estimates of yarn production and consumption. Comparative data for the 1930's are also shown.

The data in Table 6 were derived as follows:

(Columns 1 and 5). Production of domestic machine-woven cloth totalled 630,000 pieces in an average year during 1901-1910 (300 pieces per loom as estimated above $\times$ 2,100 looms). At 40 yards per piece, the standard length, 25,200,000 yards per annum would be woven. Because the nominal 36-inch width was in practice closer to 35 inches,[35] this would be the equivalent of 24,494,000 square yards. No machine looms, of course, were in operation during 1871-1880.

(Columns 2 and 6). The average number of pieces of cotton textile goods imported during 1901-1910 was 21,442,000.[36] This

[35] Yen Chung-p'ing, *Textile Industry*, p. 310.

[36] *Decennial Reports . . . 1922-1931* (2 vols.; Shanghai: Statistical Department of the Inspectorate General of Customs, 1933), I, 182.

TABLE 6

ALTERNATIVE ESTIMATES OF COTTON CLOTH PRODUCTION AND IMPORTS FOR AVERAGE YEARS

(YARDS, SQUARE YARDS, AND PERCENT)

Sources of cloth	*Domestic mills*		*Imports*		*Handicraft*		*Total*	
	yards	percent	yards	percent	yards	percent	yards	percent
1871-1880								
Alternative A	—	—	414,805,000	17.21	1,996,324,490	82.79	2,411,129,490	100.0
Alternative B	—	—	414,805,000	13.71	2,610,641,932	86.29	3,025,446,932	100.0
Alternative C	—	—	414,805,000	11.40	3,224,960,440	88.60	3,639,765,440	100.0
1901-1910								
Alternative A	25,200,000	0.79	721,400,000	22.69	2,433,255,434	76.52	3,179,855,434	100.0
Alternative B	25,200,000	0.66	721,400,000	18.92	3,066,572,934	80.42	3,813,172,934	100.0
Alternative C	25,200,000	0.57	721,400,000	16.23	3,699,890,434	83.20	4,446,490,434	100.0
1934-1935	1,513,000,000	26.97	104,000,000	1.85	3,993,000,000	71.18	5,610,000,000	100.0

TABLE 6 (*Continued*)

Sources of cloth	*Domestic mills*		*Imports*		*Handicraft*		*Total*	
	sq. yds.	percent	sq. yds.	percent	sq. yds.	percent	sq. yds.	percent
1871-1880								
Alternative A	—	—	376,165,000	27.37	998,162,245	72.63	1,374,327,245	100.0
Alternative B	—	—	376,165,000	22.37	1,305,320,966	77.63	1,681,485,966	100.0
Alternative C	—	—	376,165,000	18.92	1,612,480,220	81.08	1,988,645,220	100.0
1901-1910								
Alternative A	24,494,400	1.29	654,200,000	34.52	1,216,627,717	64.19	1,895,322,117	100.0
Alternative B	24,494,400	1.11	654,200,000	29.58	1,533,286,467	69.31	2,211,980,867	100.0
Alternative C	24,494,400	0.97	654,200,000	25.87	1,849,945,217	73.16	2,528,639,617	100.0
1934-1935	1,471,000,000	37.82	89,000,000	2.29	2,329,000,000	59.89	3,889,000,000	100.0

Sources: See text.
1934-1935, Yen Chung-p'ing, *Chung-kuo mien-fang-chih shih kao,* pp. 311-13.

period, however, included the exceptional years during which the Russo-Japanese War was fought on Chinese territory. 1905 and 1906 are, respectively, the first and fourth highest years in the entire recorded history of China's importation of cotton piece goods. The great increment of cloth imports in these years apparently was used to supply uniforms and other requirements of the two combatants. Yarn imports in 1905 and 1906 were not so much out of line, increasing only about 10 percent over 1904. I have not, therefore, altered the yarn import figures reported by the Maritime Customs in the calculations for Tables 3 and 4. In the case of cotton cloth imports, however, which rose in 1905 to nearly double the 1904 total, some adjustment is necessary if our assumption of a *typical* year for the Chinese producer and consumer is to be retained. Keeping in mind the level of importation of cotton piece goods in the years immediately preceding and following, I have somewhat arbitrarily reduced the 1905 and 1906 totals by 10,000,000 and 8,000,000 pieces respectively. The ten-year average is then correspondingly lowered to 19,742,000 pieces. Some small part of the piece goods imported were measured in dozens or yards rather than in pieces, for example, handkerchiefs, towels, and certain "fancy woven cottons." For the years 1902-1907, these goods averaged the equivalent of perhaps 300,000 pieces per year.[37] I therefore use 20,000,000 pieces as the average annual importation of cotton piece goods for the decade 1901-1910.

To convert pieces into yards and square yards, a task made necessary by the fact that not all the imported piece goods were the standard 40 yards long (T-cloths, for example, an important English import, were 24 yards to the piece) and 36 inches wide, I have calculated equivalents from data prepared by Yeh Liang for the Ministry of Finance, National Tariff Commission. These equivalents are 1 piece equals 36.07 yards equals 32.71 square yards.[38] For 1901-1910, imports of cotton cloth averaged 721,400,000 yards or 654,200,000 square yards per annum. The equivalent figures for 1871-1880 are 414,805,000 yards and 376,165,000 square yards.[39]

[37] This equivalence is derived from data in Odell, *Cotton Goods*, pp. 41-42, and in *Decennial Reports . . . 1922-1931*, I, 182.

[38] Yen Chung-p'ing, *Textile Industry*, p. 382, reprints some of Yeh's data from *Fang-chih shih-pao* (textile news), Nos. 1345-1350 (1936). I have not seen Yeh Liang, *Chung-kuo mien-hou ts'ung ch'an-hsiao liang chih chieh-suan* (a calculation of China's production and consumption of cotton products), (Shanghai: Ministry of Finance, National Tariff Commission, 1934).

[39] Data on number of pieces imported 1871-1880 from *Decennial Reports . . 1922-1931*, I, 113.

(Columns 3 and 7). There are, of course, no overall data available on handicraft cloth weaving in China. An estimate of the annual output can only be derived indirectly from a prior estimate of the amount of domestic and imported yarn consumed by handicraft weavers. This process immediately runs up against the fact of the enormous variety of lengths, widths, and weights represented by the hundreds of local varieties of handicraft cloth. As one British consul reported in 1886, "The width of the cloth is settled by the size of the loom, and the length by the quantity of cotton used by the weaver, or by the amount of cloth wanted at the moment."[40] From the early twentieth century, however, as urban handicraft workshops equipped with relatively modern looms expanded and rural weavers increasingly wove for wider markets under something akin to the putting-out system, a portion (exactly how much it is impossible to say) of handicraft cloth was produced in approximately the same lengths as machine-woven cloth, and sometimes in increased, but still relatively narrower, widths.[41] It is probably this "semi-modernized" handicraft product to which Yen Chung-p'ing refers when he estimates the average width of handicraft cloth in the 1930's at 21 inches.[42] As these developments in the handicraft weaving sector had probably not begun by 1871-1880 and were not far advanced by 1901-1910, it is necessary to derive an independent estimate of the typical or average width, and of course also of the weight of handwoven cloth.

Table 7 records estimates I have derived from several sources (more could easily be gathered) of the width and the weight of the equivalent of a 40-yard by 35-inch piece of handwoven cloth. Each estimate is based on a number of samples; they range in time from 1886 to 1930; and they include the following provinces: Kiangsu, Shantung, Hupei, Hopei, Szechwan, Liaoning, and Kwangtung. No definitive conclusion is possible, of course, but I would judge from the data in Table 7 that an average width of, let us say, one-half of the machine-woven standard of 35 or 36 inches, thus 17 or 18 inches, can be used in our handicraft cloth calculations. Similarly, an average weight of about 17 lbs. per equivalent

[40] *Report on the Manufacture of Native Cloth in the Consular District of Pakhoi* (Great Britain: Foreign Office, 1887), Miscellaneous Series, No. 38, p. 2.

[41] Nishikawa Kiichi, *Men Kōgyō*, pp. 188-225, surveys the situation of the handicraft weaving industry in the second decade of this century. For the changes in the cloth woven in Kaoyang, Hopei, an important rural handicraft center, see Wu Chih, *Hsiang-ts'un chih-pu kung-yeh ti i-ko yen-chiu* (an investigation of the rural weaving industry), (Shanghai: Commercial Press, 1936), pp. 221-24.

[42] Yen Chung-p'ing, *Textile Industry*, p. 311.

TABLE 7
ESTIMATES OF THE WIDTH AND WEIGHT PER EQUIVALENT OF A 40-YARD × 35-INCH PIECE OF HANDWOVEN COTTON CLOTH

Estimate No.	*Number of Samples in the Estimate*	*Average Width (inches)*	*Average Weight per 40-yd. × 35-in. (lbs.)*
(1)	6	17.31	14.82
(2)	7	13.48-15.17[a]	—
(3)	4	28.85-32.43[a]	—
(4)	5	13.31	21.93
(5)	6	13.89	19.90
(6)	11	16.65	—
(7)	21	15.36	—
(8)	7	—	10.60
(9)	21	21.14	21.20

[a] The variation depends on the equivalents used to convert Chinese measures into inches.

Sources: The estimates are calculated from data in the following sources: (1) Odell, *Cotton Goods in China,* pp. 188-89; (2) Ministry of Industry, Bureau of International Trade, *Chung-kuo shih-yeh chih—Chiang-su-sheng* (Chinese industrial handbook—Kiangsu) (Shanghai, 1933), Sec. VIII, pp. 87-88; (3) *Chung-kuo shih-yeh chih—Shan-tung-sheng* (Chinese industrial handbook—Shantung) (Shanghai, 1934), Sec. VIII, p. 49; (4) *La mission lyonnaise d'exploration commerciale en Chine 1895-1897,* (Lyon, 1898), Part II, p. 357; (5) *Ibid.,* Part II, p. 358; (6) *Native Cotton Fabrics Manufactured in the Shanghai Consular District,* Foreign Office, Miscellaneous Series (1886), No. 20, p. 3; (7) *Report on the Native Cotton Manufactures of Hankow,* Foreign Office, Miscellaneous Series (1886), No. 21; (8) Nishikawa Kiichi, *Men kōgyō to menshi mempu,* p. 207; (9) H. D. Fong, *Cotton Industry,* I, 236-38.

of a 40-yard by 35-inch piece appears to be a reasonable estimate. As relatively little sizing was used in handicraft weaving, the average 17-lb. weight of cloth would require the consumption of about 16 pounds of cotton yarn.

From these estimates and the total weight of yarn consumed by handicraft weaving (Tables 3 and 4), I have calculated the production of cloth in yards and square yards in an average year for each of the alternative estimates for the two decades 1871-1880 and 1901-1910:

$$\left(\frac{\text{yarn consumed [tan]} \times 133.33}{16} = \text{number of standard 40-yard by 35-inch pieces}\right)$$

WHICH OF THE ALTERNATIVE ESTIMATES IS MOST LIKELY TO REPRESENT HISTORICAL REALITY?

There are at least two approaches to an attempt to answer the question of which of the alternative estimates I have presented is

likely to be closer to the realities of cotton production and consumption in late-Ch'ing China: the first considers the probable long-run trend in the production of raw cotton in China; the second inquires into the long-run trend in the per capita consumption of cotton cloth. No regular estimates of the cotton crop were compiled before 1918, in which year the Cotton Millowners' Association began to publish annual provincial and national totals.[43] It is generally acknowledged that these estimates were incomplete and on the low side. The crop estimates made after 1931 by the National Agricultural Research Bureau of the Ministry of Industry from regular mail questionnaires completed by thousands of volunteer crop reporters, and printed in its journal *Nung-ch'ing pao-kao* (crop reports), while still inadequate, were far better than their predecessor. For 1931-1936, the average annual yield of raw cotton (ginned) is estimated by the Agricultural Research Bureau at 13,383,000 *tan* of 133.33 lbs.[44]

Nearly contemporary estimates of the raw cotton yield during 1901-1910, none very reliable, range between four and five million *tan*.[45] I have therefore used this as my lowest figure in alternative A, and increased the figure by one million *tan* steps for alternatives B and C. The seven million *tan* of alternative C comes within the range of annual estimates for 1918-1932 by the Millowners' Association. The only estimate of trends in crop acreage in the first three decades of this century which is based on extensive surveys is that of J. L. Buck. Reports from 29 localities surveyed by Buck's investigators showed an increase in the cotton crop acreage of 64 percent between 1904-1909 and 1924-1929.[46] Other things being equal, extension of cultivation to presumably poorer land might have led to decreases in per acre yields. This possibility is balanced, however, by evidence of the introduction of improved cotton varieties.[47] Assuming that cotton output increased in the same proportion as cotton acreage, and applying that increase to my hypothetical five, six, and seven million *tan* average crops for 1901-1910, I get three estimated average crops for 1924-1929 of 8.2 million, 9.84 million, and 11.48

[43] See National Economic Commission, *Mien-hua t'ung-chi* (cotton statistics), (Nanking?: Dec. 1933), pp. 2-14, for 1918-1932 estimates.

[44] The 1931-1936 estimates are given in Yen Chung-p'ing, *Textile Industry*, p. 340, in *shih-tan* which I have converted to *tan*.

[45] Negishi Tadashi, ed., *Shinkoku shōgyō sōran* (a general survey of commerce and industry in China), (5 vols.; Tokyo: Maruzen, 1906-1908), V, 292-93; Tōa Dōbunkai, comp., *Shina shōbetsu zenshi* (a complete gazetteer of China by provinces), (18 vols.; Tokyo: Tōa Dōbunkai, 1917-1920), XV, 447-50.

[46] J. L. Buck, *Land Utilization in China* (Nanking: University of Nanking, 1937), pp. 217-18.

[47] Yen Chung-p'ing, *Textile Industry*, pp. 323-33.

million *tan* respectively. In view of the 1931-1936 average of 13,383,000 *tan*, the first of these three is obviously too low and the second may be too low; but the third seems quite reasonable, allowing for some growth between the mid-1920's and the 1930's as suggested by the incomplete Millowners' Association estimates. If an eight million *tan* estimate were used for 1901-1910, the result of this exercise would be 13.12 million *tan* for 1924-1929, which is probably too high a figure. While the evidence is admittedly not overwhelming, I conclude that seven million *tan* for 1901-1910 is likely to be a better guess than the others.

For possible changes between 1871-1880 and 1901-1910 one may argue as follows. Chinese raw cotton was exported to England during the United States Civil War, but there is nothing to indicate that the demand was such as to induce a significant acreage and output increase. During the 1870's and most of the 1880's China imported more raw cotton than it exported. Only from the late 1880's did China begin to supply large quantities of raw cotton to Japanese mills. Possibly, in response to this new external demand, output increased in the late nineteenth century. On the other hand, if the increase in the export market for raw cotton between 1871-1880 and 1901-1910 were a limited one, and the size of the population remained unchanged (with constant per capita consumption assumed), then imported cotton yarn and cloth merely replaced handicraft production of these goods, and domestic raw cotton production would have declined from the first period to the second.

In fact, total population, and thus total demand for cloth and wadding, probably grew by 20 to 25 percent (ca. 75,000,000—population changes will be discussed below) between 1871-1880 and 1901-1910; the increase in raw cotton exports (average exports in 1901-1910 plus the average 1871-1880 import surplus) totalled 819,481 *tan;* and, as our earlier qualitative discussion has indicated, while imported and domestic machine-made yarn significantly replaced handspun, handicraft cloth output grew rather than declined in the period under consideration. How might these several trends have influenced raw cotton output? Assuming, as suggested above, a seven million *tan* average crop for 1901-1910, in 1871-1880 with a smaller population the demand for wadding (estimated at 2.5 million *tan* for the later decade) would have been about 500,000 *tan* less. With per capita consumption constant, the demand for all types of cloth would have been about 500 million sq. yds. smaller. This quantity of cloth is roughly equivalent to 1.6 million *tan* of raw

cotton. (500 million sq. yds. equals about 13 million standard 40-yd. pieces of which, with the product mix of the late-nineteenth century, 10 million were handicraft and 3 million machine-woven pieces; at 17 lbs. and a little over 12 lbs. per piece respectively, the total raw cotton equivalent approximates 210 million lbs.) And annual raw cotton export demand, as noted above, was about 800,000 *tan* less in the 1871-1880 decade. Thus, in raw cotton equivalents, total demand for cotton and cotton products in 1871-1880 would have been something like 2.9 million *tan* below that for 1901-1910.

From the first period to the second, however, average annual yarn imports increased by 2,265,549 *tan* (Table 5). Assuming a 10 percent wastage in spinning in India and Japan (earlier I assumed 15 percent for the less efficient Chinese mills), this would be equivalent to the importation of 2,500,000 *tan* of raw cotton. Similarly, average cloth imports grew by 306,595,000 yards (Table 6). Using the datum suggested in calculating Columns 2 and 6 of Table 6, that is, that the average piece of imported cloth was 36.07 yards long, and assuming further that each piece represented approximately 10 pounds of raw cotton (a 40-yard length of 12-lb. cloth required 11.2 lbs. of yarn), the increment of cloth imports is equivalent to 625,000 *tan* of raw cotton. The growth of cloth and yarn imports together—3,125,000 *tan* in raw cotton equivalents—just about equals the difference between total demand for raw cotton in the earlier decade and the later, and therefore suggests that domestic raw cotton output was nearly constant between 1871-1880 and 1901-1910.

These estimates are admittedly crude, but for the moment I conclude that annual raw cotton output in both periods was on the order of seven million *tan*.

A second approach, as I have suggested, is by way of estimating probable per capita consumption of cotton cloth. Total domestic consumption in 1871-1880 and 1901-1910 was slightly lower than the total of domestic production and imports shown in Columns 4 and 8 of Table 6 as a consequence of handicraft cloth exports averaging 1,323 *tan* per annum in the former period and 30,828 *tan* in the latter. For 1934-1935 domestic consumption was reduced by the annual exportation of 16 million yards (10 million square yards) of handicraft cloth, and 21 million yards (19 million square yards) of machine-made cloth. Taking account of these reductions, Table 8 shows (together with other data which will be explained presently) average per capita consumption in square yards for various hypo-

thetical populations for each of the alternatives being considered, and for 1934-1935 and 1953-1956.

Utilizing Table 8 to indicate what the likely levels of raw cotton production were in 1871-1880 and 1901-1910 depends upon first answering three difficult questions to which I now turn: What was the population of China in 1871-1880, and in 1901-1910? Did per capita cloth consumption increase or decrease from the earlier period to the later, or did it remain constant? Do yards and squares of cloth have the same value in 1871-1880 and 1901-1910 as they do in the 1930's and 1953-1956; that is, what allowance should be made for changes in the quality of the product mix?

To begin with the last question, a smaller quantity of cloth measured in square yards in the late nineteenth century and early twentieth century was the equivalent in weight and wearing quality (though of course not in coverage) of a somewhat larger square yardage of cloth later in the twentieth century. This is a consequence of the larger proportion of heavier and longer-wearing handwoven cloth in total cloth consumption in the earlier period. It was generally acknowledged that, at least in the nineteenth century, heavily sized British imports were distinctly inferior in durability both to completely homespun cloth and to handicraft piece goods woven with imported or domestic machine-spun warps and homespun wefts. While the imported cloth might cover more surface, an equal weight of handicraft cloth covering a smaller surface would normally last longer under typical Chinese conditions of wear and laundering.[48] From the descriptions of machine-woven and handwoven cloth presented earlier (assuming that imported cloth averaged 12 lbs.; domestic machine-woven cloth, 14 lbs.; and handwoven cloth, 17 lbs. per equivalent of a 40-yard by 35-inch piece), one might suggest that equal amounts in square yards of these three types of cloth would have relative durabilities proportional to their weights of 1:1.17:1.42. That is, one square yard of domestic mill cloth would last or could be used, first for clothing and ultimately for rags and the soles of sewn cotton shoes, 1.17 times as long as imported cloth; and handwoven cloth would similarly wear 1.42 times as long as imported piece goods. For the two decades under consideration, the relative proportions in square yards of imported, domestic mill, and handicraft cloth in the consumption mix for a typical year for each of the three alternatives (see Table 6) were multiplied by the

[48] See n. 9 above.

TABLE 8

ESTIMATES OF PER CAPITA CONSUMPTION OF COTTON CLOTH (IN SQUARE YARDS) AT ALTERNATIVE ASSUMED POPULATION LEVELS, AND PRODUCTS OF PER CAPITA ESTIMATES TIMES ALTERNATIVE QUALITY-DURABILITY INDICES

	1871-1880					
	Alternative A		*Alternative B*		*Alternative C*	
Population (millions)	*square yards*	*× 130.50 (q-d)*	*square yards*	*× 132.60 (q-d)*	*square yards*	*× 134.05 (q-d)*
330	4.16	542.88	5.09	674.93	6.02	806.98
340	4.04	527.22	4.94	655.04	5.85	784.19
350	3.93	512.87	4.80	636.48	5.68	761.40
360	3.82	498.51	4.67	619.24	5.52	739.96
370	3.71	484.16	4.54	602.00	5.37	719.85
380	3.62	472.41	4.42	586.09	5.23	701.08
390	3.52	459.36	4.31	571.51	5.10	683.66
400	3.43	447.62	4.20	556.92	4.97	662.23

	1901-1910					
	Alternative A		*Alternative B*		*Alternative C*	
Population (millions)	*square yards*	*× 127.18 (q-d)*	*square yards*	*× 129.30 (q-d)*	*square yards*	*× 130.89 (q-d)*
390	4.83	614.28	5.64	729.25	6.47	846.86
400	4.71	599.02	5.50	711.15	6.29	823.30
410	4.60	585.03	5.37	694.34	6.14	803.67
420	4.49	571.04	5.24	677.53	6.00	785.34
430	4.38	557.05	5.12	662.02	5.86	767.02
440	4.28	544.33	5.00	646.50	5.72	748.69
450	4.19	532.88	4.89	632.28	5.59	731.68
460	4.10	521.44	4.79	619.35	5.47	715.97

	1934-1935		*1953-1956*	
Population (millions)	*square yards*	*× 125.20 (q-d)*	*square yards*	*× 94.62 (q-d)*
450	8.58	1,074.22		
460	8.39	1,050.43		
470	8.21	1,027.89		
480	8.04	1,006.61		
490	7.88	986.58		
500	7.72	966.54		
510	7.57	947.76		
520	7.42	928.98		
530	7.28	911.46		
600			8.06[a]	762.63

[a] Assuming that the average 11 percent per annum of handwoven cloth was 21 inches wide.

Sources: 1871-1880, 1901-1910, 1934-1935: Table 6 with adjustments for exports. 1953-1956: China, State Statistical Bureau, *Wo-kuo kang-t'ieh, tien-li, mei-t'an, chi-hsieh, fang-chih, tsao-chih kung-yeh ti chin-hsi* (The past and present of China's iron and steel, electric power, coal, machinery, textile, and paper industries) (Peking: T'ung-chi, 1958), p. 186.

relative durabilities suggested immediately above to produce six different overall quality-durability indices (see Table 8).
What these indices imply is that an average square yard of cloth in the total mix for 1871-1880 Alternative C, for example, would have a higher quality-durability, that is, 134.05, than an average square yard for 1901-1910 Alternative C, that is, 130.89. The former index is higher than the latter because of the larger proportion of more durable handicraft cloth in the total mix for the earlier decade.

A similar procedure applied to Yen Chung-p'ing's estimates, with durability ratios of 1:1:1.42, however, to take account of the changed average weight of domestic machine-woven cloth, results in a quality-durability index for the 1934-1935 cloth mix of 125.20. Again, by the same procedure, the quality-durability index for the First Five Year Plan years 1953-1956, during which an average of 11 percent of the cotton cloth produced was woven by handicraft methods, is 94.62.[49]

Applying these several quality-durability (q-d) indices to the per capita consumption data in Table 8, constant per capita consumption of cloth from one period to the next or a later one is defined by equivalent interperiod products of per capita consumption in square yards multiplied by q-d indices. This follows, of course, from our definition of the q-d index, which is an attempt to take account of qualitative changes in the available product mix from one time period to another. That is, if the product of one of the q-d indices for 1871-1880 times one of the several per capita consumption possibilities for that period equals the product of one of the q-d indices for 1901-1910 times one of the per capita possibilities for the second period (and similarly for 1934-1935 and 1953-1956), per capita consumption of cotton cloth at the interperiod population and raw cotton output levels indicated by these equivalencies is taken to be of the same value. These products are shown in Table 8 in conjunction with the several per capita consumption possibilities.

What standard is to be used to interpret the products shown in Table 8? I assume that, like the consumption of grain, per capita cotton cloth consumption over the past century varied, if at all, only within a narrow range.[50] The whole one hundred years is

[49] China, State Statistical Bureau, *Wo-kuo kang-t'ieh, tien-li, mei-t'an, chi-hsieh, fang-chih, tsao-chih kung-yeh ti chin hsi* (the past and present of China's iron and steel, electric power, coal, machinery, textile, and paper industries), (Peking: T'ung-chi, 1958), p. 186.

[50] Dwight H. Perkins, *Agricultural Development in China, 1368-1968* (Chicago: Aldine, 1969), pp. 297-307.

characterized by a continued pressure of population upon available land which argues strongly against any increase in living standards. On the contrary, the latter half of the nineteenth century probably saw some worsening of economic conditions which was only partly compensated for by a slow growth in the first half of the twentieth century.[51] By the nineteenth century cotton cloth had already replaced any competitor as the principal material used in the clothing of the masses. People owned and wore so much cotton clothing as their incomes allowed. If incomes, as I have suggested, varied little over the century, it is also unlikely that per capita cotton cloth consumption changed significantly. The best years were probably the 1930's when Yen Chung-p'ing's production estimate for 1934-1935 considered in per capita terms and simultaneously "translated" into 1953-1956 equivalents by my q-d index shows a consumption of 10.22 square yards (that is, 7.72 square yards per capita at an estimated population level of 500 million in 1934-1935 $\times$ 125.2/94.62 equals 10.22 square yards in 1953-1956 equivalents, because of the larger proportion of handicraft cloth in the product mix of the earlier period).

This was, however, a brief and unique consumption peak. Constant per capita consumption at the level of the 1953-1956 figure of 8.06 square yards provided by the State Statistical Bureau of the People's Republic of China (which is unlikely to understate per capita consumption for those years) is a more plausible estimate of the amount of cloth normally available to the average Chinese during most of the years of the past century. Thus the product to look for in the other columns of Table 8 is that of the 1953-1956 q-d (94.62) times 8.06 square yards, namely 762.63. The location of this figure indicates the various production and population levels at which a per capita consumption of cloth equal to that of 1953-1956 is to be found. For each of the several raw cotton output alternatives, the corresponding population level at which products closest to 762.63 are to be found are listed below:

1871-1880	A, much less than 330 million
	B, less than 330 million
	C, approximately at 350 million
1901-1910	A, much less than 390 million
	B, less than 390 million
	C, between 430 and 440 million

[51] *Ibid.*, pp. 26-32.

The choice of the cotton output alternatives most likely to be representative of 1871-1880 and 1901-1910 respectively clearly depends on what the population of China was in each of these periods. I am, of course, not alone in having no demographically reliable answer to this enigma. There are many indications that China's population increased in the last four decades of the Ch'ing period following the demographically disastrous mid-century rebellions of the Taipings and others. Domestically, the years 1871-1910 were relatively peaceful ones, so that the demographic pattern typical of many "underdeveloped" countries which combines a high and fluctuating death rate and a high but relatively stable birth rate should have resulted in a substantial population increment. But how large an increment?

Given the strong indications that the population size in 1850 was close to 450 million, even the severe (but unmeasured) depopulation caused by the Taiping war and other civil wars is unlikely to have reduced the 1870 total below 350 million. The only reasonably reliable later figure with which to compare this 350 million conjecture is the 1953 population count of 583 million. Disregarding annual fluctuations which undoubtedly were substantial, an average annual population increase between 1870 and 1953 of 0.7 or 0.8 percent is implied by these two terminal figures. This is only one-half the annual rate of 1.4 percent which C. M. Chiao and J. L. Buck from limited survey samples have suggested as the rate by which rural population *might* have increased under the most favorable circumstances from the 1860's to the late 1920's.[52] The use of 0.7 percent is, moreover, quite reasonable in the context of what is known of China's demographic history during the Ming and Ch'ing periods. Upon these assumptions, I suggest that China's population in the 1871-1880 decade was somewhere near 350 million, that it grew to perhaps 430-440 million by the 1901-1910 decade, reached about 500 million in the 1930's, and was approximately 583 million in 1953.

[52] C. M. Chiao and J. L. Buck, "The Composition and Growth of Rural Population Groups in China," *Chinese Economic Journal*, II (Mar. 1928), 219-35. Dwight Perkins, *Agricultural Development*, pp. 192-216, has reexamined the whole matter of China's population size not only on the basis of the important institutional analyses of Ho Ping-ti and John S. Aird, but also through a comprehensive discussion of the plausibility of the actual data. His conclusions strongly support my 350 million estimate for the 1870's—after the demographic catastrophe of the Taiping Rebellion—as well as my 430-440 million figure for the 1910's. I am reasonably comfortable, therefore, in using these population estimates although they have been generally regarded as being at the lower boundary of the plausible range.

I am admittedly only guessing, but the guesses seem plausible. They suggest, in conjunction with the alternatives set forth in Table 8, that both for 1871-1880 and 1901-1910 raw cotton output Alternative C—that is, 7 million *tan*—has the greater claim to credibility. Nothing is definitively proved either by this exercise or the earlier discussion of probable output trends. The conclusion in both cases does, however, lend support to the 7 million *tan* alternative, and I shall therefore use it below in discussing changes in the handicraft textile industry from the first period to the second. Once again, no strong claim is made for the absolute values presented; but the direction of structural changes and their relative gross magnitudes are, I believe, reliably indicated.[53]

WHAT HAPPENED TO CHINA'S HANDICRAFT TEXTILE INDUSTRY BETWEEN 1871-1880 AND 1901-1910?

I shall reply to this question as if Alternative C for both 1871-1880 and 1901-1910 were fully verified empirically rather than being the product of partial data and, I believe, sound conjecture. In Table 9 the circumstances for average years in these two decades, both now represented by Alternative C, are compared. It will be seen immedi-

[53] It might be noted that the *Ch'ing-ch'ao hsü wen-hsien t'ung-k'ao* (encyclopedia of the historical records of the Ch'ing dynasty), (Shanghai: Commercial Press, 1936), IV, 11,295-96, cites an estimate for about 1910 of 7,788,000 *tan* of ginned cotton produced on an acreage of 29,554,090 *mou*. This may perhaps be too high an estimate to represent the first decade of the twentieth century as a whole, but it does lend some support to my Alternative C as an average for that decade. That 29,554,090 *mou* of land were planted in cotton is, of course, only a guess; no comprehensive field survey was made in 1910. Yet the guess comes close to the acreage suggested by later survey data. For the early 1930's, the percentage of the cultivated area planted in cotton was (according to Buck's estimate for 1929-1933) 4.3 percent of the total. Buck's investigators found that cotton acreage increased 82 percent between 1904-1909 and 1933; in the earlier period it would thus have been about 2.4 percent of total cultivated acreage. (Ta-chung Liu and Kung-chia Yeh, *The Economy of the Chinese Mainland: National Income and Economic Development, 1933-1959* [Princeton: Princeton University Press, 1965], Table A-9, p. 300; and J. L. Buck, *Land Utilization*, p. 217.) Data on the area of land under cultivation in the Kuang-hsü edition (1899) of the *Ta-Ch'ing hui-tien* (collected statutes of the Ch'ing dynasty)—with some adjustments the official figure for 1887 is 847,760,554 *mou*—are imperfect and should be adjusted upward by perhaps one-third to compensate for under-registration. This would give a cultivated area of possibly 1,130,345,000 *mou*. The output of unginned cotton per *mou* was about 80 catties, with a ginned cotton yield of about 33 percent or 27 catties (0.27 *tan*). Thus 27,127,560 *mou* of land (2.4 percent of the total) could produce about 7,324,441 *tan* of ginned cotton. (*Shinkoku shōgyō sōran*, V, 292; Odell, *Cotton Goods*, p. 207; Li Wen-chih, comp., *Chung-kuo chin-tai nung-yeh shih tzu-liao, ti-i-chi, 1840-1911* [source materials on agriculture in modern China, first collection, 1840-1911], [Peking: San-lien, 1957], pp. 620-21.)

TABLE 9
ALTERNATIVE C FOR 1871-1880 AND 1901-1910 COMPARED
(PRODUCTION PLUS IMPORTS OF YARN AND CLOTH)

	Cotton Yarn			
	1871-1880		1901-1910	
	tan	*percent*	*tan*	*percent*
Domestic mills	—	—	1,055,040	17.98
Imports	97,451	1.96	2,363,000	40.27
Handicraft	4,882,381	98.04	2,449,715	41.75
Total	4,979,832	100.00	5,867,755	100.00

	Cotton Cloth							
	1871-1880				1901-1910			
	Yds.	*percent*	*Sq. Yds.*	*percent*	*Yds.*	*percent*	*Sq. Yds.*	*percent*
Domestic mills	—	—	—	—	25,200,000	0.57	24,494,400	0.97
Imports	414,805,000	11.40	376,165,000	18.92	721,400,000	16.23	654,200,000	25.87
Handicraft	3,224,960,440	88.60	1,612,480,220	81.08	3,699,890,434	83.20	1,849,945,217	73.16
Total	3,639,765,440	100.00	1,988,645,220	100.00	4,446,490,434	100.00	2,528,639,617	100.00

Source: From Tables 5 and 6.

ately that total consumption of cotton yarn increased as the population grew from the first period to the second. The handicraft spinning of yarn, however, which had a near monopoly in the first period, declined drastically both in absolute terms and as a proportion of the total yarn supply.[54] By itself a declining share of handicrafts in total supply—from 98.04 percent to 41.75 percent—indicates nothing about their possible displacement by manufactured yarn, although it does affect the overall structure of the cotton textile sector. The fall in handspun yarn output by approximately 2.4 million *tan*—50 percent—from the first period to the second, while total supply increased, does, however, indicate a major displacement by competing products.

Handspun yarn was partially replaced by domestic and imported machine-spun which was both cheaper and a good substitute for the handicraft product. While in the first period there were as yet no modern spinning mills established in China, by 1901-1910 Chinese- and foreign-owned mills in and near the treaty ports produced over one million *tan* of yarn, nearly 18 percent of the total supply. The new domestic mill production was approximately equal in quantity to the entire increase in yarn consumption from 1871-1880 to 1901-1919. Imported yarn meanwhile increased by more than 2.2 million *tan*, and in 1901-1910 was nearly equal in quantity to the handicraft output. From 2 percent of the total in 1871-1880 it had increased to 40 percent in 1901-1910; in absolute terms it was 24 times larger in the later period than in the earlier. It is not possible from the present data to say what proportions of the domestic mill yarn and of the imported yarn increase were substituted for handicraft output. Even if all of the domestic machine-spun yarn produced directly replaced handspun, imports would still account for more than half of the displacement. As the assumption in the first half of the previous sentence is an unlikely one, imports were clearly the major factor responsible for the decline of handicraft spinning.

Total consumption of cloth, whether measured in yards or in square yards, also increased as the population grew. The output of domestic weaving mills, non-existent in 1871-1880, was still barely noticeable in 1901-1910; the great expansion was to come only from

[54] Chi-ming Hou, *Foreign Investment and Economic Development in China, 1840-1937* (Cambridge: Harvard University Press, 1965), pp. 173-77, argues that there was no decline in the handspinning industry between 1913 and 1936, and states that any "serious decline" was "highly unlikely" for the years before 1913. At least for the pre-1913 years, I obviously find myself uncomfortable with his conclusions.

the 1920's. Imported cotton piece goods, while they increased by approximately 307 million yards or 278 million square yards from the first period to the second, did so only in moderate terms as compared with imported yarn. Their absolute increase was 42.5 percent if measured in yards or square yards. As a proportion of total supply, the increase was from 11 to 16 percent in yards, and from 19 to 26 percent in square yards. The contrast with the quite remarkable increase in yarn imports is entirely due to the fact that handicraft weaving held its own very well in the face of foreign competition from the earlier decade to the later.

While the position of handicraft cloth declined slightly as a proportion of total supply, from 89 to 83 percent in yards and from 81 to 73 percent in square yards, it continued to dominate the market. Its absolute increase, moreover, by 475 million yards or 237 million square yards, was approximately equivalent to the increment in imported piece goods. Handicraft cloth over these four decades, in contrast to handspun yarn, was not displaced by domestic or imported machine-woven products. In the absence of competition from the foreign-made article, it is likely that the output of handicraft cloth—woven now often with a mixture of domestic handspun and domestic and foreign machine-spun yarn—would have grown even more rapidly. The performance of the handicraft weaving sector as it was is a remarkable one, and suggests the existence of a strong and partially discrete market, especially in the rural interior of China, for the generally heavier and longer-wearing handicraft product. Domestic mill cloth and imported goods were not perfect substitutes for the handicraft cloth.

What can be said, at least tentatively, about the probable effects of the developments just described upon the peasant spinners and weavers who in the earlier period produced 98 percent of the yarn supply and more than 80 percent of the cloth? Some part of those many peasants who had once engaged in spinning as an ancillary occupation undoubtedly turned to weaving as a replacement for their lost employment. While the absolute amount of handicraft cloth woven increased from 3.2 billion yards in an average year in 1871-1880 to 3.7 billion yards in an average 1901-1910 year, this increment was not large enough to accomodate the labor made redundant by a 2.4 million *tan* decline in the output of handspun yarn.

Handspun cotton yarn in the late-Ch'ing dynasty was for the

most part produced on a simple spinning wheel; one man working for 10 hours could spin about four *liang* of yarn. A more complex three-spindle machine, which was capable of producing eight *liang* in the same period of time, was known, but its use was limited. With the typical old-style wooden loom one operator could weave about 10 yards of 12-inch wide cloth in the same 10 hours, consuming the yarn produced by three spinners.[55] The improved iron-gear looms introduced from Japan early in the twentieth century increased the weaver's daily output fourfold, but these were more used in urban handicraft weaving shops than in the rural villages which produced the preponderance of hand-woven cloth. If I am correct in estimating that the output of handspun yarn declined by about 2.4 million *tan* from 1871-1880 to 1901-1910 and that the production of hand-woven cloth increased by about 500 million yards in the same period, the amount of labor released by the former was about ten times as great as could be absorbed by the latter: at four *liang* per day, one man-year of labor would be capable of spinning a maximum of one *tan* of yarn; thus at least two million man-years lost. One handicraft weaver, on the other hand, could produce perhaps 3,000 yards of cloth in a year; thus only 200,000 additional man-years potentially absorbed.

Nor yet, until the early 1920's, did the textile mills of the cities provide a very large outlet. The labor force in China's modern textile mills in the first decade of the twentieth century numbered perhaps 62,000.[56] Certainly some part of this total represented an inflow of peasants from Yangtze delta villages to Shanghai and a few other Kiangsu cities where 80 percent of these workers were employed. The hypothetical absorbtive capacity of redundant rural spinning labor by modern mills was, however, even smaller than the potential shift to handicraft weaving.

If the employment effects of the changes from 1871-1880 to 1901-1910 were negative, the consequences for the total value of handicraft yarn and cloth output, and thus presumably for the total income of handicraft textile workers, were quite positive. From Table 1, and the conversion factor for "pieces" of cloth into

[55] Yen Chung-p'ing, *Textile Industry,* pp. 24-26; Shih Hung-ta, "Shih-lun Sung Yuan Ming san-tai mien fang chih sheng-ch'an kung-chü fa-chan ti li-shih kuo-ch'eng" (the historical stages of the development of cotton textile machinery in the Sung, Yuan, and Ming dynasties), *Li-shih yen-chiu* (historical studies), No. 4 (1957), 35, 40, 42; *Blackburn Report,* Neville and Bell's Sec., p. 56.

[56] Wang Ching-yü, *Modern Industry,* II, 1184-92.

square yards which I used earlier, it can be seen that the average values of one *tan* of imported yarn in 1871-1880 and 1901-1910 were Haikwan Tls. 25.89 and 25.09 respectively; while one square yard of imported cloth was valued at Haikwan Tls. 0.0486 in the first period, and 0.1033 in the second. I assume that the price of a unit of handicraft yarn or cloth was approximately equivalent to that of the same weight of imported yarn or the same square yardage of imported cloth. The product of these unit values and the output quantities summarized in Table 9 is an estimate in current prices of the average annual value of handicraft textile output for each of the two decades—1871-1880: Haikwan Tls. 126,404,844 (yarn), 78,366,539 (cloth), 204,771,383 (total); 1901-1910: 61,463,349 (yarn), 191,099,341 (cloth), 252,562,690 (total). The Tls. 47,791,307 increase in the value of total output from the first period to the second is attributable to two factors: the shift from handicraft spinning to the weaving of cloth which had a greater value per unit of labor expended; and the doubling of the value of a square yard of cloth from 1871-1880 to 1901-1910 while the value of a picul of yarn fell slightly.

The possible indirect effects of foreign yarn imports on agriculture and the peasant handicraftsman should also be considered. A decline in spinning of the magnitude I have suggested could theoretically free substantial labor for work on the farm. Additional labor—if available when most needed—might contribute to increased agricultural output by speeding up both harvesting and planting operations and thus permitting more double-cropping within a given growing period. Labor made redundant by the decline of handicraft spinning was, however, unlikely to be freed at the peak harvest and planting periods; handicraft operations tended to be concentrated in the slack winter months. Few data are available for the late nineteenth century from which to conclude whether or not a substantial part of displaced handicraft labor was in fact profitably reemployed in agriculture. For the twentieth century, Buck has found some relationship between a decline in spinning and increased hog and poultry raising.[57]

If the decline in handicraft spinning had been accompanied by a sharp drop in raw cotton output—that is, if exports to Japan and consumption by domestic mills had not, as earlier indicated, substantially maintained the total demand for raw cotton—significant

[57] J. L. Buck, *Land Utilization*, p. 298.

shifts in the crops grown would have been necessary both to sustain farm income and to provide export products to exchange for textile imports. The necessity for major shifts would add a large burden to an agricultural economy incapable of the rapid movement of resources from one branch to another, and would aggravate the strains accompanying the substantial displacement of handicraft spinning. If raw cotton output fell at all, however, between 1871-1880 and 1901-1910, the decline was, I have suggested, probably not more than 10 percent. Some part of the increment of textile imports was "paid for" by increased exports of silk and by the growth from the late nineteenth century of soybean exports. Soybean production and export for the most part represented a net gain for agriculture; the case of silk, however, is more problematical. To the extent that sales of finer counts of imported cotton cloth in the urban areas, where their market was concentrated, represented decisions by the wealthier classes to buy cotton cloth rather than silk, total domestic demand for silk would if not decrease, at least stagnate. It is possible, given the growth of cloth imports at a faster rate than population grew and the nature of the market for them, that part of the export of silk was taken out of current consumption rather than from an enlarged crop. To the extent that this was true, the effect on agriculture of textile imports would be a negative one.

The simplistic indictment of "foreign capitalism" by some contemporary Chinese historians for having progressively "crushed" and "exploited" domestic handicraft industry from the mid-nineteenth century onward is belied by the actual state of the Chinese economy as late as the 1930's. In the middle of that decade, even in the cotton textile industry which allegedly suffered most severely from the "incursion of foreign capitalism," 61 percent of the cotton cloth produced in China (in square yards; if the unit of measurement were yards the proportion would be 73 percent) was woven by handicraft methods.[58] Anyone who would claim that the Hunan or Szechwan peasant in the 1930's dressed in Naigaiwata cottons, smoked BAT cigarettes, and used Meiji sugar has a big case to prove. In 1933, the output of handicrafts accounted for an estimated 68 percent of the total value of industrial output. Of course the relative share of handicrafts was greater in 1870 or 1911, prior to or in the early stages of the development of the small modern industrial sector which began in the 1890's, than it was in the

[58] Yen Chung-p'ing, *Textile Industry*, p. 311.

1930's. And in some important handicraft industries, notably cotton spinning, a sharp decline occurred from the nineteenth century to the twentieth. On both theoretical and empirical grounds, however, there is reason to believe that the total domestic and export demand for handicrafts did not decline in the twentieth century, and *a fortiori* that handicraft industry as a whole was not seriously undermined between 1870 and 1911. But to reject the crudest formulations is not to deny either that significant structural changes in the handicraft industrial sector took place in these four decades or that the strain and dislocation occasioned by these developments adversely affected substantial parts of the population.

One cannot but conclude that for many peasant households in those areas where cotton spinning had been important, who were unable either to find urban employment for some of their family members or to increase their production and marketing of cash crops, an always precarious equilibrium between income and expenditure was profoundly shaken by the decline in handicraft spinning I have described and attempted to measure. *Quod erat conciendum.*

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