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Technology and Long-run Economic Growth in Asia

Industrial Development in Republican China, Newly Revised Index: 1912-1948

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１． Introduction

For compiling long term economic statistics, we need to make adequate index series of the production. As we showed a preliminary report on the Chinese modern industrial output series in the first half of the 20th century in the workshop held in 2000, today we would like to show a newly revised one.

The most representative and most cited work related to this research was John K. Chang's book（Chang［1969］）. Chang's compilation of 1912-1949 industrial production index based on the output series of 15 mining and industry products was unquestionably a significant achievement. But the Chang's index included very few items that belonged to the modern industry（only limited to cotton yarn, cotton cloth, iron, steel and cement by the classification standard of the United Nations）. This left much room for improvement for later research. At first, this research takes up the cotton textile sector, which had a 20% share in modern Chinese industry and makes new estimates for cotton yarn production. Secondly this research attempts to make estimates for the silk industry which stood second in Chinese modern industry. In an addition, we also try to improve the Chang's index in several output series of the other products.

２． New Estimates on Cotton Yarn Production, 1912-1936

Cotton spinning industry was the most important industry in the Chinese modern economy during this period. According to our understanding, we have several kinds of estimates on the modern Chinese cotton yarn production. And an estimate compiled by the Preparatory Committee of the Shanghai Cotton Spinning and Weaving Association（1951）（hereafter refereed to as Cotton Statistics）is the best one among them, while it also needs some revisions.

How do we approach to compile the time series statistics of cotton yarn output? Needless to say, we should utilize all the information. Therefore, in our new estimation procedure, besides the basic available cotton statistics, we also use enterprise level information（such as Shenxin, Yongan, Fuyi, Xinyu, Huaxin and Japanese cotton textile factories in Tsingtao, Jinhua, Yuhua, Dahua, Daxin and others）to try to improve the statistics. Also for the northeast China, we use the reliable factory statistics compiled by the Japanese.

We need to make up for missing years, items in the statistics. From the previous studies, we can summarize the following 4 types of estimation methods.

1. Average output per spindle estimation（capital productivity series）

2. Average output per laborer estimation（labor productivity series）

3. Yarn- cotton ratio estimation（cotton loss ratio series）

4. Estimation of yarn output for own consumption in factories combining spinning and weaving operation（cotton cloth series）

We have already discussed this problem in the workshop in 2000. Please refer the workshop report.

３． Cotton Industry during Sino-Japanese War, 1937-1945

J. K. Chang used the output series of the cotton industry in the northeast China as the basic data to calculate the nationwide output series of Chinese cotton industry during the Sino-Japanese war period. But it should be correct because the cotton industry in the northeast China could not represent all of the Chinese cotton industry. In fact the cotton industry in Shanghai where half of the Chinese cotton mills located experienced a big boom from 1938 to 1941, while the output of the cotton industry in the northeast China declined very much because of raw cotton deficiency. Using enough raw cotton bought from the international market, Shanghai cotton mills could make a lot of cotton yarn and textile during the first half of the war times. So due to using the output data of cotton yarns in the northeast China, J. K. Chang underestimated the nationwide output of Chinese cotton industry from 1938 to 1941.

Then how can we get adequate data of the nationwide output series of Chinese cotton industry during the war period? We can find the output statistics in the northeast China and the Free China (the southwest China). At the same time, in this study, we use the average output per spindle estimation（capital productivity series）to calculate the output in the central China and the north China. As there were big differences among each of the capital productivity of cotton mills, we use several kinds of capital productivity data classified by the capital nationalities and the mill's location. Especially regarding the productivity of Chinese cotton mills in Shanghai, our estimate is based on the management materials of several famous cotton mills including Shenxin no.9, Yongan no.3 and Xinyu.

As a result, our new estimate on the nationwide output series of Chinese cotton industry from 1938 to 1941 becomes much higher than J. K. Chang's estimate (See table1). This trend is similar to the other estimate in the journal published just after the war.

４． Silk Industry and Silk Weaving Industry, 1912-1948

Partly mechanized silk industry in China started at Shanghai in 1861, while it once abandoned a few years later. After the 1870s in Guangdong province and the 1880s in Lower Zhangjiang basin, many Chinese merchants established lots of factories producing filature silk to export the world

market. The number of factories in 1930 was as follows.

	Shanghai	Jiang-zhe	Guangdong	Sichuan
Number	107	81	121	20

Silk weaving industry using electric power also began at Shanghai in 1915 and after the 1920s the output increased very fast by using rayon（artificial silk）with natural silk. As silk industry and silk weaving industry occupied the second important place in Chinese modern industry, we should pay an attention to their output to compile an adequate industrial output index series. But we do not have the statistics of output of silk or silk weaving. So we try to make an estimate.

It is not easy to make an estimate on the output series of silk filature by using the capital productivity data. Because we do not have annual number and productivity data of silk reeling machine, while we have a rough estimate of number of silk reeling factories in the specific years. So in this study, we mainly use the export trade statistics to calculate the output of filature silk because most of filature silk were exported in that times. However of course some of them consumed in the silk weaving mills in China were not exported to abroad. The total of export and domestic consumption indicated the output of filature silk (See table2).

So at first we must make an estimate of the output series of silk weaving industry. We use the method to estimate by capital productivity series for compiling the output of silk weaving. On one hand, we make an estimate of annual number of power silk weaving machines during this period. On the other hand, using the data of the Meiya silk weaving mill, which was one of the biggest silk weaving mills in China, we can get annual productivity data per a silk weaving machine (See table3).

５．Other Revisions

In addition to the revision regarding cotton and silk industries, we revised several estimates in the other output series as follows.

1）Output in the district under the Chongqing National Government's rule during the War period

Using several original data, we can revise a part of the output data in the district under the Chongqing National Government's rule (the southwest China) during the War period.

2）Output in the northeast China（Manchuria）during the War period

Using "Kojo tokei sokuho"（"Prompt report of industrial statistics"）, we can revise most of the output series of industrial production in the northeast China during the War period

3）Output of the electric power stations in the Central China during the War period

We can refer the documents of "Kachu suiden"（Central China Electric Power Co.）to revise Chang's data.

4）Output of the cement industry in the central China during the War period

We can refer the documents of "Shanghai shuini gongsi"（Shanghai Cement Co.）to revise Chang's data.

６． Conclusion

The result is as follows (See figure 1). At first, the post WWI depression did not cause a large decline on the overall production. While Chang's index showed a drastic drop of production in 1922, our revised figures showed only a little slowdown in the development. The Chang index possibly exaggerated the adverse impact of the post WWI depression the on the entire Chinese modern industry. Secondly, there was a very vigorous recovery in 1936 following the end of the 1930s Great Depression. Our revised figures showed there was a 10% increase in 1936 in comparison with the previous year - a good indication of the rapid recovery following the currency reform at the end of 1935. The third point is about the assessment on the industrial production during the Sino-Japanese War. According to our revised figures, we should recognize some kind of recovery from 1938 to 1941 during the War, although the industrial production sharply declined after 1942.

Table1 Cotton Yarn Production in China, 1938-1945

1,000bales

	South west China Chinese Mills	North China Chinese Mills	North China Japanese Mills	Central China Chinese Mills	Central China Japanese Mills	North east China Japanese Mills	Total	Chang's
1938	25	48	*452*	*358*	*694*	196	**1,773**	717
1939	27	35	332	*474*	917	193	**1,979**	802
1940	30	*34*	327	*457*	768	148	**1,764**	764
1941	112	28	415	*322*	598	145	**1,620**	848
1942	114	22	309	*59*	352	180	**1,036**	516
1943	117	*22*	*307*	*29*	*174*	160	**809**	500
1944	115	*20*	*276*	*12*	*72*	95	**590**	400
1945	69	*14*	*199*	*9*	*52*	*68*	**411**	300

Note:Italic letters mean estimate.

Table2 Filature Silk Production in China, 1912-1949

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	Export	Domestic Consumptio	Production
1912	59,157	—	**59,157**
1913	69,541	—	**69,541**
1914	56,766	—	**56,766**
1915	63,139	61	**63,200**
1916	68,286	241	**68,527**
1917	73,103	432	**73,535**
1918	64,187	1,160	**65,347**
1919	90,038	1,320	**91,358**
1920	56,043	1,559	**57,602**
1921	87,484	1,812	**89,296**
1922	89,248	2,841	**92,089**
1923	77,470	2,913	**80,383**
1924	81,047	5,696	**86,743**
1925	103,289	10,958	**114,247**
1926	107,279	11,143	**118,422**
1927	101,889	14,425	**116,314**
1928	123,170	14,976	**138,146**
1929	123,045	13,911	**136,956**
1930	100,242	14,739	**114,981**
1931	86,736	16,949	**103,685**
1932	45,896	11,709	**57,605**
1933	59,459	15,376	**74,835**
1934	40,129	12,363	**52,491**
1935	57,040	11,778	**68,818**
1936	47,224	13,820	**61,045**
1937	53,630	9,090	**62,720**
1938	32,305	7,320	**39,625**
1939	46,144	12,037	**58,181**
1940	46,667	7,167	**53,834**
1941	32,585	5,863	**38,448**
1942	7,837	2,538	**10,374**
1943	108	2,346	**2,454**
1944	·	1,912	**1,912**
1945	·	1,770	**1,770**
1946	10,369	2,484	**12,853**
1947	6,000	4,559	**10,559**
1948	3,000	6,067	**9,067**
1949	·	6,005	**6,005**

Table3 Silk Weaving Production in China, 1912-1949

	Weaving machines	Productivity (per	Production (pcs.)
1912	—	—	—
1913	—	—	—
1914	—	—	—
1915	69	74.88	**5,167**
1916	273	74.88	**20,442**
1917	489	74.88	**36,616**
1918	1,314	74.88	**98,353**
1919	1,495	74.88	**111,944**
1920	1,766	74.88	**132,199**
1921	2,293	67.00	**153,598**
1922	2,820	85.44	**240,893**
1923	3,421	72.20	**247,019**
1924	4,023	120.04	**482,960**
1925	4,625	200.88	**929,092**
1926	5,314	177.79	**944,797**
1927	6,040	219.61	**1,326,378**
1928	6,179	243.43	**1,504,199**
1929	6,919	222.48	**1,539,295**
1930	8,994	201.87	**1,815,539**
1931	11,320	207.98	**2,354,289**
1932	10,504	177.50	**1,864,454**
1933	12,088	237.27	**2,868,033**
1934	13,672	168.66	**2,305,958**
1935	15,256	144.01	**2,196,986**
1936	16,840	153.08	**2,577,883**
1937	13,844	89.42	**1,532,899**
1938	9,376	109.10	**968,671**
1939	8,434	177.95	**1,759,886**
1940	7,972	122.88	**1,113,413**
1941	7,663	116.32	**987,921**
1942	8,015	59.07	**473,391**
1943	8,843	55.50	**437,564**
1944	9,670	50.54	**356,697**
1945	10,542	31.32	**330,153**
1946	11,070	41.86	**463,374**
1947	11,597	73.33	**850,447**
1948	12,125	93.33	**1,131,620**
1949	12,652	88.53	**1,120,045**

Fig.1 Industrial Output in China, 1912-1949