

**A STUDY OF CHINESE INDUSTRIALIZATION
(1912-1948)**

by
Kwang Lu

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I. INTRODUCTION

A. The Purpose of This Paper

During the eighteenth and nineteenth century the English people were very successful in an Industrial Revolution. It not only made England the first country industrially in the world, but also brought its great influence to the continents, Europe, America and Asia. Under this influence China like western countries began her industrial development about 1862. Nearly sixty years later under the same influence countries such as Germany, France, the United States and Japan had become modern industrialized countries. Only China still remained backward. Why? What are the causes? To answer these questions is the first purpose of this study.

In the second place, an attempt will be made to show what Chinese industrialization had taken place under the Ching Dynasty before 1912, and by the Republic of China after 1912. Emphasis will be placed upon the period of 1912-1948 to see what the Government of the Republic had done while they dominated the Chinese mainland.

Finally, from the analysis of natural resources, from the review of past achievement in the movement of Chinese industrialization we may see what the possibilities of industrial development on the Chinese mainland are at present and we may see further what the tendency of Chinese industrialization will be in the future.

Since the communist regime took over the Chinese mainland we can not know exactly what Red China has actually done in industry because of the so-called Iron-curtain. We only hear the voice of communist propaganda and the threat of their growing power of industrialization. Is

this true or not? It is hoped that this paper will make some contribution to the free world.

B. The Reason for Choosing the Period of 1912-1948

As previously indicated China began her industrial development about 1862. Under the Ching Dynasty the government devoted about fifty years to industrialization. Unfortunately, they put their major effort upon the development of national-defense industries in order to resist the foreign invasions. So the early movement of Chinese industrialization was not directly beneficial to the people. In 1912 Dr. Sun Yat-Sen overthrew the Ching Dynasty and established the Republic of China. Thereafter the Chinese mainland was dominated by the Government of the Republic until 1948 when Chinese communist took over the mainland.

Even in this period (1912-1948), there were civil wars and the Sino-Japanese War which made trouble for the government, but the Chinese industrialization was still conducted systematically by the government. They no longer put all attention on the defense-industries; they bought machines from western countries to build heavy and light industries; they sent many students abroad to learn scientific skills and knowledge; they invited many foreign technical men and capitalists to help them to build their industries. In short, the Government of the Republic had achieved more than the Ching government had accomplished. Even then it was still not enough and too slow in comparison with the modern development of industry elsewhere. The Government of the Republic laid the basis for the development of Chinese industrialization.

C. Sources

In this paper, the materials used, including books and pamphlets, are from three sources. First, most of materials are on hand. Second, some materials are available from the library of the Virginia Polytechnic Institute and some are borrowed from the library of Columbia University. Third, some materials have been made available from professors of National Taiwan University.

II. THE BASIC FACTORS FOR INDUSTRIALIZATION

A. Resources, Techniques and Capital

The characteristic of industrialization is the production by machines. By this is meant that machines take the place of manpower to carry out mass production. Machines are made from steel. To produce the steel the basic materials such as iron, coal and manganese are needed. Also, oil, tungsten, tin, antimony, etc. are important materials for the industries. So, resources are the first basic factor for industrialization.

There are two kinds of needs in industries: one is the requirement for industrial experts like scientists and engineers, and the other is the need for master workers. Backward countries do not have their own industrial experts. In the short run, they can borrow them from progressive countries. Master workers may be developed through special training. Also, industrial development demands a large quantity of labor. Therefore, in the beginning of industrialization, the industrial experts are desirable but not a necessary condition; the labor supply is a necessary condition for the development of industrialization.

Capital is a most important factor for industrial development. For lack of capital, the resources of a country can not be exploited, and factories can not be built; the technical men and laborers will not work for you if you can not offer them reasonable pay. Especially, in the backward countries, they need more capital to import machines and the materials, and to engage foreign technical help. Even in the progressive countries the capital is also important for keeping their

Industries developing.

B. A General View of Chinese Industrial Background

In China, there are abundant basic industrial resources such as iron ore, coal, oil, antimony ore, tungsten ore and many others. Although knowledge is inadequate, reserves are known to be substantial. (see Table 1) Development and utilization, however, have been slow, and resources remain for the most part relatively unexploited.

Table 1

Estimated Mineral Reserves
China and World, 1950

(Unit - Million tons)

<u>Items</u>	<u>China</u>	<u>World</u>	<u>Percent of World Total</u>
Coal	265,000	5,000,000	5.3
Iron Ore	5,300	293,000	1.8
Crude Petroleum*	1,370	95,208	1.4
Manganese Ore	29	1,100	2.6
Antimony Ore	3.8	4.3	88.4
Tungsten Ore	2	4.4	45.0
Tin Ore	0.7	6.6	10.6

- Sources: (1) World Population and Production, by W. S. Woytinsky and E. S. Woytinsky, Chapter 22, 23.
(2) Chinese Mineral Resources, by P. F. Chen, Chapter 7, 12, 13, 17, 18.
(3) China Among the Powers, by David Nelson Rowe, Chapter 5

*In millions of barrels

China has the largest population of any country in the world. Although the labor supply is sufficient, technical and college men are too scarce. In 1954, China had 941 thousand technical and college students, which was more than the United Kingdom, France or Japan, but less than the United States and Russia. However, the proportion of

the technical and college students to the total population shows that there were 197 technical and college students in 10 thousand people for Russia, 154 for the United States, 105 for France, 69 for Japan, 29 for the United Kingdom and only 16 for China. (see Table 2)

Before the Sino-Japanese War (1937), Chinese industrial capital including the capital of manufacturing industries, public utility, mining industries and transportations, was about 3,800 millions of dollars in Chinese currency. Dividing by the population of that time (450 millions) the average for each person was only 8.4 dollars for industrial capital, if measured in terms of U.S. dollars it was only 2.5 dollars for average each person.¹ It was really poor in comparison with a 450 dollar (the capital of manufacturing industries only) average for each American person in 1930.

In 1938, Chinese national income was 1,630 million dollars more than Japanese but per capita income was 69 dollars less than Japanese. The national income of other countries such as the United States, Russia, Germany, the United Kingdom and France were much more than in China, as shown by Table 3.

From the accumulation of industrial capital and national income two decades ago, it shows that Chinese capital is not great enough for her industrial development. But it is not an obstacle to Chinese industrialization, because in the highly developed capitalistic countries capital may be available for use in less highly developed countries to the benefit of both countries.

¹ The Capital Problems of Chinese Industrialization, by C. F. Ku, Economic Mobilization, Vol. 4.

Table 2

Population and Secondary School and College
Students of the Selected Countries, 1954

<u>Items</u>	<u>China</u>	<u>U.S.S.R.*</u>	<u>U.S.A.</u>	<u>Japan</u>	<u>The United Kingdom</u>	<u>France</u>
Population (in thousands)	591,220	200,200	162,409	88,000	51,059	43,000
Students of Secondary School (in thousands)	3,712	5,252	7,385	8,209	2,184	1,000
Students of Technical and College (in thousands)	911	3,944	2,500	607	150	450
Technical and College Students in 10 Thousand People	16	197	154	69	29	105

Source: Statistical Yearbook, by United Nations, 1955, pp. 21, 570; 1956, pp. 21, 581; 1957, pp. 607

*Data for Russia for the year 1955.

Table 3

National Income of Selected Countries in 1938

<u>Income</u>	<u>U.S.A.</u>	<u>The United Kingdom</u>	<u>Germany</u>	<u>U.S.S.R.</u>	<u>France</u>	<u>Japan</u>	<u>China</u>
National Income (Millions of dollars)	67,375	22,100	23,000	17,850	10,800	6,070	7,700
Per Capita Income in dollars	519	465	335	105	260	86	17

Source: World Population and Production, by W. S. Woytinsky and E. S. Woytinsky, pp. 389.

III. THE CAUSES OF SLOW GROWTH OF CHINESE INDUSTRIALIZATION

A. Degree of Chinese Industrialization in 1930

China began her industrial development about 1862, the United States about 1865 and Japan about 1869, but in 1930 the degree of industrialization of these countries were greatly different. This great difference may be shown in the per capita coal, steel and electricity, since these are basic essentials for industry. This consumption is shown as in Table 4.

Table 4

Per Capita Consumption of Coal,
Steel and Electricity in
Selected Countries in 1930

<u>Items</u>	<u>China</u>	<u>Japan</u>	<u>The United States</u>
Coal (ton)	0.055	0.5	4
Steel (ton)	0.0022	0.5165	6.27
Electricity (KWH)	5	216	977

Source: Chinese Industrialization and Its Capital Problem, by Kwang Lu, Chapter I.

Chinese industrial background (mentioned in the previous chapter) is much better than Japanese, and China was six years earlier than Japan in developing industrialization. Why was Japanese degree of industrialization in 1930 so much greater than Chinese? In comparison with the United States, it is hard to conceive that Chinese industrialization was so poor. In the present chapter an effort will be made to show the reasons.

B. Conservatism of the People

One of the important reasons was the conservatism of the people. China is accredited to have a history of 5,000 years, and has 11,599,855

square kilometers of territory and more than 400 million people, her population is the largest in the world. Her inventions and discoveries like the mariner's compass, block printing, and gunpowder were known respectively as early as the twenty-seventh, the fourth century, B.C., and the third century A.D. Her greatest minds like Lao-tze, Confucius and Mencius were produced by 300 B.C. In a word, these great things made Chinese people believe that China is the oldest, richest and most excellent country of the world. They closed their door and conservatively said "China has enough things for herself and does not need any more from abroad." They refused to improve or to accept suggestions offered by western preachers who came to China for evangelicism. Consequently, no more inventions came out and no more progress was made in industrialization. When the western Industrial Revolution happened, the Chinese people still had no knowledge of it. China had been too much intoxicated with her own ideas.

The following stories are good examples to indicate how conservative the Chinese people were. Proposed change in the early industrial development made them furious with anger.

In 1866 the first modern weaving factory was built in Kwan-Chow. As a result of the production by machines the quantity and quality of product were much improved and the costs were lower than the product produced by the old methods. Nevertheless, the workers of the old factories were strongly opposed to the new method, and the new factory was forced to move out to Macao, but the workers there were also opposed to it. Finally, the new born factory was forced to stop its production.

In 1876, the first railway in China was a narrow-gauge line running from Shanghai to Woosung, which was built by the English people. But the Chinese people considered that the railway crossing their fields or passing their ancestral graves would cut off their geomancy and take away their fortune, so the people were excited with anger in opposition to the new built railway, and strongly demanded that the government should demolish it. In consequence, the government was compelled to buy the first railway from the English people and took it away at once.

C. Civil Wars and Foreign Invasions

Another important reason for the slow development of industrialization was civil wars and foreign invasions. In 1840, China engaged in the first Opium War with England, by which China was opened to the world. After the war, not only were the Chinese people conscious that their own country was in danger because their industries were not developed, but the people of other countries knew that the Great Ching Empire was only a tiger made of paper. Thereafter, the Chinese people were gradually dissatisfied with their government, and ambitious countries such as Russia, Japan, England and France at that time considered that it was a good chance for them to get some benefits from China. Hence, civil wars such as the rebellion of Tai-Pang-Tien-Kao, and the rebellion of Hui took place. Also foreign invasions took place one after another. (see Table 5)

As a consequence of these wars not only could China not have a tranquil condition for her industrial development, but she also lost part of her territories and had to pay large amounts of cash indemnity

Table 5

Foreign Wars and Treaties in China
Between 1840-1945

<u>Year</u>	<u>War or Treaties</u>	<u>Countries</u>	<u>Economic Losses</u>	
1840-1842	The Opium War	England	1. Ceded Hong Kong to England 2. 21,000,000 dollars for Cash Indemnity	
1857-1860	The Allies War	England and France	1. Ceded Kowloon to England 2. 10,000,000 ounces for Cash Indemnity	
1858-1881	Al-Hung, Tien-Tsin, Peking, J-Le (Treaties)	Russia	1. Ceded the northern territory of Heilung River and the eastern territory of Wusule River to Russia (about 1,200,000 square kilometers) 2. 9,000,000 rubles for Cash Indemnity	1 00 1
1894-1895	The Sino-Japanese War	Japan	1. Ceded Leu-Tung Peninsula, Taiwan and Peng Hu Islands to Japan. 2. 200,000,000 ounces for Cash Indemnity	
1900-1901	Eight-Allies War	England, France Japan, Russia, Austria, Italy and U.S.A.	1. 450,000,000 ounces for Cash Indemnity	
1931	North-east Accident	Japan	1. Japan occupied the territory of the North-east of China by force	
1937-1945	The Sino-Japanese War	Japan	1. The losses during the Eight Years' War were not estimable	

Source: Recent History of China

to other countries. Consequently, Chinese financial conditions made it more difficult to support her industrial development.

D. Lack of Communication

A third reason for the slow industrial development was the lack of communication. The basic resources for industries are coal and iron ore, which are very heavy and bulky materials. Between the mines and factories railroads were needed for transportation. So, the first step in industrial development is to develop the means of transportation.

As the beginning of Chinese industrialization, Ching's government had paid much attention to the development of communication, but as there was not sufficient domestic capital to develop it, they were compelled to use foreign capital to build some railroads. Railway growth was slow, and China had only 8,426 miles in 1930, when the United States had 250,000 miles.

From Table 6, it is shown further that in 1932 China had 1,182 locomotives and 4,965 freight net ton kilometres only. It was a very low capacity in comparison with that of other countries.

Table 6

Locomotives and Freight Net Ton Kilometres
of the Selected Countries in 1932

<u>Item</u>	<u>The United States</u>	<u>The United Kingdom</u>	<u>Germany</u>	<u>France</u>	<u>Japan</u>	<u>China</u>
Locomotives	56,732	21,492	21,150	20,204	4,016	1,182
Freight-Net Ton Kilometres	343,545	23,803	47,963	31,900	10,561	4,965

Source: Statistical Yearbook, by United Nations, 1951, pp. 305-315.

IV. GENERAL GROWTH OF CHINESE INDUSTRIALIZATION

A. The Movement of Chinese Industrialization Before 1912

1. National-Defense Industries (1862-1881)

There were two reasons to explain why the beginning of Chinese Industrialization developed in the National-defense Industries. First, in the Opium War and in the Allies War, Ching's army was defeated for the lack of modern arms and warships. Second, the Ching government tranquillized the rebellion of Tai-Peng-Tien-Kao by means of the foreign legion, which used modern arms to put down the rebels. Therefore, after the wars, some higher officers of the Ching government such as Kao-Fang Tsang, Hung-Chang Lee, Chih-Tung Cheng and Tsung-Tang Tso, believed that in time of danger the only way to save their country was to build the national-defense Industries. Then they urged their government to do it immediately. The following statement shows what national-defense Industries were built during 1862-1881:

1862 Arsenal in Anking, Shanghai and Suchow.

1865-1866 Shipbuilding factories in Shanghai and Foochow.

1867 Machine factories in Shanghai, Nanking, Fukien and Tientsin.

1872 The China Merchants Steam Navigation Company was established. It was the first Chinese steam ship company with twenty-three steam ships, one dock and five piers.

1877 Machine factory in Szuchuan.

1878-1880 Coal mining Industries in Tientsin and Tse Hsien.

1881 Machine factory in Kirin.

1881 Tang-Hsu Railway was completed. It was the first Chinese railway, nine kilometers from Tangshan to Hsukochuang.

2. Commercial Industries (1882-1894)

After 1882 the Ching government turned their attention to the commercial industries and permitted people to build some commercial industries under governmental supervision. However, most commercial industries like the national-defense industries were owned and controlled by the government. In the period of 1882-1894, the commercial industries were erected as follows:

1882 Machine cotton mills in Shanghai.

1883 Yuan-Chan Metal Works in Shanghai.

1886 Filature mills in Kwanchow.

1887 Minting of silver and copper coins in Tientsin and Kwanchow.

1887 Copper mining industries in Yunnan and Jehol.

1888-1889 Iron works in Kweilchow and Kwanchow.

1891 Iron mining industry in Tayeh.

1893 Cotton, hatched hemp and filature mills in Wuchang.

1894 Match-making company in Hupei.

Owing to the limited space it is difficult to show all national-defense industries and commercial industries erected in that period. The previous statements are only an attempt to pick out some important and representative industries. However, these industries were not very successful on account of insufficient capital and skills.

3. Foreign Capital Invasions (1895-1911)

A new phase began after the Sino-Japanese war (1894-1895). One of the stipulations of the treaty which followed was that foreigners

should be free to carry on industry in China. Except under the grant of a special concession this privilege was confined to the Treaty Ports, as Shanghai, Kwanchow, Tientsin, Chungking, Changsha, Shashi, Hangchow and Suchow. Consequently, foreign capitalists came to China, and invested much capital in the textile industries, mining industries and railways.

In 1895-1911, there were four big cotton mills and two ship-building factories erected by foreign capitalists in Shanghai:

- (1) I-Ho Cotton Mills
- (2) Lao-Kun-Mou Cotton Mills
They were built with British capital, but in 1924 they were sold to Japan.
- (3) Hung-Yuan Cotton Mills
It was built with American capital, but later it was sold to Japan.
- (4) Shui-Chi Cotton Mills
It was built with German capital, but in 1932 it was sold to the Ching government.
- (5) Shui-Jung Shipbuilding Factory and Shanghai Shipbuilding Factory
They were built with British capital.

In addition to the investments in Shanghai, Britain invested a million pounds in coal mining industries of Kai-Peng, Chiao-Tso and Kai-Luan during this period. In consequence, these industries were controlled by Britain.

From 1895 to 1903, a large amount of foreign capital was invested in railways as shown in Table 7. Although 6,926 kilometers of railways were built in this period, the Ching government had no rights in the railways. All railways businesses belonged to the foreigners.

As a result of the large quantity of foreign investments, foreign economic invasions penetrated inland along the railways. It stirred up the temper of the people. They hated that their government was so stupid to allow most national rights such as textile industries, mining industries and railways to come under the control of foreign capitalistic countries. Eventually, the national revolution took place, and the Ching dynasty was overthrown.

Table 7

Foreign Capital In Chinese Railways, 1895- 1903

<u>Name of Railway</u>	<u>Length* (Kilometers)</u>	<u>Country of Investment</u>	<u>The Amount of Investment</u>
Pei-Ning	1,391	Britain	2,300,000 pounds
Ping-Han	1,319	Belgium, Britain and France	112,500,000 Francs 2,500,000 pounds
Tsin-Pu	1,105	Britain and Germany	5,000,000 pounds
Lung-Hai	904	Belgium	4,000,000 pounds
Ping-Sui	877	Japan	6,000,000 yens
King-Hu	330	Britain	2,900,000 pounds
Hu-Hang-Yung	286	Britain	1,500,000 pounds
Tao-Ching	165	Britain	800,000 pounds
Kwan-Chiu	143	Britain	1,500,000 pounds
Nan-Hsun	128	Japan	10,000,000 yens

Source: Chinese Communications, by K. T. Liu, pp. 58, 62.

*1 Kilometer is approximately 0.62 mile

B. Periods in Development (1912-1936)

1. Period of Prosperity (1912-1931)

After the Revolution, the old opposition disappeared and a new impetus was given to development. The conservatism of old China had been replaced by the radicalism of Republican China, which had broken

with the past and was all too impatient for a speedier rate of change. Republican China showed none of the hesitations in regard to industrialization. When Dr. Sun Yat-sen, the father of the Republic of China, was thrust aside by Yuan Shih Kai after the setting up of the Republic, he spent much of his time in elaborating schemes for the development of railways, new ports and great industries in China. The adoption of modern techniques with the deliberate object of raising the standard of living in China was one of the main purposes of his program. Unfortunately, the political conditions were not stable enough for him to do what he wished to do.

During this period, (1912-1931) two great events happened in the world: (1) World War I broke out in 1914, and (2) all countries in the world except China abandoned the silver standard and adopted the gold standard in 1926. These events had a considerable influence on Chinese industrialization. Owing to the outbreak of World War I, western progressive countries could not export their machines and goods to China, and Chinese industrialists got a protective chance to develop their new born industries without any foreign competition. After 1926 India selected gold instead of silver for her monetary standard, China became the only country in the world on the silver standard. Consequently, a large quantity of silver flowed into China, and caused a rise in the price level. Under such circumstances, not only there were no machines and goods imported but the domestic prices were raised. Chinese industrialists

had a lucky chance to earn more profit, to expand their existing industries and to build new ones. For examples, after World War I, the newly built industries along the Yangtse River included twenty-six electric power plants, eighteen railways and shipbuilding industries, sixteen cotton mills and twelve mining industries; in the whole country except Tientsin, in 1913, there were 245 factories in which they employed more than thirty workers, but it increased in number up to 1,975 factories in 1930.¹ Even the world-wide business depression which occurred in 1929-1931, had no influence over China, because the decreased value of silver stimulated an increase in prices, it still kept Chinese industries in the course of prosperity.

2. Period of Decline (1932-1936)

As a result of the depression in 1930, all countries in the world built their tariff-wall against importation. There was no sale for industrial products and their prices were falling more than ever. Consequently, the gold standard system was broken, in 1932 twenty-two countries were forced to go off the gold standard, so that price of silver was increasing. In the next year an International Economic Conference was held in London, and a silver agreement was established for the purpose of keeping down price fluctuation. Nevertheless, in 1934 the United States declared that silver was nationalized and a policy of purchasing silver came into effect. It resulted in a large increase in the price of silver, and in China, a large quantity of silver flowed out, and

¹ The Problems in Modern Chinese Industrialization, H. S. Chuan.

the domestic prices fell. Chinese industries had come to a crisis.

Besides, an important event took place in 1932, it was then that Japan occupied the North-east of China by force in order to carry out their imperialism. The North-east, just like the Saar in Germany, is the most important to China in connection with the natural resources and national defense. In consequence of Japanese occupation, as shown in Tables 8 and 9, China lost 87.7 per cent of her production of iron, 49.4 per cent of coal and 21.2 per cent of manganese; and lost 42.3 per cent of her railways, 83.3 per cent of electric power and about 40 per cent of factories. This condition remained true until Japanese unconditional surrender in 1945.

Above all, Chinese industrialization in that time was on a decline because of the external oppression and internal deflation.

As early as 1935, Chinese economy was falling into a very bad condition. In order to meet the crisis, the National government reformed the money system, they abandoned the silver standard and adopted paper money for the standard. Although paper currency could not be changed into gold or silver, the foreign exchange was freely sold and bought in the market. And hence, the value of paper standard money was quite stable, and people placed great reliance in it. A result might be seen that the national banks' deposits of 1937 were increased about 59 per cent more than that of 1935, and industries were also on the way toward recovery.

Table 8

Reserves and Production of Iron, Coal
and Manganese in North-east China
in 1930

<u>Items</u>	<u>Reserves</u>		<u>Production</u>	
	(thousands of tons)	(Percent of Whole Country)	(thousands of tons)	(Percent of Whole Country)
Iron	4,126,000	77.0	1,702	87.7
Coal	20,000,000	7.5	25,320	49.4
Manganese	7,750	26.5	17	21.2

Source: 1. Chinese Mineral Resources, by P. F. Chen, pp. 125.
2. Chinese Economy in the North-east, by C. T. Chang, pp. 3.

Table 9

Railways, Electric Power and Factories
in North-east China and the
Whole Country in 1930

<u>Items</u>	<u>The North-east</u>	<u>The Whole Country</u>	<u>Percent of the Whole Country</u>
Railways (kilometers*)	6,188	14,614	42.3
Electric Power (KWH)	2,098	2,520,000	83.3
Factories (Units)	468	1,138**	41.1

Source: 1. Chinese Economy in the North-east, by C. T. Chang, pp. 3, 74.
2. Chinese Industrialization and its Capital Problem, by Kuang Lu, Chapter 3.

*1 kilometer is approximately 0.62 mile

**Excluding factories in Shanghai

C. The Influences of Sino-Japanese War (1937-1948)

1. Relocation During the War (1937-1940)

Two decades ago, under an Imperialistic policy Japan was not content with what she had obtained from her aggression in Korea and China. She dreamed of dominating Asia. In less than five years after she occupied the North-east of China, the north part of China was subject to aggressor. To endure, China was forced to protect herself against the aggressor. Then the Sino-Japanese War broke out. In order to maintain military power and avoid modern industries falling into the hand of enemy, the government decided to remove industries from the north and the east provinces to the south-west provinces: Szuchuan, Yunnan, Kwangsi, Hunan and Shensi.

The removing and re-creating work were in charge of the Removing and Reconstruction Commission and the Industrial and Mining Adjustment Administration, both under the Ministry of Economic Affairs. They utilized whatever transport means were available -- junks, sampans, carts, trucks, river steamers and human carriers. Even though enemy's bombings were cruel and dreadful, the removal work was bravely continued.

The removal of factory equipment began first in Shanghai in August, 1937. The largest single unit thus transported was 40,000 tons of the metallurgical equipment of the Hanyehping Company, China's largest iron and steel factory, from Hupei Province to Szuchuan. A Hankow blast furnace having been similarly removed,

the basis for an iron and steel industry in Szechuan was created.

The nucleus for the new industrial basis was formed by 418 factories whose machinery, weighing over 110,000 tons, was removed between 1938 and 1940 from the war zones to the hinterland. By lines of industry the removed factories consisted of 181 machine shops, 56 chemical works, 29 electrical factories, 22 food factories, 15 glass and pottery factories, 2 iron and steel factories and 145 sundry plants (including cotton mills). Among these removed factories, 339 plants were removed to Szechuan, China's new industrial base during wartime. (See Table 10)

Table 10

Factories Removed to Szechuan
Between 1938 and 1940

<u>Industry</u>	<u>Plants</u>	<u>Equipment Moved in Tons</u>
Mechanical	143	7,501
Textile	59	27,808
Chemical	37	2,116
Electrical	21	3,189
Food	19	3,073
Mining	7	8,603
Sundry	53	6,612
Total	339	58,903

Source: Chinese Industries, by T. K. Chang, pp. 111.

2. Industrial Development in Wartime (1938-1944)

(1) A general view of industrial development.

After the war broke out, the policy of the government was to remove industries to the interior on one hand, and to lead in the founding of heavy industries and the recreation and develop-

ment of these main industrial areas on the other. So, when the removing work was taking place, the recreating work was taking place also. Consequently, by the end of 1940, fifteen new industrial bases had been created with 1,354 plants of more than 10,000 dollars capital and with an average of 30 workers per plant.¹ These plants were powered by electricity and their output exceeded \$4,000,000 a year as shown in Tables 11 and 12.

Table 11

Distribution of Industrial Plants in
Fifteen New Industrial Bases, 1940

<u>Industry</u>	<u>Plants*</u>
Chemical	361
Mechanical	312
Textile	282
Mining and Metallurgical	93
Electrical	47
Sundry	259
Total	1,354

Source: Ministry of Economic Affairs

* With more than \$10,000 capital, employing 30 or more workers and electric power.

¹ Szuchuan, Yunnan, Kwangsi, Hunan, Hupel, Kwangtung, Fukien, Chekiang, Kiangsi, Kweichow, Shensi, Honan, Kansu, Tsinghai and Ningsia.

Table 12

Output of 1,354 Industrial Plants, 1940

<u>Industry</u>	<u>Value of Output in Chinese Currency*</u>
Textile	\$ 1,753,000,000
Chemical	1,438,000,000
Electrical	181,000,000
Iron and Steel	127,000,000
Power	99,000,000
Machine	67,000,000
Food	39,000,000
Sundry	342,000,000
Total	\$ 4,056,000,000

Source: Ministry of Economic Affairs

* Foreign exchange at the average rate in June, 1940, U.S. \$1 = \$25.

Production in 1939 had been about 1,400 million dollars and in 1938 only 700 million dollars. Even with the depreciation of the currency, this was a notable increase, which was further substantiated by comparing quantities:

<u>Production</u>	<u>1938</u>	<u>1940</u>
Alcohol (gals.)	1,800,000	4,500,000
Yarn (bales)	30,240	54,000
Flour (bags)	1,710,000	3,400,000
Soap (boxes)	99,000	309,000
Matches (boxes)	7,000	11,700
Paper (tons)	600	1,800
Cotton socks (doz.)	20,000	57,000

The volume, since raised, was still far from satisfying the needs of millions of people. It was, however, augmented by home industry and the output of many small one-family shops which, while escaping statistics, played a vital role. Prices were high and quality left much to be desired; but the main point was that

before the war most of these consumer goods were made in Shanghai or imported from abroad, now they were made at home.

(2) Iron and steel.

The Hanyang Iron Works, a premium quality Chinese pre-war steel plant, was removed from Hupei to Szuchuan and installed as a joint enterprise of the National Resources Commission and the Department of Ordnance. With machinery removed from the Hanyehping Company and the Tayeh Iron Works the government constructed a large plant, named Tadokow Iron Works, in Chungking, Szuchuan. The second major enterprise in this field was the China Industrial Company, organized by the government to develop the iron and steel industry in Chungking, Szuchuan; plants in Hunan, Yunan and Shensi came next in order of production.

In 1940, these re-created iron and steel industries in the inland provinces made 100,200 tons of pig iron of which 34,000 was made in Szuchuan, the remainder was made in Shensi, Yunnan, and Hunan. Though the 1940 iron and steel output was 30 per cent more than in 1939, it was still insufficient. However, the government had given every possible encouragement to enterprises to insure enough iron and steel to satisfy the most pressing military and industrial needs.

By the summer of 1941 Szuchuan had four electrical blast furnaces, each producing three to five tons of steel daily, a twenty-ton blast furnace, and several others. A sponge-iron

plant, an open-hearth furnace and several Bessemer converters were constructed later. In Yunnan, a number of Martin furnaces and a fifty-ton blast furnace and a few smaller steel plants were also being erected. The chief construction problem was the design of small furnaces -- from three to twenty tons daily capacity -- to reduce the bombing risk.

This progress might appear insignificant when compared with the American production of 100,000,000 tons of steel a year in that time, but it represented a beginning.

(3) Machine and other industries.

(a) Machine shops: As machine making is the foundation of all other industries, the government had paid particular attention to machine shops, which occupied first place among the removed factories. The Central Machine Shop, the biggest in pre-war China, originally located in Hunan, was moved to Yunnan, where it manufactured turbogenerator sets, boilers, spinning sets, and gas producers. The other 311 machine shops made motors, generators, implements, tools, and vehicles. A river steamer of the Ming Sen Industrial Company, completed in October, 1940, was entirely built from native materials by this company, except the boilers which were imported from Britain.

(b) Chemical plants: Among 361 chemical plants, there were over 150 large ones. One was the Vegetable Oil Cracking Plant, which produced lubricating oil, gasoline, kerosene and Diesel oil. Other plants, besides supplying basic chemicals for the

manufacture of munitions such as sulphuric acid, calcium carbide, nitric acid, etc., also made modern paper, cement, matches, seasoning powder.

(c) Electrical equipment factories: Among a total of 47 factories, the largest one was the Central Electrical Manufacturing Works, which made copper and iron wire, vacuum-and-gas-filled bulbs, radio receiving and transmitting sets, military and ordinary telephones, exchange switchboards, motors, generators, transformers, dry cells, batteries, etc., for the army and the Ministry of Communications. The Central Insulation Works was operated since early 1938, and produced high- and low-tension insulators. Its factories were located in Kwangsi and Yunnan. Then there was the Central Radio Manufacturing Works, which was removed from Changsha, Hunan, to Kwangsi; and production, started in September, 1937, was chiefly of broadcasting receivers and code transmitting and receiving sets. All together, the larger factories in this line number about twenty.

(d) Textile Industries: Before the war, there was not a single modern spinning and weaving plant in the interior. More than any other, Chinese textile industry was concentrated in Shanghai, Tientsin, and the lower Yangtze Basin. During the war, under the Industrial and Mining Adjustment Administration, 200,000 spindles were removed to the interior. Late in 1941, these removed spindles had been installed to produce annually 100,000

bales of yarn, which compared with 30,000 bales produced in 1938; in other words, a threefold increase. Before 1945, there were 322,000 spindles and 2,729 weaving machines equipped in textile mills which located in inland provinces as shown below:

<u>Provinces</u>	<u>Spindles</u>	<u>Weaving machines</u>
Szechuan	196,000	1,104
Shensi	96,000	1,270
Hunan	10,000	248
Yunnan	15,000	60
Kwangsi	5,000	47
Total	322,000	2,729

3. Rebuilding after the War (1945-1948)

In the earlier stages of the war the fear had been voiced that the industrialization of the hinterland might be only temporary, and that as soon as peace was concluded employers, employees, and factories would migrate back to their original homes in Shanghai, Nanking and other "down-river" cities. Undoubtedly, after Japan's defeat, the government would return to Nanking, and many people, entrepreneurs and workmen alike, would gladly settle once more in the places where they grew up, for the Chinese are deeply attached to the "Old country side." Moreover, the coastal areas and the cities along the Yangtze River offer advantages of communications and, for certain industries, proximity to raw materials which are still absent in West China.

In August, 1945, Japan made an unconditional surrender to China and other allies. This victory gave Chinese people much happiness,

they wanted to go back to their native place immediately to see their relatives, homes, fields and factories. Consequently, in the industries, it had indeed turned out as had been feared. Taking Chungking, the new industrial center in wartime, for example, 344 factories of the total 367 were closed because employers and employees moved back to East China. The same conditions occurred in the other southwest provinces about the same time. The prosperous industries which were erected during the war faded right after the war.

On the other side, in North China and East China, which Japan occupied in the war, the factories stopped their production and waited for the National government to take over. After V-day, the government appointed the Ministry of Defense to take over the arsenals, the Ministry of Agriculture and Forest to take over the agricultural product factories, the Ministry of Communications to take over the rail and bus factories and the Ministry of Economic Affairs to take over the industrial factories, mining factories, electric power plants and some other companies. As shown in Table 13, the Ministry of Economic Affairs took over 2,665 industrial factories, 104 mining factories, and 80 electric power plants.

From Table 13, it may be questioned why the government only took over 2,849 industrial factories and plants over all the North and East? Why only 147 factories were taken over in the North-east where one third of the Chinese industries were located? To answer these questions, there are two facts to be taken into consideration: (1) the Chinese communist army occupied certain cities in the North

Table 13

Factories and Plants Taken over by the Ministry
of Economic Affairs after World War II

Factory and Plant	Kiangsu Chekiang Anhwei	Hunan Hupai Kiangsi	Fukien Kwangsi Kwangtung	Shangtung Honan Shansi	Hopai Jehol Chahar <u>Suiyuan</u>	The North- east	Taiwan	Total
Industrial Factories	509	159	73	153	325	128	1,324	2,665
Mining Factories	4	11	4	15	6	15	49	104
Electric Power Plants	23	6	5	3	3	4	36	80
Total	536	170	82	171	334	147	1,409	2,849

Source: Chinese Industrialization and Its Capital Problem, by Kwang Lu, Chapter 3.

and East. They controlled these cities and prevented the National government from going there; (2) when the Russian army occupied the Northeast, they removed most of the equipment of industries to Siberia and destroyed the equipment which they did not remove. As a result of Russian removal and destruction, China lost \$1,233,164,000, as shown in Table 14.

Table 14

Post-war Industrial Losses in the Northeast
By Russian Removal and Destruction

<u>Items</u>	<u>Losses by Removal (US dollars)</u>	<u>Percent Reduction of Capacity</u>
Electric Power	219,540,000	60
Coal	44,720,000	80
Steel	204,052,000	60-100
Railway	193,756,000	50-100
Machine	158,870,000	68
Fluid-fuel	40,719,000	90
Chemical Industries	74,786,000	33
Food Industries	59,056,000	50
Cement	23,187,000	54
Non-metal	60,815,000	50-100
Fiber	135,113,000	50
Paper Manufacture	13,962,000	80
Radio, Telegram, Telephone	4,588,000	30
Total	1,233,164,000	

Source: Chinese Economy in the Northeast, by C. T. Chang, pp. 7, 8.

Right after the war, Russia transferred the arms and equipment of 600,000 Japanese troops to Chinese communists. Then the civil war started. The National government was unable to give much attention to the development of industry, all efforts were put in the communist war. Consequently, the supply of consumer's goods could not meet the demand, the price level was raised, and non-

controllable inflation took place. In 1948, the National government moved to Taiwan, and the Chinese mainland was taken over by the Chinese Communists.

V. DEVELOPMENT IN PARTICULAR INDUSTRIES

A. Steel and Iron Industries

1. Iron Ore Reserves

China's iron ore reserves, according to 1954's estimate, is 5,316 million tons, 1.3 per cent of the total of the world. Among the areas of iron ore reserve, Liaoning (a province of Northeast), the richest area in China holds 4,119 million tons, 77.5 per cent of the whole country. Next comes to Kwangtung, Hupei, Suiyuan, Chahar, Fukien, Shansi, and Hoper as shown in Table 15.

Table 15

The Distribution of Iron Ore Reserves in China

Province	Reserves (Thousand Tons)	Percent of Total
Liaoning	4,119,650	77.50
Kwangtung	300,855	5.67
Hupei	147,574	2.80
Suiyuan	117,700	2.21
Chahar	93,645	1.76
Fukien	92,562	1.74
Shansi	60,480	1.14
Hopei	56,787	1.06
Sinkiang	46,160	0.87
Kweichow	44,753	0.84
Sikang	41,756	0.78
Hunan	31,753	0.59
Szechuan	22,023	0.41
Honan	21,537	0.40
Anhui	19,204	0.36
Kiangsi	15,466	0.28
Shantung	14,080	0.26
Yunnan	12,156	0.22
Jehol	11,340	0.21
Shensi	10,847	0.20
Others	36,362	0.70
Total	5,316,690	100.00

Source: Chinese Mineral Resources, by P. F. Chen, pp. 125.

2. Iron Ore Production

From 1912 to 1942 China's iron ore production was increased yearly, except for a little decrease in some years because of war or depression, as shown in Table 16. Theoretically, the increase of iron ore production is a highlight in the development of industrialization. But due to the limited capacity of steel and iron mills, China exported about one third of the iron ore produced to Japan and other countries before 1930.

During twenty-eight years in the periods of 1912-1931 and 1935-1942, China produced 87,384,401 tons of iron ore in total, whereas the United States produced 73,000,000 tons in 1929 and averaged 99,681,795 tons for the period of 1942-1952.¹ This shows that Chinese steel and iron industry in that time was still underdeveloped.

3. Industries

In 1937, there were nine large steel and iron works in China as shown in Table 17. They produced 3,403,000 tons of iron and 2,248,000 tons of steel each year. Anshan Steel and Iron Works, the largest one in China, produced 60.88 percent and 86.70 percent respectively of the total iron and steel of the country. During the war (1938-1944), The National government moved the center of industrial production to Szuchuan (see Chapter IV, C-2). This was done by creating eight new steel and iron works in the Southwest, such as: Taidokow Iron Works, 24-Arsenal, Hsinyeh Iron Works, Yuhsin Steel Works, Electrical Metallurgy Works, Tzuyu Iron Works, China Electrical Steel Works and Yunnan Iron Works. In order to reduce

¹ American Minerals Yearbook, 1957, Vol. 1, p. 583.

Table 16

**Iron Ore Production in China
1912-1931 and 1935-1942**

Part A--1912-1931

<u>Year</u>	<u>Production (tons)</u>
1912	721,280
1913	959,711
1914	1,005,140
1915	1,095,555
1916	1,129,056
1917	1,139,845
1918	1,474,698
1919	1,861,230
1920	1,856,985
1921	1,462,988
1922	1,559,416
1923	1,733,226
1924	1,765,732
1925	1,519,021
1926	1,561,911
1927	1,710,135
1928	2,003,800
1929	2,630,176
1930	2,252,486
1931	2,447,020
Total	31,889,411

Part B--1935-1942

1935	3,135,541
1936	3,379,339
1937	3,189,389
1938	3,189,500
1939	4,998,067
1940	7,916,898
1941	12,436,775
1942	17,849,481
Total	56,094,990

Source: Part A - Chinese Industrialization and Its Capital Problem, by Kwang Lu, Chapter 4.

Part B - Chinese Mineral Resources, by P. F. Chen, p. 133.

Table 17

**Steel and Iron Works, Equipment and Capacity
in China in 1937***

Name of Works	Location	Steel Furnace		Iron Furnace		Capacity per year -- (tons)	
		Tons	Unit	Tons	Unit	Steel	Iron
Anshan	Liaoning	100	4	400	2	1,950,000	2,075,000
		150	8	500	1		
		300	7	600	1		
				700	5		
Penchihu	Liaoning			200	2		560,000
				600	2		
Hanyang	Hupel	30	7	100	2	190,000	240,000
				250	2		
Taiyam	Hupel			450	2		315,000
Yangtze	Hupel			100	1		35,000
Lungyen	Hopel			250	1		90,000
North-west	Shansi	30	3	40	2	89,000	70,000
				120	1		
Paochin	Shansi			20	1		7,000
Mohsing	Shanghai	10	2	10	1	20,000	16,000
				25	1		
Total						2,249,000	3,408,000

Source: 1. Chinese Industrialization and Its Capital Problem, by Kwang Lu, Chapter 4.
2. Chinese Industries, by T. K. Chang, pp. 12-15, 25, 27.

*Excluding Taiwan Province

the bombing risk, the capacity of each unit was kept small.

After the Sino-Japanese War (1937-1945) the Chinese Communist war started. Even the National government had re-organized the existing steel and iron works into four big steel companies such as Anshan Steel Company, Penchi Steel Company, Hwapel Steel Company, and Hwachun Steel Company, and planned to expand Hainan Iron Mining Factory, Electrical Metallurgy Factory and Taidokow Iron Works. But these companies and works expanded little because of the civil war.

B. Coal Industries

1. Coal Reserves

According to 1953's estimate China's coal reserves are 265,563 million tons, 5.3 per cent of the world total. China ranks next to the United States and Russia in the coal reserves. The most coal reserves are located in the north part of China. Shansi is the richest coal area, it has 127,127 million tons, 47.87 percent of total reserves. Next comes Shensi with 71,950 million tons, 27.11 percent of total reserves. The other 25.02 percent of coal reserves are as shown in Table 18.

2. Coal Production

In 1912-1927, the average coal production was 20,000,000 tons each year, while the United States had produced 615,000,000 tons in 1927. After 1928 the coal production was generally increased year by year and up to 68,000,000 tons in 1942, it was 7.5 times more than the production in 1912. During thirty-one years since

Table 18

The Distribution of Coal Reserves in China

<u>Provinces</u>	<u>Reserves (Million Tons)</u>	<u>Percent of Total</u>
Shansi	127,127	47.87
Shensi	71,950	27.11
Sinkiang	31,980	12.04
Honan	7,566	2.85
Hopei	3,065	1.15
Szechuan	2,786	1.05
Yunnan	2,397	0.90
Shantung	1,639	0.62
Hunan	1,381	0.52
Keichow	1,370	0.51
Kwangsi	1,157	0.44
Kansu	1,056	0.40
Tsinghai	824	0.31
Kiangsi	694	0.26
Sikang	531	0.20
Northeast*	6,938	2.61
Others	3,102	1.16
Total	265,563	100.00

Source: Chinese Mineral Resources, by P. F. Chen, p. 47.

*Including provinces of Liaoning, Antung, Liaopei, Kirin, Sungkiang, Hokiang, Heilungkiang, Ringkiang, Hsingan and Jehol.

1912 China had produced 868,581,000 tons of coal in total, as shown in Table 19, but it was merely a little over 1.4 times of one year's coal production of the United States, 582,692,937 tons in 1942.¹

Table 19

Coal Production in China, 1912-1942

<u>Year</u>	<u>Production (Thousand Tons)</u>
1912	8,988
1913	12,880
1914	14,102
1915	13,417
1916	15,903
1917	16,902
1918	18,340
1919	20,055
1920	21,260
1921	20,459
1922	21,097
1923	24,552
1924	25,769
1925	24,255
1926	23,040
1927	24,172
1928	25,092
1929	25,437
1930	26,036
1931	27,245
1932	26,376
1933	28,379
1934	32,734
1935	37,388
1936	41,529
1937	38,778
1938	34,050
1939	41,059
1940	49,663
1941	61,671
1942	68,033
Total	868,581

Source: Chinese Mineral Resources, by P. F. Chen, pp. 50-51.

¹ 1957 Minerals Yearbook, Vol. 11, p. 49.

There was a distinctive feature in China's coal industries, as previously stated, the coal reserves in Shansi are 47.87 per cent of the whole country whereas the Northeast holds only 2.61 per cent. But in 1931, the Northeast had produced 9,208,810 tons of coal, 33.80 per cent of the whole country, whereas Shansi had produced 2,261,335 tons of coal only, 8.30 per cent, because the Northeast area had more transportation than Shansi.¹ It shows, therefore, how important is the relation between the coal industries and communication.

Moreover, coal consumption was different for the areas. Generally speaking, in the Northeast of China about 26 per cent of coal was for domestic use, 38 per cent for modern industrial use; but in the main part of China 50 per cent for domestic use, 29 per cent for modern industrial use.² It appears that the degree of industrialization in the Northeast was greater than in the other areas.

Although China's coal reserves are abundant, the volume of coal production in 1948 was still small because of the war and the lack of transportation.

3. Industries

Table 20 shows that in 1934, there were twenty-four large coal mining companies each with a capacity of more than 200,000 tons located in North China and three companies with a capacity of 200,000 tons or over located in South China. They produced 22,155,000 tons of coal each year, about 70 per cent of the total for the country.

¹ In 1930, 42.3 per cent of total railways in China was in the Northeast as shown in Table 9.

² According to 1934's statistics in "Chinese Mineral Resources," by P. F. Chen, p. 61.

Table 20

Coal Mining Companies and Its
Capacity and Ownership in China, 1934

<u>Name of Companies</u>	<u>Location*</u>	<u>Capacity Per Year (tons)</u>	<u>Ownership</u>
Fusheng	Liaoning	7,500,000	Japan
Kailuan	Hopai	5,000,000	China & Britain
Pingsiang	Kiangsi	800,000	China & Japan
Chunhsin	Shantung	800,000	China
Lude & Fantze	Shantung	800,000	China & Japan
Chiaotso	Honan	700,000	Britain
Chinghsing	Hopai	600,000	China & Germany
Chunyuan	Honan	564,000	China
Linhokou	Honan	555,000	China
Penchihi	Liaoning	500,000	China & Japan
Chalainoer	Heilungkiang	380,000	China & Russia
Cheng Feng	Hopai	366,000	China
Sian	Liaoning	350,000	China
Mantaokou	Hopai	300,000	China
Paochin	Shansi	300,000	China
Yuehsheng	Shantung	300,000	China
Tatung	Shansi	250,000	China
Muleng	Kirin	250,000	China & Russia
Peipiao	Jehol	240,000	China
Linchen	Hopai	200,000	China
I-Li	Hopai	200,000	China
Yental	Liaoning	200,000	China
Huainan	Anhui	200,000	China
Changhsin	Chekiang	200,000	China
Total		22,155,000	

Source: Chinese Industrialization and Its Capital Problem, by Kwang Lu, Chapter 4.

*These provinces are all located in the northern part of China with the exception of Kiangsi, Chekiang and a large part of Anhwei. Kiangsi, Chekiang and most of Anhwei are located in the south.

Japan, Britain, Russia and Germany had invested in these coal mining companies, thus, they controlled about one-fourth of the coal production of China.

When the Japanese war started in 1937, the National government expanded the existing coal mining industries in the Southwest in order to meet the deep need of steel and iron industries during the war. In 1942 the coal industries in the Southwest had produced 6,000,000 tons of coal, among which the Tienfu Coal Mining Company and Paoyuan Coal Mining Company in Szechuan were the large ones. They produced 222,000 tons and 100,000 tons of coal respectively. After the war (1945) the government rebuilt the coal industries in the North and the East; consequently, the coal production over all the country increased to 18,158,00 tons and 19,487,000 tons in 1946 and 1947. However, it was still less than the production of 1942 on account of the Communist War.

C. Electric Industries

1. The Early Development of Electric Industries

Electric power is one of the ultimate factors in the development of industrialization. It needs a large sum of capital and technical skill. The Ching government had to use foreign capital and technicians to develop it. Consequently, Britain established the first electric power company in Shanghai in 1893, and later she built up two more electric companies in Tientsin and Peking; the French also established two electric power plants in Shanghai and Hankow in 1902. Since then, the electric industries have grown up

rapidly in other big cities along the coastal regions. In 1917, there were only 90 electric power plants but the number increased rapidly up to 575 in 1929. It showed that within twelve years the number of electric power plants had increased six times.

2. Progress before 1937

After 1931 China lost one hundred electric power plants in the Northeast because of Japanese aggression in that area. However, she had the remaining 452 plants in 1932. From 1932 to 1936, the National government, in order to mobilize all power for fighting against the aggressor, put more effort on the development of industrialization, and hence, they made some progress in the electric industries during this period. For example, the capacity of the electric power plants was increased a little less than 32 per cent and the invested capital was increased a little over 9 per cent, as shown in Table 21.

Table 21

Electric Industries in 1932-1936

<u>Year</u>	<u>Number of Plants</u>	<u>Power Capacity (KW)</u>	<u>Capital Invested</u>
1932	452	478,750	281,577
1933	448	496,140	269,252
1934	450	542,399	295,680
1935	446	584,914	301,647
1936	460	631,165	307,731

Source: Chinese Industrialization and Its Capital Problem, by Kwang Lu, Chapter 4.

3. Location and Ownership

Taking 1936, the year before the Sino-Japanese War, for example, China's electric industries were mostly located in the provinces

along the Pacific coast and the Yangtze River. Table 22 shows that among the total 460 electric power plants, there were 346 plants, 75 per cent of the total, located in the coastal provinces such as Shantung, Hopei, Kiangsu, Chekiang, Fukien and Kwangtung, 65 plants, 14 per cent of the total, in the riverside provinces (not including Kiangsu) such as Hunan, Hupei, Kiangsi, Anhwei and Szechuan. In other words, the coastal and riverside area held 89 per cent of total electric power plants of the country. It shows that the electric industries were developed mainly along the coastal and riverside regions, the inland area was still under-developed.

Table 23 shows another viewpoint on the development of electric industries. The government did a successful job to encourage private investors to invest in electric industries. In 1936, 90 per cent of the total electric power plants belonged to private individuals and they supplied 38 per cent of the electric power for the whole country, the government held only 6 per cent of the power plants and 11 per cent of power. Besides, attention is placed on the foreign capital invested in these industries. Although 10 plants, 2 per cent of the total, were built by foreign capitalists, they supplied 43 per cent of the electric power of the country. It suggested that the other 98 per cent of the electric power plants, or, at least a part of them, were too small in their capacity.

4. The Influence of the War

When the Japanese war began in 1937, most of the big cities along

Table 22

Location of Electric Industries, 1936

<u>Provinces</u>	<u>Number of Plants</u>	<u>Power Capacity (KW)</u>
Kiangsu*	107	125,740
Shantung*	23	52,044
Hopei*	17	44,079
Kwangtung*	12	36,060
Chekiang*	109	30,908
Hupei**	18	20,427
Fukien*	29	11,555
Hunan**	12	7,074
Shansi	6	5,572
Szechuan**	22	5,172
Anhui**	25	4,644
Kiangsi**	13	3,972
Kwangsi	12	2,846
Honan	7	2,110
Yunnan	3	1,614
Shensi	1	709
Suiyuan	2	608
Chahar	1	385
Kweichow	2	165
Kansu	3	141
Ningsia	1	100
Tibet	1	100
Sikang	1	25
(Owned by Foreign Investors)	10	275,295
Total	460	631,165

Source: Chinese Industries, by T. K. Chang, p. 166.

* Coastal Provinces

**Yangtze-riverside provinces

Table 23

Ownership of Electric Industries, 1936

<u>Owner</u>	<u>Number of Plants</u>	<u>Percent of Total</u>	<u>Power Capacity (KW)</u>	<u>Percent of Total</u>
Private	415	90	241,150	38
Government	26	6	69,866	11
Government & Private	5	1	3,354	1
Local People & Foreigners	4	1	41,500	7
Foreigners	10	2	275,295	43
Total	460	100	631,165	100

Source: Chinese Industries, by T. K. Chang, p. 167.

coastal and river-side areas were occupied by Japanese forces. Consequently, most of the newly built electric industries were destroyed. Even though the National government had moved some electrical equipment to inland areas when they evacuated from Kiangsu to Szechuan, it was very difficult for them to rebuild the electric industries in the Southwest where only a few electric power plants existed prior to the war. From 1937 to 1945, the period of the war, the total electric power capacity was reduced about 90 per cent as shown in Table 24. In 1946, the war ended. The government recovered all the territory which it lost in the war, including the Northeast and Taiwan. At that time the government took over all electric industries except those in the Northeast where most of the equipment was stolen and moved to Siberia by Russia. The total electric power was consequently increased to 1,281,179 kilowatts or about double that of 1936. By October, 1947, the capacity had increased to 1,455,088 kilowatts. Unfortunately, after the beginning of the communist war, the National government built no more new electric power plants.

D. Textile Industries

1. The Early Development of Textile Industries

The first machine cotton mill was established by the governor of Ching's dynasty, Hung-Chang Lee, in Shanghai in 1882. This mill was owned by the Ching government. It was reorganized in 1890, and private capitalists were invited to invest in this new textile industry. Later on, two more machine cotton mills were set up, one in Hupai and the other in Kiangsu. The development of cotton mills

Table 24

Electric Power Capacity in 1936-October, 1947

<u>Year</u>	<u>Power Capacity (KW)</u>
1936	631,165
1937	50,826
1938	35,505
1939	40,376
1940	40,722
1941	44,313
1942	49,826
1943	64,131
1944	69,917
1945	73,577
1946	1,281,179
1947 (Oct.)	1,455,088

Source: Chinese Industries, by T. K. Chang, p. 171.

caused the Chinese people to appreciate the importance of textile industries. Not only did the people heartily support the government's effort to develop the new industry but they also erected three private cotton mills. Thus, before 1895, China had six machine cotton mills and a total of 183,000 spindles.

2. A Big Change after 1895

In consequence of the first Sino-Japanese War (1894-1895) China concluded the Ma-Kwang Treaty with Japan, by which the Chinese government permitted Japanese enterprise to have the right of setting up cotton mills in China. Other countries followed Japan in obtaining permission to establish textile plants. So, after 1895, the Chinese textile industries were developed rapidly by the competition of both the Chinese and foreign capitalists. The following table, Table 25, gives the development of the cotton industry from 1896 through 1930 (See page 43).

In the thirty years since 1896, Chinese cotton mills had increased from 13 to 127, and the spindles from 429,609 to 3,969,552. This was considerable progress in the textile industries. From Table 25 another point should be mentioned. The productive capacity of the foreign mills, as indicated by the number of spindles, had increased over seven times since 1896, during the same period the capacity of the Chinese mills had increased over eight times. At no time did the foreign mills have productive capacity more than the Chinese.

3. Location and Production of Cotton Mills

Table 25

Development of Cotton Mills, 1896-1930

(1896 = 100)

At End of Year	Chinese				Foreign				Total		
	No. of Mills	Number of Spindles	Index No.	Percent of Total	No. of Mills	Number of Spindles	Index No.	Percent of Total	No. of Mills	Number of Spindles	Index No.
1896	8	225,267	100	52.5	5	204,342	100	47.5	13	429,609	100
1906	17	426,767	190	66.5	5	214,347	105	33.5	22	641,114	149
1916	30	721,105	320	64.3	11	400,146	196	35.7	41	1,121,251	261
1925	76	1,600,000	710	64.3	37	890,000	436	35.7	113	2,490,000	580
1928	73	2,181,880	969	56.7	47	1,668,186	816	43.3	120	3,850,066	896
1930	81	2,326,872	1033	58.6	46	1,642,680	804	41.4	127	3,969,552	924

Source: The data are taken from the report of the Chinese Cotton Mill Owners' Association in 1930.

Table 26 gives the figures for the year of 1930 covering the number and location of the mills as well as production. It shows that the most of the cotton mills were located in Shanghai or in the neighboring cities of Nantung and Wusih. Sixty-three per cent of all the mills in China were in Shanghai. These included all the British mills and 69.7 per cent of the Japanese mills, but only 58 per cent of the Chinese mills. Besides their three mills in Manchuria and nine in Shantung, the Japanese had a mill at Hankow. There were nine Chinese cotton mills in Hupel province, seven of them being in Tientsin. Six of the seven Chinese mills in Hupel province were in the Hankow-Wuchang area. Honan and Shansi provinces each had four Chinese mills. There was a small Chinese cotton mill, with 1,200 spindles, in remote Turkestan. Yet, interestingly enough, there were no cotton mills south of the Yangtze River Valley. The figures in Table 26 show, also, that the Chinese mills produced a little less than twice as much cotton year as the Japanese mills (the Japanese production was 50.8 per cent of the Chinese) and about four-fifths (81.2 per cent) as much cotton cloth. The British mills produced only cotton yarn.

4. Comparison of Chinese and Foreign Textile Equipment and Raw Material Used.

In the development of industrialization, the textile industries were developed faster than other industries and were the most successful industries. However, a comparison with other countries shows

Table 26

Location and Production of Cotton Mills, 1930

Item	<u>Chinese</u>		<u>Japanese</u>		<u>British</u>		<u>Total</u>	
	<u>No. or Amount</u>	<u>Percent of Total</u>	<u>No. or Amount</u>	<u>Percent of Total</u>	<u>No. or Amount</u>	<u>Percent of Total</u>	<u>No. or Amount</u>	<u>Percent of Total</u>
Number of Mills	81	63.8	43	33.8	3	2.4	127	100
Location of Mills								
Shanghai	47	58.8	30	37.5	3	3.7	80	63.0
Manchuria	1	25.0	3	75.0	-	---	4	3.1
Shantung	2	18.2	9	81.8	-	---	11	8.7
Elsewhere	31	96.9	1	3.1	-	---	32	25.2
Spindles	2,326,872	58.6	1,489,360	37.5	153,320	3.9	3,969,552	----
Bales of Yarn Produced	1,476,363	62.6	750,548	31.9	129,522	5.5	2,356,433	----
Pieces of Cloth Produced	6,625,544	44.8	8,153,994	55.2	-----	---	14,779,538	----

Source: The data are taken from the report of the Chinese Cotton Mill Owners' Association in 1930.

that the Chinese textile industry was still relatively small.

Table 27, compiled from reports of the International Cotton Industry's Association, makes a comparison of spindles, weaving machines and raw cotton used in the nine countries.

Table 27

A Comparison of Spindles, Weaving Machines
and Cotton Used in Nine Leading Countries

Countries	Number of Spindles (1937)	Number of Weaving Machines (1933)	Bales of Cotton Used (1937)
Britain	39,938,000	587,964	2,733,000
U.S.A.	27,288,000	613,633	6,329,000
Japan	11,853,000	277,343	3,651,000
Germany	10,247,000	222,500	1,323,000
France	9,932,000	198,200	1,180,000
U.S.S.R.	9,900,000	250,000	2,063,000
India	9,877,000	189,648	3,012,000
Italy	5,483,000	146,500	788,000
China	5,071,000	45,354	2,340,000

Source: The data are taken from the reports of the International Cotton Industry's Association.

In 1937, China only had 5,071,000 spindles, 12.6 per cent of Britain, 18.6 per cent of the United States, 49.4 per cent of Germany and 3.73 per cent of the world (150,960,000). Nevertheless, from the viewpoint of the quantity of the raw cotton used, China became fifth country in the world as to the quantity of cotton used in the textile industry. According to the report of 1937, Chinese cotton industries consumed 2,340,000 bales of cotton, which was 9.2 per cent of the world total consumption (25,389,000 bales). It meant that even though Chinese spindles were less than the other eight countries, the Chinese cotton mills had efficient and

economic use of their equipment, and hence they consumed a larger quantity of cotton than other countries except Britain, the United States, Japan and India.

5. Recovery after the Japanese War

During war time (1937-1944) a part of Chinese cotton industries was removed and installed in the Southwest provinces (see the detail in Chapter IV, C-2). After the war the National government took over all the textile industries and rebuilt them as soon as possible. A large company, the Chinese Textile Construction Company, was established by the government in Shanghai in order to control all textile industries of the country. Consequently, 4,509,514 spindles and 66,080 weaving machines were rebuilt. Table 28 shows the distribution of the cotton industries after the Japanese war.

Table 28

Distribution of the Cotton Industry, 1945

<u>Areas</u>	<u>Number of Spindles</u>	<u>Number of Weaving Machines</u>
Shanghai	2,158,624	25,918
Kiangsu	598,784	7,218
Hopel	452,548	10,660
The Northeast	396,080	8,692
Shantung	387,132	8,066
Szechuan	195,862	1,104
Shansi	95,808	1,270
Others	224,716	3,152
Total	4,509,514	66,080

Source: Chinese Industries, by T. K. Chang, p. 493.

E. Machine and Petroleum Industries

1. Machine Industries

Chinese machine industries began with the manufacture of ordnance equipment. The first one was the Arsenal Works, which was built by Ching's governor, Hung-Chang Lee in 1862 in Shanghai. This works was expanded and reorganized in 1865, and named as the Kiang-Nan Machine Factory. At that time, this factory contained 1,408 machines and 3,093 workers. In 1866, the second machine works was erected in Tientsin, it manufactured machines not only for ordnance purposes but also for domestic use. Later, large scale machine works were developed in China, such as Hanyang Iron Works in 1890 and Yangtze-Kiang Machine Works in 1908. After 1912, the National government heartily promoted the movement of industrialization, but the domestic political condition was unstable, and hence, the development of the machine industry was slowed down.

After the civil war, China made great progress in the development of industry. Table 29 shows that there were a total of only 19 machine works in China in 1927. But after 1927, the machine works increased regularly.

Table 29

Development of Machine Industries
In China, 1927-1931

<u>Year</u>	<u>No. of Works</u>	<u>Capital Invested (Dollars)</u>	<u>No. of Workers</u>
1927	19	194,160	643
1928	53	778,180	2,250
1929	101	1,626,450	4,202
1930	149	4,304,500	5,739
1931	191	4,809,700	7,105

Source: Chinese Industries, by T. C. Chang, p. 104.

The number of machine works were increased 10 fold in 1931 over 1927, the capital was increased 24.8 fold, and the number of workers were increased 11 fold. By the Japanese aggression in the Northeast, China lost many machine works in that area, but it stirred the Chinese people to put forth more effort in the development of industries. Consequently, the machine industries were developed rapidly. In 1933, the total machine works were increased to 6,140,883 dollars and the number of workers were increased to 20,354 persons. They produced machine products such as motors (100-200 HP), generators (200 KW), boilers (200 HP), spinning sets, gas producers, implements, tools, vehicles and so forth. The value of these products amounted to 17, 969,360 dollars in 1933.¹

During the Japanese war, the government did its best to remove a part of the machine industry from the north and east areas to the southwest area. As a result of the removal, 900 machine works were set up in the southwest and southeast provinces. They produced a lot of the arsenal and industrial products to satisfy the urgent needs of the war. After the war, the National government intended to recover all machine industries in the north, northeast and east regions. Unfortunately, further progress was stopped by the civil war.

2. Petroleum Industries

There is no exact figure of Chinese petroleum reserves because many petroleum sources have not been investigated. As far as was

¹ Chinese Industries, by T. K. Chang, pp. 104-110.

known in 1950, Chinese petroleum reserves were 1,370 million barrels, they were 1.4 per cent of the world total. The richest petroleum areas discovered were Kansu, Sinkiang, Shensi and Szechuan provinces. In 1948, there were 98 wells in mainland petroleum areas. They produced about 80,000 barrels of crude petroleum each year as shown in Table 30.

The modern petroleum industries in China are very young. There were only four oil refineries in the mainland before 1948. Their capacity and location are shown in the Table 31.

Due to the underdevelopment of the petroleum industry, China did not have enough petroleum for her consumption, she had to import a large quantity of crude petroleum from other countries. Consequently, the oil refineries other than the Lao-Chun-Miao Refinery in Kansu were placed along the coastal areas in order to refine conveniently, the imported crude petroleum.

Table 30

Crude Petroleum Produced in the Four Major Areas, 1948

Province	Oil-well (holes)	Average Depth of Oil-wells (feet)	Average Crude Petro. Produced Each Year (barrels)	Per cent Petroleum Products				
				Gas	Kero- sene	Diesel Oil	Heavy Oil	Other
Kansu	44	200-900	30,000-50,000	21.5	14.4	11.1	53	*
Sinkiang	23	200-1,000	25,000-50,000	43	6	20	30	1
Shensi	26	600-3,500	3,000- 4,000	10	25	35	25	5
Szechuan	5	—**	—	—	—	—	—	—

Source: Data in the table are taken from:

(1) Chinese Mineral Resources, by P. F. Chen, Chapter 8.

(2) Chinese Industries, by T. K. Chang, Chapter 8.

* 53% heavy oil includes other miscellaneousness.

**Not available.

Table 31

Oil Refineries in Chinese Mainland, 1948

<u>Name of Refinery</u>	<u>Location</u>	<u>Capacity (barrels)</u>	<u>Source of Crude Petroleum</u>
Lao-Chun-Miao	Kansu	2,000	Local and Near Areas
Ta-Lien	Liaoling	5,000	Import
Chingsi	Liaoling	3,000	Import
Kaochiao	Shanghai	2,000-3,000	Import

Source: Chinese Mineral Resources, by P. F. Chen, p. 89.

VI. CONCLUSION

A. A Sound Policy for Chinese Industrialization

Although Chinese industrialization showed considerable development from 1862 to 1948, it still remained backward. The main causes generally given are as follows:

1. The unstable circumstances for industrial development due to the continual wars.
2. The unsound policy at the beginning of industrialization due to the fact that the Ching government started with the arsenal industry for the purpose of national defense.
3. The lack of transportation for linking the mineral resources area with the industrial production areas.
4. The shortage of sufficient capital and technicians.

Therefore, in order to make a fast growth of Chinese industrialization, a sound policy should be set up.

First of all, a stable political condition is the first important thing China has to have in the development of industrialization. In other words, there should be no more political conflicts among parties, no more aggressions coming from neighboring countries. Then, Chinese industrialization can be developed peacefully and progressively without any disturbances.

Second, heavy industries, which are the foundation of industrialization, including mining industries, iron and steel industries, power industries and transportation industries, should be developed first; then light industries, which are more related to the people's living requirements, including textile industries, electric industries, machine

Industries and chemical industries, should be developed; after the heavy and light industries have been built up, the national defense industries may be developed. China has the beginnings of heavy industry, light industry and a small amount of the arsenal industry since she began her industrialization about one hundred years ago. So, it will be easy for her to follow these three steps in developing industrialization.

Third, industrial capital may come from domestic sources or foreign sources. In detail, domestic sources include private capital and people's savings, but it is merely a small sum; the foreign sources include the overseas Chinese, the International Bank, and the highly capitalistic countries. The latter would be the richest source for the Chinese industrial capital. Because, in the advanced industrial countries, like the United States, they have a large sum of leisure capital which is available for investing in Chinese industries so long as China provides a protective and stable environment for investment. Under this condition, the problems of the leisure capital in advanced industrialized countries and the shortage of capital in China would be solved beneficially for all countries.

Fourth, China has the largest population in the world, so there is no problem about the manpower in the development of industry. But the technical skill and technicians are still not enough because of the limited number of technical schools in China. However, she may borrow technicians from the progressive countries in the short run, and she may send more students to these highly industrialized countries

to learn the different techniques in the long run.

B. The Great Future of Chinese Industrialization

The distinguishing characteristic of industrialization is mass production by machines. Thus, to produce and to use these machines are the chief needs in the development of industrialization. But the producing of machines requires sufficient resources, capital and technicians. In the preceding section, the problems of capital and technicians have been discussed, and it would be solved by international cooperation and mutual help.

The natural resources are the basic factor for industrialization; they cannot be moved or borrowed from other countries as easily as capital and techniques. Therefore, a country which wants to be industrialized must have its own resources. In other words, the future of a country's industrialization is dependent upon whether she has sufficient resources or not.

The natural resources may be divided into two aspects: one is mineral resources, such as iron, manganese, antimony, tungsten, tin, bauxite, etc.; the other is power resources, such as coal, petroleum, water power and so forth.

Among the mineral resources of the world, China has 5,300 million tons of iron ore reserves excluding some unexplored iron mine areas. China has more than the highly industrialized countries like Britain, Germany and Canada, as shown in Table 32. In addition, China has 29 million tons of manganese ore reserves, 2.6 per cent of the world total; 3.8 million tons of antimony ore reserves, 88.4 per cent of the

Table 32

**Estimated Coal, Crude Petroleum and
Iron Ore Reserves in the World and Selected Countries
1950**

<u>Countries</u>	<u>Coal (billion tons)</u>	<u>Crude Petroleum (million barrels)</u>	<u>Iron Ore (million tons)</u>
World	5,000	95,200	293,000
U.S.A.	2,800	26,218	70,800
U.S.S.R.	1,200	5,570	10,860
China	265	1,370	5,300
Germany	---*	160	2,800
Britain	172	---*	3,400
France	---*	---*	10,500
Canada	89	1,200	4,360

Sources: Data are taken from:

1. World Population and Production, by Woytinsky, W. S. and E. S., Chapter 22 and 23.
2. Chinese Mineral Resources, by P. F. Chen, Chapter 7, 12, 13, 17 and 18.
3. China Among the Powers, by David Nelson Rowe, Chapter 5.

*Not available.

world total; 700 thousand tons of tin ore reserves, 10.6 per cent of the world total and 200 million tons of bauxite reserves, 10 per cent of the world total. Precious uranium mines have been discovered also in northwest and southwest China.

Among the power resources of the world, China has 265,000 million tons of coal, 1,370 million barrels of crude petroleum excluding some unexplored petroleum resources, and over 60,000,000 kilowatts of water power. Table 33 shows that next to the United States, China is the second leading country in power resources of the world. She holds 24.9 per cent of the total power resources of the world, whereas the United States holds 28.99 per cent.

Table 33

**Power Resources and Power Produced
in Percentage World Total in Selected Countries**

<u>Countries</u>	<u>Power Resources*</u>	<u>Power Produced in 1935</u>
U.S.A.	28.992	37.695
China	24.898	1.622
U.S.S.R.	15.152	8.584
Canada	6.048	1.488
Germany	3.554	12.556
South Africa	2.462	0.824
Britain	2.042	13.743
Poland	1.123	1.790
France	0.886	3.300
Japan	0.480	2.963
Czechoslovakia	0.380	1.046
Belgium	0.127	1.609
Other	13.892	12.780
World	100.000	100.000

Source: Chinese Industrialization and Its Capital Problem, by Kwang Lu, Chapter 10.

*Including Coal, Crude Petroleum and Water Power.

Even though China has a little less than one-fourth of the power resources in the world, she merely produced 1.6 per cent of the total power of the world in 1933. At the same time, Britain, holding 2.04 per cent of the total power resources of the world, produced 13.74 per cent of the world's power; and Germany, holding 3.55 per cent of the total power resources, produced 12.56 per cent of the world's power. It is suggested that the potential production of power in China is much greater than the highly industrialized countries of Britain and Germany in which they have low percentages of power resources but high percentages of power production.

Generally speaking, China has many more natural resources than the progressive industrialized countries, like Britain, Germany, Canada, France, etc. However, the greater part of her abundant natural resources are unexploited because of her slow industrialization. On the contrary, Britain and Germany have only limited natural resources but they are exploited extensively because of their high industrialization.

Table 34 shows that China's industrial achievements after World War II astounded the world. China, really, made big progress in the development of industry during recent years. For instance, the production of coal in China increased 211.4 per cent from 1937 to 1957, whereas, production in the United States increased only 4.3 per cent, and production in U.S.S.R. 198 per cent. During this period, production in Germany and Britain decreased 16.7 and 7 per cent, respectively. In crude petroleum production, China had increased more than ten fold

Table 34

Coal, Crude Petroleum and Iron Ore Production
in the World and the Selected Countries, 1937 and 1957

(thousand tons)

<u>Countries</u>	<u>Coal</u>			<u>Crude Petroleum</u>			<u>Iron Ore</u>		
	<u>1937</u>	<u>1957</u>	<u>Index 1937 = 100</u>	<u>1937</u>	<u>1957</u>	<u>Index 1937 = 100</u>	<u>1937</u>	<u>1957</u>	<u>Index 1937 = 100</u>
World	1,263,900	1,604,500	126.9	279,500	884,300	216.4	97,800	202,200	206.8
U.S.A.	440,303	467,595	104.3	172,865	353,630	204.6	36,991	55,420	149.8
U.S.S.R.	109,878	328,438	298.9	28,501	98,340	345.0	16,107	48,800	303.0
China	40,731	126,816	311.4	125*	1,441	1,152.8	3,189	5,940	186.3
Britain	244,251	227,217	93.0	122	155	127.1	4,333	4,637	107.0
Germany	184,489	153,592	83.3	451	3,960	878.1	2,759	4,667	169.2
France	44,346	56,795	128.1	79	1,418	1,794.9	11,520	18,770	162.9
Canada	13,411	9,925	74.0	309	24,536	7,940.1	850	11,113	1,307.4

Source: Data are taken from:

1. Statistical Yearbook, 1957, by United Nations.
2. China's Industrial Growth, 1953-1957, by Ronald Hsia. The Annals of American Academy of Political and Social Science, Vol. 321, January, 1959.

* 1949

over 1937, while other countries except Canada and France had increased less than China. As to iron ore production, China increased 86.3 per cent over 1937, while the United States increased 49.8 per cent, Germany 69.2 per cent, France 62.9 per cent and Britain 7 per cent. Only U.S.S.R. and Canada had increased more rapidly than China.

In short, the previous statements show that China's industrial potentiality is great enough for her to develop rapidly as an industrialized country and to keep abreast of the advanced countries of the world. The quotation below by Lillian Kessler throws light on the potential industrial development of China: "China looms large as a potential field for development. Not only does she have the greatest single national population in the world but she is fortunate in possessing many of the natural resources required to develop and industrial economy. Although at least eighty per cent of her people live by agriculture, China's untapped energy resources and mineral deposits represent an unknown potential for industrial expansion.

All groups in China today are convinced that only through industrialization and the fullest use of the country's natural resources and manpower can China emerge as a strong national entity. There is no longer any concerted resistance to industrialization as there was in the middle nineteenth century when Western culture and Western machines were looked upon with equal suspicion. The Chinese have lived through a technological war and they are now determined to profit

by the benefits that technology can bring them in peace. Through science and industry they intend to obtain for themselves better food, housing and clothing; improved sanitation and medical care; modern means of communication; and more widespread education. Moreover, the Chinese never again want to defend themselves with bare hands. They firmly believe that their natural resources, combined with their great reservoir of manpower, can be welded into a sound industrial structure that will give them a place among the important nations of the world."¹

¹ 'The Industrialization of China' by Lillian Kessler, in the book of Towards World Prosperity. (Harper & Brothers Publishers, New York and London, 1947).

BIBLIOGRAPHY

Woytinsky, W. S. and E. S., World Population and Production. Twentieth Century Fund, New York, 1953.

United Nations, Statistical Yearbook, 1951, 1955, 1956, and 1957. The Statistical Office of the United Nations, New York.

Ezakiol, M., Towards World Prosperity. Harper & Brothers Publishers, New York and London, 1947.

Clark, G., Economic Rivalries in China. Second edition. Yale University Press, New Haven, 1933.

Rowe, D. M., China Among the Powers. Harcourt, Brace and Company, New York, 1945.

Taylor, J. B., Farm and Factory in China. The Edinburgh Press, London, 1928.

Hsia, R., China's Industrial Growth, 1953-1957. The Annals of American Academy of Political and Social Science, Vol. 321, January, 1959.

The United States Department of the Interior, American Minerals Yearbook, 1957. Washington, 1959.

Chen, P. F., Chinese Mineral Resources. Second edition. Chinese Culture Publishing Committee, Taipei, Taiwan, China, 1954.

Chang, T. K., Chinese Industries. Second edition. Chinese Culture Publishing Committee, Taipei, Taiwan, China, 1954.

Chang, C. T., Chinese Economy in the Northeast. Second edition. Chinese Culture Publishing Committee, Taipei, Taiwan, China, 1955.

Liu, K. T., Chinese Communications. Second edition. Chinese Culture Publishing Committee, Taipei, Taiwan, China, 1954.

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the scanned document

A STUDY OF CHINESE INDUSTRIALIZATION

(1912-1948)

by

Kwang Lu

Abstract of thesis submitted to the Graduate Faculty of the Virginia Polytechnic Institute in candidacy for the degree of MASTER OF SCIENCE in Business Administration.

The purpose of this thesis is to investigate three aspects of Chinese Industrialization: first, what are the causes of slow growth of Chinese Industries; second, what Chinese Industrialization had been done by the Ching dynasty before 1912, and by National China after 1912; third, from the analysis of natural resources, from the view of past achievement in the Chinese Industrialization, what will be the possibilities of Chinese Industrialization in the future.

The investigation and analysis are concerned with the following:

- 1. The basic factors for Industrialization.**
- 2. The general causes of slow growth of Chinese Industrialization.**
- 3. General growth of Chinese Industries.**
- 4. Development in particular Industries:**
 - a. Steel and Iron Industries.**
 - b. Coal Industries.**
 - c. Electric Industries.**
 - d. Textile Industries.**
 - e. Machine and petroleum Industries.**

The conclusion of this study is to show a sound policy for Chinese Industrialization for the future.