THE MECHANISM OF CHINA'S INDUSTRIAL DEVELOPMENT

—Background to the Shift in Development Strategy—

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IN ORDER to transform itself into a strong socialist power, since its emergence the People's Republic of China has been giving first priority to establishment of a modern industrial foundation to replace the warped industrial structure inherited from semicolonial, semi-feudal days. If one compares China's present industrial structure and level of productivity with the state of the Chinese economy at the outset of such transformation some thirty years ago, the progress in industrialization is undeniable. The Chinese themselves have maintained that their high rate of growth in industrial production is the best proof of the superiority of socialism.

Since the declaration by China in 1979 of a policy shift to "economic readjustment," however, doubt has been cast on the idea that a high growth rate alone is symbolic of socialism, and the main criterion for assessment of industrialization policy has been changed from growth rate to indices of efficiency of investment. The reason for this change is the fact that the policy of *extensive* industrialization that has supported the growth of the Chinese economy in the past has run into insurmountable difficulties. This paper is a reassessment of the achievements in construction of the industrial sector over the past thirty years. The focus is on identification of the factors involved in the shift of development strategy to the present "economic readjustment."

I. THE PROGRESS OF INDUSTRIALIZATION TO DATE

A. *Rate of Growth*

As of 1979 China ranked as a "low income country" in terms of per capita GNP and per capita consumption of industrial products ("low-income" status in 1981 was defined by per capita income of under U.S.$370). On the basis of China's figures for "national income" calculated according to socialist economic formulas, per capita GNP in 1979 is estimated at some U.S.$260 (according to the World Bank's *World Development Report, 1981* [37]). For the same year, China's per capita steel consumption was only 35 kilograms. China's rate of economic development has been fast, but its achievements have been offset by its enormous population, now touching the 1 billion mark.

Let us first consider how the Chinese economy has fared in terms of growth

TABLE I
INTERNATIONAL COMPARISON OF GROWTH RATES

(%)

Country	Average Annual Rate of Growth in GDP			Average Annual Rate of Increase in Mining and Manufacturing Production			
	1950-60	1960-70	1970-79	1950-60	1960-70	1970-79	1950-79
China	(11.0)	5.2 (4.8)	6.0 (5.9)	(28.72)	(4.73)	8.9 (11.47)	(14.97)
India		3.4	3.4	3.6	5.5	4.4	4.5
Indonesia		3.9	7.6		5.2	11.3	
Brazil		5.4	8.7	9.0		9.6	
USSR		5.2	5.1	11.6	8.7	6.2	8.9
Japan		10.5	5.0	17.5	10.9	5.6	11.5
U.S.A.		4.3	3.1	2.7	5.2	2.7	3.5

Sources: World Bank, *World Development Report, 1981* [37]; United Nations, *Statistical Yearbook, 1979/80* [32]; and *Zhongguo jingji nianjian, 1981* [45].
Note: The figures in parentheses for China are those for rate of growth in "national income" and for the rate of increase in "gross industrial production" (published by China).

rate. World Bank estimates of the growth rate of different countries are given in Table I for the sake of comparison. (With the exception of Japan, only countries with very large populations are included in the table.) In the period 1960–79 China's average annual rate of growth in GDP was 5.6 per cent. According to the estimates made by China, average annual growth rate in "national income" for the same period was 5.3 per cent. Although these rates can be considered relatively high, they are not particularly outstanding. Remarkable growth was, however, achieved in industrial production (mining and manufacturing industries), the average annual growth rate from 1950 to 1979 being 14.97 per cent according to statistics published by China. (The statistics show a slackening in the growth rates for industrial production in the 1960s.) Considering only the "normal" part of that period, i.e., excluding the postwar recovery years 1950, 1951, and 1952, we have an average annual rate of growth of 12.8 per cent from 1953 to 1979. It is no mean feat for a country of this size, and an agricultural country at that, to maintain such a high rate of industrial growth for nearly three decades entirely on its own (Table II).

On the other hand, growth was not even throughout that period. Rather, as shown in Figure 1, it was marked by sharp fluctuation, with three main peaks and three corresponding main troughs. The first peak was in 1958–59, the years of the Great Leap Forward, the second was in 1963–65, the period of readjustment, and the third was in 1969–71. Of these three peaks, the second can be considered as having been due to recovery factors—a reaction to the major slump in 1960–61 following failure of the Great Leap. The third peak was the result of a new "Great Leap Forward" policy[1] involving rapid expansion

[1] According to Yang Jianbai [40], the good showing in agricultural production in 1970 made the Chinese overconfident with respect to their chances of making another "great leap forward" and persuaded them to start work in 1970 on projects scheduled for the Fourth Five-Year Plan commencing in 1971.

TABLE II
GROWTH RATES BY SECTOR

(%)

Period	National Income	Industrial Production			Agricultural Production
		Overall	Heavy Industry	Light Industry	
Period of economic recovery (1950–52)	11.2	34.8	48.9	29.1	14.1
1st five-year plan (1953–57)	8.9	18.4	25.4	13.3	4.5
2nd five-year plan (1958–62)	−3.1	9.5	16.7	3.18	−4.3
Period of economic readjustment (1963–65)	14.5	18.2	15.0	22.6	11.1
3rd five-year plan (1966–70)	8.4	13.42	17.7	9.16	3.9
4th five-year plan (1971–75)	5.6	9.3	10.5	9.1	4.0
1976–79	7.0	9.4	9.5	9.3	8.6

Sources: For national income and agricultural production: Yang Jianbai [40, pp. 118–26]. For industrial production: *Zhongguo jingji nianjian, 1981* [45].

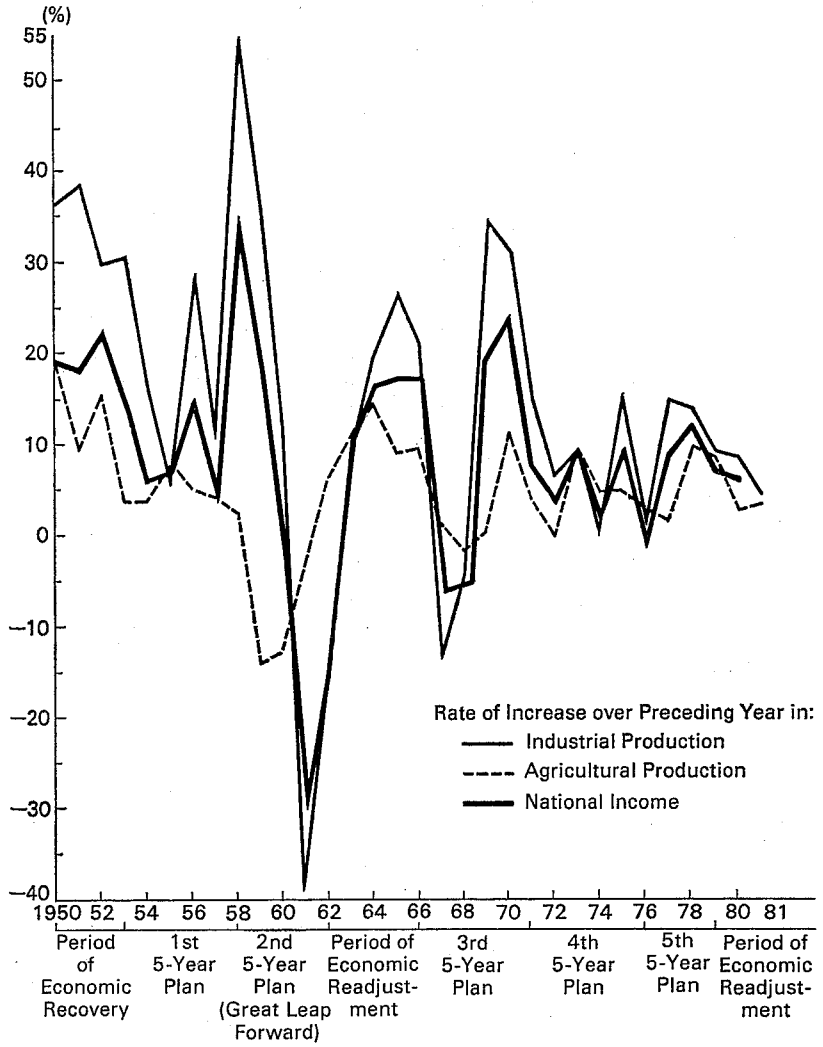
of investment in heavy industry. Recovery in 1972 and successive years from the trough following that peak was weak, however. In fact, the rates of increase in national income and industrial production after 1971 were below the average for the thirty-year period. As we shall see below, this was a symptom of decline in growth potential.

B. *Structure of Productive Capacity*

The motive power for China's high rate of growth in industrial production has been provided by the heavy industry sector. (What is meant here by "heavy industry" as opposed to "light industry" will be explained later.) The 1981 edition of *Zhongguo jingji nianjian* [China economic yearbook] [45] gives statistics for annual production of seventy-two industrial items (forty in heavy industry and thirty-two in light industry) over the past thirty years, this being the largest number of items yet covered by any such publication. Figure 2 shows the increase in production of forty-three of these items during the period 1952–79. Among those items whose production multiplied fantastically are crude oil and petrochemical products, motor vehicles, tractors, TV sets, and various types of heavy industrial plant and equipment. It must, of course, be borne in mind that the industries in question started virtually from scratch after liberation. Furthermore, since the products of new industries are assigned relatively high prices, the percentage that they represent of the overall value of industrial production is greater than it would otherwise be. Yet although the structure of prices in China must be taken into account in considering the difference in the growth rates between heavy industry and light industry, it is still apparent that it is the high rate of increase in the production quantities of heavy industrial products that is mainly responsible for the relatively high multiplication factor in the monetary value of heavy industrial production as compared to light industrial production.

The features of Chinese industrial development during the twenty-eight-year

Fig. 1. Rates of Increase



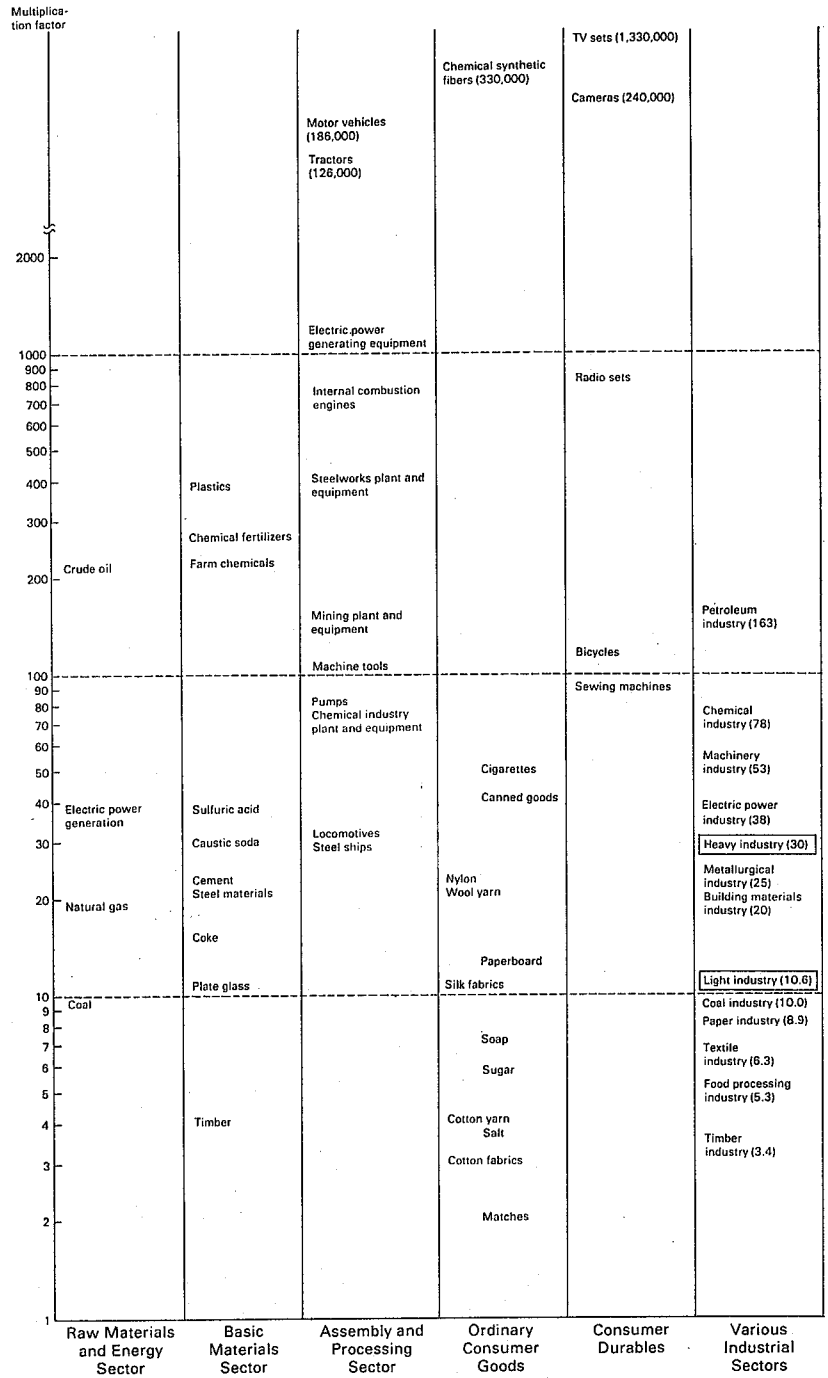
Source: See Table II.

period in question can be described in terms of these forty-three items as follows: In contrast to the poor showing of ordinary consumer goods and coal (the major item in the raw materials and energy sector in terms of supply and demand), assembly and processing industries underwent tremendous growth. The great disparity in rates of growth meant that coordination between various industrial sectors—raw materials and energy production → basic materials production → assembly and processing—was marked by difficulties.

C. *Extensive Development Pattern*

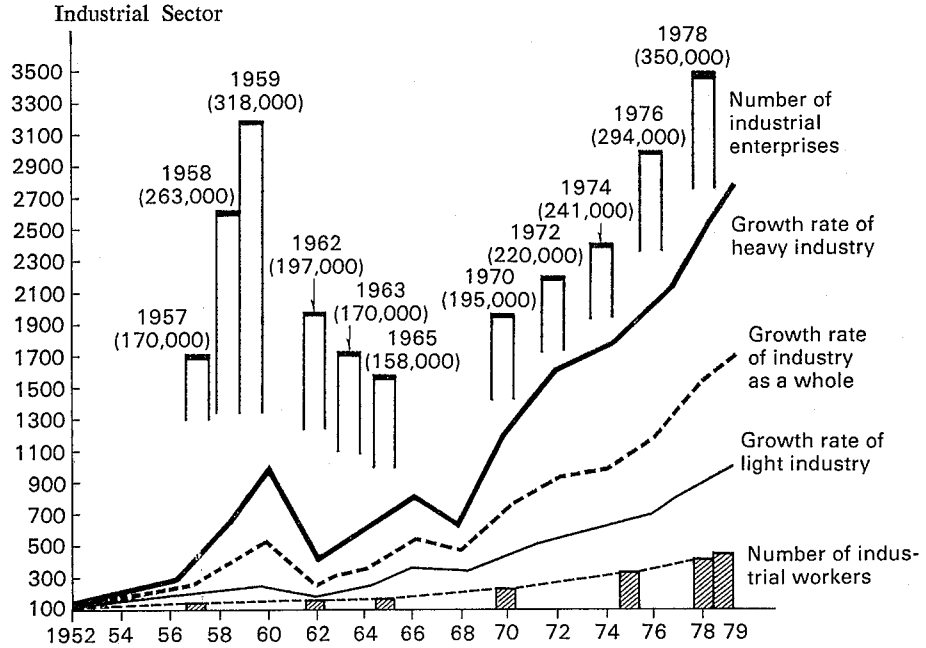
If the period of the Great Leap Forward is considered to be an exceptional

Fig. 2. Multiplication Factors for Production of Main Industrial Items (1952–79)



Source: *Zhongguo jingji nianjian, 1981* [45, p. VI-17].

Fig. 3. Growth Rates, Number of Workers, and Number of Enterprises in the Industrial Sector



Sources: *Zhongguo jingji nianjian, 1981* [45]; Ma Hong and Sun Shangqing [24, pp. 104, 691]; *Zhongguo tongji nianjian, 1981* [China statistical yearbook, 1981].

Notes: 1. Growth rates of industry are shown by multiplier index (at 1952 fixed price =100).

2. Number of industrial workers:

1952	12,460,000	1970	28,090,000
1957	14,010,000	1975	42,920,000
1962	17,050,000	1978	50,080,000
1965	18,280,000	1979	53,400,000

case, a widening gap in the rate of growth between heavy industry and light industry may be seen as commencing with the "new Great Leap Forward" starting from 1970 (see Figure 3). The main feature of industrialization in the 1970s was rapid expansion of smaller-scale industry in the provinces under the policy of "walking on two legs." As indicated in Figure 3, the number of industrial enterprises reached approximately 320,000 in the period of the Great Leap Forward, a large percentage of them being smaller industries. During the period of readjustment in the early 1960s, however, many such companies were closed down, and the total number of industrial enterprises sharply declined. It was not until after 1965 that the number of such outfits regained the steady growth that continued to 1978.

The main emphasis of industrialization policy in the 1970s was on increased investment in capital goods to be utilized in the agricultural sector in order to solve the food production problem, which represents the main bottleneck in the Chinese economy. The purpose of industry in the provinces was first of all to contribute to such a solution. With the rapid expansion of local industry,

TABLE III

PLANT-SCALE CLASSIFICATION AND PRESENT DISTRIBUTION

Type of Plant	Scale	Standard of Classification	Number of Plants	% of Overall Production Accounted For (1978)
Iron and steel	Large	Annual production of crude steel over 1 million tons	9	Crude steel 85%, Pig iron 60% } Produced by large plants
	Medium	100,000 to 1 million tons	30	
	Small	less than 100,000 tons	In all areas other than Tibet	Crude steel 5.3%, Pig iron 25.6% } Medium plants
Foundry	Large	Annual production of pig iron over 1 million tons		Crude steel 9.7%, Pig iron 14.4% } Small plants
	Medium	200,000 to 1 million tons		
	Small	less than 200,000 tons		
Coal mines	Large	Annual production of raw coal over 5 million tons		56.3%
	Medium	2–5 million tons		
	Small	less than 2 million tons	20,000+	43.7%
Power stations	Large	Installed capacity over 250,000 kw		96% (87.4% of hydroelectric power plants)
	Medium	25,000 to 250,000 kw		
	Small	less than 25,000 kw	90,000+	4% (12.6%)
Synthetic ammonia	Large	Annual production of synthetic ammonia over 150,000 tons		44.3% (40.6% of all nitrogen fertilizers)
	Medium	45,000 to 150,000 tons		
	Small	less than 45,000 tons	1,533	55.7% (59.4%)
Cement	Large	Annual production of cement over 1 million tons		34.8%
	Medium	200,000 to 1 million tons	80%+	
	Small	less than 200,000 tons	3,400+	65.2%
Motor vehicle	Large	Annual production of general motor vehicles over 50,000 units	9	62%
	Medium	5,000 to 50,000 units		
	Small	less than 5,000 units	In 25 provinces and cities nationwide	38%

Sources: For classification criteria: Zhu Bohai, ed. [46, p. 164]. For number of plants and percentages: [26] and Ma Hong and Sun Shangqing [24, p. 693].

Note: The following are other examples of classification criteria. Machinery plants: large=investment of over 20 million yuan; medium=8–20 million yuan; and small=less than 8 million yuan. Cotton spinning plants: large=more than 100,000 spindles; medium=50,000–100,000 spindles; and small=less than 50,000 spindles.

TABLE IV
INDUSTRIAL ENTERPRISES IN CHINA (1978)

Type of Enterprise	Gross Industrial Production		Number of Enterprises		Number of Workers	
	Value (Billion Yuan)	(%)	No.	(%)	No. (Million Persons)	(%)
Total	423.075	(100)	348,447	(100)	42.56	(100)
Large	106.033	(25.1)	1,222	(0.35)	10.64	(25)
Medium	77.387	(18.1)	3,160	(0.91)	31.92	(75)
Small	239.655	(56.8)	344,065	(98.74)		
State-owned	341.422	(80.7)	79,097	(22.7)	30.41	(72)
Collectively-owned	81.653	(19.3)	269,350	(77.3)	12.15	(28)

Sources: For gross industrial production and number of enterprises: Ma Hong and Sun Shangqing [24, p. 694]. For number of workers: *Beijing Review*, February 11, 1980, p. 15; and Wang Xiangming [35].

the portion of smaller-scale industry in the heavy industry sector also expanded, as indicated in Table III. China's industry as a whole also continued to develop as shown in Table IV.

In terms of the size of enterprises (according to the criteria of classification as modified in 1978), the structure of Chinese industry is pyramidal with a very wide base formed by an overwhelming majority of smaller industries. This structure is more similar to that of Japan than to those of the United States and West European countries.

From Table IV, one can deduce one characteristic of China's industries, namely, that the value of industrial production per unit for large enterprises is some ninety-five times that for medium and small-scale enterprises, while production per worker is about the same. In other words, in China there is not the difference in labor productivity between large-scale and smaller industry that is to be observed elsewhere. This might be due to excessive work force even in state-operated enterprises. The overall industrial labor force over the years is indicated in Figure 3 in graph form by interpolation between the published figures for 1952, 1957, 1962, 1965, 1970, 1975, 1978, and 1979. As can be readily seen, the rate of increase in the number of industrial workers has been rising since the late 1960s.

From scrutiny of all the data presented in this section we may conclude that industrial development since the late 1960s has been largely in terms of extensive development in the form of expansion of smaller-scale industry.

D. *Relative Weights of Industry and Agriculture*

Between 1952 and 1979 the weight of the industrial sector in national income rose from 19.5 per cent to 45.5 per cent, with a corresponding decline in the weight of the agricultural sector from 57.7 per cent to 38.7 per cent (see Table V). Since the 1950s prices have been revised four times—in 1952, 1957, 1970, and 1980—as a result of the rise in productivity in the industrial sector and

TABLE V

CHANGES IN DISTRIBUTION OF NATIONAL INCOME

(Billion yuan and %)

	1952	1957	1965	1975	1979
National income	58.9 (100)	90.8 (100)	138.7 (100)	250.3 (100)	335.0 (100)
Agriculture	34.0 (57.7)	42.5 (46.8)	64.1 (46.2)	98.7 (39.4)	129.5 (38.7)
Industry	11.5 (19.5)	25.7 (28.3)	50.5 (36.4)	111.3 (44.5)	152.6 (45.5)
Construction	2.33 (3.9)	4.54 (5.0)	5.60 (4.0)	10.02 (4.0)	13.4 (4.0)
Transportation	2.33 (3.9)	3.63 (4.0)	5.60 (4.0)	10.02 (4.0)	13.4 (4.0)
Commerce	8.75 (14.8)	14.53 (16.0)	12.61 (9.1)	20.04 (8.0)	26.8 (8.0)

Sources: *Zhongguo jingji nianjian, 1981* [45]; Ma Hong and Sun Shangqing [24, p. 103]; and Martin Weil [36, pp. 22–23].

Note: Since the data derives from various sources, the total for the different sectors does not always come to 100 per cent, but this discrepancy has been ignored as not being very significant.

the policy of narrowing the gap between agriculture and industry. Over the twenty-eight-year period in question the prices of industrial products were lowered by an average of 23 per cent, while those of agricultural products were raised by an average of 31 per cent. If prices had remained fixed, the weight of the industrial sector would have been seen to have increased still more, and that of the agricultural sector would have exhibited an even greater decline. The extent to which the actual respective "values" of agriculture and industry are reflected by these nominal weightings is, however, another question. It has, for example, been estimated that if we were to add to agricultural production other items related to this sector like net production in the light industry sector in which agricultural products are used as raw materials as well as the increase in the value of agricultural products and products processed from them during distribution, 70 per cent of total national income would be seen to come directly or indirectly from the agricultural sector [43, p. 47]. This cannot, however, be precisely demonstrated quantitatively at the present time.

Table VI gives a comparison of China's industrial structure with other countries as of 1979. Although there is some difference between data provided by the Chinese themselves and World Bank estimates, the divergence is not all that great. Especially notable in China's case is the overwhelming preponderance of employment in the agricultural sector despite the large percentage of GDP represented by the industrial sector (see also Table VII). This imbalance is the result of the astonishingly low labor productivity in agriculture due to the absorption of the country's excess labor by the sector. It is also attributable to the relatively high level at which the prices of industrial products have been set in comparison to prices of agricultural products.

During the past twenty-eight years employment has increased at a faster pace in nonagricultural sectors than in the agricultural sector. According to statistics given in *Zhongguo jingji nianjian* [45], the rates have been 6.75 per cent and 1.7 per cent per annum, respectively, in comparison with a growth in national income of 4.85 per cent per annum. Employment growth has been particularly

TABLE VI
INTERNATIONAL COMPARISON OF STRUCTURE OF PRODUCTION (1979)

(%)

Country	Distribution of GDP			Distribution of Employment		
	Agriculture	Industry	Services	Agriculture	Industry	Services
China	31	47	22	71	17	12
India	38	27	35	71	11	18
Indonesia	30	33	37	59	12	29
Brazil	11	38	51	40	22	38
Japan	5	40	55	13	38	49
U.S.A.	3	34	63	2	32	66
USSR	14	38	48	15	44	41
Low income countries	34	36	30	71	14	15
Middle income countries	14	38	48	43	23	34

Source: World Bank, *World Development Report, 1981* [37].
Note: The industrial sector comprises mining, manufacturing, construction, and electricity, water, and gas. Economic activities classified neither as agricultural nor as industrial sectors are regarded as services.

TABLE VII
SECTORAL DISTRIBUTION OF EMPLOYMENT (1979)

	Workers (Million Persons)	%
Total working population	405.80	100
Agriculture	299.34	73.7
Mining and manufacturing	53.40	13.2
Construction	8.903	2.2
Transportation and communications	6.825	1.7
Commerce and other services	12.872	3.2
Science, education, and health	11.310	2.8
Urban public works	1.109	0.3
Finance	0.504	0.12
Government offices and organizations	4.510	1.1
Other employment	7.027	1.68

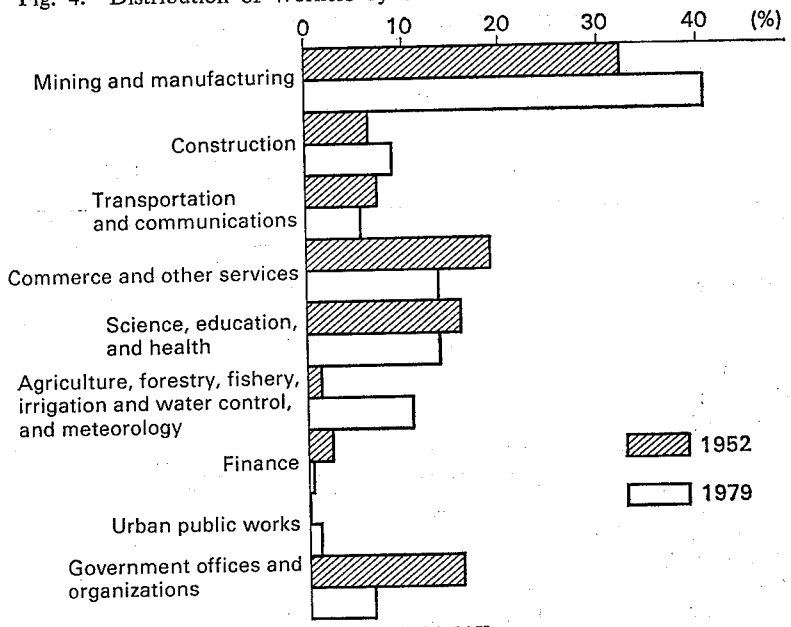
Source: *Zhongguo jingji nianjian, 1981* [45].

rapid in mining and manufacturing, as can be seen in Figure 4 which deals with change in the structure of employment in state-owned enterprises. It is significant, however, that whereas the percentage of employment represented by the manufacturing sector has increased sharply, there has been a corresponding decline in employment in transportation and services and other indirect sectors. Although many different policies have contributed to this trend, it can be chiefly explained as the result of long-term continuation of the policy of giving priority to direct production sectors.

E. *Breakdown by Industrial Sector*

Chinese industry is classified according to the Standard List of Production Branch Classifications, published in 1953 and revised in 1958, 1965, and 1972.

Fig. 4. Distribution of Workers by Sector (State-owned Enterprises Only)



Source: *Zhongguo jingji nianjian, 1981* [45].

The latest version has 12 sectors, 44 departments, and 160 subdepartments.[2] Table VIII shows how the shares of the 12 sectors have changed since 1952 (see also Figure 2). There is however some doubt as to the consistency of the estimates for the different sectors in this table in view of the fact that the scope of each has changed with each of the classification revisions.[3] Setting aside this problem and the question of differences in the pricing system, the fact remains that during the twenty-nine-year period in question the positions of the light industrial and the heavy industrial sectors were reversed in terms of their relative importance in industry as a whole.

Looking at metallurgy, which is central to Chinese heavy industry, it should first be noted that this classification includes the manufacture of iron and steel products and the attendant mining sector which provides the raw materials, and the mining and smelting of nonferrous metals. If an international comparison is made on the basis of the same definition, in Japan's case metallurgy represents 21–22 per cent (1978) of the total value of mining and manufacturing production, while in India's case it represents 12 per cent (1976) [15] [13]. Although the figure of 8.9 per cent for China is relatively high for a developing country, it is not particularly high.

[2] A copy of the List of Classifications was presented by a Chinese delegation of industrial statistical methods experts that visited Japan in January 1982 (headed by Chen Zhenyu, vice head of the Industry and Transport Statistics Office of the State Statistical Bureau and hosted by the Japan China Association on Economy and Trade).

[3] Of the three revisions, those of 1958 and 1965 were major. For instance, the mining sector, a raw materials sector, was added to the metallurgy and chemical industry sector, and light industry sectors were unified. For details, see Tu Defu [31, p. 16].

TABLE VIII
CHINA'S INDUSTRY BY SECTOR (1979)

	% of Aggregate Value of Industrial Production		Index[a] (1952 level = 100)	Number of Workers and Staff		Number of Enterprises
	1979	(1952)		No. (Million Persons)	(%)	
All industry	100	(100)	1,734.4	53.40	(100)	377,300
1. Metallurgy	8.9	(5.9)	2,516.9	4.10	(7.7)	5,000
2. Electric power	3.8	(1.3)	3,824.6	1.00	(1.87)	9,800
3. Coal	2.6	(2.4)	1,000.6	4.00	(7.5)	8,700
4. Petroleum	5.4	(0.5)	16,342.5	1.00	(1.87)	400
5. Chemicals	12.2	(4.8)	7,782.4	2.80	(5.2)	23,600
Of which: Chemical fertilizers and insecticides	2.3	(0.1)	57,988.5	n.a.		3,900
6. Machinery	27.1	(11.4)	5,288.2	12.83	(24)	107,300
Of which: Agricultural machinery	2.4	(0.3)	23,093,5	1.45	(2.7)	8,400
7. Building materials	3.6	(3.0)	1,959.0	3.45	(6.6)	48,900
8. Timber	1.8	(6.5)	337.9	n.a.		16,800
9. Food processing	11.3	(24.1)	533.8	n.a.		51,800
10. Textile	12.9	(27.5)	627.8	3.10	(5.8)	15,300
11. Paper	1.3	(2.2)	891.1	n.a.		18,100
12. Other industries	9.4	(10.0)	1,170.1	n.a.		n.a.

Sources: *Zhongguo jingji nianjian, 1981* [45]; [26, p. 32]; and *Zhongguo tongji nianjian, 1981* [China statistical yearbook, 1981].

Notes: 1. Figures for 1980 were used for the number of workers and staff in cases where those for 1979 were not available.
2. Figures for 1980 were used for the number of enterprises.

[a] Index of value of production of each sector is on the basis of fixed prices.

As for the machinery industry, it would represent far more than the given 27.1 per cent of the total if that total were limited to manufacturing industries, yet even that can be considered a fairly high percentage in comparison with the 1976 or 1977 figures of 35.8 per cent for Japan, 20.4 per cent for India, 19.8 per cent for the Republic of Korea, and 12.1 per cent for the Philippines.[4]

The reversal in the relative importance of the heavy and light industrial sectors started in the second half of the 1960s, assuming that the earlier Great Leap Forward period was exceptional. By the second half of the 1970s heavy industry represented 60 per cent of the total, and China's industrial structure came to be referred to by the Chinese themselves as *zhongxing jingji gouzao* ("a heavy-type economic structure") (Table IX). Just how great is the difference between the percentages of industrial sectors falling under the category of "heavy industry" as defined by the Chinese and by "heavy industry" as more generally defined elsewhere, i.e., the percentage of net value of heavy industrial production in net value of manufacturing production?

[4] The figures are from Shigeru Ishikawa [14, p. 43].

TABLE IX
RELATIVE SHARE OF HEAVY AND LIGHT INDUSTRIES IN GROSS VALUE OF INDUSTRIAL PRODUCTION

(Billion yuan)

Year	Gross Aggregate Value of Industrial Production	Light Industry		Heavy Industry	
		Value	%	Value	%
1950	19.105 (100)	13.393	70.0	5.712	30.0
1955	54.914 (100)	32.00	58.3	22.914	41.7
1960	183.745 (100)	59.56	32.4	124.185	67.6
1965	155.242 (100)	76.134	49.0	79.108	51.0
1970	269.598 (100)	113.793	42.2	155.805	57.8
1975	418.46 (100)	164.954	39.4	253.506	60.6
1976	421.89 (100)	169.374	40.2	252.516	59.8
1977	483.63 (100)	193.087	40.0	290.543	60.0
1978	548.80 (100)	213.95	39.0	334.85	61.0
1979	593.39 (100)	234.26	39.5	359.13	60.5

Source: *Zhongguo jingji nianjian, 1981* [45].
Note: Calculated on the basis of 1952 fixed prices. See text of article for explanation of classifications.

From the 1950s to 1963 China subclassified the industrial sector into that sector producing means of production (group A) and the sector producing consumer goods (group B), as the Soviets do. Although the classifications "heavy industry" and "light industry" were introduced after 1963, they can be considered to have been of much the same scope as the earlier classifications though not entirely so. In the traditional Soviet-type classification, heavy industry encompasses mining, raw materials industries, and manufacturing industries, and light industry is subdivided into industry making use of agricultural products and industry using other raw materials.

If one examines China's Standard List of Production Branch Classifications and Japan's Standard Industrial Classification (as revised in 1972 by the Administrative Management Agency), one can see that they differ considerably. In China's case, "heavy industry" includes mining (metallurgical industries, the coal and lignite industries, crude oil and natural gas, mining, and non-metallic minerals industries) and timber and its transport. Since the Chinese classification also depends on the use made of the product, the same industrial product can be classified under heavy industry if it is used for production and under light industry if used for consumption. Such items as dyes, paints, pharmaceuticals, soaps, and synthetic detergents that are classified in Japan as heavy industrial (chemical) products are classified in China as light industrial products. On the other hand, cement and glass, which are classified as light industrial products in Japan (as products of the ceramics and stone and earthenware manufacturing industries), are classified as heavy industrial products in China.

The breakdown of the 160 subdepartments in the Chinese classification catalog is as follows:

Heavy industries:	82	Mining industries: 8	
		Raw materials industries: 16	74
		Manufacturing industries: 58	
Light industries:	78	With input of agricultural products: 41	
		Using nonagricultural raw materials: 37	

If one were to reclassify these industries on the basis of the Japan Standard Industrial Classification into the subclassifications "chemical and other heavy industries" and "light industries" (together comprising the "manufacturing industries"), sixteen of the seventy-four industries falling under the Chinese subclassification "raw materials and manufacturing industries" would be seen as among the light industries, and twenty-six of the seventy-eight industries in the Chinese classification "light industry" would be transferred to the "chemical and other heavy industries" sector. Thus, compared to the Japanese classification, China's "light industries" category can be considered to be excessively comprehensive. Applying the Japanese definition for "manufacturing industries," the number of Chinese "heavy industries" would increase from eighty-two to ninety-two (eighty-four + eight mining industries), and the number of Chinese "light industries" would decrease from seventy-eight to sixty-eight.

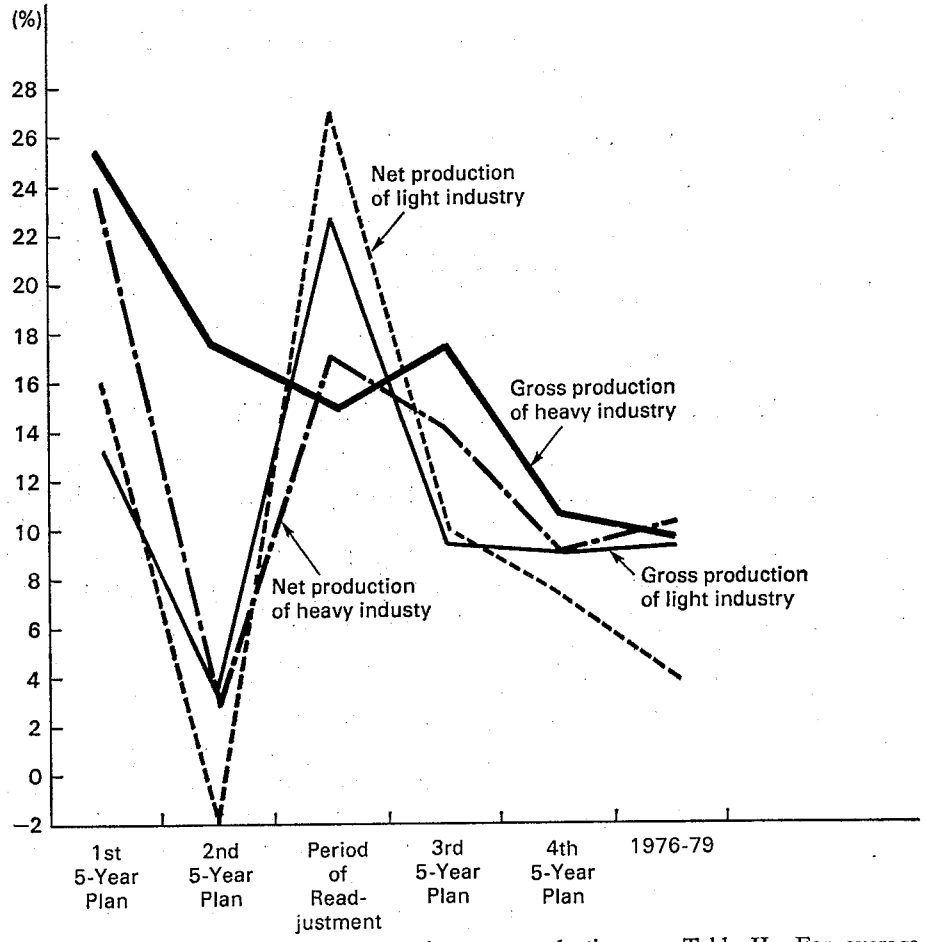
II. ECONOMIC EFFICIENCY

A. *The Meaning of the Statistics*

The question now being asked is what the high rate of increase in Chinese industrial production as reflected in the statistics really means. To start with, there is a considerable tendency to doubt the accuracy of the statistics themselves (see, for example, [21] [34, p. 16]). First of all, it has been pointed out that the figures for gross production value have been considerably "padded." The inclusion of rejects, unfinished products, and inventory in production figures and even completely false declarations are not uncommon in "command economies," but in China's case such practices have been carried to excess. Secondly, since statistics for the value and quantities of gross production are compiled on an "establishment basis," i.e., with respect to individual plants, there is extensive double counting. In particular, insufficient concern for the need to economize has helped to inflate the figures for the value of gross production because excessive amounts of intermediate goods are consumed in production.

Figure 5 shows how the average rates of increase in gross and net production have changed over the years. Particularly during the period of the Great Leap Forward there was extraordinary divergence between the two. It would not be surprising if, starting with the period of the Fourth Five-Year Plan, there had been a widening divergence between gross and net production in heavy industry in view of the rapid expansion of the steel and machinery industry sectors since that time, sectors which are characterized by considerable consumption of intermediate goods. However, this has not been the case, as far as Figure 5 indicates. Instead, it is in the light industry sector that this has occurred.

Fig. 5. Average Rate of Increase in Industrial Production



Sources: For average rate of increase in gross production, see Table II. For average rate of increase in net production: Ma Hong and Sun Shangqing [24, p. 160].

Besides the statistical aspect, doubt has been cast on the growth rate figures due to excessive increase in inventories and a decline in the rate of operation of production facilities, the problem of excessive inventory having become pronounced since about 1977–78, particularly in the steel materials and heavy machinery and equipment sectors. In this connection it is reported that as of 1980 steel material inventories reached approximately 20 million tons and those of heavy electrical equipment a value of over 60,000 million yuan. These excessive inventories have resulted from a problem inherent in the system itself: the inability to cope with changes in consumption needs due to the complete separation of supply and demand. They also derived from the increased imbalance between these and other sectors due to their increase in size. This feature of Chinese heavy industry is referred to as its expansion "autocycle."

Since the second half of the 1970s, excessive increase in inventories has been

a major factor in the decline of efficiency in the use of funds. As distribution congestion has increased in both the production and commercial sectors, the quantities of working funds tied up have also increased year by year. As of the end of 1978, the total amount of working funds tied up in state-owned enterprises nationwide had reached 290,000 million yuan, or very near the national income for that year of 301,100 million yuan. The average capital turnover coefficient for enterprises is reported to be 2.96 [39]. Enterprises whose profitability has declined because of increased inventories supplement their working funds through bank financing and in this way pay their industrial and turnover taxes and the state's share of their profits. Thus, state revenues are calculated on an unsound basis, and there is the constant danger of exposure of the contradictions. This is one of the factors behind the sudden sharp increase in state deficit since 1979.

B. *Decline in the Operating Ratio of Production Facilities*

It is reported that there has been a clear decline in the rate of operation of production facilities since 1977. This is not to say that the rate was high prior to that time, but the phenomenon still came as something of a surprise since it occurred after the recovery of fair stability following the extreme disorder that prevailed in production during the period of the Cultural Revolution. The operating ratio for 1977–78 is reported by the Chinese to have been 58 per cent in the iron and steel sector (in terms of crude steel production capacity) and only 50 per cent in the machinery industry sector, and in industry as a whole approximately one-third of production capacity is said to be idle.

The decline in the rate of use of fixed assets can be said to be the result of the effect of the "bottleneck multiplier" in which excessive investment reproduces balance-disrupting factors on increasing scale, leading to tension and disorder in the supply and demand situation with respect to materials.[5] Particularly because of poor linkage between coal and railway transport, electric power shortages have become chronic, and this has lowered the rate of operation of plant facilities. Furthermore, the disproportionate growth of steel, chemicals (fertilizers), and other industries with high energy consumption has made the energy supply and demand balance still tighter. Starting from the energy and transport sectors, then, the bottlenecks spread, with chronic shortages of materials discouraging efforts to improve operations and encouraging lax management.

C. *Investment Efficiency Indices*

Chinese scholars in the field of business administration now identify the following mechanism as having been at work under past industrialization policy [33]:

High growth targets → larger project scale → high rate of accumulation →

[5] According to Wlodzimierz Brus, the "bottleneck multiplier" is the opposite of Keynes's multiplier which indicates the extent of increase and development of demand. It indicates how the bottleneck effect of a cut in imports or other similar unfavorable occurrence in one sector spreads to other sectors, reducing overall production (see Brus [2, p. 43]).

TABLE X

INVESTMENT RATE AND INVESTMENT EFFECT

	Growth Rate of National Income (%)	Average Rate of Accumulation[a] (%)	Investment Coefficient[b]	Rate of Completion of Fixed Assets Investment[c] (%)	Labor Productivity Growth Rate of State-owned Industrial Enterprises (%)
1st five-year plan (1953–57)	8.9	24.2	1.68	83.7	8.7
2nd five-year plan (1958–62)	−3.1	30.8	73.7	71.4	−5.4
Period of readjustment (1963–65)	14.5	22.7	0.92	87.1	23.1
3rd five-year plan (1966–70)	8.4	26.3	2.32	59.5	2.5
4th five-year plan (1971–75)	5.6	33.0	3.76	61.4	−0.3
1976–78	6.3	33.5	3.20	68.8	
1953–78	6.5	29.7	3.18	68.0	

Sources: For growth rate of national income and average rate of accumulation: Ding Hua and Chen Zhiqun [7, p. 132]; for the ratio of completion of fixed assets investment: Chen Shengchang [6, p. 17] and Shigeru Ishikawa [14]; for labor productivity growth rate of state-owned industrial enterprises: Pei Yuanxiu, Liu Bingying, and Li Bingzhong [29].

[a] China's concept of "rate of accumulation" is the percentage of net savings (including investment for state material reserve) in available national income (net income of domestic material production ± export and import surplus). It is identical to the rate of domestic capital formation, provided that net payment abroad and net borrowing from abroad are negligible.

[b] "Investment coefficient" is the amount of investment needed in order to increase national income by one yuan. It is the inverse of the accumulation (effect) coefficient (=rate of increase in national income/rate of accumulation) which has been traditionally used in China, and is equivalent to the concept of the marginal capital output ratio in the Feldman-Domar model.

[c] "Rate of completion of fixed assets investment" is the increase in value of fixed assets (=value of completed capital construction investment) for the year in question divided by the amount of state capital construction investment earmarked for that year.

excessive wear and low consumption → low economic efficiency → reduced rate of increase in national income.

Describing the period of the Great Leap Forward and the period from the Cultural Revolution through the 1970s as periods of extremely poor economic efficiency, they have presented data such as that given in Table X.

Although it is not possible to make a straightforward international comparison of rates of investment because the Chinese calculate the rate of investment differently than elsewhere (see average rate of accumulation in Table X), the Chinese figure of an average of 30 per cent for 1953–78 can be considered very high for a developing country. For thirteen of the twenty-six years in question the rate was over 30 per cent, which compares favorably even with Japan's rate of investment during its period of rapid growth.

Let us now consider the capital coefficient (marginal capital output ratio). The Chinese estimate the average for 1953–78 as having been 3.18. For the

sake of comparison, we may note that for the period 1956–76 the average was 3.12 for the United States, 3.1 for Japan, 3.0 for West Germany, 2.8 for the United Kingdom, and 2.9 for France and that for the period 1960–76 it was 6.6 for the USSR [22, p. 27]. It is certainly surprising that the Chinese economy, which is characterized by relative scarcity of capital and a high degree of correlation between increase of labor and increased production, should have registered capital coefficients as high or even higher than those of economically advanced countries. Although the productivity of capital was extremely low, at the same time that the capital coefficient was high, high investment rates (or high rates of accumulation) were also being registered. From this fact we can surmise that there was some kind of vicious circle mechanism at work linking the amount of investment expended and the capital coefficient. That mechanism can be described as follows:

> High growth targets → high rate of investment → excessive investment in capital construction → disorder in supply of materials and greater imbalance between industries → soaring prices for materials and construction delays.

Table XI gives figures for construction times and unit investment costs for coal, cement, and railway projects implemented during different periods. Table XII gives the results of a survey of major domestic enterprises with respect to change since 1966 in per-unit costs of iron and steel and nonferrous metal products and semi-finished products. In the case of the sixteen iron and steel products and the eighteen nonferrous metal products for which figures are available, the average increase was 33.2 per cent and 46.4 per cent, respectively, between 1966 and 1980. Those are substantial increases for a country which has been considered to have little price fluctuation.

As we have seen, investment costs are considered to have risen owing to soaring materials prices, but it is also necessary to take into account the effect of the introduction of large-scale plant facilities from abroad. As indicated in Table XIII, there have been four waves of introduction of technology by China from abroad. The two waves since 1973 were larger than the preceding ones. The total of approximately U.S.$11,500 million for 1973–79 is in terms of contract prices and represents for the most part deferred payments rather than immediate payments and investment. Although it is not clear what portion of annual capital construction investment is represented by expenditures for projects involving introduction of plant facilities from overseas, such projects fall under the Chinese classification of "large-scale" or "extra-large" projects. In recent years delays in implementation of such projects have become a big problem. For instance, as of the end of 1979, they accounted for 76 per cent of uncompleted investment [41].

The main reason for the construction delays has been China's low capacity for absorbing technology transferred from Western countries, but also to be taken into account is the global inflation triggered by the oil shock of 1973 and the soaring construction costs that resulted. By 1978 the construction cost per ton of annual production capacity of crude steel for a vertically integrated steelworks in developing countries had reached 4.4 times what it was in 1970

TABLE XI

RISE IN CONSTRUCTION INVESTMENT COSTS

	Coal Pit Construction (450,000 Tons Annual Production)		Large and Medium-size Cement Plants (Annual Production of 200,000 Tons or More)		Construction of Trunk Railway Lines (per 100 km)		Rate of Completion of Large and Medium-size Projects during Year in Question (%)	Ratio of Investment Expended for Uncompleted Construction in the Total Amount of Investment Allocated for Year in Question (%)
	Average Construction Period (Months)	Investment per Unit of Capacity (Yuan/Ton)	Average Construction Period (Months)	Investment per Unit of Capacity (Yuan/Ton)	Average Construction Period (Months)	Amount of Investment (1,000 Yuan)		
1st five-year plan period	30	37	28	74	11.7	573	15.5	62.9
2nd five-year plan period	25	28.1	36	97	14.8	461	8.1	
3rd five-year plan period					16.7	1,734	11.5	175.4
4th five-year plan period	52	41.9	73	121	21.5	1,414	9.4	165.7
1976–79	69.6	62.7	90	114	28.8	2,474	7.4	{210 (1976) {213 (1977)

Sources: Ding Hua and Wu Xingguo [8]; and Ding Hua and Chen Zhiqun [7, p. 49].

TABLE XII
RISE IN COST OF PRODUCTS OF MAJOR IRON AND STEEL AND NONFERROUS METAL ENTERPRISES

(Yuan/ton)

Item	1966	1978	1980	Rate of Increase 1980/1966 (%)
Iron ore	5.48	6.12	6.84	25
Coke	63.02	66.03	81.20	29
Pig iron	105	138	161.44	54
Converter steel ingots	228	231	253.9	11.3
Hot-rolled sheet metal	260	408	455.51	75.2
Welded steel pipes	408	521	524.27	28.5
Refined copper	2,088	2,489	2,687.66	28.7
Lead	931	900	1,058.37	13.7
Zinc	1,399	1,441	1,403.12	0.3
Alumina	218	199	206.50	−5.3
Tungsten	4,378	5,190	5,974.75	36.5
Molybdenum	7,822	8,285	9,253.92	18.3
No. 2 purple sheet copper	6,460	6,428	6,106.73	−5.5
Industrial pure aluminum sheet	2,737	3,792	3,633.70	32.8
Average for 16 iron and steel products				33.2
Average for 18 nonferrous metal products				46.4

Source: Du Ang and Chen Qizhang [9, p. 19].

TABLE XIII
INTRODUCTION OF FOREIGN TECHNOLOGY

($ billion at current prices)

	1950s	1963–66	1973–77	1978–79	Total for the 30-Year Period
Total value	2.7	0.3	3.5	7.99	14.49
Of which:					
Plant facilities	2.4	0.28	3.15	7.61	13.44
Petroleum industry (%)	2.9	5.8	2.0	1.7	2.1
Coal industry (%)	4.5	—	3.0	11.5	8.0
Electric power industry (%)	29.4	5.0	13.8	11.5	15.1
Metallurgical industry (%)	22.9	31.7	20.1	26.1	24.1
Chemical industry (%)	5.6	28.1	26.2	29.1	24.0
Textile industry (%)	4.6	11.7	23.4	7.5	10.3
Light industry (%)	2.7	5.0	1.1	1.7	1.8
Machinery industry (%)	11.3	10.9	3.1	1.1	3.7
Military industry (%)	11.8	—	5.6	6.3	7.0
Building materials industry (%)	2.6	—	0.2	1.6	1.5
Transportation (%)	0.5	—	0.9	0.5	0.6
Agriculture, forestry, and fishery (%)	0.7	—	—	0.1	0.2

Source: Chen Huiqin [5, p. 51].
Note: Cancelled contract values have been subtracted from the figures for 1978–79.

before the oil shock, and in the case of construction of a 300,000-ton ethylene plant the construction cost was 3.1 times higher per ton of annual capacity [30]. Just as China bought and began constructing considerable steel plant (e.g., the rolling facilities at Wuhan) and ethylene plant facilities in 1974 and the following years, the prices of industrial products were also beginning to soar worldwide.

Shortages and rapidly increasing materials prices have hit local smaller industries the hardest since they have limited choice of materials supply channels owing to inadequate social infrastructure and do not enjoy economies of scale. Many such smaller industries are thus operating in the red, constituting the deficit part of the national economy. Of the total deficit in the industrial sector of 4,000 million yuan in 1978, approximately one-half was accounted for by small-scale iron and steel, chemical fertilizer, coal-mining, hydroelectric power, and cement industries (the *wu xiao gongye,* "five small industries"), the largest deficits being those of small ironworks (900 million yuan) and small chemical fertilizer plants (800 million yuan) [20, p. 32].

III. POLICY PROBLEMS

A. *Sectoral Investment Distribution*

We have already seen how excessive investment resulted in a lowering of investment efficiency in the period following the Cultural Revolution and through the 1970s. Now let us take a look at the economic policy background of the same phenomenon, first from the angle of distribution of capital construction investment. Tables XIV and XV show how capital construction investment has been distributed among different economic sectors and among different industrial sectors, respectively.

As long as developing countries want to establish their industrial foundations in a short period of time, it is only natural that a large share of investment will go to the producers' goods sector. In China's case, not only has this tendency been consistently maintained, but the share has also been steadily increasing. On the other hand, along with the expansion of the mining and manufacturing sector, the share of investment in construction, transportation, and other types of social infrastructure has, paradoxically, been declining. The shares of iron and steel, chemicals, and machinery in the producers' goods sector are conspicuously high. Yet, although investment in the energy sector should have been stepped up along with expansion of the high-energy-consumption materials sector, it has remained fairly stable. The share of investment in the railroad sector has actually declined whereas it, too, should have been increased in order to transport increased supplies of energy. Thus it is maldistribution of investment more than anything else that has been responsible for the growing imbalance between industrial sectors and worsening of industrialization bottlenecks.

The problem is a lack of flexibility to change investment distribution according to the stage of industrial development, the changing needs of society, and the occurrence of bottlenecks in particular sectors. For instance, the development

TABLE XIV
DISTRIBUTION OF CAPITAL CONSTRUCTION INVESTMENT AMONG DIFFERENT ECONOMIC SECTORS

(%)

	1st Five-Year Plan Period	2nd Five-Year Plan Period	Period of Read-justment	3rd Five-Year Plan Period	4th Five-Year Plan Period	1976–78	1979
Industry	45.5	61.4	52.1	59.2	58.2	63.6	56.4
Transportation and communications	16.4	13.8	13.3	16.4	18.9	19.6	12.8
Of which:							
Railways and port facilities	15.7	n.a.	n.a.	n.a.	13.8	13.8	n.a.
Construction	3.9	1.4	2.2	1.9	1.7	1.8	2.3
Agriculture, forestry, fishery, irrigation and water control, and meteorological facilities	7.6	11.4	18.4	11.4	10.3	11.3	11.6
Commerce, trade, etc.	3.9	2.0	2.6	2.3	3.0	3.1	4.1
Education, health, and science	8.1	3.9	6.0	3.0	3.3	2.3	6.7
Urban public works	2.6	2.3	3.0	1.9	2.0	4.2	6.0
Total amount of capital construction investment (billion yuan)	54.996	118.667	40.374	91.473	168.03	120.388	47.96

Sources: Xu Dixin [38, p. 12]; Ma Hong and Sun Shangqing [24, pp. 120, 247, 279]; and *Zhongguo tongji nianjian, 1981* [China statistical yearbook, 1981].
Note: Amounts of investment are in current prices. Totals do not come to 100 per cent since the percentage for "others" are not included.

TABLE XV
DISTRIBUTION OF CAPITAL CONSTRUCTION INVESTMENT AMONG INDUSTRIAL SECTORS
(%: total amount of capital construction investment=100)

	1st Five-Year Plan Period	2nd Five-Year Plan Period	Period of Read-justment	3rd Five-Year Plan Period	4th Five-Year Plan Period	1976–78	1979
Heavy industry	38.7	54.9	48.0	54.5	52.1	57.0	50.4
Coal	5.4	7.3	6.2	5.1	5.4	6.3	6.4
Petroleum	2.2	2.1	4.1	4.2	5.3	7.5	6.2
Electric power	5.4	7.5	5.5	7.5	7.7	9.8	10.2
(All energy	*13.0*	*16.9*	*15.8*	*16.8*	*18.4*	*23.6*	*22.8)*
Metallurgy	8.5	14.3	8.4	10.8	10.3	n.a.	7.0
Machinery	7.0	9.8	6.0	8.1	12.9	n.a.	7.2
Of which:							
Agricultural machinery	0.5	1.4	1.6	1.6	1.4	1.1	n.a.
Chemicals	2.5	4.7	5.8	6.8	5.7	7.6	n.a.
Of which:							
Chemical fertilizers	0.9	1.8	3.3	3.6	4.1	5.1	n.a.
Building materials	1.2	2.0	1.4	1.6	1.8	n.a.	2.4
Light industry	6.8	6.5	4.1	4.7	6.1	6.7	6.0
Textile	2.9	1.7	1.3	1.5	1.9	n.a.	2.8
Total amount of capital construction investment in industry (billion yuan)	25.078	72.803	21.018	54.151	97.797	76.567	27.049

Source: See Table XIV.
Note: See Table XIV.

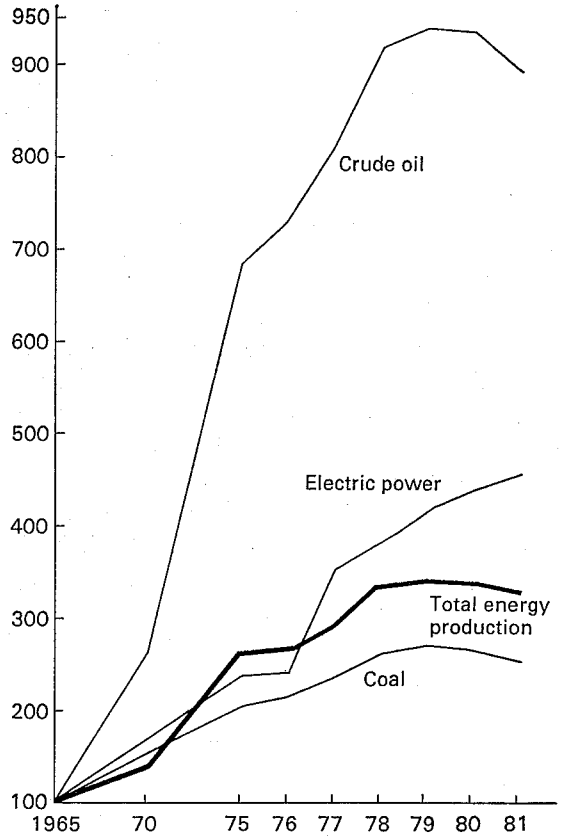
of the basic materials industries sector gives rise to an increase in demand for investment in the energy sector while at the same time bringing about expansion of the machinery assembly and processing industries. Furthermore, this process leads to expansion of the consumer durables industry, which in turn further stimulates the materials sector. This was exactly the case in Japan's rapid economic growth. Since, for lack of a capital market, China is without a mechanism for automatic adjustment of investment distribution, decisions on these matters must be made by the government.

One reason why China's basic construction investment distribution has been so rigid and inflexible has been the adherence to a policy of always giving priority to the iron and steel sector (the *yi gang wei gang,* or "steel as the key link," policy). Not only has the metallurgical industry been given the largest share in investment distribution, but in the formulation of state plans the first step has always been to set the goals for crude steel production. In the period of the First Five-Year Plan, 156 large-scale heavy industry projects in various sectors formed the backbone of the plan, but in the following Great Leap Forward period the planning process centered on steel. In the period of readjustment in the early sixties, when an "agriculture first" policy was adopted, planning started with agriculture, then proceeded to light industry and only then took up heavy industry, but that change in planning approach was short-lived, and was followed by a reversion to the method giving priority to steel production under the Third Five-Year Plan. The latter approach was maintained up to the second half of the 1970s [16].

In the Cultural Revolution period, in addition to the *yi gang wei gang* policy, political pressure was exerted to raise growth rates. Whether or not one approved of the "high speed" associated with the Great Leap Forward period was taken as the criterion for distinguishing between the "two lines" of economic construction, i.e., the capitalist line and the socialist line, and those who were in favor of adjustment and balance were labelled "right opportunists" [42]. In such an atmosphere, individual production units were under intense pressure to set high goals even if it was unlikely that they would be able to attain them, and so-called "counter planning" (the spontaneous formulation of plans by the enterprises themselves which set goals beyond those prescribed by the national planners) came to play an important role. As the planning goals set at lower organizational levels were further padded at each stage until they were eventually totalled at the higher governmental levels, the final national plans turned out to be grossly inflated.

With national planning commencing with the setting of high production goals for crude steel, other sectors in turn had their goals set higher than would otherwise have been the case through the operation of "emulation," with the result that the overall plans were characterized by a state of extremely high "tautness." Because of such unrealistic planning, serious inconsistencies arose in the supply of materials, and *quekou* ("gaps") between the plans and the actual production situations became everyday occurrences. As a result of the kind of abuses described here, economic planning in China became completely divorced from reality, to the point where, in fact, the planning authorities themselves

Fig. 6. Energy Production (Index for base year 1965=100)



Sources: *Zhongguo jingji nianjian, 1981* [45]. Total energy production is estimated by Seiichi Nakajima [27].

Note: The index for total energy production is based on conversion of coal, oil, natural gas, and hydroelectric power to standard coal equivalent, and noncommercial energy is not included.

Statistical data are not available for the period 1965–75, except for the years 1965, 1970, and 1975.

were unable to determine what the situation of the economy was. It is only since they have been actually faced with bulging inventories and government finance and international payments crises that the results of mismanagement have become manifest.

At the present time oil production in China has hit a ceiling (Figure 6), and there is a great to-do about an "energy crisis." Among the background factors is human error arising from the inadequacies of the planning system. In the early seventies the whole country was visited by an oil boom, crude oil production increasing by over 20 per cent a year on the average. In this situation there was a tendency for "proved" oil reserves to be overestimated wherever

exploration took place. If one test boring at a particular place happened to yield good results, this was immediately reported to the central authorities, and they lost no time in formulating oil supply and demand outlooks based on the assumption that a major oilfield would materialize at that spot. When the results of the second and third test borings fell far below expectations, the situation turned sour. Classic examples are the Renqiu oilfield on the northern part of the North China plain and the illusory natural gasfield in the Sichuan basin. This is one of the reasons it became necessary to revise crude oil and natural gas production goals downward after 1978. At the same time, on the basis of slipshod and overoptimistic production planning, a domestic switch from coal to oil as the main source of energy took place around 1972–73.[6] The subsequent sharp increase in oil consumption for fuel purposes and the introduction of numerous petrochemical plant facilities from abroad set the stage for the present "energy crisis."

Another of the reasons for such rigidity of distribution of capital construction investment is organizational inadequacies. Management of investment funds in China is the responsibility of central government ministries in charge of the different industries, either directly or through local governments. Such separate management for different sectors makes it difficult to adjust investment between different industries since the individual sectors feel that their allocations are vested rights that they should protect against change. Because of the difficulty of adjustment between sectors, general autarkic attitudes within individual sectors are strengthened. Furthermore, the central government and local governments are also always squabbling over authority to authorize investment, and they tend to act as patrons of the sectors under their direct control. It is these competitive frictions on the part of individual sectors and levels that are at the root of such oft-mentioned problems as redundant investment and redundant import of industrial machinery and equipment.

B. *Regional Distribution of Investment*

Besides the problem of distribution of investment among different sectors, there is the problem of its regional distribution. The following considerations have been involved in Chinese regional development policy since liberation.

(a) The need to reduce the gap in development between coastal areas and inland areas and particularly areas populated by ethnic minorities.

(b) The need to minimize labor expenditure in the production process by minimizing transportation costs. This requires the location of industry near its sources of raw materials. (This is consistent with the policy of emphasizing development of inland areas, which are characterized by high resource endowment.)

(c) National defense. It is strategically safer to locate the bulk of the country's industrial power in inland areas.

(d) The need to enhance the self-sufficiency of individual regions.

[6] At present, 30–40 per cent of annual crude oil production is said to be used for fuel. See [17] for detailed background.

TABLE XVI
DIFFERENCES IN REGIONAL INVESTMENT COSTS

	Inland Areas	Coastal Areas	Nationwide
Amount of investment per ton of production capacity of crude steel (yuan)	3,000	1,000	—
Average amount of investment per 1,000 kw of installed capacity (1,000 yuan)	952	—	833
Amount of investment for construction of 1 km of railway (million yuan)	3–4 (Chengkun-Xiangyu Railway)	generally 1/3 to 1/4 of inland cost and sometimes as little as 1/7 to 1/8 thereof	—
Marginal capital output ratio (1953–78)	2.415	1.03	—

Source: Chen Dongsheng [4].

TABLE XVII
INLAND ECONOMIC DEVELOPMENT

(%)

	Inland Areas	Coastal Areas	Nationwide Average
Average annual increase in industrial production (1952–78)	11.6	9.9	10.5
Change in share (of nationwide total industrial production) (1952→1978)	29.2→36.7	70.8→63.3	
Change in share of steel, coal, electric power, machine tools, cement, cotton yarn, paper, and other main industrial products (of nationwide total industrial production) (1952→1978)	8–30 ↓ 36–60	70–92 ↓ 40–64	

Source: Li Yue [19].

Although these four considerations have in principle been applied, they have not been applied to the letter at all times. If they had been, investment would have been spread too thin geographically, and the merit of a division of labor between regions on the basis of comparative advantage would not have been realized. Although in the long run location of industry near its source of raw materials can be expected to pay off, this policy involves tremendous investment in the initial period (due to the infrastructural inadequacies of inland areas) and hence poor investment efficiency (Table XVI). This is why regional development policy has been so unstable.

Let us, however, consider what was accomplished in this respect during the last three decades. During that period approximately 40 per cent of the total amount of capital construction investment nationwide was in inland areas, including ethnic minority regions [28]. The regional breakdown is indicated in Tables XVII and XVIII. As can be seen, a decline in the relative investment importance of East China and the Northeast, where industry had traditionally been concentrated, was accompanied by a corresponding rise in the relative importance of such inland areas as the Central-South, the Southwest, and the Northwest.

TABLE XVIII
DISTRIBUTION OF INDUSTRIAL PRODUCTION BY REGION
(%; by value)

	1952	1957	1965	1978
East China	40.7	36.3	36.2	36.33
Northeast	22.5	23.5	21.4	17.76
North China	14.1	15.1	16.5	16.21
Central-South	13.3	14.3	14.3	17.00
Southwest	6.6	8.4	6.7	7.35
Northwest	2.8	3.4	4.7	5.35

Source: Liu Zaixing [23].

Since the development of inland areas, including regions inhabited by ethnic minorities, is to a certain extent a matter that concerns the country's political ideals and should also be viewed with a long-term economic perspective as well, it would not be fair to overemphasize the problem of investment efficiency. What follows is a consideration of the problems connected with the policy of regional autarky and national defense.

1. *Regional autarky*

The point of departure for regional autarky was a pronouncement by Mao Zedong in August 1958 during the period of the Great Leap Forward to the effect that the respective regions should find ways of establishing independent industrial systems and, *"if the conditions are right,"* first establish comparatively independent industrial systems in the zones of cooperation "according to their *concrete circumstances*" and later in the various provinces (italics added) [25]. In the period of the Cultural Revolution, when Mao's authority became absolute, political pressure began to be exerted for uniform application of this policy. Ignoring the qualifications—"if the conditions are right" and "according to their concrete circumstances"—the exponents of this policy demanded that independent industrial systems be established even in counties and prefectures below the provincial level. By the mid-seventies application of this policy became still more thorough, with the requirement being that each major economic region be self-sufficient with respect to all or most of its steel, fuel, and general machinery needs and that each province and autonomous region be self-sufficient with respect to ordinary consumer goods [4, p. 33]. As indicated in Table III, this resulted in a maze of local smaller industries and clear waste of resources as exemplified by the existence of motor vehicle plants in every province.

The policy of regional autarky also had a great influence on investment trends in the energy and transport sectors. For the promotion of local industry, it was necessary to provide coal and means of transportation. The main obstacle to the provision of these necessities was the paucity of coal resources in the nine provinces and near major cities south of the Yangtze River (Hunan, Hubei, Jiangxi, Jiangsu, Fujian, Zhejiang, Guangdong, Guangxi, and Shanghai). Table XIX compares the coal resources south of the Yangtze (the "Jiangnan" region) with those of Shanxi Province, which has the richest coal deposits in the country.

TABLE XIX
COAL RESOURCES OF SHANXI PROVINCE AND JIANGNAN REGION

	Shanxi	Jiangnan
Confirmed reserves	1/3 of nationwide total (200 billion tons)	1.8% of the nationwide total
Production (1979)	More than 100 million tons	Approx. 70 million tons
Development investment per ton	62 yuan	103.95 yuan
Average thermal value per ton	7,000 kcal or more	2,300–3,500 kcal
Cumulative amount of investment (1950–78)	2,815 million yuan	6,418 million yuan (3,900 million yuan during 1966–79)

Sources: Zhang Siping [44]; and Ma Hong and Sun Shangqing [24, p. 669].
Note: "Jiangnan" refers to south China (China south of the Yangtze River).

In terms of national energy strategy, development priority seemingly ought to be given to North China and particularly Shanxi Province, which not only produces the largest quantities but also the best quality coal. However, because of the need to promote regional industrialization, this would mean the traditional pattern of transferring coal from the north to the south (*beimei nandiao*) must be continued and even intensified. Furthermore, such a pattern would not necessarily be economically rational for that part of China below the Yangtze. For instance, whereas coal can be produced at 30 yuan per ton in small mines in Guangdong and Guangxi provinces, the cost per ton of Shanxi coal mounts to 100 yuan when transport to Foshan in Guangdong Province is added in and 120 yuan when transport to Liuzhou in Guangxi Province is included [48, p. 14].

As long as the policy of regional industrialization was maintained, there were two policy choices. Priority could either be given to development of North China and particularly Shanxi Province and to increased investment in the transportation sector in terms of railways and port facilities, or to developing coal in the Jiangnan region despite the lower investment efficiency in that sector, but with savings realized in investment in the transportation sector. The choice fell to the latter option. As indicated in Table XIX, a considerable portion of the investment in coal development went into the area south of the Yangtze after 1966. As a result, development of the coal-rich North China region was postponed, and existing large coal mines became outdated because of neglect of maintenance and repairs. The main reason it has been necessary in recent years to lower the rate of increase of coal production is the need for improvement of existing mines (see Figure 6).

The reason why priority development of coal in the Jiangnan region was opted for is probably to be found in the view that investment in reinforced railroad transportation between North and South China was not feasible, at least not to the extent required. Besides the difficulties in increasing railroad construction investment substantially in view of the priority given to manufacturing industries in the overall allocation of capital construction investment, after the beginning of the Cultural Revolution construction of new railways came to be concentrated in such inland areas as the Southwest and the Northwest because of the

so-called third-front construction strategy explained below. The statistics show that approximately 80 per cent of the investment in construction of new railways during the period in question was accounted for by areas west of the Jing-Guang Line (Beijing-Zhengzhou-Zhuzhou-Guangzhou) [10]. Not only did construction of new lines in the Southwest and the Northwest result in considerably higher construction costs (see Table XVI), but investment for improvement of the transportation capacity of existing lines east of the Jing-Guang Line through repairs and modifications was cut to only about 10 per cent of the total amount of investment in the railroad sector, despite the fact that China's north-south transportation network is concentrated in the area east of that line, an area which accounts for 70 per cent of nationwide railroad transportation demand [24, p. 396]. As a result, in the seventies, when capital construction investment was stepped up, the entire Chinese economy was adversely affected by the inability of north-south transport facilities to meet the demand.

The policy of regional autarky cannot be condemned outright as many factors, both economic and noneconomic, are involved including the problem of railroad transportation—one of the weakest links in the Chinese economy — national defense strategy, and the instability of the country's system for supply of materials. The problem is that this policy was administered according to uniformitarian political thinking that did not take into account economic costs. The result has been a waste of resources and an "equalization of poverty."

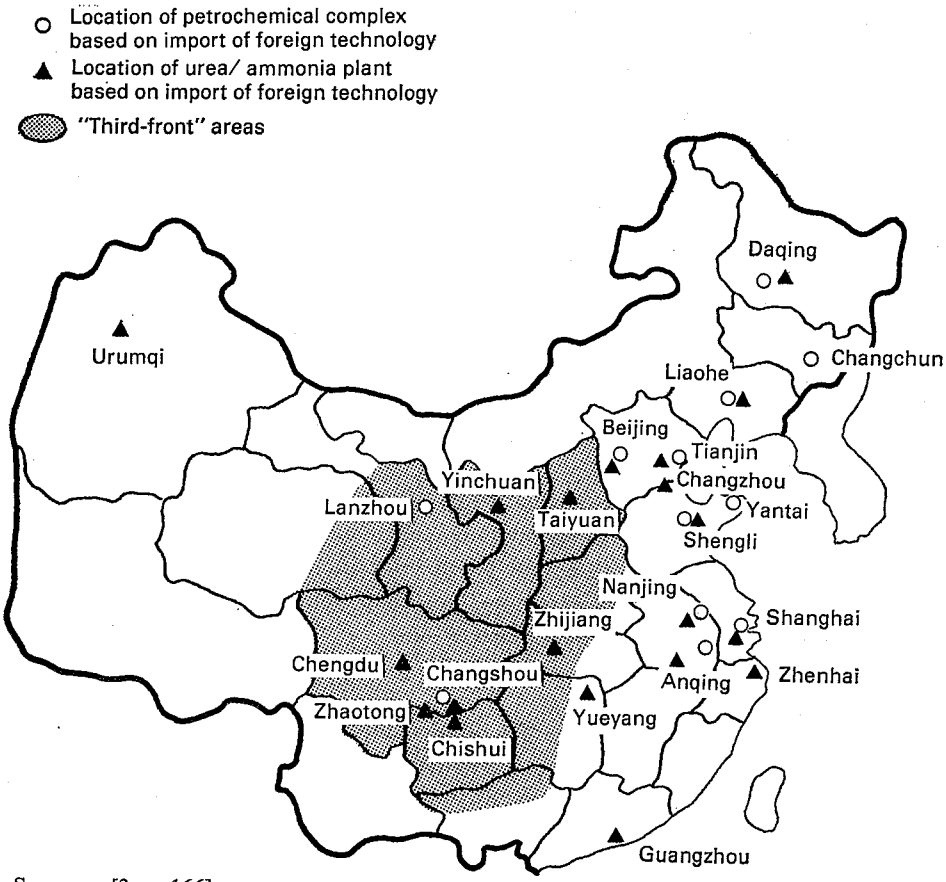
2. *The national defense problem*

The priority given to inland areas in development strategy has been closely linked to the perceived need to strengthen national defense, this trend being particularly pronounced after 1965 with escalation of the war in Vietnam by the United States.

The percentage of government spending represented by national defense expenditures averaged 20.2 per cent during the 1950s, disregarding the Korean War years. It is not clear what it was during the 1960s, but it averaged 16.4 per cent during the period 1977–81, the average for 1977–80 being equivalent to 5.1 per cent of gross domestic production. No one would, of course, equate the figures given for "national defense expenditures" with China's total military spending. Research institutes in the United States and Western Europe have made many estimates of the actual portion of the Chinese national economy represented by military and related expenditures, including everything from the country's gigantic defense industry to the shelters that have been built in all major Chinese cities since the late sixties and the expense of maintaining militia forces, but none of these estimates can be said to be very well founded.

Our interest here lies in the impact the various measures taken since 1965 to strengthen the country's military posture have had on the Chinese national economy, such measures consisting primarily of a buildup of defense industries and decentralization of the country's industrial power to inland areas. The "third-front construction strategy" is said to have been adopted in 1964, the term "third front" applying to those areas which could serve as rear bases for

Fig. 7. Petrochemical Projects Involving Import of Foreign Technology



Source: [3, p. 166].

withstanding enemy attacks. Such inland areas as the Southwest, the Northwest, and the western parts of Hunan, Hubei, and Henan provinces as well as Shanxi Province were known as the "main third front" and the term "minor third front" referred to mountainous areas throughout the country that could be used as refuges for dispersed Chinese military forces. The idea was to locate the country's heavy industry and defense industries in such areas in order to make the country's basic industry less vulnerable.

"Third-front" construction appears to have taken place on a substantial scale. Many plants that, from the standpoint of transportation, availability of raw materials, and access to consumer areas, would ordinarily be expected to be located more centrally and in large cities and even plants that had already started operating at such locations were located or relocated in inconvenient remote mountainous areas [12]. Large-scale projects were included in the "third-front" strategy, well-known examples being the Second Motor Vehicle Plant (at Shiyan City, in northwest Hubei Province), the Panzhihua Steel Complex

(at Dukou City on the border between Sichuan and Yunnan provinces), the Liupanshui Coal Mine in Guizhou Province, the Guiyang Ironworks, and the plant extension scheme of the Chengdu Seamless Pipe Plant.

Large-scale plants imported from abroad were also affected. Figure 7 shows the locations of such plants built in "third-front" areas. National defense considerations have not taken precedence in all cases, however, some of these projects having been implemented near sources of raw materials, as in the case of projects in Sichuan Province using natural gas. Still, it has to be admitted that it is hard to justify such projects as the large urea and ammonia fertilizer plant at Chishui in Guizhou Province and the color television picture tube manufacturing plant at Xi'an in purely economic terms. The plant at Chishui, which was by no means resource-bound, was dependent on natural gas supplied from Sichuan Province and was very slow in getting into operation when the natural gas supply plans went awry. And it is hard to understand why a picture tube production plant should have been built at a place like Xi'an, so far removed from the TV set assembly plants at Beijing, Shanghai, and elsewhere and plagued by fine wind-blown sand and dust—certainly not the kind of ambient conditions one would normally select for the manufacture of precision items.

An example of a project implemented in a "minor third-front" area is the Beijing Yanshan Petrochemical Complex based on plant facilities imported from Japan and West Germany. That complex, located deep in the mountains outside of Beijing has a bizarre layout in that its individual plants are cut off from one another by mountains instead of being closely grouped together.

Since "third-front" projects do not involve military industries alone, it is hard to get an exact idea of their scope and scale. According to figures published by the Chinese themselves, however, such projects accounted for half of the total nationwide capital construction investment in the twelve-year period from 1964 to 1975. Other figures indicate that in the fourteen-year period from 1966 to 1979 "third-front" construction investment amounted to 170 billion yuan, or more than 40 per cent of total nationwide capital construction investment for that period. As far as general inland investment is concerned, after 1965 there was an increase of more than 60 per cent over the pre-1965 period.[7] With such a sharp increase in inland investment, the industrial capacity of "third-front" areas was considerably raised, such areas coming to account for over one-third of nationwide industrial fixed assets, 34.4 per cent of nationwide crude steel production (as compared to 14.2 per cent in 1952), 64 per cent (52.1 per cent) of nationwide coal production, 45.3 per cent (35.7 per cent) of nationwide electric power generation, and 37.2 per cent (17.5 per cent) of nationwide cotton yarn production by 1978 [43, p. 28].

Naturally, military industries can be expected to represent a high percentage of the industrial fixed assets in "third-front" areas. The Chinese themselves admit that many military industries are missing from the Chinese Standard List of Production Branch Classifications [31, p. 19]. Although military industries are

[7] The sources of the data here are the articles by Ding Hua and Wu Xingguo [8], and Xue Baoding [1].

included in the calculation of industrial fixed assets, a considerable portion of them is considered to be excluded from the statistics for industrial production (particularly weaponry based on vanguard technology). Sichuan Province, for instance, ranks fifth among China's provinces in terms of gross industrial production and second behind Liaoning Province in terms of industrial fixed assets (1979) and is well-known for the high percentage of its industrial production accounted for by military industries.

The size of military industry can perhaps be more clearly conceived in terms of the stock of machine tools. As of 1978 China had 2,670,000 machine tools, and about 10 per cent of that number was accounted for by military industries. Furthermore, most machine tools used in military industry (70 per cent) are large, high-precision ones equipped with numerical control facility. In Yunnan, Jiangxi, Henan, and Shanxi provinces not only do military industries account for 20–30 per cent of the stock of machine tools, but they also enjoy considerable preferential treatment such as priority allocation of imported facilities and priority assignment of highly skilled technicians.[8]

Although little is known about Chinese military industries apart from such fragmentary information as the above, they can no longer be disregarded in considering the Chinese economy. Indeed, "third-front" industrial construction and construction of military industries may be seen to have had an adverse effect on Chinese economic efficiency, when we consider, for instance, that the marginal capital output ratio for "third-front" areas has been a high 3.91 as compared to 1.03 for coastal areas and 2.415 for inland areas as a whole [4, p. 31] (see also Table XVI). Certainly "third-front" construction has to be taken into account when considering why investment efficiency declined during the period of the Cultural Revolution and into the seventies.

CONCLUSION

The process of Chinese industrializatoin has been marked by both quantitative aggrandizement as well as enormous cumulative waste, and in view of the great number of factors involved, it is difficult to make a balanced overall assessment of the situation. Nevertheless, I do not agree with the present-day contention of Chinese economists that the Chinese economy should be evaluated solely from the standpoint of economic efficiency, for it is necessary to take into account the handicaps that it has had to cope with since liberation in terms of a warped industrial structure and interregional disparity dating back to pre-liberation days and to bear in mind considerations of national security.

Considering the burden posed by the country's geographical vastness and the great disparity between its different regions, it seems to me that application of the methods of micro- and macroeconomic assessment should also be varied depending on the region under study rather than trying to impose unrealistic standardized criteria of evaluation. Although investment efficiency has been poor

[8] For the data here, see Jingji-jiegou-diaocha-yanjiuzu (Group for Surveys and Research on the Economic Structure) [18, p. 63], and Huang Qiuyan [11, p. 81].

from a short-term point of view, in the long run the large amount of investment that has taken place in the capital goods sector and in the development of inland areas could have a salutary effect.

Even given the above reservations, however, one can still retain doubts about Chinese industrialization policy. I, for one, cannot help thinking that in spite of the limited options open to development policy a somewhat better choice could have been made. The high industrial growth rate since the fifties can be ascribed above all to the mobilization of the hitherto unused resources of the inland "frontier" and the rural areas. In the process, China has failed to make efficient use of its scarce resources because of the irrationality of the planning mechanism resulting from the administrative system of control of its "command economy" and because also of political irrationality in the form of far-left policies and political instability.

Since the beginning of the latter half of the 1970s China has been making little progress in its "frontier" development, and a deterioration of economic efficiency has wiped out the positive effects of a heightened growth rate. This being the case, it has proved necessary to readjust investment distribution and to conceive the renewal of the existing industrial capacity as the country's "new frontier," an approach China adopted in laying out the policy of "economic readjustment" in 1979. The goal of economic development strategy having now been changed from extensive development to intensive development, China is embarked on a new experiment to see whether it can continue to move its economy ahead on the new basis without producing new social tensions against a continuing background of tremendous population pressure.

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