

THE PETROCHEMICAL INDUSTRY IN CHINA - GOVERNMENT REGULATION AND DEVELOPMENT POLICIES¹

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*“Crossing the river by touching stones”
Deng Xiaoping, speaking of the reform policy*

Abstract

This paper describes the history of the Petrochemical industry in China after the Second World War. Analysis of the political foundations for the regulatory policies that shaped the industry is followed by a detailed review of the role and responsibilities of various government bodies in the decision making process. The paper refers to the three fundamental political decisions in China, related to the political system, the macroeconomic policy, and the crude oil prices. A critical analysis of the price reforms in the 90's, and the alterations in the corporate structure and the distribution system, leads to conclusions on the effectiveness of regulatory policies at different stages of planned industrial development.

1. Introduction

The petrochemical industry is one of most important fundamental industries in the Chinese economy. In the latest Five-Year Plan (1996-2000) the petrochemical industry is placed at the heart of China's economic development program (Ren Min Bao, 1996). The main questions, addressed in this paper are: What were the main factors that have determined the evolution of China's petrochemical industry? What was the role played by the Government in promoting the industrial development of this sector?

We discuss the history of the petrochemical industry, and examine the current problems and constraints for its development under the central planning system. We also examine the relationship between the Government and the industry, including formulation and implementation of Government policies. The emphasis is put on the fact that future development can only be fully understood when placed in the historical context of the economic reforms in China.

We look at the Government's direct and indirect interventions, and their effect on investments and enterprises performance. The direct Government intervention in the industrial development is conducted through the State Investment Plan. The indirect regulation is conducted through implementation of industrial policies, management of incentives to firms, relative pricing, and the administrative marketing and distribution introduced to the sector with the establishment of the state corporation *SINOPEC*.

We also discuss the policy problems under the central planning system, and analyze the current situation of the petrochemical industry.

The study is based on both primary and secondary data. The collection of primary data

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includes face-to-face interviews with executives from the industry. The interviews in China were conducted with officials from the Ministry of Chemical Industry, the president of *SINOPEC* Sheng Huaren, and several top government consultant agencies. The interviews in the UK were conducted at a petrochemical conference with chief executives and strategists of large petrochemical companies.²

2. The Nature of the Petrochemical Industry

There are significant difficulties to define the boundaries of the petrochemical industry because of the complexity of its operations, and the diversity of its products. So far, the broadest definition of the industry is in terms of its raw material basis. Thus petrochemicals are those chemicals that are manufactured from feedstock, and are obtained from oil or natural gas.

The complexity of the petrochemical industry is illustrated by the fact that, the definition covers products as varied as *basic petrochemicals*; *intermediate products* (manufactured by combining basic products, and/or by making these to react with other chemical compounds); and *finished products*. The precise terminology of finished products varies from one set of national statistics to another, but petrochemicals generally include *plastics*, *resins*, *synthetic fibers* and *organic chemicals*.

The operation of the industry typically involves linked and sequential processes. The manufacture of basic petrochemicals is the first stage in the conversion. Generally speaking, basic petrochemicals and intermediates are associated with transactions that are internal to the industry, whilst finished petrochemical products usually are integral parts of other industrial sectors.

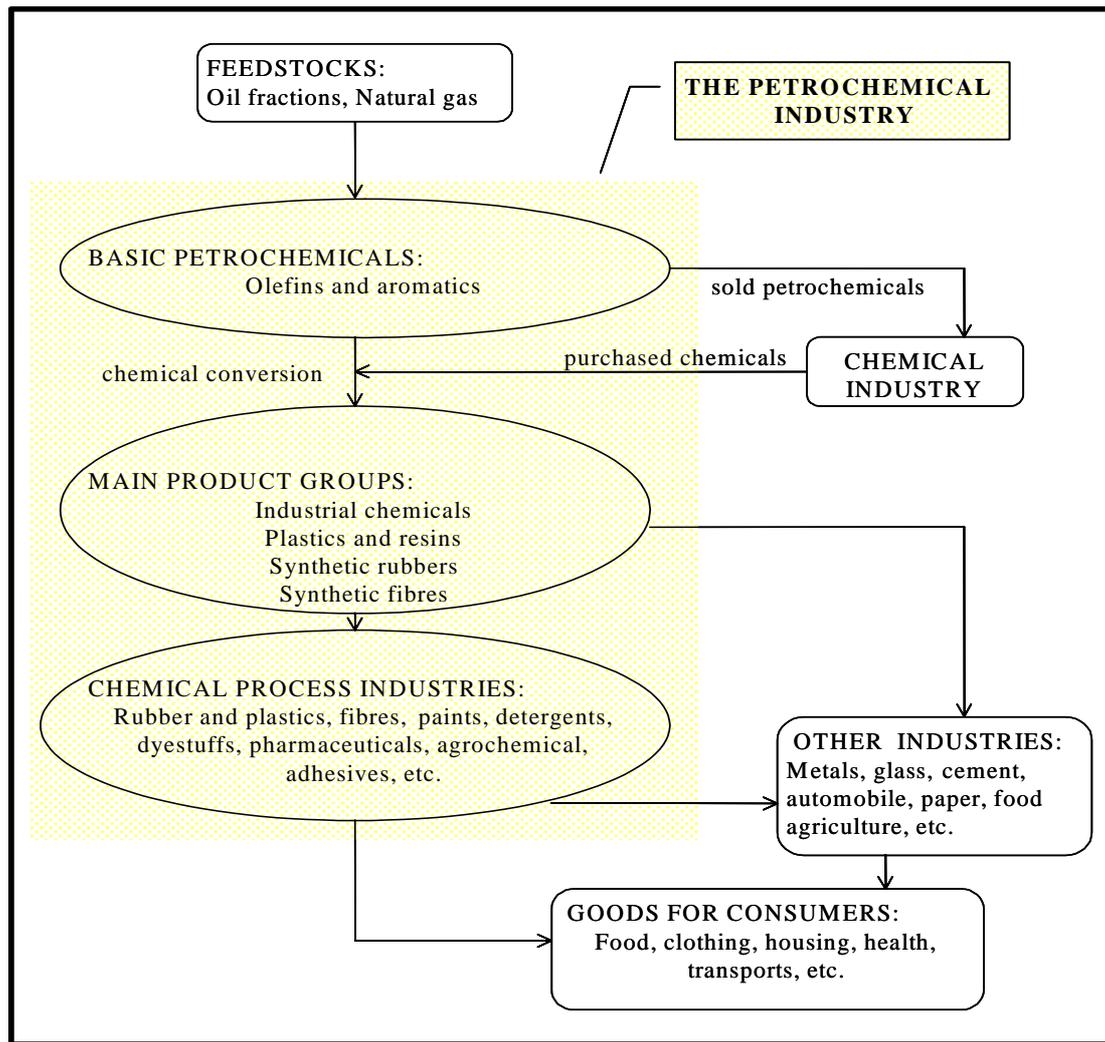
Even though the range of products is vast, the total volume of output is dominated by relatively few of them. Well over half of the total output by weight of the world petrochemical industry is in the form of plastics and resins, and this broad group together with synthetic fibers and synthetic rubbers accounts for more than three-quarters.

The petrochemical industry embraces numerous activities with highly complex inter-relationships. Figure 1. represents the boundaries of the petrochemical industry, and the relationships that it maintains with the other sectors of the economy. At the upstream end, it obtains its feedstock from the natural gas and oil refining industries. However, the distinction between the petrochemical industry and the other sectors at the downstream end of the processing chain is not always clear.

At the upstream end, petrochemical activities are often integrated with oil refining at one production site, and the conditions for the petrochemical production are directly influenced by the optimization policy for the manufacturing complex as a whole. The vertical integration therefore includes refining operations and basic petrochemical production. As a result of that, a large share of the trade between the two sectors is a captive trade, influenced in various ways by the overall strategy of the manufacturing complex. Therefore, the term petrochemical industry in our study includes the refining sector as well.

² Bryan Sanderson - Chief Executive of *BP Chemicals*, Ian Bird - Vice President of Government Affairs *Waste Management International Services Ltd.*, Charles Stewart - Executive Vice President of *Occidental Chemical Corporation*, and Andrew Buttler - Director of *Dow Europe*.

Figure 1. The Petrochemical Industry



Source: Adapted from Shell International Chemical Co.

3. The History Of The Petrochemical Industry in China and Patterns of Industrial Development and Government Policy Implementation

*** The Self-Reliant Policy and Industrial Development 1950s-1970s**

The principles underlying China's policies during Mao's leadership included Independence and self-reliance; equality and mutual benefits; supplying each other's needs. These were the fundamentals in most political decisions from the Maoist period, when the foundations of the Chinese economy were built. The petrochemical industry was established in the early 60s. Most of the equipment was bought from the Soviet Union, and consisted of onshore oil well-drilling equipment. These technological purchases accounted for 70% of the total imports in 1955, 71% in 1956, and 88% in 1957. After this period, the import of drilling machines declined steadily: 49% in 1958, 35% in 1958, and 29% in 1960. By 1960 China was able to provide most of its own drilling machines for onshore exploration, and the most important items for an import became oil refinery plants.

During the 60's and 70s, China changed its choice of partners and started importing plants, equipment, and technology from the United Kingdom, France, the United States, Italy, Germany, and the Netherlands. During this period, more positive relations were developed with Japan, and after 1970 Japan became the major foreign supplier of plants and technology for the petrochemical industry in China.

From the changing pattern of equipment procurement, which was totally planned and controlled by the central Government, it would appear that the long term objective for the Chinese petroleum industry was not to export crude oil in huge quantities, as the OPEC countries have tended to do in the past, but rather to expand China's petrochemical industry. As a result of that the petrochemical industry in China became one of the most significant industries during the 1980s.

Unfortunately, there was little geographical planning by the Government in order to choose the location of these plants, and that resulted subsequently in high transportation costs and in difficulties to control the industry.

*** *The Acquisition of Foreign Technology During the 70's***

The purchase of petrochemical plants became a major import item for China during the 1960's and 1970's. The Italian State Petroleum Company - Ente Nazionale Idrocarburi (ENI), supplied the first set of oil refining equipment from Western Europe. A contract between Italy and China was signed in Beijing in December 1963 for an integrated refining plant with an annual capacity of 300,000 tons, at a cost of \$8.9 million (US dollars). In the following year China signed another contract for two more plants at the cost of \$14.2 million (US dollars) (see Table 1.).

In the same year, France sold to China two plants at a price of \$7.2 million (US dollars). The Netherlands supplied three plants for \$10.5 million (US dollars), and Norway provided a naphtha refinery for \$14 million (US dollars). In July 1964 West Germany sold to China an integrated plant for heavy oil-cracking and olefin separation, at a price of \$12.5 million (US dollars), followed in 1964-65 by two other plants at the total cost of \$12.5 million (US dollars) (see Table 1).

In 1963, China prepared a contract with the *Kurashiki Rayon Company* of Japan to supply an integrated vinyl plant. The contract for the \$20 million (US dollars) plant was signed but not executed because the Japanese Government refused to grant the required export credits to the Japanese company.

Prior to 1972, the government-financed *Japan Export-Import Bank* denied all credits for trade with China. The large-scale acquisition of Japanese equipment occurred primarily after 1970. The Japanese government policy toward trade with China changed dramatically in 1972, and subsequently it offered to China long-term credits at low interest rates. As a consequence, exports of petrochemical plants from Japan to China experienced a tremendous increase between 1972-73. Overall 14 contracts were awarded to Japanese firms with an aggregate value of over \$400 million (US dollars) (see Table 1.).

Table 1. Imports of Petrochemical Plants from the West and Japan, 1963-1974³

Firm	Value (Million US dollars)	Date Contract was signed
Japan		
Tokyo Engineer Chemical	46	December 1972
Mitsubishi Yuka and Heavy Industries.	34	February 1973
Asahi Kasei	30	March 1973
Kuraray Industries	26	March 1973
Mitsui Toatsu	42	April 1973
Toray and Mitsui Shipbuilding	50	May 1973
Sumitomo Chemical	5	May 1973
Mitsubishi Petrochemical	22	July 1973
Sumitomo Chemical	41	August 1973
Mitsui Toatsu Chemical and Toyo Engineering	43	September 1973
Mitsui Petrochemical and Mitsui Shipbuilding and engineering	25	October 1973
Nisso Petrochemical	15	December 1973
Toho Titanium	5	January 1974
Kuraray	19	February 1974
United States		
M.W. Kellogg	73	March 1973
M.W. Kellogg	130	November 1973
United Kingdom		
Humphery and Glasgow	8.4	October 1963
Simon Carves	12.6	September 1964
Vickers Zwimmer	7	March 1965
Humphery and Glasgow	23.8	August 1965
Prine	8.4	September 1965
Former West Germany		
Friedrich Unde Gmb H.	1.75	July 1964
Lurgi-Gasellschaft	11	May 1965
Uhde	19	January 1974
Uhde	15	March 1974
Italy		
Monticattini	14.2	December 1963
Snam Progetti	5.55	1966
Snam Progetti	16	January 1974
France		
Speichem	90	May 1973
Technip and Speichem	282	September
Huertey Industries	120	February 1974
Netherlands		
Kellogg Continental	34	February 1973
Kellogg Continental	55	September 1973

In September 1973, the largest and most impressive single contract was granted to a French consortium at the value of \$300 million (US dollars). The entire project involved 17 plants. From the perspective of US trade, the most significant development in 1973 was the order by the Chinese Government to *M.W. Kellogg*, a division of *Pullman, Inc.*, for eight ammonia plants at the value of \$205 million (US dollars) (see Table 1).

The imports of petrochemical plants together with the advanced technologies, peaked in 1973 when more than 1 billion (US dollars) worth of petrochemical plants were contracted. The

³ **Sources:** *Japan External Trade Promotion Organisation*, China News Letter, March 1974, Tokyo; *Japan Times* (various issues), Tokyo; *People's Republic of China International Trade Handbook*, Central Intelligence Agency, September 1974, pp. 16-17; *US China Business Review*, January -February 1974; *Yearbook on Chinese Communism*, (1973) Institute for the study of Chinese Communist Problems, Taipei, pp. 56-58.

extensive procurement of foreign equipment for the petrochemical industry corresponded with the concerted efforts by the Chinese officials to accelerate the acquisition of the latest technology from the West and Japan. The petrochemical industry is a capital-intensive and technology-intensive industry. In order to avoid foreign participation in the industry, China started to purchase equipment and technology, and the foreign currency for these purchases was earned from selling crude oil.

Since 1972 Chinese technical delegations have been dispatched to tour the principal oil-producing nations in the West in order to study their experiences in petroleum and petrochemical production. The countries visited for evaluation of equipment manufacturers and negotiations included Iran (1972), Canada (1972), France (1973), the UK (1973) and Japan (1973). Foreign experts were also invited to China, including state officials from Iraq (1971). Between 1972 and 1974, almost all major trade partners in Western Europe held industrial exhibitions in Beijing - overall 32 exhibitions. The Chinese Government mobilized technicians and college students to obtain detailed drawings of the machinery on display as well as to engage in scientific exchanges with the representatives of the major corporations. (Heymann, 1975).

However, the most direct way in which China acquired foreign technology was by making the training a part of the equipment contracts. With respect to integrated plant purchase agreements, arrangements for the training of technicians were made in a five-year exchange of know-how, as well as training for Chinese engineers in the equipment-producing countries. In some contracts with Japan and with *M. W. Kellogg* 20% of the contract value was allocated for technical services (China Newsletter, March, 1974).

The changes in trade orientation were partly a result of the changing domestic demands, but also they were dictated by the changes in international relations. In the early post-war years, the Soviet Union was the sole source of supply. In the 1960s, when China was at odds with both USSR and United States, the European Common Market and Japan became the natural alternatives. The movement towards normalization of the relationships between China and the United States in the 1970s has helped to promote US exports to China. In 1971 China became a full member of the United Nations. In 1972, the US President Richard Nixon made his historic visit to China. At the same time, the diplomatic relationship between China and Japan was normalized.

Another important aspect of the structure of imports during the 70's is the change of China's foreign trade policy, particularly related to intergovernmental credits and payments. During the 1950's China adhered to the principle of balanced trade and declined to accept credits offered by non-communist countries. The ability to import was therefore directly constrained by China's ability to export in a given year. Since 1949 China has managed to maintain a trade surplus, except during the 1951-55 period when China accepted Soviet Union credit to finance her trade deficit.

In August 1972, in a discussion with a Japanese representative, the Chinese Prime Minister Zhou En Lai stated that the Government would welcome exports based on international payments standards, which included the concept of deferred payments for imports. From 1973, most export credits granted by Japan were at an annual interest rate of 6%, with a repayment period of about five years. The acceptance of deferred payments has considerably enlarged China's ability to import. The large-scale procurement of integrated petrochemical plants in 1973 reflected this policy orientation and provided a pattern for the later trade

relations.

The parallel co-existence of state investment in technology imports, and yet retaining the same managerial and labor practices, the same administrative, financial and economic organization that was developed over thirty years of Central Planning, gave roots to problems related to the full utilization of the value of imports. Labor productivity in the industry during the late 1970's and 1980's remained stagnant as the system of lifetime employment provided no benefits for surpassing production targets, or for improving efficiency. Decision-making remained centralized and directives were sent down from higher authorities. The expensive imported refining and petrochemical plants continued during the late 70's and 80's to burn surplus petroleum products rather than to sell them, due to the fact that the horizontal linkages to other potential consumers were not in place.

** Transition During the 1980s*

At the end of the 70s, Deng Xiaoping's 'Open Door' policy was a turning point and affected virtually every sector of the Chinese economy. In December 1978, the Sixth Congress of the Chinese Communist Party overturned the Maoist line of development and started the so called 'Open Door' policy. One evident characteristic of the Open Door policy was the implicit recognition that the imports of technology alone were unable to solve the problems facing the economy.

Regarding the petrochemical industry, the Government attempted to loosen political and economic constraints blocking the modernization of the industry. The new policies gave legitimacy to foreign participation, and led to a rapid development of financial, technical and economic ties with overseas suppliers. More outwards thrust was directed towards the international capital markets for large infrastructural projects. This was particularly the case of the capital-intensive petrochemical industry, which created requirements that were beyond the ability of the Government. While the practice in the past was to pay cash for large equipment purchases, the new commitment to modernization brought the realization that additional development assistance would be needed for large infrastructural projects.

Table 2. Capital Investment in China's Petrochemical Industry, 1978-1983 (*billion Yen*)

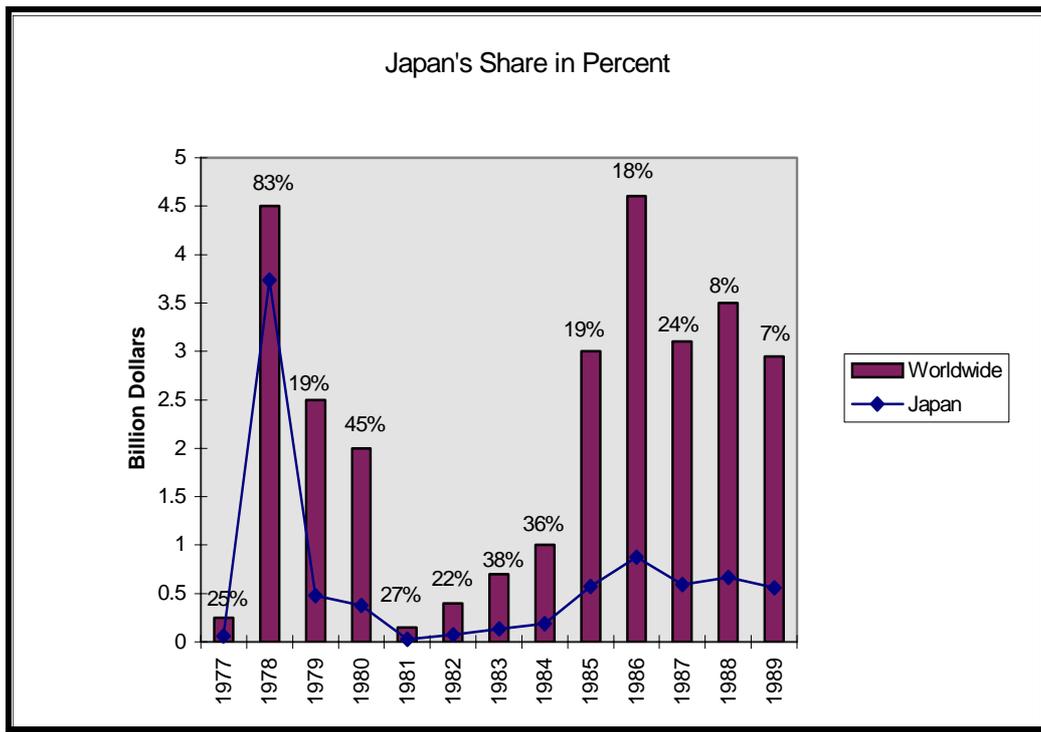
	1978	1979	1980	1981	1982	1983
Refining	0.5	0.5	0.6	0.5	0.4	0.5
Chemical & Fertilizer	3.1	2.9	3.0	1.9	2.6	3.0

Note: In 1983, 1 Yen = \$0.5

Source: China State Statistical Bureau

Several sources of finance were explored. From the World Bank, China received over \$500 million (US dollars) to finance equipment purchases for oil-field surveys and petrochemical production modernization. Additional multilateral aid came from the United Nations Development Program. Bilateral aid was received from several countries, with Japan being the largest donor. Much of the foreign aid was channeled towards 'soft' assistance, including feasibility studies, technical advice, and consultants. Before the world oil prices collapsed in the early 1986, the Government committed itself through the Seventh Five-Year Plan to the figures of \$300-500 million (US dollars) in software expenditures, and \$50-100 million (US dollars) for refining and petrochemicals (Woodard, 1985).

Figure 2. China's Plant and Technology Imports



Source: adapted from Ono, S. (1992) *World Bank Discussion Paper*

Other financial resources have also been mobilized. The Chinese Government floated Yen-denominated bonds in the Tokyo market on behalf of the refining sector, and later on expanded to the Euro-currency market. Domestically, central allocation of investment funds had been reduced in favor of commercial bank loans.

Although the links with foreign capital developed rapidly, China was more hesitant to adopt the Western accounting system. This was because the Government feared that the use of foreign financial analysis and foreign standards would ultimately change the way in which production decisions were made. The Government officials were also aware that the use of foreign accountancy management in purely domestic projects would remain somewhat limited as long as the pricing system remained unchanged.

Foreign participation in China's petrochemical industry provided impetus for a major re-organisation of the management structure of the industry, resulting in the creation of giant centralised corporations to deal with foreign counterparts. *The State Council* established these new corporations to give foreign companies and investors a single entity to deal with. This eliminated partially the confusion arising from overlapping jurisdiction and responsibilities. As a result of this re-organisation the petrochemical and petroleum system was de-centralised and segmented, and responsibilities for the industry policy-making were distributed across several Ministries and Provinces.

The aim of the re-organisation was in part to prevent from the development of multiple linkages between foreign companies and Ministerial or Provincial authorities, thereby strengthening the leverage at the center. In addition, the centralisation enabled the Central Government to wrest control of taxes and re-location of profits from the Ministries and Provinces to State Corporations.

In November 1984, an executive-level *SINOPEC* delegation toured the United States and visited most of the major oil companies and their most advanced refining units. In 1985, the US Department of Energy funded an exchange program with *SINOPEC* that began in late April with an executive-level conference at the East-West Center in Honolulu. These and other contacts have greatly raised the profile of US companies in China's petrochemical construction market, traditionally preserved for Japanese and West European firms.⁴ All these new projects were just the beginning of what will be the substantial involvement of US-based companies in the modernization of China's petrochemical industry.⁵

Wishing to avoid the intrusion of arbitrary political decisions into business negotiations, foreign companies insisted that their interactions with Chinese counterparts be governed by routinised procedures and standardised contracts that are the international norm.

The pressure for change has also been felt throughout the economy. Just as the lack of explicit legal procedures obstructed foreign participation in China, the absence of compatible standards for its economic output hindered trade. Problems developed in integrating imported petrochemical equipment with domestically built equipment based on Soviet design standards from the 1950s. Conversely, the petrochemical exports (a very small part of the Chinese exports) have suffered because of differences in domestic and international specifications. In response to that, China reformed rapidly its domestic standards, adopting 2,500 international standards by the end of 1980's (China State Statistical Bureau).

*** *Internationalisation During the 1990s***

The fundamental transformation during the 1990s was driven by the widespread adoption of foreign norms, practices and standards, and gave a new support to the reform of the industry. The financial, technical, and trade ties with the rest of the world, established by the state Corporations, provided channels for foreign influence. The initial steps towards internationalization were perceived as a way to supplement domestic capabilities.

The internationalization of the Chinese petrochemical industry began initially through the establishment during the 1950s of *SINOCHEM* (responsible for the export of crude oil on behalf of the Ministry of Foreign Trade (*MOFERT*)). The acquisition of foreign technology during the 1960s and 1970s established foreign partnerships, but it targeted mainly the development of the internal market.

⁴ During this short period the contracts or agreements with US-based companies include:

- A 15 - year joint venture with *Sun Oil* to mix and package 50,000 tons of lubricating oil per year at a facility in Shenzhen
- A \$50 million contract with *Kellogg* to upgrade an ethylene facility in Gansu Province
- A \$25 to \$30 million contract with *Kellogg* to build a coal gasification unit in Shanxi province for reducing gas at a steel mill
- Purchase of 24 centrifugal pumps from *Union Pump* for \$1 million
- Process licenses with *SOHIO* (acrylonitrile), *Union Carbide* (low-density polyethylene), and *Chemtex/American Cyanamid* (acrylic fibers)
- Purchase of refinery instrumentation (Provox System) from *Fisher Controls* through a Fisher joint venture in Shanghai
- Purchase of a Spree 1100/72 process control computer for \$1.72 million
- A joint venture between *Fluor* and *Sinopec's Beijing Design Institute* to design, engineer, construct and upgrade refinery and petrochemical plants.

Three other letters of intent for joint ventures similar to the Fluor project with *Bechtel*, *Kellogg*, and *C. F. Braun*.

⁵ Capital investment in China's petrochemical industry averaged at 3 billion (US dollars) (US dollars) Renminbi per year between 1978 and 1983 (about 10% of total industrial investment). Investment in the refining sector added another 500 million Renminbi to this figure, for a total investment in the petroleum downstream sector of 3.5 billion (US dollars) (US dollars) Renminbi per year. (China State Statistical Bureau)

The consolidation at home of *SINOPEC* operations during the 1980s gave the corporation a sound base for its move into the global arena. In 1991, exports of petrochemical products totaled about \$1.42 billion (US dollars) in 1990 and \$1 billion (US dollars) in 1991 which included \$251 million (US dollars) worth of products exported directly by *SINOPEC* (Ono, 1992). The value of imported technology and equipment for the same period was \$750 million (US dollars). Investment in petrochemical construction totaled \$1.3 billion (US dollars, and \$407 million (US dollars) was allocated for modernization projects. In 1991 the Corporation turned over \$3.3 billion (US dollars) to the State, or about \$270,000 more than the target (Ono, 1992).

In 1992, China exported 100 kinds of petrochemical products, totaled at \$1.5 billion (US dollars) (US dollars), including \$254 million (US dollars) worth of products directly exported by *SINOPEC*. That was due to a change in Government policy, announced at the *SINOPEC* Annual Conference in 1992. The Government officials allowed *SINOPEC International* to control about one fifth of China's petrochemical exports. *SINOPEC International* has offices in the US, Japan, Hong Kong, Thailand, Germany, and Ecuador, and has plans to enter the markets in Africa and South America with paraffin and petroleum coke. The fast growing market for petrochemical products in China has been the main attractive feature for a number of joint ventures with foreign partners, which has started to feed back into further modernization and internationalization of the industry.

A very important fact of the period since 1990 is that according to a number of fragmentary reports, there has been almost no significant foreign investment in the petrochemical industry, despite a great deal of publicity regarding prospective joint venture refineries to be built along China's coastline. Official Chinese figures show that some \$44 billion (US dollars) foreign funds were invested in China between 1979 and the middle of 1993 (World Investment Report, 1992). In fact, money from Hong Kong accounts for well over half of this investment, and the overseas Chinese are responsible for 80% of the total investment (Woden, 1993).

4. State Intervention and Regulation

The analysis of Government intervention and impact on the trade and the investment flow internationally has been isolated in the literature on International Trade and Trade Policies. The role of Government decisions and regulatory activities is a fairly neglected area. Regulatory policies, according to Dicken (1992), can be divided into two broad types: *stimulatory policies* (or those that aim to stimulate economic activity), and *regulatory policies* (or those that put constraints in the form of standards, requirements, and permissions).

Stimulatory policies, according to Dicken, are those such as: fiscal or financial incentives offered by the Government to private firms (in the form of either capital grants/loans, or tax incentives); subsidies for labor, or training; state procurement; encouraging technological collaboration between firms through developing an information infrastructure and financial and technical support. In the list of regulatory policies Dicken includes: state ownership of production assets; mergers and competition policies; company legislation; labour regulation; and other elements of the legal framework (Dicken, 1992).

These policies considerably overlap, and the boundaries between them are blurred, as each of

them may reinforce or counteract with the other. State industrial policies may be part of a national economic strategy, or may be individually implemented with a little co-ordination. There is a wide variety of practices within both developed and developing market economies. We will discuss the major types of industrial policies, that were implemented in China, and had an impact on the petrochemical industry.

There are some descriptions in the literature of the complex system of state institutions in China, involved in the process of policy design and implementation (Kornaj, 1992, Child, 1994, Todeva, 1998). However, policy research has been obstructed not only by political factors, but also by fundamental methodological problems stemming from the delayed effects that is experienced by the socio-economic systems. We argue in this paper that the present condition of the petrochemical industry in China is a result of the accumulated effect from state intervention during the entire period after the Second World War.

* ***China's Petrochemical Planning System***

Since the petrochemical industry was founded, the firms in it remained almost exclusively state-owned. Despite the number of industry reforms, the Central Government still exercises a strong degree of control over the sector and a handful of quasi-governmental organisations oversee nearly every aspect of the business operations. The major players in the industry are presented in Figure. 3., and are grouped in two levels: the level of Central Government, and the Ministerial level. At the Ministerial level *SINOPEC* Corporation is presented as the dominant petrochemical producer and distributor. The decision powers of all agents are briefly described in the following sections.

(a) Central Government Level

The *State Council*, headed by the *Premier*, decides on the overall industrial strategies, on major investments, on certification of import quotas for petrochemicals, and for crude oil, and the approval of large projects. All joint ventures in the petrochemical industry typically surpass this level.

The *State Planning Commission (SPC)* in China serves the same purpose as the Public Utility Commission in the US. It is the most powerful state economic agent in China, and is responsible for the formulation and carrying out of the National Economic Plan, for setting production targets for state industries and firms, for setting prices of products, for collecting taxes, and for approving of most of the large investment projects. This structure of responsibilities resembles very much what has been described for the centrally planned economies in Eastern Europe and Russia (Chavance, 1992, Kornaj, 1992, Todeva, 1998).

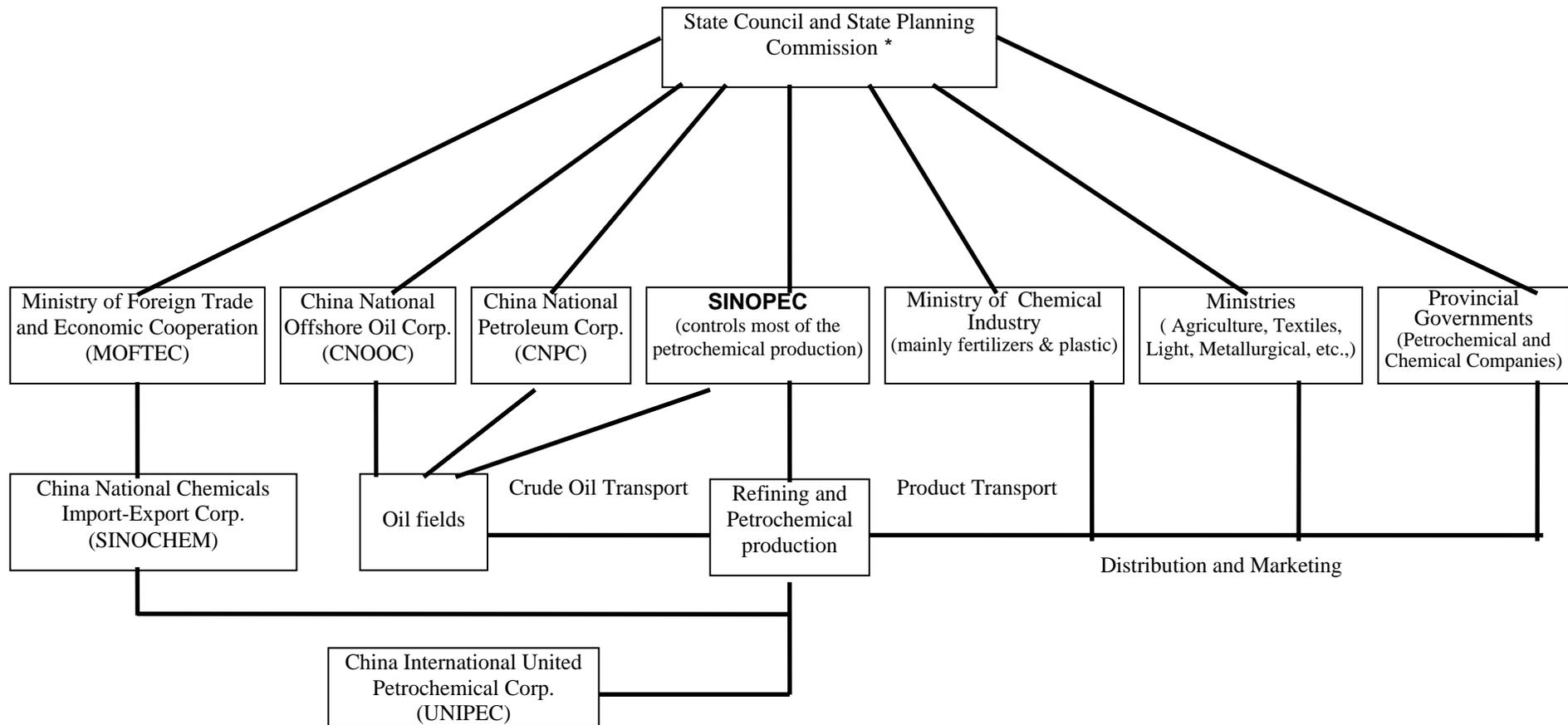


Figure 3. Administrative Structure of the Petrochemical Planning and Production

The *SPC* in China is assisted in its tasks by the *Provincial Planning Commissions*, which report both to the *SPC* and to their Provincial Governor. The most important task that these *Provincial Commissions* perform is the collection of the taxes.

The *State Economic Commission (SEC)* existed throughout most of the 1980s. Its task was to implement the plans, formulated by the *SPC*. It was concerned in the middle of the decade with the issues of technological improvement, management reform, and the national distribution of raw materials and energy (Lieberthal & Oksenberg, 1990). The *SEC* was dissolved in 1988 with many of its functions going to the *SPC* and to the new *Ministry of Materials*.

In March 1993, the *Economic and Trade Commission* was established. It struggled to regain the powers previously held by *SEC*, but this time the task was focused on the conglomeration of state-owned enterprises; implementation of bankruptcy laws; reduction of stockpiles of goods; and improvement of the quality standards in the passenger airline industry. This did not influence the petrochemical industry directly, but indirectly it led to a boom in the petrochemicals-consuming industries (e.g. the aircraft manufacturing and car industries), which extended the demand for petrochemicals at the domestic market.

(b) The Ministerial Level

The most important player at this level is *SINOPEC (China Petrochemical Corporation)*, which dominates the production and the distribution in the industry. *The State Council established SINOPEC in 1983* in order to consolidate the processing and distribution of petroleum products (Table 3.). The establishment of this ministry-level corporation was part of the overall reform of both the industrial economic sectors and the planning system. It enabled the Government to control the immense revenue stream generated by the refining industry, as well as to embark on a national program for refinery upgrade. *SINOPEC* also became the most important link between China's petrochemical industry and the international markets.

Table 3. SINOPEC - Capital Assets (in billion Renminbi)

	1983	1984
Registered Capital	21.8	21.8
Gross Revenues	25.0	27.4
Profit	9.9	11.5
Employees (thousand)	480	500

Note: in 1984, 1 Renminbi = \$0.43

Source: SINOPEC Annual Report, 1992, 1993

SINOPEC, as a dominant organisation in the Chinese petrochemical industry, controls more than 70 subsidiaries and processes about 90% of China's crude oil, gas, and petrochemical products. This includes 38 refineries, 21 basic organic chemical facilities, 15 synthetic fiber facilities, five synthetic rubber plants, three synthetic resin plants, 13 chemical fertilizer facilities, five construction companies, seven research and design institutes, and six trade and sales

organisations (see Table 4.). The overall value of *SINOPEC* fixed assets is at \$15 billion (US dollars).

Table 4. Production Facilities Under *SINOPEC* in 1983

Enterprise	Former Administration
1. Yanshan Petrochemical Co.	MOCI
2. Tianjin Petrochemical Co.	MOT, MOPI
3. Shanghai General Petrochemical Works.	MOT
4. Shanghai Gaoqiao Petrochemical Co.	MOPI, MOCI
5. Yangzi Petrochemical Co.	MOCI
6. Jilin Petrochemical Co.	MOLI, MOPI, MOCI
7. Fushun Petrochemical Co.	MOPI
8. Jinzhou Petrochemical Co.	MOPI
9. Shandong Qilu Petrochemical Co.	MOCI
10. Lanzhou Chemical Industry Co.	MOCI
11. Maoming Petrochemical Industry Co.	MOPI
12. Daqing General Petrochemical Works	MOPI
13. Anqing General Petrochemical Works	MOCI
14. Guangzhou General Petrochemical Works	MOCI
15. Liaoyang Petrochemical Fiber Co.	MOT
16. Sichuan Vinylon Plant	MOT
17. Dalian Petrochemical Co.	MOPI
18. Anshan Refinery	MOMI
19. Linyuan Refinery	MOA
20. Harbin Refinery	Heilongjiang Province
21. Lanzhou Refinery	MOPI
22. Dushanzi Refinery	MOPI
23. Urumqi General Petrochemical Works	MOPI
24. Cangzhou Refinery	Hebei Province
25. Jinan Refinery	Shandong Province
26. Changling Refinery	MOPI
27. Zhenhai General Petrochemical Works	MOPI
28. Jingmen Refinery	MOPI
29. Wuhan Petrochemical Works	MOPI
30. Jiujiang refinery	MOPI
31. Shijiazhuang Refinery	MOPI
32. Luoyang Refinery	MOPI
33. Yueyang General Petrochemical Works	MOCI
34. Dongting Nitrogenous Fertilizer Plant	MOCI
35. Zhijiang Chemical Fertilizer Plant	MOCI
36. Ningxia Chemical Fertilizer Plant	--
37. Qianguo Refinery	--
38. Yiping Chemical Plant	--
39. Daqing Ethylene Construction Headquarters	--

Key to Abbreviations:

MOA	Ministry of Agriculture
MOCI	Ministry of Chemical Industry
MOLI	Ministry of Light Industry
MOMI	Ministry of Metallurgical Industry
MOPI	Ministry of Petroleum Industry
MOT	Ministry of Textiles

Source: SINOPEC Annual Report, 1992

SINOPEC was established as directly accountable to the *State Council* and the *State Planning Commission*, rather than to other Ministries. The rationale for the setting up of such a Corporation included the following objectives: (1) to reduce the competition for key resources and products by bureaucratic ministries; (2) to integrate vertically and horizontally the related industries throughout China; and (3) to increase the importance of financial and economic considerations in management decisions.

Although ministry-level corporations have been nominally separated from the Ministries, virtually all of their staff has been transferred from the relevant departments of the Ministries (in many cases their offices were still within the same buildings). *SINOPEC*'s leadership has been taken almost exclusively from the Ministry of Petroleum Industry and the Ministry of Chemical Industry.

Prior to the establishment of *SINOPEC*, several different Ministries - assigned largely according to the final use of the products (see Table 4.) administered petrochemical processing. In fact, they were closely attached either to individual oil-field administrations (such as Daqing, Shengli, etc.), or to large municipalities (Beijing, Shanghai, Tianjin, Nanjing, etc.), which led to underutilisation of many of the by-products.

Table 4. presents 39 of China's largest petroleum downstream facilities that were placed under the control of *SINOPEC*. The Corporation was effectively given the control of about 95% of China's petroleum refining capacity. The remaining refineries (mainly small capacity units, located near small oil fields) were left under the administration of the *Ministry of Petroleum Industry*. With this restructuring in 1983, *SINOPEC* was also given the jurisdiction over the production of about 85% of China's ethylene, 80% of synthetic fiber monomers, 75% of synthetic rubber, and over 40% of synthetic fiber and plastics. The concern therefore was not with the competitiveness and efficiency of the production units, but with streamlining coordination and control, and achieving economies of scale.

The *China Chemical Import and Export Corporation (SINOCHEM)* is the company responsible for marketing crude oil and petroleum products internationally since 1950's. The firm is an arm of the *Ministry of Foreign Economic Relations and Trade (MOFERT)*. *SINOCHEM* has been channeling foreign exchange earnings from crude oil through *MOFERT* directly into the Central Budget under the control of the *State Council*. *SINOPEC* was not given access to this revenue stream, but was allowed to compete for its share of the potential foreign exchange. This change made the refining sector a key profit center in China's petrochemical industry. However, the competition in crude oil export was undermined by the dual price structure of crude oil and its products.

The China National Petroleum Corp. (CNPC) is China's major producer of crude oil, accounting for 97% of the country's crude oil output in 1992. It controls all onshore fields and shallow-water offshore fields up to 5m deep. The *CNPC* was formed when the former *Ministry of Petroleum* was dissolved in 1988 - an action that intended to streamline bureaucracy and to rationalise oil production operations.

The contracting agent for *CNPC* in its cooperation with foreign companies is *China National Oil*

and Gas Development Corp. (CNODC), which is a wholly owned subsidiary of CNPC. CNPC still serves as the major policy adviser to the *State Council* on oil and gas issues. Much of its output is sold at below-market prices to state enterprises, and state planners have a direct say in how the company operates. Most of oil producers within CNPC turn over their profits to the State, in return for direct investment from the Central Government.

The China National Offshore Oil Corp. (CNOOC) was formed in 1982 to control all offshore oil and gas fields in water more than 5 m deep. The Company was organised to act as a state representative in joint projects with foreign companies related to the development of China's offshore oil and gas reserves. CNOOC is more commercial than CNPC, and is in a far better financial position. This is due mainly to the fact that foreign exploration contracts account for nearly 40% of CNOOC's long-term investments, and much of its production is exported.

China International United Petroleum and Chemical Corp. (UNIPEC) is a 50-50% joint venture between SINOPEC and SINOCHEM, which was formed in February 1993. UNIPEC is authorised to import both petroleum products and crude oils for SINOPEC's refineries.

5. Analysis of the Impact of Government Regulation Policy on the Petrochemical Industry

In the early period after the Second World War, China adopted the Soviet model of central planning to promote economic development. Since the introduction of the 'Open Door' policy during the 1980s, the most important change has been a gradual reduction of the role of the Central Planning System. The share of the investments, controlled by the *State Planning Commission* and financed through the budget, have declined dramatically.

However, most of the developments in the petrochemical industry correspond to a series of Five-Year Plans promulgated by the Government planners. The formation of SINOPEC in 1983 coincided with the rapid acceleration of investment in domestic petrochemicals. Total growth in domestic petrochemical investment averaged 15.4% per year during the Sixth Five-Year Plan (1981-1985). This growth was slowed down to 10% per year during the Seventh Five-Year Plan (1986-1990), but still remained ahead of China's general economic and industrial growth rates (China's Chemical Information Centre). Overall, the pattern of the domestic investment shows that during the Sixth Five Year Plan China invested a relatively large amount of capital with relative small returns (Vergara & Babelon, 1990). Part of this was due to long construction lead-times. However, the small return on investment raised the fundamental question of efficiency. Meanwhile as the export of crude oil decreased during this period, the industry did not have the sufficient financial resources.

By 1990, the petrochemical industry experienced an explosive, demand-driven expansion of capacity⁶, fed by carefully allocated capital investment in new constructions. The Eighth Five-Year Plan (1990-2000) stipulated that at least 18 new major projects would need to be financed within the SINOPEC Corporation, or via joint ventures. The Government's Ninth Five-Year Plan

⁶ Because of long construction lead-time, the momentum generated by the rapid increase of investment during the 1981-1985 period had carried over to a major expansion of capacity in basic petrochemicals, synthetic rubber, plastics, and synthetic fiber during the Seventh Five-Year Plan (1986-1990).

(1996-2000), projected the construction of 14 new plants and numerous downstream factories in order to increase the production capacity. Even with these aggressive plans, the supply of plastic and fiber materials still cannot satisfy the local demand. A Japanese consultancy report predicts that China will continue to experience impressive double-digit growth in demand for commodity resins (*Martech Inc.*, 1995, Tokyo).

In this context of continuous expansion of the petrochemical industry, a number of changes in the planning system were introduced. Broadly speaking, the role of *mandatory planning* through production quotas, and the use of the material supply system for the allocation of inputs to enterprises to meet these quotas, was drastically reduced in the 1990's. The system of mandatory planning has slowly given way to the use of a new form of *indicative planning* via the use of direct contracts with enterprises to meet industrial output targets.

The number of key materials allocated to firms through the *Central Material Supply System* (CMSS) was also gradually reduced. The bulk of the investments in the 90's was financed through bank loans or retained earnings by the firms. Investment approvals were still required, but approval limits have been withdrawn, and investment decisions have been decentralised. The decentralisation of investment decisions from the *State Planning Commission* to the ministerial-level corporations and Provincial Governments has meant a loss of central control over both the level and the type of investments being made.

The Government control is still exercised through price controls and through intervention in the distribution system. Although recent economic reforms have introduced more individual incentives and a greater use of markets, China's economy is still characterised by a strict vertical control, and relatively few horizontal linkages, and most of the industrial goods still fall under the jurisdiction of the *State Materials Supply Bureau* (Singh, 1992). The crude oil, as one of the key materials, is still subject to Government's tight control.

At present, the distribution system for crude oil is controlled by the Government through allocating product quotas to firms at fixed prices. The authority to distribute refined products was solely given to *SINOPEC*, thereby prohibiting any reselling of products⁷. Relying on such a structure for state allocation of crude oil resources, the Government intends to create a stable, vertical, hierarchical marketing and distributing system. This integration is expected to reduce the geographical unbalance in the supply and demand of petrochemicals. *SINOPEC* has been authorised to control all the production of crude oil according to the Government's allocation instructions. However, in reality its failure to control and distribute all the products has exposed its inefficiency.

An example of it is the fact that in 1992 *Daqing Petrochemical Corporation* (one of the biggest and earliest oil refineries) was forced to reduce its output, because *SINOPEC* was not able to

⁷ In order to avoid limitations and conflicts between Local Governments, in 1983 the Central Government divided *SINOPEC*'s distribution system into six provincial level subsidiaries to cover all the provinces. These subsidiaries were expected to facilitate the adjustment of the local supply and demand balance by reallocating resources. This added one more administrative layer to the distribution system. Unfortunately, these subsidiaries had the authority only to sell crude oil allocated by their parent company - *SINOPEC* - and had no access to any other sources of supply. Principal products could be imported only by a licensed company, and only three companies - *SINOPEC*, *China Oil*, and *UNIPEC* - were granted licenses.

allocate and distribute the produced crude oil⁸.

The industry reports also point out that despite the shortage for petrochemical products, Chinese plants are running at an extremely low capacity-utilisation rate. In addition, local resins apparently can't compete in terms of quality with imported resins, especially from Japan and Taiwan, and are thus not favored by processors and their customers (UNIDO, 1991).

The tension within the *SINOPEC*'s allocation and distribution system, derives also from the competition that is allowed between its provincial subsidiaries. Some of the subsidiaries are able to get more crude oil quotas from the *SINOPEC*'s Headquarters, and to sell the excess of 'planned' crude oil at subsidised prices to some enterprises in other provincial areas. The result of this combination of planned allocation and competition is a distribution system, which is neither capable to stimulate growth of the supply of crude oil, nor capable to satisfy the demand for it.

The inflexibility in the crude oil allocation not only blocks product flow between regions, and also crude oil flow among refineries. The southern refineries could not receive adequate crude supplies allocated by the Central Government, while surplus products stockpiled in the north could not be shipped to the south because of a transportation bottleneck (UNIDO, 1991). The losses by the state-owned enterprises have amounted to as much as 5% of China's gross domestic product (The Economist, 1994).

SINOPEC's administrative distribution system has integrated vertically supply and demand lines, and at the same time it has absorbed all the conflicts in the supply chain for crude oil. The entire system involves considerable bargaining between various organisations, and this leads to significant differences between various administrative areas of the country. This is a result of the relative economic and political strengths of various regions, enterprises, and individuals. The enterprises' individual role in the entire system can be downplayed by the Government intervention.

6. The Contradictory Effects of the Price Reform in 1993:

Pricing policies during 60's, 70's and 80's created the largest distortions, with low-value products - subsidised by high-value ones, and underpriced crude oil - subsidised by overpriced products. Refineries were forced to provide quota amounts of the subsidised fuel to the state firms to meet local needs. High-cost oil-fields were often subsidised by an oil-field refinery. Innovation was discouraged through a lack of price incentives and personal decision-making power. Politics remained in command, and in many instances guided both the choice of imports, and their disposition (Foreign Broadcast Information Service, 1980).

A report, commissioned by the World Bank concludes that the most persistent problems in China are caused by the dual pricing system that exists for state planned and market goods (Singh, 1992). This system, according to Singh, creates distortions in the allocation of resources away from their best usage (by fixed price), and encourages the development of corruption and rental

⁸ *Daqing* is the largest oil-field in China. It opened in 1960 in the northeastern province of Heilongjiang province. Produce nearly half of national production of crude oil. Output growth levelled off in recent years.

payments (through the gap between the high and low prices). The system has particularly serious negative consequences for the long-term industrial development, especially since the Government's ability to correct these distortions has been reduced because of the decentralisation and the declining revenues (Singh, 1992).

Under such an oil policy, the *China National Petroleum Corp. (CNPC)* has been losing as much as Renminbi 6 billion (US dollars) (US dollars) a year since its inception in 1985 (*CNPC Annual Report, 1992*). Besides the drain on the state coffers, these losses have squeezed the money available for oil exploration and even for maximising output from existing fields. As a result of that, onshore crude oil production has been stagnated since 1985, even though the consumption of refined oil products has grown by 7% a year.

After the 14th Party Congress an ambitious plan to bring the crude oil price more into line with international rates was launched. As a result of the price reform, a barrel of crude oil in China costs about \$1 per barrel more than on the international markets. Transport bottlenecks were also responsible for pushing up the price.

The economic impact of raising crude oil prices was mixed. *CNPC* became profitable virtually overnight. This, together with the release of control of the distribution of crude oil made 1993 the year of great oil market freedom. During the same year, the crude oil distribution faced an increased demand from the fast growing domestic market. It boosted the crude oil trade flow domestically. This increase resulted in the establishment of three separate petroleum exchanges, and as a result of that the private petroleum retailing mushroomed. However this also created chaos on the market because of the weaknesses in the legal system. Inflation soared in 1993, in part, as a result of the liberalised crude oil prices. In 1994, the Government decided to re-establish its control over the crude oil market. During the same period of turmoil on the market some state-owned enterprises came under more pressure to cope with the higher prices. The biggest loser was *SINOPEC* as the largest refinery in China. *SINOPEC* was a main beneficiary of a system in the past that ensured artificially low crude oil prices and relatively high prices for refined products. In the short term, the overhaul of crude oil prices shifted subsidies within the economy from *SINOPEC* to *CNPC*.

The reform of the crude oil price in 1993 exposed numerous *SINOPEC* problems, which were ignored by the company previously because of its monopolistic position and its large profits in the past. One of these major problems was that *SINOPEC* was saddled with far too many refineries, and most of them were too small to be economically efficient. The uneconomic basic structure exposed *SINOPEC* as having a lack of competitiveness in a free market environment.

In terms of plant-utilisation rates, most of *SINOPEC*'s facilities use only 50-75% of their rated capacity. Anything less than 80% is generally regarded as unprofitable in the global petrochemical industry. Staffing levels also run three to four times higher than the international standard (*SINOPEC Annual Report, 1994*).

7. Conclusions:

The inefficiency of *SINOPEC* is an example of the effect of government regulation policies that

enhances market distortions, and allows large players to exist comfortably on subsidized prices and preferential allocation of resources and control functions. *SINOPEC*'s misfortunes illustrated also the broader problems facing China's economy. The efforts of policy makers to untangle irrational price regimes had intensified contradictions between the Central Government and the Provinces, the producers and the consumers. Sharp operators were also reaping windfall profits by exploiting regional price differentials. It has been argued that this sort of phenomenon results from taking reforms half way and then stopping them. There are also views that China is a unique case and has to find its own way to modernization (Warner, 1998)

The political intervention on the market for petrochemicals in China have undergone through various evolutionary stages. In 1981, the Central Government advocated that the mandatory planning stands first, while the market economy is second. In October 1984, the socialist commodity market was established, and in October 1987, the political thinking evolved to a point advocating that the state guides the market, and in turn the market guides enterprises.

Somewhat later in 1991, the combination of the state planning and market force was accepted. The fact that both the planning and the market are means of co-ordination of the economic development was first recognised in 1992, and the program to establish a socialist market economy was officially announced at the 14th Party Congress.

The main vehicles for change are: less intensive protection by the Government, attracting more foreign investment; lowering or removal of the non-tariff trade barriers; and intensifying the competitions from TNCs. A greater internationalisation is the aim of both the Government and the industry leaders.

The opening to international competition in the 80's transformed both the administrative structure and the management practices in the petrochemical industry. Equipment and construction became financed through loans rather than relying on the exports of crude oil. The soft assistance in the form of feasibility studies and training became as valuable as hardware purchases. Projects were emphasised over quantitative targets. The importation of advanced technology moved the industry towards national integration in order to facilitate diffusion. Operational equipment became subject to the requirements set by international standards. A new legal infrastructure was created to govern the transactions with foreign companies. The authority over the petrochemical production was wrested away from the several Ministries, and was concentrated in *SINOPEC*. However, the strict regulations on labor and technology transfer forced some foreign companies during the 80's to pull out of China. In addition to that, the most promising big petrochemical complexes remained close to foreign operators.

All these facts lead to the conclusion that while the government intervention has a positive effect on building capacity, it has a clearly negative impact on efficient use of resources. The centralisation of decision making power leads to fundamental distortions on the market. The entrenched interests of corporate leaders affect further decision making, resource allocation, and raise barriers to innovation and competition. The idea of a socialist market after all is only a political objective, and there are no clear evidence yet in what way it may become a reality in China.

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