

KNOWLEDGE, POWER AND GOVERNANCE: TECHNOCRATS AND THEIR POLITICAL PRACTICES IN MODERN CHINA—TAKE THE NATIONAL DEFENSE PLANNING COMMISSION (NDPC) AS A CASE STUDY (1932-1935)

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Abstract: The *National Defense Planning Commission* brought together the earliest groups of technocrats in modern China, and this technocratic group played an important role in shaping the political landscape of modern China. This paper aims to examine how their technical expertise enabled them to gain political influence and authority, thereby exerting significant influence on key economic policies, infrastructure construction, and scientific and technological development through the commission. It found that these technocrats first gained social recognition and entered politics based on their professional knowledge, and then carried out industrial construction by introducing modern scientific management systems, finally, they used the trust of political leaders and administrative authority to facilitate their work. However, constrained by traditional political structures and power struggles, the political practices of technocrats have obvious limitations of their time. In the later period, technocrats began to band together and became accomplices of authoritarian rule, while taking advantage of the convenience of the construction process to accumulate political capital for themselves, which ultimately led to administrative inefficiency. This study provides a unique historical perspective for understanding the complex relationship between knowledge, power and governance.

Keywords: Technocrats; Expert politics; Scientific management; Governance; Political practice; Technocracy; Modern China

1 INTRODUCTION

Since the 1920s, the Technocracy Movement, which began in North America, has led the public to consider the possibility of technical experts and engineers participating in political decision-making and social management. The movement's original aim was to respond to the crisis of the Great Depression [1], and its basic idea was to replace politicians with engineers in the management of government and society. The social thinking triggered by the North American technocracy movement soon flooded China, creating a huge ripple effect in Republican society. Several progressive periodicals published articles on the subject to the extent that the discussion in newspapers and magazines was about technocracy, and the private discussion of particular interest was also about technocracy [2]. After the Mukden Incident, with the establishment of the NDPC of the National Government, the thinking of technocracy in modern Chinese society began to take a practical turn.

The NDPC was secretly established in Nanjing in November 1932, directly under the National Government's Staff Headquarters, with the aim of developing the country's natural resources, establishing various industries, increasing production, and promoting the economic construction of national defense and people's livelihoods in support of the war of resistance against Japan [3]. Its primary responsibilities were to formulate specific plans for national defense, plan the construction of national defense as the center of the project, and prepare temporary dispositions concerning national defense. Due to the unique nature of the commission, it existed in secrecy in the early days and was once considered to be the private organization of Jiang Jieshi and remained unknown to the public until it appeared under the name of the *National Resources Commission* (NRC) in 1938 [4].

The NDPC employed many overseas scientists and engineers who were actively involved in China's defense industry and economic construction during the war, promoting China's industrialization and making outstanding contributions to the war effort and post-war reconstruction. This group of technocrats has distinctive group and era characteristics. Their emergence broke the political tradition of Chinese civil officials ruling the country, creating a precedent for technocrats to participate in politics. Their political practice has profoundly affected the political landscape of modern China. Until today, there are still a considerable number of engineer officials in China's administrative system, and they are the main force of China's modernization. The three-dimensional framework of the expert-technology-power relationship provides an effective lens for understanding the political practices of the NDPC's technocratic community. Through this framework, we can explore how technocrats use their expertise, technical competence, and interactions with power structures to influence political decision-making and nation-building.

2 THE BIRTH OF THE TECHNOCRATIC COMMUNITY IN MODERN CHINA

The birth of the technocrats in modern China did not occur in isolation, it was a direct response to social changes that called for a shift away from traditional modes of governance in favor of more pragmatic and modern solutions. With the

Self-strengthening Movement in the mid-to-late 19th century, modern China caught its first glimpse of a powerful state apparatus that blended western science and technology with modern ideas of governance. At the beginning of the 20th century, the reality of the national renaissance and the opening of new paths of education prompted more intellectuals to travel across the globe to receive advanced and modernized education, and upon their return to their home countries they grew up to become scientists, engineers, educators and began to rise to prominence in the form of scientific community organizations. In the face of modern China, which was beset by internal and external problems and whose people's livelihood was withering, many radical intellectuals linked the necessity of a political revolution in China with the urgency of a scientific revolution [5]. Convinced that the development of technology and industry was the way to national renaissance, the group actively preached the salvation of the country through science while criticizing the current situation, which laid the foundation for the transformation of these intellectuals into technocrats.

2.1 Impact of Western Science and Technology

Beginning in the mid-nineteenth century, the western powers, with their advanced technology and military power developed in the wake of the Industrial Revolution, carried out a series of invasions and interventions in China, the most famous of which were the Opium Wars and the Second Opium War. These wars not only opened China's doors by force but also forced the Chinese government and intellectuals to begin a profound reflection on the country's present and future. During the wars, the West demonstrated its technological superiority with steam warships, repeating guns, and advanced communication technology, which greatly shocked the Chinese court. This huge gap in technology made the Chinese elites realize that only by introducing and mastering western science and technology could they strengthen their country and resist foreign invasion. The impact of western science and technology was not only a material challenge but also a cultural and ideological one. It prompted China to embark on a quest for modernization led by the elite at the top, and at the heart of this quest was the renewal of science, technology, and knowledge. Although this change was full of twists and turns, it undoubtedly accelerated the modernization process of Chinese society and laid the foundation for more intensive technological and scientific development.

2.2 The Role of the Self-strengthening Movement

The Self-strengthening Movement, which lasted from the 1860s to the 1890s, began as a self-improvement movement after the Second Opium War. The movement got its name from its aim - learn from the West to self-strengthen - to enhance China's self-reliance by learning from the western advanced technology. The Self-strengthening Movement, whose main advocates included Zeng Guofan, Li Hongzhang, Zuo Zongtang, and several other visionary Qing officials, centered on the development of military and civilian industries. On the military front, the foreign leaders realized that China's traditional military equipment and tactics could not withstand the military power of the western powers, so they began to set up machine-building bureaus, shipping bureaus, and gunnery factories to manufacture new weapons and warships. In terms of civil industry, they built mines, railways, telegraphs, textile factories, and so on, aiming to improve the country's industrialization level. The Self-strengthening Movement also pushed for educational reforms to better introduce and digest western science and technology. The Qing government and local bureaucrats set up translation bureaus to translate western books on science and technology and established new schools such as the school of combined learning to train a new generation of scientists and engineers, which gradually gave birth to China's modern technocratic community. The Self-strengthening Movement had its limitations, however, as it emphasized Chinese learning as substance, western learning for application. The adoption of western technology while retaining traditional Chinese political and cultural institutions and such partial reforms ultimately failed to fundamentally change China's backwardness. Without the true support from the supreme power on one hand, and without the support of the populace on the other, the Movement was an intermediate reform in attempt to preserve the royal system and forestall its continued decline [6]. Nevertheless, the Self-strengthening Movement played an important role in promoting China's socio-economic modernization, advancing scientific and technological development, and fostering technocratic talents.

2.3 Modern Educational Reform

In modern China, in the face of the impact of western science and technology and the Self-Strengthening Movement, educational reform became an important means of cultivating new types of skilled personnel and promoting social modernization. This reform was mainly embodied in the abolition of the imperial examination system, the introduction of new schools and the dispatch of foreign students.

First, abolition of the Imperial Examination System. In 1898, the Qing government announced the abolition of the Imperial Examination System, which marked the transformation of China's traditional Confucian education into modern scientific education. The abolition of the imperial examination system broke the monopoly of traditional scholarly education and created conditions for the introduction of new knowledge and the development of science and technology.

Secondly, introduction of new-style academies. The Qing government and local bureaucrats actively promoted new-style education and set up several academies that mainly taught natural sciences and technical knowledge, such as the Mechanical Academy attached to the Jiangnan Manufacturing Bureau and the Tianjin Military Academy. These academies not only taught basic sciences such as mathematics, physics and chemistry but also applied technologies

such as engineering, shipbuilding and military engineering, training many professionals in the fields of technology and engineering in China.

Finally, sending students abroad. To learn more directly from the advanced technology and management experience of the western countries, the Qing government also began to send students to Europe, America and Japan. These students received systematic modern education and professional training overseas and became an important force in promoting China's modernization when they returned home.

Through these educational reform measures, a new techno-intellectual class, the technocrat group, began to form in modern China. They played an increasingly important role in the political, economic, and cultural spheres and contributed to the modernization of Chinese society. However, due to various constraints, these reforms did not completely change the backwardness of Chinese education, but they laid the foundation for later, more in-depth educational and technological development.

2.4 Changes in Socio-cultural Attitudes

In modern China, with the impact of western science and technology and the Self-Strengthening Movement, there have been profound changes in social and cultural concepts. These changes are mainly reflected on the understanding of science and technology, traditional values and the pursuit of modernization.

First, in terms of the understanding of science and technology. In traditional Chinese society, science and technology were not valued and were even regarded as diabolic tricks and wicked craft. However, in the face of the gunboats of the western powers, the Chinese began to realize the importance of science and technology. Gradually, a consensus was formed that science and technology were the keys to national wealth and strength and to the revitalization of the nation. Therefore, learning Western science became the call of the times.

Secondly, there is a reflection on traditional values. The traditional Confucian culture emphasizes the importance of moral cultivation rather than practical application. However, this value has been challenged in the face of the impact of advanced Western technology. More and more people have begun to reflect on the conservative elements of traditional culture and to advocate reform and openness to meet the needs of the times.

Finally, in the pursuit of modernization. With a change in its understanding of science and technology and a rethinking of traditional values, Chinese society has begun to pursue modernization. This pursuit was not only reflected at the material level, such as the modernization of industry, military, and infrastructure, but also at the institutional and cultural level, such as educational reform, political change, and cultural renewal. This quest for modernization provided a broad arena for the formation and development of technocratic groups.

In general, changes in social and cultural attitudes have provided the prerequisites for the emancipation of ideas that led to the formation of the technocratic community. These changes have led to an unprecedented emphasis on science and technology, creating a favorable social atmosphere for the development of technocratic groups. At the same time, these changes have also promoted the modernization of Chinese society and provided a broad space for the technocratic community to play its role.

3 ESTABLISHMENT AND OPERATION OF THE NDPC

The NDPC was a secret body set up in response to the Japanese invasion, with the main objective of national defense preparation. The Commission was subordinate to the Staff Headquarters of the Nanjing National Government and recruited a wide range of the country's elite, who did a great deal of research and statistics and studies in the areas of military, economy and finance, resources and industrial manufacturing, etc. In 1935, it was merged with the Resources Division of the Military Industrial Department and reorganized as the NRC, which continued to be under the Military Commission, and in 1938 the NRC was transferred to the Ministry of Economic Affairs, and then to the Executive Yuan in 1946, and then again to the Ministry of Economic Affairs in 1949. These changes not only reflected the different needs of the National Government for economic construction and national defense mobilization at different times but also showed the important position of the NDPC in the national institutions. Overall, the NDPC was not only a planning body for wartime economic mobilization and industrial construction but also a think-tank organization covering a wide range of professional fields. Its economic preparations during the war laid a solid foundation for victory in the war against Japan.

3.1 Historical Background

The early 1930s was a period of great global upheaval, with the Great Depression affecting economic policies and living standards around the world. Politically, the period witnessed a shift towards extremism that had a significant impact on international peace and stability. The rise of totalitarian regimes provided the ground for conflicts that erupted later in the decade, culminating in the outbreak of the Second World War.

Regarding the international situation, the Wall Street stock market crash of 1929 triggered a global economic crisis known as the Great Depression. The crisis led to massive unemployment, a decline in production, a contraction in international trade, and deep economic distress in many countries. To protect domestic industries, countries such as the United States implemented protectionist policies, such as the Smoot-Hawley Tariff Act of 1930, which exacerbated the global economic crisis by stifling international trade. Politically, the rise of militaristic regimes in Nazi Germany, Fascist Italy and Japan, who pursued aggressive foreign policies, threatened world peace and stability. In the face of the

threat of war and economic crisis in Europe, the United States adopted an isolationist policy and avoided direct involvement in international affairs. The League of Nations, established after the First World War, performed poorly in dealing with international disputes and maintaining world peace and gradually lost its influence.

Regarding the domestic situation, after the Mukden Incident, Japan occupied most of the three northeastern provinces of China, and China's industry and economy were dealt a severe blow, with the country's economic situation deteriorating sharply. The outbreak of war led to a substantial increase in the military expenditure of the National Government. Coupled with internal corruption and embezzlement, the National Government was in a very difficult financial situation. To cope with the financial difficulties, the National Government issued a large amount of currency, leading to serious inflation and hardship for the people. The war and the economic crisis caused many peasants to lose their land and jobs, and the rural economy was on the verge of bankruptcy. Politically, the internal and external pressure on the National Government increased: on the one hand, the National Government needed to cope with the Japanese invasion; on the other hand, internal local secession and warlordism also brought great political pressure on the National Government. Especially after the Mukden Incident, the Chinese people became strongly rebellious against the Japanese aggression, and the nationwide anti-Japanese salvation movement rose rapidly. In the face of Japan's aggression, the Kuomintang and the Communist Party reached a consensus on resisting Japan's aggression and were ready to start the Second United Front. At the same time, Jiang Jieshi was also seeking a path of salvation and was preparing to secretly set up a special agency to deal with matters of national defense.

3.2 Operational Mechanisms

Jiang Jieshi, in the draft regulations on the organization of the NDPC, presented to the National Government on November 29th, 1932, stated that this is a confidential request for the record. I have found that this Ministry oversees national defense, and at the present time of the national crisis, the NDPC is to be set up for the purpose of concentrating talents and designing meticulously with a view to determining the plan and engaging in the construction of the NDPC [7]. It is thus clear that the core task of the NDPC is to pool together talents to discuss matters of national defense in order to cope with the possibility of an all-out war. To do this, the commission needs to ascertain the true state of development of various industries up and down the country, especially the development of raw materials and industry-related industries. This will be done through eight working groups that will conduct surveys in support of economic preparedness [8].

First, regarding military strategy and international relations. Because the National Government had already set up the Military Commission and the Staff Headquarters, the NDPC did not do much research and study on military matters. It concentrated largely on the study of the military situation in Japan and Germany while planning the training of new recruits and stipulating the equipment of posts for each standard division. Attention was paid to the study of the situation in various countries of the world, especially the diplomatic developments in neighboring Japan, as well as to the Chinese border areas and the business of various countries of the world in China.

Secondly, in the areas of education, culture finance and economy. Studying the ways and means of training young people in various countries of the world, and preparing primary and secondary school textbooks on civics, history, the national language, geography and so on. The central and local financial systems were studied, and attempts were made to reform the currency system, while national income was surveyed. At the same time, a questionnaire on human resources was issued to analyze and study the use and distribution of specialists in wartime [9].

Thirdly, in the areas of transport, land and food. The railway survey focused on the equipment of the various roads and the capacity of military transport; the road survey focused on the standards of military roads and the capacity of automobile workshops; the waterway survey focused on harbor equipment and the safety of waterways; and the communications survey focused on the manufacture and storage of equipment. Since the land issue was too wide-ranging and there was a full-time organ responsible for it, the Commission only carried out some of the surveys, such as a pilot survey of land administration and land use in 24 counties in Zhejiang Province and a pilot survey of the agricultural population in Jurong, Jiangsu Province. On the food issue, the Commission conducted a nationwide survey of food transport and marketing and established a regular reporting system in major cities.

Fourthly, in terms of raw materials and manufacturing. Because of the needs of the war, the NDPC paid particular attention to the investigation of relevant strategic resources, involving three major categories: metal mines, coal mines and petroleum mines. Metal mines were mainly investigated as gold mines in Sichuan and Qinghai; iron mines in the Yangtze River Basin provinces and in Shandong and Fujian; copper mines in Hubei, Henan, Shanxi, Sichuan and Yunnan; and lead and zinc mines in Hunan and Guangxi. Coal mines are mainly divided into two investigation directions: one is the railway, the Yangtze River has developed a detailed investigation of coal mines, including their production status, transport and marketing situation, fuel system; the second is the development of heavy industry in the mainland, the number of new mines or expansion of coal mines, such as Pingxiang in Jiangxi Province, Gaokeng, Tianhe and Hunan Tanjiashan coal mines, and so on. The oil mines involved field drilling in oil fields such as Shanbei and Sichuan; experiments on low-temperature distillation of bituminous coal; and the supply and demand situation of domestic oil.

The development of related manufacturing industries based on raw materials is also the focus of the Commission's attention, and this part of the survey is mainly divided into a general industry survey and a special industry survey. The general industry survey covered 145 places in major industrial counties and cities, and 2,345 factories that complied

with the Factory Law [10]. The special industry survey mainly focuses on the heavy industry survey, such as iron and steel smelting factories, machine shipbuilding factories, and electrical equipment factories in various places.

4 THE STRUCTURE OF THE NDPC

The three-dimensional knowledge-power-governance nexus is an analytical framework for exploring how individuals or groups with a background of expertise acquire and use power in political and social structures through technological means and capabilities. Applying this framework to analyze the political practices of the technocratic group of the NDPC can reveal how technocrats have risen to prominence in modern Chinese society and played an important role in political and economic life.

4.1 Knowledge

The technocratic community of the NDPC consists of a group of highly educated experts with professional scientific knowledge and management experience. They have in-depth expertise in the fields of geology, mining engineering, petroleum extraction, metal materials, power engineering, and so on. Most of these technocrats are returnee intellectuals who brought advanced scientific knowledge and management concepts from abroad and gained social status and influence through their expertise in science and technology, later becoming an important force in promoting China's modernization. Their professional authority provided a solid foundation for their participation in policy formulation and implementation.

The NDPC existed for two years and six months from November 1st, 1932, to April 1st, 1935, after which it was reorganized into the NRC of the National Government, which became the largest industrial construction organ in the Republic of China. The NDPC had a chairman who was the prime minister of the whole commission, a secretary-general, a deputy secretary-general, and three to five secretaries, 36 to 48 members appointed by the chairman, and the head of the Executive Yuan ministries as ex officio members, a director of investigation and a director of statistics in the commission's secretary's office, 30 to 50 commissioners, and 20 to 30 clerks. Under the NDPC, there are seven special committees: Military, International Relations, Economy and Finance, Raw Materials and Manufacturing, Transportation and Communications, Culture, Land and Food [11]. The members of the Specialized Commissions are appointed by the Chairman of the Commission from among national academic experts, and this organizational structure ensures that experts in various fields are able to participate in NDPC, thus effectively integrating the national resources, and enhancing the scientific and professional nature of national defense construction.

On September 10th, 1934, to better carry out the related planning work, the Commission also slightly revised its organizational structure by adding a Planning Department to the Office of the Secretary to be responsible for planning matters for the defense business, and at the same time increasing the number of assistant researchers in the Commissioner's Office to the establishment. Since the NDPC was a secret body, much of the early information is not available, and there are many discrepancies in its personnel arrangements. What is certain is that Jiang Jieshi was the chairman of the Commission; Weng Wenhao (then director of the Geological Survey of the Ministry of Economic Affairs) and Qian Changzhao (then executive undersecretary of the Ministry of Education) were the first and deputy secretaries-general; Yang Gongzhao (then secretary-general of the Tsinghua University) was the director of the survey department; Sun Zheng (then member of the China Institute of Economic Statistics) was the director of the statistics department.

In terms of personnel structure, due to the special nature of the NDPC, recruiting suitable scientific and technical talents became the first thing before the Commission [12]. According to Qian Changzhao recalls, in the preparation of the NDPC members list, mainly based on the following two principles of selection. First, listed in the list of experts and scholars in various aspects, or have the financial strength of the capitalists; secondly, there is no Kong Xiangxi, Song Ziwen system of the people, and there are no Central Club Clique members of the Kuomintang [13]. In this list of forty to fifty people [14], it is mainly divided into four major categories: big intellectuals, people in the financial real estate industry, military and political personnel of the Kuomintang party, and experts in science and technology, in which people with professional backgrounds in science, technology, and engineering occupy half of the country, such as the chemist Zeng Zhaolun, the physicist Yu Dawei, the geologist Ding Wenjiang, and the metallurgist Wang Chongyou, and so on. This group of scientific and technological intellectuals not only made outstanding achievements in their respective fields, but also held important positions in the later government departments, once occupying half of the cabinet of Jiang's regime, and becoming indispensable technocrats in the national government, known as the Sanyuan Lane Cabinet [15].

Table1 First members of the NDPC (engineering and technology)

Name	Graduation Institution	Research Field
Weng Wenhao	Catholic University of Leuven	geology
Ding Wenjiang	Cambridge University Glasgow University	geology
Wang Chongyou	University of California, Berkeley Columbia University	mining and metallurgical engineering
Zeng Zhaolun	Tsinghua University Massachusetts Institute of Technology	chemistry

Zhao Chenggu	University of Manchester University of Geneva	phytochemistry
Shen Zonghan	Georgia University Cornell University	crop genetics
Chen Bozhuang	Columbia University	railway engineering
Shen Yi	Tongji University Dresden University	Hydraulic engineering
Yan Renguang	University of Chicago	physics
Qian Changzuo	Massachusetts Institute of Technology	aviation machinery
Yu Dawei	Harvard University Berlin University	ballistics
Huang Boqiao	Technical University Berlin	electrical machinery
Wu Jian	University of Sheffield	Metallurgy

4.2 Power

By virtue of their irreplaceable role in economic construction and resource management, the technocrat community has gradually gained more and more power within the national government. Many of them have risen to the top of the government as decision-makers or policy advisors directly involved in the formulation and implementation of national policies. Within the political system, technocrats practice power not only in terms of their ability to influence policies related to their own areas of expertise, but also in terms of their ability to advise and make decisions on the country's macroeconomic development and national strategies.

The relationship between modern intellectuals and the government has gone through a process of change from far and near. 1932, Hu Shi, Ding Wenjiang, Weng Wenhao and others founded the Independent Review, the spirit of not relying on any party, not superstitious about any preconceptions opened the first political journal. Jiang Tingfu once recalled that the intellectuals discussed current affairs without drawing conclusions...not only were they independent of the outside world, but also did not interfere with one another [16]. Hu Shi also confessed in his reply to Wang Jingwei's invitation to join the cabinet:

"I feel that I can contribute more by staying out of the government than by participating in it. ... Only in this way can I objectively and impartially express my own views at critical moments, and only in this way can I be of benefit to the country. ... And of course directly or indirectly to the benefit of the government."

Weng Wenhao even repeatedly shrugged off Jiang Jieshi's invitation to work together on great things, refused to give up the geological survey of academic research, mocking himself as a poor organ origin, unable to take up the responsibility of the important organs of the government.

After the Mukden Incident, the modern relationship between intellectuals and the government was broken. It was during this period that many of China's most talented intellectuals, scientists and technicians entered the government service for the first time to serve what they and Jiang Jieshi saw as China's most pressing need: the creation of a planned defense economy [17]. With the establishment of the NDPC, the liberal intellectuals centered in Beijing were incorporated into it, and their independent identity and relationship with the Kuomintang quietly changed. They began to change from critics of the government to advocates of the system, from confrontation with the government to co-operation with the authorities. As the leader of this group, Hu Shi's change of political attitude had a weathervane effect. The establishment of this institution also dissolved the group strength of liberal intellectuals in Beijing, and the fracturing of the political views of some intellectuals provided ideological and public opinion assistance to Jiang Jieshi's dictatorship.

4.3 Governance

Using their professional knowledge, the technocrat community has proposed and implemented a series of technical programs and projects for the investigation, development, utilization and conservation of resources. They play a key role in the process of technology selection, project planning and implementation. Especially in times of war when resources are scarce, technocrats effectively support the war economy and national construction through scientific resource deployment. In addition, they promoted technological innovation and industrial upgrading in China through the introduction of foreign technology, the development of indigenous industries, and the construction of infrastructure. To quickly gather national strength to cope with the war, the National Government began to implement a unified economy after the Mukden Incident, which provided an institutional guarantee for technologists to carry out more efficient scientific management. According to Wu Dingchang, a unified economy is a systematic economic plan made by each state, under a certain economic doctrine of the state, in times of peace or on an ad hoc basis, for a certain purpose, to be carried out in a certain economic organization by the power of the state to rule [18]. Liberal intellectuals such as Hu Shi and Ding Wenjiang also believed that a limited degree of control or planned economy could be adopted in special times, which became the most popular slogan in China at that time [19]. The National Government's economic planning policy, which relied on the NDPC and other departments, fully reflected this consensus among the Chinese political and cultural elites at the time [20]. After the establishment of the NDPC, the National Government

granted it many administrative powers, and the latter became the executive of the unified economy, with its primary task being to develop and manage key industrial sectors, including industry, mining and electricity [21], and to take the lead in the planning and management of the nation's industrial and mining industries. The establishment of the NDPC and its plans for heavy industry reflected the National Government's intention to strengthen the power of national capital and thus to exercise total control over the national economy [22], which was both an agent for the implementation of the united economy and the chief organ of the late National Government for the development of national capital.

At the beginning of the 20th century, scientific management (also known as Taylorism) began to prevail in major factories in the United States. Its core concept is to develop a standard operating system for maximum efficiency through a series of mechanical engineering experiments to improve factory management. Early students in the United States became the first Chinese to encounter the idea of scientific management, represented by Yang Xingfo, one of the founders of the Chinese Science Society, and Mu Xiangyue, an industrialist from the Republic of China, who was the first to translate Taylor's *The Principles of Scientific Management* into Chinese [23]. From the 1920s to the 1930s, Chinese industrialists, officials, and scholars were attracted by Taylor's ideas of scientific management and made extensive attempts to apply them [24]. And members of the NDPC were also deeply inspired, believing that the operation of industry depends on talents, not only mechanical expertise, but also management. The members of the NDPC were also inspired that "the most important thing in running an industry is talent, not only mechanical expertise, but also management [25]. In order to enrich the scientific management knowledge of the members and enhance the scientific management ability of the leaders at all levels, NDPC published the most advanced management knowledge from abroad in the internal publications such as *The Resources Commission Bulletin*, *The Resources Commission Monthly*, and *The Resources Commission Quarterly* from time to time and invited the professors of the domestic universities to give relevant reports and lectures. In 1942, NDPC also established its own management society, and promulgated *The Brief Charter of Management Society of National Resources Commission*. In 1947, with years of front-line management experience, the NRC established China Industrial Management Association, which was the first of its kind in China's industrial management. In practice, the NDPC also implemented scientific management ideas into all corners of production, such as the formulation of the weekly business review meeting and daily report at 8:30 a.m. [26], as well as the personnel management system that emphasizes the decentralization of personnel authority and the adoption of a three-tier system of appointment and dismissal of personnel engineers and technicians are given equal weight and equal pay for the same position as managers. Among all the scientific management measures, the most far-reaching one was the general establishment of the factory director-engineer responsible management system in enterprises led by the NDPC [27], which provided a major reference for the reform of the state-owned enterprise system after the reform and opening up.

In addition, the National Defense Planning Commission also pays particular attention to scientific planning, even in times of war, all its construction work must be rigorously investigated and verified, and cannot be easily started and implemented, which is also in order to make use of the limited manpower and material resources as far as possible in order to achieve the greatest effectiveness. Weng Wenhao also said that the ancients seven years of disease must seek three years of the wormwood, we can now say that five years of construction, must be preceded by five years of surveys and research, which shows the importance of the preliminary investigation and statistical work. To this end, the NDPC has set up seven working groups with clear lines of authority and responsibility to map out the existing resources and development trends in various areas, namely: military, international relations, economy and finance, raw materials and manufacturing, transport and communications, culture, land and food. The Office of the Secretary was also established to lead the NDPC's major decision-making plans and coordination. The establishment of the groups is not static, and they may be added to or removed from the NDPC as and when necessary [28], which reflects the scientific and flexible nature of the organizational structure of the NDPC.

In the three-dimensional interaction of knowledge-power-governance, the technocratic community applies expert knowledge to practical problem-solving and achieves remarkable successes in the technological field, which naturally enhances their influence in government. With increased power, they are better able to promote their technological ideas and implement relevant policies, creating a positive feedback loop. However, this increased power may also bring about tensions between technocrats and politicians and military leaders, especially in terms of possible conflicts over policy objectives and resource allocation.

The practices of the technocratic community of the NDPC demonstrate the importance of expert knowledge for national development and reflect how technicians enhanced their social status and influence by improving their technical skills and participating in the political process in modern China's pursuit of modernization. By analyzing the three-dimensional relationship of knowledge-power-governance, we can not only gain a more comprehensive understanding of the role of the technocratic community in historical development, but also gain a deeper insight into the complex interactions between modern technologists and political power structures.

5 THE DILEMMA OF TECHNOCRATIC POLITICAL PRACTICE

Proponents of the theory of technocracy argue that engineers tend to be insulated from economic and political distortions of interest and are better able to manage society than politicians [29]. The technocracy movement is essentially a political movement and running through it are two basic principles - expert politics [30] and scientific management. Scientific management is the use of scientific principles and technical methods to govern society; and

expert politics is the holding of political power by experts who have received a systematic education in modern natural science and technology [31]. Expert politics is the prerequisite for the realization of technocracy, while scientific management is the practical tool of technocracy, which can only be successfully implemented if technocrats possess a considerable degree of political power and implement a strict system of scientific management. The technocrats in recent times have implied two meanings in the context of technological governance: one refers to a type of administrative system dominated by the participation of technologists in political decision-making; the other refers to a group of technologists with political power.

Can scientific management be fully implemented by technical experts who hold decision-making powers in government? Is the NDPC, which is composed mainly of technical experts, better able to avoid certain bureaucratic problems than the traditional executive branch? These questions are open to question in the light of the later development of the NDPC. In one of his opinion pieces, Fu Sinian was highly critical of the NDPC:

“You cannot say that the two road bureaus and the NDPC are corrupt, but incompetence and irrationality are more common. The reason for this is that various evil forces dominate (naturally, not limited to Kong and Song), and the rich and powerful are in control, so it is generally in disorder, absurd, frozen, and corrupt.” [32]

He argued that the NDPC, a national capital, was essentially held by a few powerful families, which led to corruption as well as administrative inefficiency. In fact, the NDPC has been plagued by more than its share of problems, from shocks caused by arbitrary changes in administrative affiliation to conflicts between foreign aid and self-construction, as well as its own corruption and authoritarianism, which have contributed to its downfall.

5.1 Technocracy vs. Democracy

Technocracy has specific administrative advantages over traditional bureaucracy, first and foremost in terms of its independence. Independence comes from the privileges granted by the higher administration on the one hand, and from its own professionalism on the other. The NDPC was established under the direct leadership of Jiang Jieshi at the very beginning of its establishment, and the work of the Commission reported directly to Jiang, and it was once believed that its existence was a direct extension of Jiang's power [33]. Although it was suspected that Jiang was trying to co-opt various forces in order to consolidate his rule, it was also a privilege that objectively ensured that the commission's daily affairs were not influenced by other administrative bureaucrats and that it could carry out its work more independently. Qian Changzhao also confessed that since 1934, the NDPC was transferred to the Military Commission and began to organize industry, using Jiang's name to give orders to do a lot of things, and sometimes even quite important things do not need to report [34]. At the same time, the NDPC to attract the world's talents, at the beginning of the creation of set up a special committee of 200 people, are then various aspects of the technical experts, and more than 10 colleges and universities to train scientific and technological talents, and even sent to Harvard, Yale and other prestigious schools to find suitable technical experts, such as metallurgy Ye Zhupei is the director of the room gave up a well-paid position in the United States and chose to serve the country. The director of the metallurgy department, Ye Zhupei, gave up his high-paying position in the United States and chose to work for his country. Such measures to attract talents have ensured the professionalism of the NDPC and enabled them to have more independent voice in their work.

In addition, technologists, with their rigorous scientific training and high social prestige from a serious scientific community, could be drawn from the ranks of the executive branch in a way that traditional bureaucracies could not. The NDPC also accumulated a good reputation for its technical competence, non-partisanship, and relative loyalty. And achieved a leapfrog development from the 50-odd employees at the beginning of its establishment to nearly 200,000 employees in the future [35]. It can be said that the expansion of the NDPC in terms of size and reputation marked the development of the Nanjing government's governing capacity towards professionalism. It can be said that the expansion of the size and reputation of the NDPC marked the development of the Nanjing government's ability to govern towards professionalism [36]. Weng Wenhao, Qian Changzhao and others played an indelible role in this. Weng Wenhao wrote several articles calling for scientists and engineers to actively participate in the construction, and in his speech at the Beiyang Engineering College, he encouraged the students and teachers to actively practice:

“Knowledge is more capable of implementation, and can-do work and research, this is what you engineerson your way to building a new China, you should recognize your special responsibility and work hard to move forward.” [37]

Qian Changzhao, on the other hand, made use of Jiang Jieshi's position as a staff member to introduce all kinds of intellectuals to meet with Jiang, to give lectures to him, and to strongly advise him to reuse scientific talents to build up industries, which gave birth to the initial idea of the NDPC. Geologist Ding Wenjiang also called for a certain degree of new-style dictatorship under special circumstances, and actively make use of the nation's expertise to solve the country's difficulties [38]. The encouragement and attraction of the community brought many talented people to the NDPC, who later became the backbone of the construction process.

5.2 Accept Assistance vs. Develop Independently

Making full use of foreign investment was an important measure taken by the NDPC in developing and managing the nation's industrial and mining enterprises, and economist Ma Yinchu argued that foreign investment could be used for construction within the bounds of China's sovereignty [39]. In fact, foreign investment would be channeled directly into state-owned enterprises, which theoretically did not undermine China's sovereignty, but rather strengthened the power of the government, which had the highest authority. The absorption of foreign aid during the special period promoted the rapid development of the NDPC, but the influx of large amounts of foreign capital also led to the NDPC's serious dependence on foreign countries, making it difficult for it to develop its own technological strength in a substantial way. Especially in the late stage of the War of Resistance, the United States sent several delegations to assist China's war effort, and the one that had the closest relationship with the NDPC was the U.S. Wartime Production Delegation headed by Nelson. Nelson suggested Jiang Jieshi to set up a wartime production bureau to oversee all matters of wartime production, Chiang accepted this suggestion and appointed pro-US Weng Wenhao as the director. Although Weng Wenhao used his position as director of the Bureau of Wartime Production to bring about a new round of expansion of power for the NDPC, all matters of wartime production had to be reported to the American advisers, which virtually put the NDPC under the control of the U.S. and made the Commission lose its independence of development.

In the latter part of the war, as it gradually took charge of the important industrial and mining enterprises in the country, the NDPC began to become the object of competition among many political forces, and the independence of the early expert politics was being eroded step by step, and the dilemma of the NDPC at this time was mainly reflected in three aspects: firstly, Jiang Jieshi made use of the NDPC to draw in forces of various parties, and Jiang desperately hoped to consolidate his own position within the party after the Merger of Ning-Han, and so he tried every means to draw in talents of various parties for his use, which facilitated his dictatorial rule within the party. After the Ning-Han merger, Jiang was eager to consolidate his position in the party, so he tried every possible means to bring in talents from all sides to be used by him. The growth of the NDPC was also the growth of Jiang's power, which facilitated his dictatorial rule in the party. The second is the relationship between the NDPC and the members of the Four big families of the Republic of China. Song Ziwen used the NDPC to push forward the currency reform, Kong Xiangxi coveted the right to exploit the rare mineral resources in the hands of the NDPC, and Chen Guofu & Chen Lifu tried to install the party department in the NDPC all the time to control the entire NDPC through the power of the Kuomintang. Thirdly, the imperialists used the NDPC to manipulate China's economy. In the exchanges between the NDPC and foreign investors, the western powers aspired to open China's market through the NDPC, on the one hand, purchasing China's scarce resources at low prices, and on the other hand, eroding China's monetary system through the reform of the currency system, to achieve the purpose of controlling China's economy. Currently, the NDPC has gradually lost its independent status under the competition of various forces, and internal and external collusion and corruption have also appeared within the NDPC, and the former industrial giant is being eaten up by the whales.

5.3 Administrative Inefficiency

The NDPC was subject to several changes of affiliation, which to a certain extent affected the implementation of some of the industrial plans. Weng Wenhao reminded the NDPC at its inception that the government should be careful in making changes to construction agencies and specialized undertakings and should not reorganize them recklessly and easily [40]. As a matter of fact, during the ten years of its prosperous development, the NDPC was successively subordinated to the Staff Headquarters of the National Government, the Military Commission, the Ministry of Economy of the Executive Yuan, the Executive Yuan, and merged and reorganized with the Ordnance Service's Resources Division, the Construction Commission, and the Third and Fourth Departments of the Military Commission successively. A series of administrative changes led to the intermittent work of the NDPC, coupled with the gradual deterioration of the external environment, many large-scale projects were forced to interrupt, such as the construction of the Three Gorges Project. The stability of the team of experts and the continuity of management operations are two important factors affecting the efficiency of technical governance, and frequent changes in affiliation have broken the stability of the team and seriously affected the continuity of management measures. In addition, the technocrats, as a new administrative force, were still a bit young in terms of administrative capacity, as Weng and Qian frankly stated, most of the factory and mine directors on this commission are technical experts, and it is inevitable that there will be mistakes in specific business operations, which ultimately lead to reduced efficiency. This requires active remedial measures [41]. As most of the early technical experts of the NDPC studied overseas for many years, they lacked a deep understanding of Chinese society, especially the lower classes, and were often guilty of empiricism and dogmatism in their work, which, coupled with a lack of relevant management experience, led to the NDPC's chaotic operation.

5.4 Conclusion

The development of the NDPC was a microcosm of modern China's industrialization. In the early years, the NDPC grew explosively due to the involvement of a group of technocrats who mastered advanced technology while sitting on many administrative resources; in the later years, the NRC lost its autonomy due to the fact that the technocrats were held hostage in government affairs, and it became a battleground for the seizure of resources by various parties. At present, Chinese society is emphasizing the modernization of the national governance system and governance capacity, and technology governance with expert politics and scientific management as its core is undoubtedly an important part

of the process of governance modernization, and the practice of technology governance in the Republic of China provides a historical model for reference. New technologies are emerging all the time, benefiting mankind on the one hand and quietly changing the traditional way of production and life on the other, and at the same time, causing many social management problems. It is true that a technological society needs a large number of experts to participate in management and provide technical support for social development, which requires them to be given full administrative power, but technological experts also need to receive systematic training in management knowledge and only those technological experts who have mastered the ability of modern scientific management will be able to participate in the socio-political life in a better way, and also play the most effective role.

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- [15] The NDPC is located at No. 2 Sanyuan Lane in Nanjing, and during the period of its secret office, it was known to the public as the NDPC by the name No. 2 Sanyuan Lane. There was another "Sanyuan Lane Cabinet" in history: during the Jiajing period of the *Ming* Dynasty, when the government needed to be reformed, three statesmen, Zhang Juzheng, Gao Gong, and Xu Jie, assisted the government, and together they held the positions of chief cabinet minister and assistant at the same time, and together they had a significant influence in politics. These three men used to live in the vicinity of Sanyuan Lane in the city of Beijing, so the cabinet during this period is often called the Sanyuan Lane Cabinet.
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