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The Development of China's Financial Sector as a Catalyst for Growing Space Industry

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ABSTRACT

The relevance of the article's topic is determined by the current trend of searching for ways to ensure the sustainable development of national space activities and methods of financing them. Along with them, we take into account the emergence of the private space industry and the accelerated overall pace of innovation processes in high-tech sectors of the economy. **The objectives** of this research work is to analyse the most significant transformation stages of financial sector of the People's Republic of China and the impact of this process on the country's achievements in space exploration within the period over the past several decades. The principal method used by the authors is qualitative content analysis, combined with a chronological approach to data systematisation. **The scientific novelty** lies in the combination of several aspects into a single causal field, namely, the development of Chinese financial system, the organisational structure of its space industry, its achievements, as well as the state support measures. **The results** of the study suggest that one of the key factors of success in space exploration of the People's Republic of China could be the combination of market mechanisms with strong elements of a planned economy, which allows for the effective management of investment allocation in this strategic industry. **The practical significance** of the research work insofar, lies in potential application of its results to provide effective instruments for the financial support of high-tech industries, including the space exploration sector. The conclusions obtained may be beneficial for specialists involved in the planning activities and in the implementation of major national projects.

Keywords: China; space industry; financial sector; public administration; project and programme financing; investments; private capital

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INTRODUCTION

The space industry holds a priority position in the state policy of the People's Republic of China (PRC), contributing to a stronger national defence, economic, and scientific-technical potential. It serves as a major source of technological development and makes a multiplier effect on adjacent economic sectors. Over the recent decades, Chinese space industry initially used the Soviet experience and technologies, but later it abandoned a catch-up position in development and become one of the world's leaders. The competent state governance played a pivotal role in it and the priority position in this sector, in the development of national financial sector and diversification of funding sources. Its fast-growing industrial capacity resulted to major changes in domestic economic and financial systems. In this context, the banking sector of China plays a major role: the world's second-largest economy has a developed financial ecosystem with investment opportunities in space projects and expanding access to capital for space enterprises.¹

This, in turn, contributes to implementing large-scale research projects, developing new technologies, and supporting private initiatives in space exploration, which consolidates China's leadership in the space exploration.

THE HISTORY OF CHINESE SPACE EXPLORATION: FROM BACKWARD SECTOR TO GLOBAL LEADERSHIP

Chinese space industry emerged and developed in specific political, economic, and technological conditions with strong influence of isolation and **lack of** advanced foreign technologies due to embargos imposed by the US and Western world. The primary challenges were techno gap, a lack of skilled experts, low coordination between departments, the absence of a unified strategy, and a limited funding. However, focusing on autonomous development and scientific-technical sovereignty, China has built a technologically progressive space sector.

¹ According to the International Monetary Fund and the World Bank, China takes the second position after the USA in terms of nominal GDP and the leading position in the world ranking in terms of GDP as calculated regarding purchasing power parity.

Many academic studies were devoted to analysis of creation of this sector. Many scholars describe the chronology of basic technical achievements and evolution of the strategy and concepts in the space programme of China [1–3]. Some research address the aspects of growing political influence related to the success in the rocket and space sphere there [4,5]. Foreign scholars also analyse the process of adaption of defence innovations for civilian needs and transformation of management mechanisms for dual-use technologies in this sector [6, 7]. Some researchers specify Chinese state programmes to support scientific studies, experimental R&D, and encouragement of innovations [8,9]. In recent years, many works focused on development of commercialisation process and the role of expanding private space sector in China [10–12]. However, the impact of development of the financial sphere and investment instruments on the sector.

The evolution of the financial sector and space activities of the PRC can be tentatively segmented into four key stages, each of them representing notable institutional and technological transformations.

Stage One (mid-1950s – mid-1970s) is characterised by rigid centralised planned economic system, the appearance of national space programmes oriented on defence. In this period, Chinese economic system represented a uniformity of ownership forms, centralised decision-making in economy, natural resource distribution, equal-opportunity system of income distribution, and isolationism due to the foreign policy. The-then economic model was a planned economy with elements of radical communism policy. An important nature of centralised planned economy was the unity of economic and political systems that manifested in the management by the Party, and this led to distortions in the allocation of resources [13].

Until the mid-1970s, the PRC policy of isolationism from external collaboration and investment affected the development of the space industry. A lack of sufficient state funding for R&D deteriorated the situation as well.

The People's Bank of China (PBC) represented national financial system combining operational functions of central and commercial banks. The

PBC made transactions of financial flows of state institutions, provided banking settlements, cash services, and lending. The operations of other banks and financial entities were rigidly controlled by the state with high subordination to its policy. The list of these banking institutions included:

- *The Bank of China (BOC)*, one of the oldest banks founded in 1912, to handle global financing operations, currency transfers, and cross-border trade services.
- *The Agricultural Bank of China (ABC)* was in charge of financing agriculture and development of agrarian sector, provision of loans and services to the peasant farms.
- *The People's Construction Bank of China (later re-named as China Construction Bank, CCB)* was oriented to industrialisation policy financing construction and industrial projects.

This trio of banks operated under a large extent of centralised management and control of the PBC, which limited their functions and opportunities depriving flexible lending and client services [14].

In view of limited financial resources and hard-line centralisation in China, the major efforts to set up and build space industry were made in close collaboration with the military sector intended to develop long-range ballistic missiles for safeguarding national security and creating a strategic nuclear arsenal. In 1956, space industry emerged, when the Fifth Academy of the Ministry of Defence was founded as the first national research institute of rocket technology [15]. Military tasks were of top priority, which influenced the nature of scientific research and technological innovations.

From in the mid-1950s, China waged a large military-and-technical assistance, which led to a strong contribution for the establishment of space industry with provision of samples of missile technology and training of Chinese specialists. In 1960, a breakdown of the bilateral ties gravely affected the progress of the Chinese space industry due to a shortage of qualified personnel and modern technologies. From this time, China relied its state strategy on space exploration with internal technological resources and national funding, autonomously developing its space ecosystem [2].

The centralised funding from the state budget covered all expenses in the space industry. Support programmes were advanced in two directions:

- Funding in the context of development projects of national defence under the control of military and defence-industrial institutions.
- Funding via subsidising scientific research institutions involved in civilian space science, primarily, the Chinese Academy of Sciences (CAS).

In that time, the highlight project of the national space industry was the development of the “*Dongfeng*” ballistic missile series. The major triumph was the launch of the first Chinese satellite, “*Dong Fang Hong 1*” delivered to the orbit by the Chinese launch vehicle “*Long March 1*” [16]. It was symbolic for Chinese technological independence in space exploration. Thus, on April 24, 1970, China became the fifth country in the world, which autonomously launched a satellite into orbit and won the status of a space power [17].

Concurrently, in this period of time China indicated quite a low progress in space landmark developments as a result of external isolation, a shortage of financial, technological, and qualified human resources, as well as internal political instability that negatively hindered the implementation of research and development [18]. Despite the general strengthening of military power, the space programme of China remained largely limited. It was aimed mainly at defence tasks and characterised by backward technological position behind space-oriented world leaders.

Stage Two (Mid-1970s — Late 1990s): A gradual transition from a centralised planned economy to the socialism with market mechanisms and reforms in domestic financial sector, institutional formation, and effective progressive development of independent national space industry. In the late 1970s, the government of the PRC acknowledged the need to reform its national rigidly centralised economy and switch to a new model of economic development, which combined market instruments with political control. In December 1978, the Third Plenary Session of the 11th Convocation of the Central Committee of the Communist Party of China proclaimed the official start of the reform and the policy of transparency.



The import of advanced technologies and equipment was necessary for the modernisation programme of the economy in China. According to assessments of Chinese experts, capital construction investments alone required an amount of approximately 400 billion USD. China recommenced the system of active purchasing equipment from abroad, which, in turn, increased the need of foreign currency resources [19]. Financial limitations posed a grave risk for national modernization plans that prompted the government to pursue the policy stimulating foreign trade and drawing foreign investment into domestic economy. Concurrently, the objective was to make these measures compatible for the achievement of strategic goals for the benefit of the national economy in order to evade defiance between admitting foreign capital and preserving the principle of self-sufficiency.

The desire for global market access external markets and investment sources stimulated transformation of the banking system in China. In 1985, an important initiative was adopted: the State Council Provision “On the Regulation of Foreign Banks and Sino-Foreign Joint Venture Banks in Special Economic Zones”. For the first time at the legislative level, this law regulated the presence of foreign banks in the territory of China, however, limiting their activities to the territories of the Special Economic Zones established in 1980: Shenzhen, Zhuhai, Xiamen, Shantou, and later, Hainan Island [20]. Furthermore, as a follow up to the reforms aimed at institutionalising the stock market and strengthening investor confidence, in 1990–1991, two key stock exchanges were established: the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE) [21]. Then in 1992, the China Securities Regulatory Commission (CSRC) was founded as a body subordinate to the State Council in charge of the centralised supervision of stock market participants. In 1994, to deploy a multi-level, diversified banking system with components of the market mechanism, three so-called “policy banks” were established: the China Development Bank (CDB), the Export-Import Bank of China (China Eximbank) and the Agricultural Development Bank of China. They were in charge

of relieving other major state banks from targeted financing of state programmes and transforming them into commercial structures to interact with enterprises, the population, and foreign trade on a market basis. In 1996, the PRC government approved provisions for dealing with pilot projects in venture investment, permitting the creation of venture funds on a commercial basis with potential participation of private and foreign investors. This indicated the appearance of the institutionalisation of venture capital as a segment of financial system in China [22].

Accumulating foreign investments for the development and modernisation of industrial production has become one of the major trends in the economic history of China [23]. The banking system strongly controlled by the state, has operated as the principal channel to mobilise the economic development of the industry. The PBC reinforced credit emissions through the state-owned banks and institutions of development in line with the government’s indicative plans. In fact, this provided centralised planning of investments, that ensured the allocation of credit resources to develop high-priority sectors [24].

As the Chinese economy became more intricate, the process of lending grew more discerning and the monetary policy turned out more flexible. In the course of growing priority of space research, the budget for these programmes expanded, which allowed developing new technologies and launching more spacecrafts. During this period, Chinese space exploration programme gradually became more transparent and application-oriented. It also revealed a growing interest in international collaboration.

Besides, following the suite of *the US Stevenson-Wydler Technology Innovation Act of 1980*,² the PRC implemented a policy for “civilising mission of military technologies” in the 1980s, using military R&D findings and production potential to manufacture civilian products [25]. In 1986, China launched “The 863 Program”, aimed at increasing domestic

² URL: https://en.wikipedia.org/wiki/Stevenson-Wydler_Technology_Innovation_Act_of_1980

competitiveness for the global market and improving the overall R&D capacity in high technology. This made a broad systemic impact on the development of national space industry from the late 1980s throughout the 2000s. “The 863 Program” was financed via the central budget with support of the China’s Ministry of Science (MOST)³ and the Commission for Science, Technology and Industry for National Defense (COSTIND) primarily through targeted grants. This involved the financing for key laboratories and projects, infrastructure subsidies for upgrading production level, and state orders for specific applied developments provided to contracted R&D institutions [26]. Thus, the development of key space technologies was supported and the funding facilitated the renewal of the R&D base of institutions in the space sector.

With gradual infiltration of market mechanisms into China’s economy, the state was coordinating the application of achieved results, undertook measures to ensure a sustainable development of the space industry [27]. In 1993, the state adopted a decision of systematic management in the space industry: managerial and production functions were separately transferred to the China National Space Administration (CNSA) and the China Aerospace Corporation (CAC), respectively. In 1999, the latter was dissolved and transformed into two entities: the China Aerospace Science and Technology Corporation (CASC), in charge of civilian space projects, and the China Aerospace Science & Industry Corporation Limited (CASIC), responsible for military technologies and their applied use.

These institutional transformations laid the basis for the subsequent progress of the industry, facilitating possible opportunities for the introduction of market mechanisms in certain segments of outer space activity.

During this time-frame period, the national space industry focused on developing launch vehicles and satellites, as well as the basics of future manned spaceflight. In the 1980s, China started actively developing its technologies in satellite communications, meteorology, and navigation:

- In 1975–1980, the *Dongfanghong* (DFH-2) communications satellites were produced and in 1984, the first of them was launched into geostationary orbit (followed by others), which was a breakthrough for the national telecommunications infrastructure. Thus, in the 1990s, a unified satellite communications network was assembled covering the territory of China.

- In 1988, the first Chinese meteorological satellite, *Fengyun* (FY-1A), was launched improving weather forecasting in China.

- China implements active development of Earth Remote Sensing (ERS technologies).

- China developed and launched the *Fanhui Shi Weixing* (FSW) series of recoverable satellites for Earth photography. It became the third country in the world with soft-landing satellites returning from orbit.

- In 1994, China approved and officially initiated the programme to create the *Beidou* navigation satellite system.

- Gradual deployment of the launcher vehicle series *Long March* for placing payloads into different types of orbits.

- In the 1990s, intensive knowledge and experience was gained for developing a manned space programme that culminated in the successful launch of the *Shenzhou 5* spacecraft, thus, China became the third nation after the USSR and the USA to launch a cosmonaut in outer space using its own autonomous system [28].

In 1985, China officially announced its plans to provide launch services on the global market with *Long March* launch vehicles (an important step towards the commercialisation of space activities, which contributed to the further growth of funding for the outer space programme). Besides, growing market-based financing mechanisms facilitated access for Chinese space companies to funding not only from the state but also from the society. Thus, IPOs were listed on the stock exchange by subsidiaries of the state corporation CASC: China Aerospace Times Electronics Co., Ltd. (in 1995, it financed the development of satellite electronics and microsystems) and China Spacesat Co., Ltd. (in 1997, it attracted funds for developing ERS

³ Prior to the year of 1998, The State Science and Technology Commission was the predecessor of The Ministry of Science and Technology in China.



and telecommunication technology satellites). Concurrently, the key funding source for space programmes remained allocations, including the sponsorship of academic institutions, ensuring central control and resource allotments. The key growth factor served as state investment.

Thus, in that time, China executed large-scale economic reforms (including in the financial sector), but their impact on the space industry was still small. The space industry remains a strategically sensitive and secret sphere, closely linked to the military industry, but its practical application gradually developed. The state controlled funding for strategic industries carried out mainly beyond market mechanisms occurs through the state budget, sectoral planning, and defence programmes. Concurrently, China devises financial markets, green-lighting companies to raise funds directly from the society and involving market mechanisms. In the 1990s, the PRC initiated offering launch services on the global market as the first step towards the monetizing of its outer space activities. Henceforth, the PRC gradually transformed from a catching-up nation into an independent space power.

Stage Three (Late 1990s — Early 2010s): Integration into the global financial system and hitting the world market of space services and technologies. At the early stage of attracting foreign investment, the main goal of Chinese policy was a compensation of drastic lack of foreign currency. As competitive benefits, it offered a high level of services, a variety of financial products, competence in fulfilling innovations and new services, as well as successful asset and liability management.

However, China's entry into the WTO in 2001 was a turning point in the liberalisation of the financial sector. By the year of 2006, the PRC closed its obligations to the WTO, completely opening its banking market to world players. Therefore, foreign banks gained the permission to operate in the PRC like the local banks, providing a wide range of services in yuan without any restrictions related to service territory or client type [19, 20]. Besides, in 2002, China launched the programme *Qualified Foreign Institutional Investor*, which allowed foreign institutional investors within established quotas to

purchase Class A shares, bonds, and other securities traded on the Shanghai and Shenzhen exchanges paying in yuan through custodian accounts in eligible Chinese banks.

The growth of the stock market, stimulated by the inflow of foreign capital, reinforced the Chinese financial system, including banks, which, in turn, could support projects in strategic sectors. Moreover, from the late 1990s to 2010, China carried out a thorough reform in largest state-owned banks BOC, ABC, CCB, as well as the Industrial and Commercial Bank of China (ICBC) founded in 1984. The transformation involved revitalisation, corporatisation, and entry into global stock markets. Each of them conducted IPOs jointly with major foreign investors, thus, it attracted billions of dollars and transformed the banks into modern financial institutions integrated into the world-wide financial system.

Concurrently, in 2006, China adopted the first ever comprehensive state document for strategic planning in science, technology, and innovation “*National Medium-and-Long-Term Program for Science and Technology Development (2006–2020)*”. Its goal was to create an innovation-oriented economy. Outer space activity was included in the list of priority high-technology venues of key significance for national development and global competitiveness. The given programme indicated the following strategic benchmarks: building national and regional innovation system, support for the interconnected development of defence and civilian technologies, fostering enterprises to increase R&D expenditures, development of international collaboration in science and technology, and enhancement of the potential of exported Chinese high-tech products. The plans for state-support mechanisms to implement this policy included the following directions:

Active improvement of the system for organising investment and financing in science and technology, refinement of the venture investment mechanism for innovation and pioneering activities, creation of platforms for financial cooperation in science and technology in various forms.

- Attraction of high-tech enterprises to listings visible on stock market platforms.

- Provision of more agreeable banking and currency environment for high-tech venture companies.
- Provision of preferential loans by banking institutions for major national industrial projects in science and technology, as well as for their commercialisation projects.
- Encouragement of enterprises to set up special funds aimed for financing R&D.
- Government procurement activation of scientific and technological resources throughout the country using various financial mechanisms, such as direct appropriations and tax incentives.⁴

Under these conditions, the state funding for space industry increased substantially: by 2013, China took the second top-list global position in terms of volume after the USA.⁵ At the same time, budgetary planning increasingly aggregated with elements of market logic in the light of transformation of the financial sector within the framework of mechanisms attracting and allocating funds. Primary funding is still allocated as a directive from the state budget. However, a number of departments in charge of scientific, technical, and industrial policy, *MOST*, *COSTIND*, the *Ministry of Industry and Information Technology (MIIT)*, and the *National Development and Reform Commission (NDRC)*, started introducing market-oriented approaches to resource allocation related to dual-use technologies and civilian high technologies.⁶ This has been revealed in competitive selection, evaluation of potential civilian returns, commercialisation subsidies, guidance on preferential lending through state banks, support for clusters of technology, and partially, in co-financing requirements. Thus, CASC and CASIC operated within the framework of a hybrid model where command and market mechanisms concurred with support for efficiency, innovation, and an element of competition [29].

Furthermore, the space industry utilised invest-

ment instruments through state and public private banks. Thus, during this period, China initiated implementation of ready-to-use export projects for satellite production and their launch, construction of ground infrastructure, and personnel training (in particular, for Pakistan, Venezuela, Nigeria, Bolivia), subsequently, becoming an alternative to Western and Russian suppliers. Export was backed up by financial instruments from the state banks *Exim Bank* and *CDB*, which provided foreign countries with long-term tied-preferential loans (usually with an interest rate of 2–3 per cent for a 5-year forbearance extra-time period). Primarily, due to the provision of such flexible financing, the PRC is preferable as a partner for space projects among the Global South countries [29].

It is worth noting that by the year of 2011, space sector in China was officially regarded as an economic, not just science and defence sector. This is indicated by core strategic documents (the 3d White Paper “China’s Space Activities in 2011” and “The 12th Five-Year Plan for National Economic and Social Development (2011–2015)”, which directly defines a course towards the commercialisation of space technologies and recognises the role of the market in managing space infrastructure.

Within this time-frame period, the Chinese space programme achieved a notable success in:

- the sphere of manned spaceflight using *Shenzhou* spaceship (spaceflight with cosmonauts, multi-day orbital manned docking flights);
- the area of orbital station construction (*The Tiangong-1* experimental module launched in 2011);
- the national lunar programme carried out with the *Chang’e* series of spaceships created and launched;
- Chinese *Beidou* navigation grouping was launched and deployed;
- The *Long March* vehicle series were furthermore developed successfully, moreover, from 2001 up to 2013, the launch-to-orbit success rate increased, reaching 98 per cent [29];
- launches of a large number of scientific, technological, and application-use satellites.

Such transformation of the funding concept for high-tech organisations made a positive impact

⁴ URL: https://www.itu.int/en/ITU-D/Cybersecurity/Documents/National_Strategies_Repository/China_2006.pdf

⁵ URL: https://www.oecd.org/en/publications/the-space-economy-at-a-glance-2014_9789264217294-en.html

⁶ Since 2008, *COSTIND* was transformed in The State Administration for Science, Technology and Industry for National Defense (*SASTIND*).



on the development of Chinese space industry. As the leading role of state investments remained, gradually there occurred their market-oriented redistribution of support. Currently, the commercial component of Chinese outer space activities grows due to the activity of state corporations. This period can be defined as a transitive one — from exclusively state-centralised to a more application-oriented regulatory model of management with market elements.

Stage Four (2010s – present): Liberalisation of access for non-state actors to outer space activities and the use of market tools of the financial-investment ecosystem for support of commercial space industry. Until 2014, all activity of the space industry in the PRC was under the auspice of the state corporations CASC and CASIC. However, in the context of the emerging global *New Space* phenomenon, the Chinese government began considering the development of its own similar direction in the space industry.⁷ A perception appeared, that the space industry had reached such a level of development where the actual involvement of the private sector was not only helpful but quite necessary in order to generate a sustainable space ecosystem, enhance the level of technological innovation, and competitiveness.⁸

In 2014, the Chinese Government adopted “Guidelines of the State Council on Innovation of Investment and Financing Mechanisms in Key Areas and Encouraging Social Investment”, also entitled “Document No. 60”. It postulated new measures of the policy encouraging the attraction of private capital to ensure growth in seven areas, including civilian outer space infrastructure.⁹ This document can be regarded the legal starting point for the en-

couragement of the rise of Chinese free-enterprise space sector.

“Document No. 60” was reinforced by the administrative issue of “Medium-and-Long-Term Development Plan for National Civil Space Infrastructure (2015–2025)” issued in 2015. It established that all investment enterprises involved in creation and operation of basic space infrastructure would mainly remain under the state control, however, they are permitted and stimulated for private investment in applied commercial projects, which are related to civilian space objects.¹⁰

Subsequently, other documents on the policy emerged to encourage private investment in the previously closed sphere of space industry. Currently, Chinese private space companies officially receive state support and are able to do the following:

- Use existing infrastructure of space destination (testing grounds, launch pad complexes).
- Operate within the framework of state techno parks and innovation clusters with standard benefits for residents.
- Gain support from central and regional authorities through officially published plans and regulatory documents.
- Attract venture private and public-corporate financing (through various funds);
- Raise venture private and state-corporate financing (by means of various funds).
- Take part in national strategic initiatives and receive state orders.

Notably, the *New Space* phenomenon in China has an important characteristic of the development. Apart from the support scheme of the central government for a small number of commercial companies, financing of the private space sector by the central government within the framework of R&D funding or product and service contracts is smaller, than financing provided from provincial governments, that strive for regional economic and technological development (*Fig. 1*).

Many representatives of regional authorities are

⁷ *New Space* is a new stage or phenomenon in the development of outer space activities, where commercial players apply innovative business approaches and financial mechanisms, leading to technological breakthrough innovations, reduction of the costs of access to outer space, and expansion of the number of participants in the space sector.

⁸ *New Space in Asia — Experts views on space policy and business trends in Asian countries.* European Space Policy Institute, report 77. 2021. 128 p.

⁹ URL: http://www.gov.cn/zhengce/content/2014-11/26/content_9260.htm

¹⁰ URL: <https://www.ndrc.gov.cn/xxgk/zcfb/ghwb/201510/W020190905497791202653.pdf>

convinced that the aerospace industry positively influences other economic spheres, they understand its strategic significance, and regard its development a clear indicator of the general industrial power of a district [30]. Meanwhile the central government develops macro-plans for space exploration, local authorities back up private space enterprises and entities via complementary symbiotic relationships facilitating regional development and the growth of technological innovations in a stable financial environment [31]. Such support for the New Space era can be regarded as one of the key factors for its prosperity in China: private space projects are often financed through investment funds of provinces and cities.¹¹

As Chinese commercial space companies build up, the issue of their ability to list their shares to the IPO market became relevant, which has always been difficult in China due to tough listing rules. However, in 2019, this procedure was simplified with the foundation of *The Science and Technology Innovation Board (STAR Market)*. The latter is a branch of the *Shanghai Stock Exchange* that facilitates IPO listing for Chinese early-stage high-tech companies with no stable profits (particularly in the sphere of AI, commercial space, and low-orbit economy projects).¹² One of the first entity, which filed to list its shares on IPO's *STAR Market* was the state-private satellite company *PIESAT Information Technology*. This has become a clear signal of a possibility for implementing a mechanism for attracting venture capital and direct investment in the industry.

It is worth mentioning that, despite liberalisation and the active use of market mechanisms, foreign companies still cannot freely invest in sensitive industries, including the Chinese space sector. In 1995, the government PRC for the first time issued "The Catalogue of Industries for Guiding Foreign Investment".¹³ In 2017–2019, it stipulated

items related to the space industry, including the design and production of civilian satellites, their payloads, components, and testing equipment, as well as R&D of innovative space materials. However, despite the unified PRC "Foreign Investment Law" adopted in 2020, which formally guarantees foreign investors market access and business activities, the abovementioned Catalogue contains "*The Negative List*" that indicates the industries with limited or prohibited access. The List includes certain segments of the space industry, for example, the access to the sphere of Earth Remote-Sensing satellites (ERS) is banned for foreign investments without special corresponding permission from the competent authorities of China.¹⁴

Chinese private space enterprises are predominantly financed through internal sources: private investors, as well as private, state, corporate, academic, and mixed venture funds. Active private venture funds are *MPC* (formerly known as *Matrix Partners China*), *Shunwei Capital*, *Source Code Capital*, *HongShan* (alias *Sequoia China*), and *CDH Investments*. Subsidiaries of state space corporations more often receive resources from corporate investment platforms, affiliated state banks, university funds, as well as state funds (central government and Chinese provincial funds) [32]. We distinguish some of them: *CASIC Fund*, *Guochuang Investment Guidance Fund* (a large national Fund of the Funds" set up in 2017 by several state structures), *CAS Star* (the foundation of the Chinese Academy of Sciences), and the state fund *National Manufacturing Transformation and Upgrade Fund*. As regards municipal funds, the list of examples includes *Beijing Commercial Space and Low-Altitude Economy Investment Fund* (Beijing), *Hainan Free Trade Port Aerospace Industry Fund* (Hainan), and *Hubei Yangtze Aerospace Equity Investment Fund* (Hubei).

The abovementioned processes facilitated introduction of wide development of a public-private partnership model in the industry and significant changes in the image of Chinese space sector. Since 2015, over the recent ten years, the amount

¹¹ New Space in Asia — Experts views on space policy and business trends in Asian countries. European Space Policy Institute, report 77. 2021; 128 p.

¹² URL: https://paper.people.com.cn/zgjzk/pc/content/202506/30/content_30084872.html

¹³ URL: <http://www.gov.cn/xinwen/2019-06/30/5404701/files/9d2d>

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¹⁴ URL: <https://www.ndrc.gov.cn/xxgk/zcfb/ghxwj/202504/P020250424307430450848.pdf>

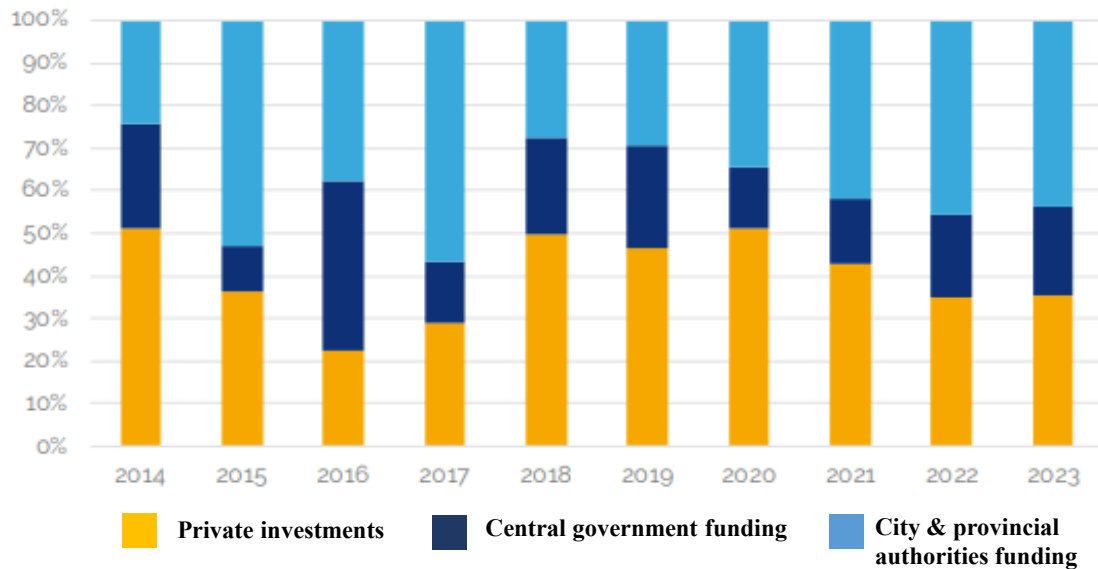


Fig. 1. Funding of Commercial Space Activities in China by Source Type, 2014–2023

Source: compiled by the authors: URL: https://www.espi.or.at/wp-content/uploads/2024/05/ESPI_Space_Venture_2023.pdf /

of commercial space companies in the PRC increased to several hundred. Nowadays, developed, institutionally established mechanisms for the functioning of the financial sector, a significant amount of various venture funds, the growth of direct investment volume have become the factors of positive influence on Chinese *New Space*, which was actively operating with investments starting from the year of 2017. From 2014 to 2023, over 7.5 billion euros was invested in companies in the sector.¹⁵ In 2024, Chinese space start-ups attracted a record volume of funding: 1.9 billion USD (24 per cent of the total private investment globally in space start-ups). Based on this index, the PRC took the second leading position in the world to follow only the USA (Fig. 2)

Compared to 2021–2023, it is observed a significant growth in investments, as a result of support for Chinese private launch service providers, as well as manufacturers and operators of planned satellite mega-constellations.¹⁶

Commercial players operating successfully to secure funding resources are the following:

- launch vehicle developers *Galactic Energy*,

OrienSpace, *LandSpace*, *Space Pioneer*, *iSpace*.

- satellite manufacturers *MinoSpace*, *GeneSat*, *Commsat*;
- provider of ground segment satellite communication equipment and service *EmpoSat*;
- the ERS operators *Chang Guang Satellite Technology*, *ADA Space*, *Spacety*;
- the state-private space project *SpaceSail* creating a large orbital constellation for providing satellite broadband, it is considered a future competitor to *SpaceX's Starlink*.¹⁷

In addition to developing private domestic space-flight, China simultaneously increased the budget to implement state space programmes: during the period under study, the budget more than tripled from 6 billion USD in 2013 to nearly 20 billion USD in 2024.¹⁸ The PRC established the development of space technologies as a main priority and made gross investments in space activities, implementing policy initiatives in the industry. So, in the last decade, China has got the following big success:

¹⁷ How Subnational Government Support is Helping China Build Its Version of Starlink. Asia Pacific Foundation of Canada, 2025. URL: <https://www.asiapacific.ca/publication/subnational-government-support-china-satellites-and-space>

¹⁸ URL: <https://www.weforum.org/stories/2016/10/china-space-programme-tiangong-numbers/> |World Economic Forum; URL: <https://nova.space/press-release/defense-spending-drives-government-space-budgets-to-historic-high/>

¹⁵ URL: https://www.espi.or.at/wp-content/uploads/2024/05/ESPI_Space_Venture_2023.pdf

¹⁶ URL: https://brycetek.com/reports/report-documents/start_up_space_2025/

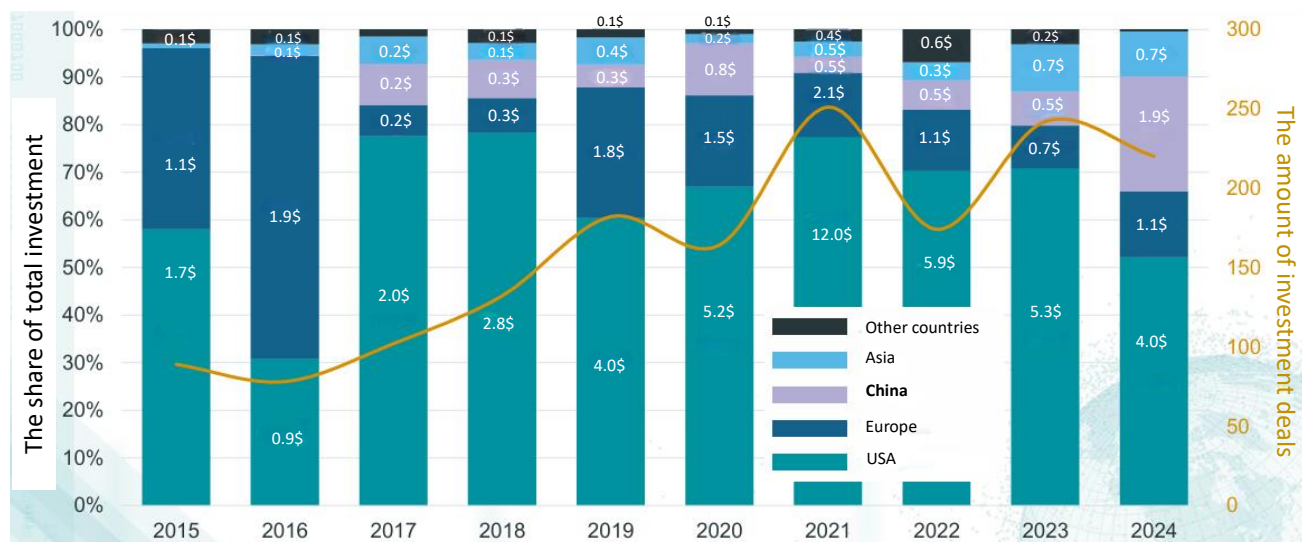


Fig. 2. Geographical Distribution of Private Investment in Space Start-Ups for the Period of 2015–2024, in Billion US Dollars

Source: compiled by the authors: URL: https://brycetechnology.com/reports/report-documents/start_up_space_2025/

- a technological breakthrough by launching *Mozi*, the world's first quantum communication satellite in 2016;
- in 2019, China became the first in the world to accomplish a soft landing of the *Chang'e-4* apparatus on the other side of the Moon, later, in 2021, the second country in the world after the USA when successfully landed its *Zhurong* rover on the surface of Mars for its interplanetary mission *Tianwen-1*;
- in 2020, China deployed the 3rd generation of the *Beidou* navigation system, providing global coverage;
- by 2020, the state high-precision *Gaofen* observation system was in operation, providing 24-hour all-weather Earth monitoring;
- since 2015, China started to deploy *Jilin-1*, the largest national ERS commercial satellite constellation with over 100 apparatuses;
- in 2022, the multi-module space station *Tiangong* was completed, since 2023 manned missions were launched with *taikonauts* who stayed in the station for months;
- China strongly expanded its presence in orbit: by early 2025, its total satellite constellation included over 1,050 active apparatuses, which ranks second in number after the USA. As compared to 2015, the amount of Chinese satellites in orbit has

grown more than six fold¹⁹;

- In 2018, the PRC launched the record number of space ships in a single year, and since then it has considerably outmatched at the first or second top-list position by this indicator, by increasing launch vehicle launches from 19 in 2015 to 68 in 2024.²⁰

Such a space success is based on China's achievements in rocket technologies, allowing for the reliable launches of payloads into various orbits. Qualitative launch vehicles can be viewed as an indicator of growing space potential achieved with considerable technological progress in this field. It is possible that private companies will furthermore contribute to this success. In 2023, they demonstrated initial results: *LandSpace* conducted the world's first successful launch of a methane-liquid-and-oxygen-fueled rocket placing a payload into low orbit.²¹ Chinese *New Space* companies open the doors for innovation and technological progress beyond the state entities and allow for reducing potential dependence on foreign suppliers of space components [31, 33].

¹⁹ URL: <https://ts2.tech/en/inside-chinas-space-empire-satellites-services-and-the-secret-power-of-cnsa/>

²⁰ URL: <https://aerospace.csis.org/data/space-environment-total-launches-by-country/>

²¹ URL: <https://www.landspace.com/en/news-detail.html?itemid=15>

Thus, the measures of the PRC in the state industrial and technological policy to back up the private space industry (incl. the issuance of directive documents, creation of institutional mechanisms, including financial, to raise non-state investment into the industry, implementation of direct and indirect funding) lead to building a hybrid model of the national space industry. Thus, private companies jointly reinforce the national space programme, the synergy of the state and private sectors contributes to innovation and increases the development of the space industry. Nowadays, notable progress confirms China's position of a leader in space, capable of challenging its competitors.

CONCLUSIONS

The rapid progress of China in space is not easy to explain by a single reason: the phenomenon should be viewed as the result of functioning of the ecosystem with a combination of stimulating and supporting factors. One of them is the effective use of the national mechanisms of financial sector. At the early stage, the space programme faced many problems, incl. lack of funding and tech gap. Reforms in the financial sector via transformations in the banking system, development of stock platforms, and activating venture investment, as well as gradual opening to external markets allowed the following:

- Raising international capital, strengthening the financial system and economy, and, as a result, enhancing opportunities for growing funding for technological development and fulfilling ambi-

tious projects in space activities.

- The use of market-driven approaches of financial support for space companies by listing shares on exchanges, preferential lending, switching to a project approach for subsidies and grants, requirements in co-financing etc. fit well with directive state financing of the space industry. Notably, an important role in supporting space industry play a developed national system of state (both central and municipal governments), corporate, private, and mixed venture foundations.
- Securing opportunities for operation in the sector for private companies, contributing to commercialisation and growth of innovation of the industry. These companies count on provided mechanisms of direct and indirect financing from the state and can also use the financial approaches to the stock and venture markets to raise private capital to launch, develop, and expand their activity.

Currently, China's feats in space exploration cover all key directions, from satellite launches to manned flights or comprehensive space scientific research, which is one of the main factors of the global political influence of China. A growing capacity in this sphere is facilitated by a strict political will, strategic priority policy of the government, and large state and private investments, which are ensured by a competent use of mechanisms of Chinese financial sector in the development policy of the space industry.

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