Research on the Development of China's High-tech Industry under the Background of Sino-U.S. Trade War

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Abstract. High-tech industry has always occupied an important position in many industries in China. Since the reform and opening up, China's high and new industries have been developing at a rapid pace. However, since the beginning of 2018, there has been a trade war between China and the United States. In the new international situation, China's high-tech industry is facing huge opportunities and challenges, so it is particularly important to study the competitiveness of China's high-tech industry. Through literature analysis, based on micro and macro perspectives, this paper compares the situation of China and the United States in Sino-U.S. trade, and analyzes the Sino-U.S. trade frictions in recent years and the contest between the two countries' national core competitiveness. The focus of this paper is to study how the survival and development of China's high-tech industries are affected under the background of Sino-U.S. trade war.

Keywords: High-tech industry, micro-perspective, macro-perspective, Sino-U.S. trade war.

1. Introduction

1.1. Background to the U.S.-China Trade War

With China's active layout in 5G communications, cloud computing, smart cars and other fields, the industrial competitiveness of relevant domestic companies is rising rapidly [1]. At the same time, China has become an important player in the global market that cannot be ignored. However, in recent years, China's development has influenced and challenged the hegemony of the United States, which has intensified its oppression of China in all aspects in recent years [2]. In 2018, U.S. President Donald Trump insisted on launching a trade war against China, and the economic and technological disputes between China and the U.S. have become increasingly fierce [3]. Since the beginning of the trade war, high-tech enterprises such as Huawei, ZTE and SMIC have been subjected to unreasonable repression by the U.S. government. The development of Chinese high-tech enterprises has been severely tested. Sino-U.S. trade frictions will have many impacts on China's high-tech industries. In terms of trade, the export structure of China's high-tech products is relatively unitary, so it is severely restricted by the trade barriers of exporting countries [4]. In terms of innovation activities, external technology spillover, as well as the reduction of domestic R&D investment, to a certain extent, hinder the improvement of China's independent innovation ability. Since the beginning of 2018, there has been a trade friction between China and the United States, the so-called trade war. The reason why we are so concerned about the Sino-U.S. trade war is that the U.S. has imposed huge tariffs on China, such as restricting China's high-tech exports; Barring China from entering their market, etc. Therefore, China's high-tech industry has been suppressed by the United States, unbalanced and inadequate development and other problems.

1.2. Research Significance

Among many industries in China, high-tech industry has always occupied a very important position. Since the reform and opening up, China's high and new industries have been developing at a rapid pace [5]. It is likely to bring a series of economic and social benefits to our country in the future. High-tech industries can also promote industrial upgrading and improve the core

competitiveness of enterprises through technological innovation and product upgrading. In addition, the development of high-tech industries can also promote the adjustment and transformation of industrial structure, and promote the upgrading and optimization of economic structure. The industry can also provide us with a lot of job opportunities and promote social employment [6]. High and new technology industry is an important engine for China's economic development. The development of high and new technology industry relates to China's comprehensive national strength, can improve China's core competitiveness, promote social development, and has far-reaching strategic significance for China. Therefore, we should study the development status of China's high and new technology industry under the background of Sino-U.S. trade war, and find out the development prospect of China's high and new technology industry. It has not only theoretical significance, but also the research results can provide reference for the formulation of relevant policies and has broad practical significance.

2. Development Status from Macro Perspective

Let's first investigate the development of China's high-tech industry in the context of the Sino U.S. trade war from a macro perspective. Firstly, many studies have taken tariff measures such as anti-dumping and countervailing measures as examples to explore the impact of product market trade frictions on target countries. Under the influence of trade disruption effects, tariff measures such as anti-dumping and countervailing measures have led to an increase in the export cost and a decrease in the export volume of related products in the target country, while at the same time, the import volume of the initiating country has decreased, it also directly harms the import and export trade of related industries between the two countries. Therefore, overall, anti-dumping measures against China have an inhibitory effect on China's export trade. Some studies suggest that policies for identifying high-tech enterprises can help improve the innovation level of enterprises. However, there are also enterprises that use various means to beautify their behavior in order to obtain the qualification recognition of high-tech enterprises [7].

In addition, trade frictions between China and the United States may hinder trade exchanges in some high-tech industries, which may have adverse effects on the normal operation of enterprises. This is specifically manifested as obstacles to the daily production of high-tech industries, as many of China's high-tech industries rely on foreign suppliers. If trade frictions escalate and foreign suppliers cut off supply, the industry will not be able to operate normally. At the same time, the operational efficiency of high-tech industries will be impacted. China's high-tech enterprises are closely connected to foreign markets, and their products need to be sold abroad, even some of which rely entirely on foreign markets. If exports are blocked, it will seriously affect the operational efficiency of related industries; Then, the high-quality development of high-tech enterprise groups will be hindered. Currently, China's high-tech industry has formed multiple ecosystems mainly composed of industry leading enterprises and leading enterprises in segmented fields, with upstream and downstream enterprises in the industrial chain interdependent and mutually promoting. In the Sino U.S. trade friction, many chain owners have been included in the "physical list" of the United States, which to some extent affects the development of the industry itself, As well as the normal operation of the upstream and downstream industries, some enterprises may face the risk of bankruptcy as a result [8].

On the other hand, trade frictions between China and the United States may bring some benefits to China's high-tech industries. The results of anti-dumping investigations are generally reflected in the increase in tariffs. Tariff barriers will form a reverse force mechanism for industries and enhance innovation and research and development in technology intensive industries. Enterprises tend to choose passive innovation investment strategies, increase their innovation efforts in products, improve product quality, expand their export competitiveness, and promote product exports. Research shows that when products are at a high level among high-end products, upgrading product quality can indeed effectively alleviate the adverse effects of trade frictions between China and the United States.

Then, China's technology intensive industries have a comparative advantage compared to the United States, but their comparative advantage is indeed affected by trade frictions. However, a certain level of anti-dumping intensity can actually promote industrial upgrading in China and increase exports of high value-added industries such as technology intensive industries [9].

In summary, trade frictions between China and the United States are generally very unfavorable for China's high-tech industries, which will inhibit the import and export trade of the industry and also make the high-tech industry use various means to beautify itself. The development of the industry's group will also be hindered, and many enterprises may face the risk of bankruptcy due to this; However, it also has one advantage, as tariff barriers can form a reverse force mechanism on industries, which can stimulate innovation and upgrading of technology intensive industries and increase exports of technology intensive industries.

3. Development Status from Microscopic Perspective

The fundamental issue in microeconomics pertains to the optimal allocation of resources, and its foundational framework is constructed upon the theory of how relative prices are determined via the interplay of supply and demand forces. Consequently, the principal paradigms within microeconomics encompass the analysis of consumer decision-making, supplier behavior, and the equitable distribution of income.

Centered on specific sectors, notably high-tech industries encompassing pharmaceuticals, aerospace, and semiconductor manufacturing, this study concentrates on a meticulous analysis. It delves into the unique attributes characterizing high-tech industries and their proclivity towards innovation initiatives. Both the impact of domestic and foreign competition and the degree of indigenous technological innovation acumen are examined. Adopting a vantage point rooted in U.S. competitive dynamics, the research investigates China's high-tech industry. This involves scrutinizing how scientific and technological advancements, intertwined with innovation endeavors, engender heightened vigor within procurement and production undertakings. Such dynamics are particularly pronounced in the context of augmented rivalry emanating from the United States within emerging economies. High-tech sectors have demonstrably acted as potent drivers of economic expansion within various nations. Consequently, the prioritization of innovation finds itself ensconced as a preeminent national agenda. The escalating influx of foreign-directed enterprises introduces the potential to impact the native market landscape, potentially accentuating industry competition and further amplifying the high-tech rivalry between China and the United States [10].

Viewed through the lens of the underlying catalysts of the Sino-U.S. trade conflict, an examination of trade imbalances and the manufacturing sector, bolstered by empirical data, offers insights into the fundamental character and drivers of this economic confrontation. Following China's integration into the World Trade Organization (WTO) in 2001, a conspicuous upswing in the U.S. trade deficit ensued, concurrently coupled with a depletion of 5 million manufacturing jobs since the advent of the new millennium. Notably, the attrition of employment was especially pronounced within the low-wage manufacturing realm, as observed by Feenstra and Sahara in 2018 [11]. It is pertinent to consider whether the profound trade imbalance with China unequivocally instigated the commencement of the trade war, following China's WTO accession.

Amid the intricate tapestry of the twentieth-century international milieu, characterized by intricate scientific and technological rivalries, the landscape underwent a paradigm shift in 2018 with the official declaration of the trade war between China and the United States. The ensuing tariff escalation unveiled a noteworthy deviation; it centered not merely on the realm of mid to low-tier manufacturing, but critically encompassed the domain of elevated-value, sophisticated manufacturing pursuant to China's "Made in China 2025" initiative. It is paramount to accurately discern the underlying essence and rationale underpinning the Sino-U.S. trade strife. Beneath the superficial layers of this economic contest lies a nuanced verity: the ostensibly trade-driven antagonism orchestrated by the United States

serves as a conduit for the exertion of dominance and marginalization across multifaceted dimensions encompassing China's military, economic, political, and cultural domains, as posited by [12].

Amidst the ongoing trade conflict initiated by the United States, adopting a micro-environmental perspective entails a comprehensive approach encompassing diverse stakeholders: suppliers, the public, competitors (with a notable focus on the United States), and consumers. This multifaceted strategy aims to champion and bolster the emergence of novel and advanced technology industries. The strategy includes provisions such as incentives for the new tech sector, tax cuts to spur its growth, and the creation of a self-perpetuating cycle from supplier to consumer. Furthermore, the "infant industry" theory is invoked as a protective measure to expedite the advancement of nascent high-tech sectors, especially in the face of external pressures, notably from the United States.

Within the realm of consumer choice, a strategic avenue involves reforming consumption taxes, particularly for products like domestic microchips. Such reform would involve a reduction in consumption taxes to enhance consumer motivation for increased product consumption. In terms of manufacturers' supply, targeted strategies could be implemented for sectors like pharmaceuticals, aerospace, and aviation. These strategies encompass financial incentives, tax exemptions, and region-specific support mechanisms. Regarding income distribution, it is proposed to introduce high-tech incentives for professionals within pertinent industries and departments, thereby elevating their motivational drive. This initiative would involve heightened investments in education to cultivate a skilled high-tech workforce, this will improve the quality of education and promote greater student participation in high-tech research, development and innovation. In this process, it is suggested to learn from the developed countries' support and incentive policies for high-tech industries.

Examining the trajectory of China's high-tech industry in the context of trade friction with the United States relies on two foundational assumptions. Thesis suggests that the imposition of prohibitive tariffs on key import commodities by China and the U.S. would unfavorably impact their welfare gains, characterized by trade effects divided into trade creation and diversion categories. Notably, the most profound repercussions of trade conflicts are observed within the consumer goods and industrial products sectors. Upon comparing the cumulative trade effects and the welfare effects between the U.S. and China, both nations experience favorable outcomes under trade liberalization. However, the U.S. would realize greater gains than China in terms of overall trade, while China would reap more extensive social welfare benefits than the U.S. across most product categories. Specifically, the total trade value for the U.S. would amount to $35.57 billion, surpassing China's $34.76 billion, and China's aggregate welfare would reach $2.86 billion, exceeding the U.S.'s $1.85 billion. A substantial augmentation of social welfare for China, amounting to $997.45 million, would be notably observed in the industrial products sector [11].

In an overarching context, while the primary high-tech manufacturing exports for both China and the United States predominantly consist of low and medium technology complexity exports, variations in the distribution proportions of technology complexity types are evident. Over the past decade, China has consistently maintained a commanding lead, with low and medium technology complexity exports accounting for more than 70%, consequently exerting considerable pressure on other export categories. As a consequence, the proportion of high technology complexity exports, particularly upper-middle technology, remains notably constrained, with no discernible upward trend in recent years. Conversely, the United States exhibits a divergent pattern, where the categories of high-tech and upper-middle-tech complexity exports align with those of lower-middle-tech complexity exports [12].

4. Underdevelopment

4.1. Development Deficiency from Macro Perspective

Firstly, the vast majority of domestic literature studies the efficiency of national high-tech development zones, innovation efficiency of national high-tech development zones, institutional incentives, economic development, ecological efficiency, and other aspects. However, there are

relatively few independent research objects on the efficiency of national high-tech development zones based on innovation spillover effects, neighboring activities and innovation networks, incentive systems, and market structures that may form endogenous problems. Although some literature has also conducted relevant studies, such as incentive systems, innovation activities, and the efficiency of national high-tech development zones, there are very few literature that comprehensively analyzes the endogenous efficiency of national high-tech development zones within an endogenous valve system framework [13].

In addition, the existing empirical literature adopts research methods that rarely consider endogeneity efficiency, and most of the literature is limited to linear changes in the efficiency of national high-tech development zones. However, the correlation, market structure, and incentive system of innovation activities have changed.

The endogeneity problem of migration leads to biased estimates in traditional empirical methods. However, in the literature on quantitative analysis of the efficiency of national high-tech development zones, the vast majority of literature uses methods such as data envelopment, factor analysis, and transcendental logarithm for experimental research. The above research methods can reasonably analyze the impact of explanatory variables on the economy of national high-tech development zones, but intentionally or unintentionally give up considering the correlation between explanatory variables, the influence of accidental factors, and common factors. Many times, although there are discussions about institutional changes and innovation activities in national high-tech development zones, especially changes in basic core technologies, empirical analysis assumes that these obvious institutional changes will only lead to linear changes in the efficiency of national high-tech development zones [13].

Then, currently, there is a relatively lack of systematic and precise research on the endogenous efficiency of national high-tech development zones, and there is a large research space in this field. The research objects, dimensions, and methods urgently need to be further expanded [13].

4.2. Development Deficiency from Microscopic Perspective

This paper uses the framework of factor endowment theory to explore the development track of China's high-tech industry in Sino-U.S. trade frictions. Compared with the United States, China is more inclined to labor-intensive production and the United States is more capital-intensive in its preference for China scrutinizing the prevailing literature reveals a conspicuous void, indicative of an inadequacy in comprehending the intricate nuances that underscore the high-tech domain. It is imperative to recognize the pivotal role of intellectual capital in high-tech sectors, which stand as citadels of scientific and technological advancement. Of particular pertinence is the enigmatic Leontief paradox, which persists even when the Heckscher-Ohlin theorem remains substantiated. This paradox is particularly intriguing given the U.S.'s export of labor-intensive goods despite its capital-intensive profile. The scholarly discourse is replete with diverse interpretations, with one school of thought highlighting the U.S.'s export of labor-intensive products as a reflection of its abundance of educated and skilled labor—an assemblage often referred to as talent, which serves as a fount of innovation [14]. This perspective underscores China's comparative deficit in labor quality vis-à-vis the U.S., consequently impeding the robust advancement of industries spanning the gamut from rudimentary to sophisticated sectors.

The evolution of China's high-tech sector in the context of economies of scale underscores the concept's essence, defined as the enhancement of economic efficiency consequent to the expansion of production scope, resulting in diminishing costs with rising output. Economies of scale are categorized into internal and external variants. External economies of scale emanate from factors such as the dry secondary school effect and agglomeration effect.

Exploring the trajectory of China's high-tech sectors within the context of trade frictions between China and the United States through the lens of the infant industry theory and trade protection reveals a diversity of interpretations within scholarly discourse. Various scholars offer distinct definitions of the infant industry, such as Kemp's criterion and Muller's criteria, among others. This concept pertains

to nascent enterprises exhibiting latent developmental potential, yet to attain maturity, thereby warranting state-backed safeguarding. Within the contemporary landscape characterized by intense competition in terms of national comprehensive strength and technological prowess, the high-stakes competition inherent in the realm of high-tech industries has evolved into a pivotal component of the broader contest for comprehensive national ascendancy.

From the period Tolper-Samuelson theorem Theorem: exporting a product raises the price of the factor intensively used in that product and raises the income of the owner of the factor intensively used in that product. And nowadays, the wages of Chinese scientists and technicians are lower, especially when compared with the wages of the entertainment industry and so on, and from this point of view, the wages are not attractive enough.

5. Recommendations for Economic Underdevelopment

5.1. Suggestions for Macro Perspective

China should increase its research on the efficiency of national level high-tech development zones that may cause endogenous issues as an independent research object, and should also increase the literature on the shortcomings mentioned above, such as adding literature that comprehensively analyzes the endogenous efficiency of national level high-tech development zones within an endogeneity valve system framework. This helps to supplement the literature on analyzing the endogenous efficiency of national high-tech development zones by integrating an endogenous visual valve system framework.

China should increase its consideration of endogeneity efficiency when conducting research, and not be limited to national level linear change research. This helps to consider and explain the correlation, contingency, and common factors between variables. At the same time, when conducting research, China should not blindly assume, but should consider changes in basic core technologies. China needs to expand its research objects, dimensions, and methods through research on increasing endogenous efficiency.

5.2. Suggestions for Micro Perspective

From this point of view, if China's high-tech industries want to develop in a high-quality and sustainable way, the country should vigorously develop education, improve the quality of nationals, and create more talents.

Given the current state of China's high-tech industry, it is imperative to contemplate the strategic utilization of economies of scale to engender elevated quality developmental advantages. Enhancing the caliber and pace of progress in this sector necessitates a deliberate augmentation in the establishment of technology-oriented or inventive industrial parks. This entails a nationwide dissemination of pilot initiatives aimed at catalyzing their proliferation [15]. By aggregating industries with heightened remunerative potential, the synergistic influences of agglomeration and the dry middle school effect can be harnessed to their utmost potential.

Amidst the United States' imposition of tariffs and other measures stifling China's high-tech industry, adopting a passive approach is infeasible. A more proactive stance involves supporting high-tech development through external means like tariffs, subsidies, and internal strategies such as tax cuts, financial incentives, and increased wages for skilled professionals. This can enhance confidence, attract investment, and mitigate the sector's current wage unattractiveness. An issue stems from the Tolper-Samuelson theorem era, positing that heightened product exports intensify factor owners' income linked to its production. Presently, China's scientists and technicians earn comparatively less, notably against industries like entertainment. This wage disparity diminishes the high-tech sector's appeal and underscores the need for enhanced compensation.

From this perspective, it becomes imperative to incentivize the export of high-tech industries while concurrently enhancing the proficiency of the Chinese workforce and nurturing a pool of adept individuals. This concerted effort will facilitate an escalation in the remuneration of high-tech

professionals, thereby establishing a self-reinforcing cycle. The augmentation in the cadre of high-tech talents will, in turn, catalyze the advancement of the high-tech industry.

6. Conclusion

Sino-us trade frictions may bring some benefits to China's high-tech industries, and tariff barriers and technological blockades are conducive to forcing enterprises to transform and upgrade. But more importantly, it will affect the domestic market structure, intensify industry competition, and intensify the competition between China and the United States in high-tech industries. In terms of trade, because the export structure of China's high-tech products is relatively unitary, it is severely restricted by the trade barriers of exporting countries; In terms of innovation activities, external technology spillover, as well as the reduction of domestic research and development investment, to a certain extent, hinder the improvement of our independent innovation ability. On this basis, the paper analyzes the domestic and external environment of the development of China's high-tech industry, including China's strategic support for high-tech industry, the domestic problems of the United States and its cognition of China's high-tech industry development. Finally, according to these problems, this paper puts forward the corresponding countermeasures and suggestions. In this study, there are many innovative points. First of all, the most important point is that this paper is based on the macro and micro perspectives of China's high-tech industry research. Secondly, this article is very relevant to China's current environment -- Sino-U.S. trade war. With the change of the situation in real time, many articles on the research of relevant content are not combined with the current general background, which is a deficiency, and our article just makes up for this defect.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

References

[1] Jiarui Liu, Yi Yang. Trade Protectionism and International Trade Order: A Case study based on Sino-U.S. Trade War. Investment and Cooperation, 2023, (06): 60-62.

[2] Lu Lu. The impact of Trade Friction on R&D of Chinese enterprises, 2023, (03): 13-14.

[3] Guangen Xiao, Hui Xin. Sino-U.S. trade conflicts on China's export trade effect analysis. Journal of the Asia-pacific economy, 2023, (01): 5-60.

[4] Wei Zhang. Change rules of the international economic and trade under the restructuring, the Sino-U.S. trade friction. Journal of Shanghai business school, 2022, 23 (6): 44-62.

[5] Yuxuan Tao. Study on the impact of Sino-U.S. Trade War on the number of China's trading partners. Northeast university of finance and economics, 2022.

[6] Zunpu Zhou. Sino-U.S. trade friction problem research. Northeast university of finance and economics, 2022.

[7] Haomin Shen. Research on the Impact of Factor Market Trade Friction on Innovation of High-tech Enterprises, 2022.

[8] Qiusheng Zheng et al. Trade Friction between China and the United States and the Development of High-tech Enterprises in China, 2021 (11): 122-123.

[9] Shuangshuang Feng. Research on the Impact of Trade Friction on China's High tech Manufacturing Exports, 2019.

[10] Yumeng Hu, Xing Zheng. Analysis of Export Technology Complexity Structure of High-tech Manufacturing Industry in China and the U.S., 2018, 85-91.

[11] Jiyong Chen. The Background, Reasons, Essence and China's Countermeasures of the China-U.S. Trade War, 2018, 71 (05): 72-81.

[12] Kerry Liu. Chinese Manufacturing in the Shadow of the China-U.S. Trade War, 2018, 38 (3): 307-324.

[13] Joe Liu. The China-U.S. Trade War and Future Economic Relations, The Chinese University of Hong Kong Press, 2019.

[14] Vani Archana. Who will win from the trade war? Analysis of the U.S.-China trade war from a micro perspective, 2020, 13 (3): 376-393.

[15] Jianguo Ding, Research on Endogenous Efficiency Evaluation of National High tech Development Zones, Guangxi University, 2021.