

Trade Frictions between China and the United States and Discussions of Chinese Manufacturing Innovations--Based on the Statistics of Chinese Listed Enterprises between 2008-2017

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Abstract: As the motivation for each country's economic development, manufacturing enterprises, especially high-tech enterprises, play a critical role in maintaining international competitiveness. Accordingly, technical innovation is fast becoming a key instrument in promoting the advantages in the global market. This paper uses the literature research method, case analysis method, and a comparative analysis approach to study Chinese manufacturing enterprises' statistics between 2008-2017. Based on these statistics, this study shows the relationship between China-U.S. trade frictions and Chinese manufacturing innovations and finds out the existing problems inside the enterprises and the reasons behind. Consequently, this study proposes new Chinese manufacturing strategies to promote the transformation and upgrading of China's manufacturing enterprises, especially high-tech enterprises.

1. Introduction

China and America, two important parts of the world's economy and global trade, try their best to expand market share in the worldwide market. However, the two countries frequently have international trade frictions when they try to expand their trading size. Escalating trade frictions focus on high-tech areas, urging Chinese manufacturing enterprises to increase independent research-development investment and utilization ratio, and promoting enterprises to create more innovations. Take Zhongxing Telecommunication Equipment Corporation (ZTE) and Huawei Technologies Co., Ltd, for example. ZTE exposed chip problems, and Huawei revealed software problems. Both the chip and software industries need a lot of research and development investment. The U.S. sanctions against ZTE and Huawei made Chinese manufacturers aware of the importance of mastering core technology, significantly accelerated innovation in manufacturing enterprises.^[1] The previous studies have carried out a lot of discussions and research on the China-U.S. trade friction. For example, Hong Junjie and others (2019) analyzed the impact of China-U.S. trade friction on Chinese manufacturing development environments and thus proposed a strategy for the long-term, high-quality Chinese manufacturing industry development.[2]

However, through the literature review, the focus of the current research is on the impact of China-U.S. trade frictions on the manufacturing industry of the two countries, the future direction of trade frictions, and how the Chinese government should deal with it, but neglects the link between trade frictions and innovation of manufacturing enterprises. This study focuses on Chinese manufacturing enterprises under China-U.S. trade frictions. It aims to analyze China's manufacturing industry's operating conditions and development trends under trade frictions by literature research, case analysis, and comparative analysis. Based on the relevant data of 2,316 manufacturing listed companies in 2008-2017, this study deeply explores the impact of China-U.S. trade frictions on Chinese manufacturing enterprises' innovation to enhance the international market competitiveness of Chinese manufacturing enterprises through technological innovation.

2. Methodology

This study utilizes three research methods to analyze the operating statistics from 2316 Chinese listed enterprises during 2008-2017. There are literature research method, case analysis method, and a comparative analysis approach. By these methods, this study explores how trade frictions between China and the United States impact on Chinese manufacturing innovations.

2.1 Literature Research Method

Literature research method is a systematic way of collecting and synthesizing previous research to identify materials' essential attributes.^[3] By reading and analyzing many literatures related to trade frictions between China and America, this study figures out that previous studies paid less attention to how trade frictions impact Chinese manufacturing innovations. Thus, this study helps determine the previous levels of manufacturing innovations, predicts future trends, illuminates strategies that can be applied to practice, and future developments of Chinese technical innovations, which provides academic references and demonstrations for future studies. However, this method generates some levels of errors due to the limited collections and second-handed resources.

2.2 Case Analysis Method

Case analysis method requires an in-depth analysis of typical examples to reveal a thorough understanding of the research problem.^[4] This study investigates 2316 listed manufacturing enterprises to collect their operating statistics during trade frictions, showing enterprises' management conditions and developing trends. This study explores how trade frictions impact Chinese manufacturing innovations and proposes new strategies to create more technological innovations, aiming to promote competition and advantages in the international market. However, this method generates errors because some enterprises varnish their published statistics.

2.3 Comparative Analysis Approach

Comparative analysis approach is a critical investigation of two or more subjects to identify the similarities or differences, gain a deep understanding of topics, and reach a certain conclusion.^[3] This study uses vertical comparison to analyze the total number of trade-frictions cases in various manufacturing subsectors between China and the United States from 2008 to 2017. It uses horizontal comparison to explore Chinese innovation inputs with other countries. However, due to the selection of comparative references, the results of the study lack of universality.

3. Result

3.1 The Relationship between China-U.S. Trade Frictions and Innovation in Chinese Manufacturing Enterprises

With the rapid expansion, the global acceptance, and popularity of Chinese high-tech, China-U.S. trade frictions have gradually become a hot spot in the international market. Zhang Qunhui and others (2013) found that global export controls on high-tech products would increase Chinese trade surplus, and trade imbalances would cause trade frictions.^[6] Given the increasingly frequent frictions between China and the United States on high-tech products, Zhai Chuanjie (2014) found that the U.S. trade protection blocks the export of Chinese high-tech products without terminating the development of Chinese high-tech industry. This phenomenon makes Chinese investment in foreign high-tech enterprises on the rise model, trade friction of Chinese high-tech enterprises pressure into the driving force of enterprise technology innovation, flexible use of foreign high-tech investments to promote enterprise innovation, high-end industrial chain transfer, and industrial improvement.^[7] Therefore, the positive and negative impacts of trade frictions on manufacturing innovation will be more reflected in high-tech enterprises.

3.2 Typical Case Analysis of Chinese Manufacturing Enterprises

(1) The current situation of trade friction between China and the United States.

This study selects the total number of trade-friction cases in various manufacturing sectors between China and the United States from 2008 to 2017 to measure the trade frictions between

China and the United States, and divides the types of trade-friction cases into five categories: anti-dumping, countervailing, safeguard measures, special safeguard measures and 337 investigations by the National Economic Industry Classification (GB/T4754-2002) ^[8]. The specifics of the China-U.S. trade frictions for 2008-2017 are shown in Table 1.

Table 1 Statistics on The Number of China-U.s. Trade Friction Cases from 2008 to 2017.

| Year | Anti-dumping | Countervailing | Safeguard measures | Special safeguard measures | 337 Investigations | Total |
|-------|--------------|----------------|--------------------|----------------------------|--------------------|-------|
| 2008 | 10 | 5 | 0 | 0 | 16 | 31 |
| 2009 | 12 | 10 | 0 | 1 | 9 | 32 |
| 2010 | 3 | 3 | 0 | 0 | 18 | 24 |
| 2011 | 5 | 4 | 0 | 0 | 15 | 24 |
| 2012 | 5 | 3 | 0 | 0 | 13 | 21 |
| 2013 | 5 | 6 | 0 | 0 | 10 | 21 |
| 2014 | 7 | 7 | 0 | 0 | 13 | 27 |
| 2015 | 6 | 5 | 0 | 0 | 12 | 23 |
| 2016 | 11 | 9 | 0 | 0 | 18 | 38 |
| 2017 | 11 | 9 | 2 | 0 | 25 | 47 |
| Total | 75 | 61 | 2 | 1 | 149 | 288 |

From China Trade Remedies Information, United States International Trade Commission

As can be found from Table 1, China-U.S. trade frictions showed a downward trend in 2008-2017. Since 2008, China-U.S. trade frictions have first experienced a de-escalation period, with the total number of trade friction cases declining and with the least level of trade friction between China and the U.S. between 2012 and 2013. Since then, the number of trade-friction cases between China and the United States has been rising, and the level of trade friction has increased, reaching its highest level in 2017.

(2) Analysis of the problems and causes of innovation in Chinese manufacturing enterprises under China-US trade frictions.

Based on the statistics of 2316 listed enterprises from 2008 to 2017, this study analyzes technological innovation problems and discusses the root causes of the problems.

(I) Insufficient investment in technological research and development.

China-U.S. trade frictions have continued since 2018, with main disagreements focusing on product tariffs, intellectual property rights, and mandatory technology transfer. These frictions result in reduced tax- orders of related manufacturing enterprises, increased production costs, and impacts on enterprises' operation. For manufacturing enterprises which use American products as raw materials, they are increasing trade frictions between China and the U.S. resulting in a narrowing of profit margins and even losses due to the increase of tariffs in the U.S. market, which has an impact on the production, operation, and even survival and development of Chinese manufacturing enterprises. Nearly 60% of the companies surveyed expect profits to fall by 20%. To analyze from the input funds, according to the 2019 National Bureau of Statistics ^[9], China's high-tech manufacturing research and experimental development (R-D) expenditure is about 380.40 billion yuan. Compared to a ratio of operating income, investment intensity is about 2.41%. And, equipment manufacturing research and experimental development (R-D) funds are about 786.80 billion yuan. Investment intensity is about 2.07%, far lower than the level of 2.5%-4% in developed countries; To analysis from the human resources, the Chinese number of research and development personnel per million people is low. It is about 1/4 of the United States' and German, and German technology research and development personnel accounts for nearly 50% of the total number of research and development personnel. ^[10]

(II) The shortage of high-level scientific and technological innovation talent

For the innovation of manufacturing enterprises, the quality and ability of human resources play an important role. At present, Chinese researchers' quality and that of developed countries are different, and China faces a shortage of high-level technological innovation talents. There are three specific performances: First, a considerable number of enterprise decision-makers on scientific and technological innovation awareness are insufficient, resulting in a few project investments which

are long-term results and conducive to enterprise innovation ability. For example, due to pay, social status, and other issues, China's science and technology talents generally tend to work in big cities instead of working as skilled workers in manufacturing. The long training cycle of technical personnel and senior technicians could also deter young people from working in manufacturing^[11]. Moreover, the traditional educational model formed by China's current education system ignores the cultivation of individual creativity and ability.^[12]

(III) Weak policy support and integration power in technology and innovation

Chinese policy support and special provisions on technology and innovation are not complete. Due to the lack of attention to technological innovation, the investments in capital and scientific research are insufficient, the venture capital policies are not enough, and the technology property rights trading policies, as well as tax and other policies, need to be improved. Scientific and technological innovation returns low yields in a short period, insufficient investment in scientific research funds and tax policy are not perfect. The narrow financing channels of scientific and technological innovation restrict the vitality of technology and international competitiveness to some extent.

The integration of power in technology and innovation is not enough. Although departments of science and technology, education, finance, taxation have taken several initiatives to promote scientific and technological innovation, the lack of an effective coordination mechanism results in repeated declarations of science and technology projects, which support scientific and technological innovation funds dispersed. Besides, problems such as the repeated constructions of technology platforms and the low degrees of resource sharing also complicate the situation.

(IV) Low transform rate of technological achievements

The United States accounts for 6% of the world's technological and manufacturing publications, while China accounts for only 2.7%^[13]. Although China ranks among the top in the world in the number of papers and patents, the industrial transform rate of technological achievements is low. According to statistics, the Chinese contribution rate of technology is about 50%, far lower than 70% of the developed country, and 80% of the United States. There are many reasons behind this, such as the unperfect Chinese scientific research evaluation system, one-sided pursuit of papers, periodicals, and grades, and ignoring the needs of scientific research and the market. These reasons make scientific research results hard to transform into productivity.

4. Discussion

4.1 To Strengthen Independent Innovation and Improve the Technological Level of Enterprises.

The adverse effects of China-U.S. trade frictions on Chinese manufacturing industry provided an effective mechanism for China to improve its independent innovation ability, reduce its dependence on the United States in technology, and accelerate technological innovation independently. (1) China should enhance the innovation platform energy level by strengthening the construction of Chinese manufacturing innovation belt and actively building several “technological city”, “to the technological area” “technological country” and other innovative highlands as a typical benchmark; (2) China should strengthen the cultivation of innovation. It should actively implement cluster manufacturing (cultivation) action; advocate innovation and empowerment characteristic plate economy; and promote the cultivation of science and technology-based enterprises that are professional, skillful, special, and advanced. China should also increase the coverage of research and development institutions and achieve the innovation action requirements, including “focusing on a key area, complementing the shortboard, empowering upgrade, and improving the ecology.” (3) Chinese manufacturing should emphasize the deep integration of the innovation chain and industrial chain. It should accelerate the construction of a modern industrial system, strengthen the cutting-edge layout of scientific and technological innovation, and explore the establishment of a scientific research mechanism in line with the market. What’s more, China should also demonstrate the in-depth implementation of the traditional manufacturing industry intelligent transformation,

reference to emerging industrial technology, and promotion 5G industrial applications, to create some intelligent manufacturing plants and workshops as the industry demonstration leading role, to promote industry, technology, and ecology in the application in the future.^[14]

4.2 To Attach Great Importance to Technological Talents and Actively Encourage Scientific Researchers to Innovate.

The Chinese government can formulate a long-term plan for the training of technological personnel and strengthen innovative talents in implementing major projects. It should promote educational reform, advocate heuristic education, and pay attention to cultivating the habit of exploring and practicing with the courage to innovate. The Chinese government should attach great importance to technology education, strengthen the construction of places for technological activities, enhance the technological knowledge of whole people, and exercise their practical ability. It should improve policies and measures to train and attract all kinds of talents and establish a diversified incentive and restraint mechanism that conforms to the law of the development of technological talents. It should encourage the use of part-time employment, cooperative research, joint training, and other forms to attract and cooperate with all kinds of domestic and foreign technological innovation talents or teams to improve the industrial cohesion of scientific and technological innovation talents.

To increase tax incentives for scientific and technological innovation talents, the Chinese government can learn from Singapore's experience which uses personal income tax rebates, wage subsidies, and other ways to encourage technological innovation talents.

4.3 To Increase Investment Technological Innovation and Increase Support for Technological Innovation Policies.

Chinese government should strengthen support for high-tech enterprises. Trade frictions play a more obvious role in inhibiting or promoting high-tech enterprises' innovation, so China should strengthen the support for high-tech enterprises in policy and create a good environment for their development. Moreover, Chinese government can promote the independent innovation of low-tech enterprises and improve products' added value. Low-tech enterprises should get rid of the technology dependence of other countries such as the United States, increase their research and development investment, and improve their innovation ability.

4.4 To Reform the Evaluation Mechanism of Scientific Research and Increase the Transform Rate of Technological Innovation

First, China should gradually eliminate all kinds of government subsidies or incentives for scientific research institutes and universities to grant patent applications and authorizations. China should decouple patent applications from public resources and urge the government to invest valuable scientific research funds and public resources in scientific research grants and development activities of various small or medium-sized manufacturing enterprises.

Moreover, manufacturing enterprises should devote their limited resources and energy to patent applications that can be “used for actual production,” realize the highest purpose of “technology is the first productive force,” and maximize the social benefits of technological achievements by formulating patent strategies and patent operations, establishing results declaration and pre-screening systems, etc.^[15]

4.5 To Seek Dispute Resolution Mechanisms and Try to Coordinate Trade Conflicts.

Trade frictions between China and the United States play an important role in global trade and global economic development. China should actively seek the support of international organizations such as the World Trade Organization, abide by the regulations of world trade, make full use of the dispute settlement mechanism within the World Trade Organization framework, and safeguard legitimate Chinese rights.

Besides, China should establish a responsible image as a significant power to promote China-U.S. diplomacy, conduct economic and trade consultations, and finally reach consensus and reduce

friction through peaceful means. At the same time, China can join forces with developing countries to form a united front against unreasonable U.S. sanctions.

By exploring the current situation of Chinese manufacturing innovation under China-U.S. trade friction, this paper's results are universal but less targeted because of the lack of in-depth study of typical enterprise cases. In the future research process, a specific manufacturing enterprise can be used as a research case to make the results more specific.

5. Conclusion

The innovative research perspective of this study defines the link between trade frictions and manufacturing enterprise innovation and studies the problems of innovation in Chinese manufacturing enterprises under China-U.S. trade friction, such as insufficient investment in technological research and development, lack of high-level innovation talents, insufficient support and integration of technological innovation policies, and low conversion rate of scientific and technological achievements. Given the above problems, this study proposes the corresponding concrete measures, such as strengthening the technological level of enterprises, attaching great importance to technological talents, increasing investment in technological innovation, improving the support of scientific and technological innovation policies, reforming the mechanism of scientific research and evaluation, and improving the conversion rate of technological innovation, providing some reference for China and developing countries in the plight of trade frictions to strengthen the innovation of manufacturing enterprises and enhance the competitiveness of international trades.

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