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Abstract. Accompany with the industrial upgrading of China, the Chinese economy is changing from emphasizing products amount to the superior quality and the higher added value. This procedure definitely influences the benefit of the United States, which results in the China-United States trade war. It is well known that the industrial upgrading needs the support of high-level scientific talents, which relates to the higher-education quality. In this paper, we have discussed the original of Sino-United States trade war with the comparative advantage theory and the international trade theory. We demonstrated that China had applied the technological spillovers in developing the comparative advantage industry of the United States, semiconductor for example; thus lead to the trade war. What is more, the neural network of products is applied and analyzed under the trade war background, which shines light the avenue of Chinese higher education. A series of developing directions and countermeasures are proposed.

1. Introduction

On March 22, 2018, the United States declared that it imposed a 25% tariff on steel and a 10% tariff on aluminum products from China, according to Article 301 of the Trade Act in 1974. The total amount of products involved reached US\$60 billion. On September 18, 2018, US President Trump announced a 10% increase in tariffs on 200 billion products, and it plans to raise it to 25% on January 1, 2019. Since then, the Sino-US trade war has entered a white-hot stage. As shown in Figure 1, along with the Sino-US trade war, the global economic uncertainty index increased from 113.24 at the beginning of 2018 to 337.25 (December 2018). The sharp increase in global economic uncertainty is also related to the Britain exiting from the EU and the four interest rate hikes by the Federal Reserve System in 2018. But the trade dispute between China and the United States, which are the largest and second largest economy, is undoubtedly the most significant driver for the continued rise in global economic uncertainty.

2. Main Text

The Sino-US trade war was caused by excessive trade surplus between China and the United States. But according to the "comparative advantage theory" put forward by British classical economist David Richardo, the output of product A is as followed

$$Q_A = L / \alpha_{LA} - (P_B / P_A) Q_B \geq L / \alpha_{LA} - (\alpha_{LB} / \alpha_{LA}) Q_B, \quad (1)$$

where L is the total labor force on the market, α_{LA} and α_{LB} the labor required to manufacture products A and B, respectively, Q_B the output of product B, and P_A and P_B are the values of products A and B, respectively. (Wood, 1991) Therefore, the quantity of product B by self-producing product A is greater than the number of products by producing A and B by itself. That is to say, each country produces its own comparatively superior products and acquires other necessities through trade, so that each country produces more types of products, and it also has the possibility to expanding its trading volume and promoting consumption. This also forms the basis for international trade. According to this theory, the Sino-US trade war is harmful to both countries.

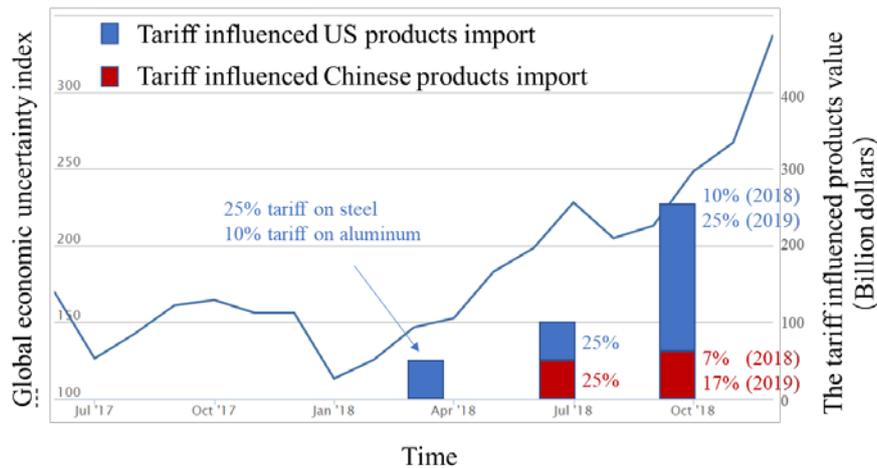


Figure 1. The time-dependent global economic uncertainty index after the Sino-US trade war (data source, <http://www.policyuncertainty.com>)

In actual economic production, the "comparative advantage theory" is also affected by the international political and economic environment. For the economy, since the global economic crisis triggered by the US subprime mortgage crisis in 2008, most of the major economies in the world have kept deposit interest rates low, even zero interest rates and negative interest rates to stimulate economic development. In the case of low-interest rates, some international commodities production is greater than the market demand, resulting in market saturation and forming a bubble economy. Take Apple Inc., for example, in the three months from October 2018 to January 2019, its stock price fell from the highest point, \$232.07 per share, to \$142.19, a sharp drop of 38% in two months. The market value evaporated hundreds of billions of dollars. The reason lies the demand from the international mobile phone market is gradually approaching saturation, and a large number of mobile phone users change a mobile phone in two years to three years. Mobile phone users have lost the need to purchase new mobile phones. As the company with the most profit in the mobile phone market, their profitability has also fallen sharply. In terms of international politics, the international economic status in China has increased year by year, and people's lives have continued to improve. At the same time, the ratio between gross domestic product (GDP) and the world's total economic output in developed countries such as the United States, Europe, and Japan has been declining year by year. Their national life has fallen into a bad dilemma, and the domestic contradictions have intensified. As shown in Figure 2, in the 30 years after the US

"Black Monday" in 1987, the percentage of US purchasing power parity (PPP) in the world economy decreased from nearly 22.42% to 15.17%. (Bogle, 2008) The PPP percentage of Europe union decreased from 27.37% to 16.29%. The decline in economic status in Japan is even more pronounced, from 9.05% in 1990 to 4.17% in 2018, a drop of 54%. Contrary to developed countries such as Europe, America, and Japan, China, India and other developing countries have experienced rapid economic growth during these three decades. The PPP in China has increased by 3.59 times compared with 1990 (18.87% in 2018). As President Trump said in his speech to the US president, "the US airport and railway traffic are far less than those of China, which is a third-country in the world."

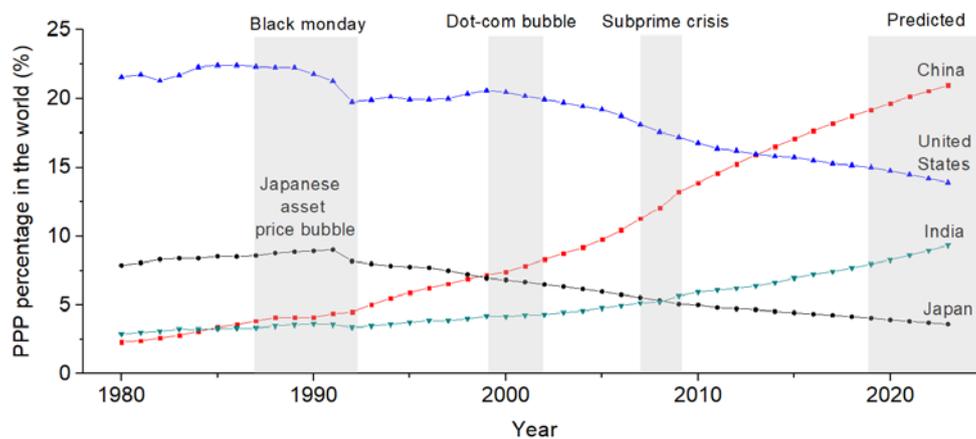


Figure 2. The year dependent PPP percentage in the world of China, United States, India, and Japan (data source, International monetary fund).

In addition to being influenced by the international political and economic environment, the “comprehensive advantage theory” is also affected by technological spillovers, that is, there are partial technical outputs in the trade or other economic activities. According to Paul R. Krugman's new international trade theory (Krugman, 1991), if the importing country uses the technology from the foreign country for comparative advantage, it will be beneficial to the trade in both countries. (Naveed and Ahmad, 2016) Obviously, China is a spillover technology importer, and the United States is a technology spillover. In the 1990s and 2000s, the United States has completed the information technology revolution and has comparative advantages in the fields of electronics and automobile manufacturing. (Collins and Halverson, 2018, Brinkman et al., 1997) China's comparative advantage industry is low value-added clothing manufacturing, textile industry, and the metallurgical industry. Therefore, it is beneficial to the trade in both countries. Along with the development of the economy, China began to develop into the core area, that is the industrial network. Based on the metallurgical industry, it accelerated the high value-added automobile manufacturing and electronic product manufacturing and proposed China Manufacturing in 2025. At this stage, China (technical importing countries) used the technology from the United States (technical spillover countries) to develop the comparative advantage industries in the United States. This is the only way for China to move from a manufacturing power to a strong country, and it will inevitably lead to trade conflicts between China and the United States. Along

with its industrial upgrading, China needs a large number of high-end scientific and technological talents, which puts higher demands on higher education.

Firstly, the higher education aims to cultivate talents that are suitable for the socio-economic production and development. There is a correlation (connection) between various industries, at the same time, in the core area, there is a high-density connection between various industries. For example, in the electronics industry and the automotive industry, the distance between their internal branches is close. These industries have similar core technologies. One of the core values for the higher education is to master the ability to cross different industries, master core technologies, and understand the scientific nature behind technology. Opening a professional course in frontier science and technology outside the basic course, and teaching the electronic nature behind the electronic products technology (the core technology is the semiconductor energy band theory) will greatly enhance the ability of college graduates to develop in multiple branches.

Secondly, in the industrially dense central area, the amount of industrial trade is much more significant than that in the marginal area. Therefore, to cultivate the talents needed by the society is to put more graduates in the center of the industrial network map. For universities, we can strengthen the industry internship to achieve the docking between college graduates and employers. Through internships, students can learn about the status quo of the industry. At the same time, it is recommended to encourage students to contact the internship units independently, to promote the internship unit diversity, and students can be fully informed about their profession through multi-scale information dissemination between students and students, teachers and students.

Thirdly, creating new nodes in the industrial network map, and even developing new industries is the important priority for higher education and is the cornerstone for the science and technology and industrial development in a country. The United States is strong, thanks to its position at the forefront of the second industrial revolution (electrification revolution) and the third industrial revolution (information technology and biotechnology revolution). During the third industrial revolution, the leaping development of Silicon Valley in the United States created a new field - electronics manufacturing. As shown in Figure 1 of Ref. (Hidalgo et al., 2007), the electronics manufacturing industry is outside the traditional manufacturing industry (such as automobile manufacturing and metallurgical industry) in the industrial network map, and its economic scale has reached about one-third of that in the traditional manufacturing industry, and it will continue to grow. As the forefront of technological innovation, talents trained in higher education must have the ability to create new industries. From a scientific view, most innovations come from multidisciplinary intersections. For colleges and universities, if they can achieve a double degree or even a multi-degree system, allowing students to freely choose courses is conducive to the inter-disciplinary integration. In addition, they should adhere to the people-oriented innovation talent training, encourage interested undergraduates to join the research team as soon as possible. It is beneficial to promote them to understand and apply existing knowledge, as well as to innovate in research.

3. Conclusion

This paper analyzes the development of the Sino-US trade dispute and its causes through the "comparative advantage theory" and "new international trade theory". It is found that the domestic industrial upgrading and technological innovation in China are one of the important reasons for the Sino-US trade dispute. Subsequently, this paper uses the industrial neural network map to explore how higher education can help China complete industrial upgrading in the Sino-US trade disputes context.

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