Research on International Trade and China's Technological Progress Based on Trade Breakdown Data

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Abstract. In the 21st century, the rapid development of science and technology will improve the productivity of the industry. Therefore, technological progress will improve economic growth. In the process of economic globalization, the role of technological progress will continue to increase. Therefore, we must promote technological progress, which will achieve a virtuous circle between technological progress and the growth of international trade. By improving the technological content and trade competitiveness of export products, we can achieve steady development of international trade. Through trade decomposition data, we use standardized supply side system to measure the direction of technological progress, which is the dynamic evolution of technological progress in the future. Through analysis, we can get the following results. International trade is the main factor for China's technological progress to favor capital, which is the fundamental driving force for technological progress.

Keywords: Trade Breakdown Data, International Trade, Technological Progress

1. Introduction

Through the attraction of international trade, we can well save in China's technological progress, which will play a fundamental role in the spillover of international technology[1]. By giving full play to the role of international trade in China's technological progress, we advocate promoting international trade[2]. By breaking the technical barriers, international trade will lead to China's technological progress, which is the fundamental theory of technology spillover. Based on the global production network as the leading form of international trade, China must systematically analyze the mode of trade development, which will promote China's technological progress in different ways[3]. Therefore, international trade has a certain practical significance for the realization of sustainable economic growth. Among them, Baldwin (2015) divides the international trade mode. Through trade decomposition, he created a dynamic panel model, which systematically analyzed the impact of international trade on China's technological progress[4]. It is found that various forms of trade in international trade will have a significant positive effect on China's technological progress, such as the import of final consumer goods and the import of intermediate goods for processing[5]. However, the export trade of intermediate goods and the import trade of non-processing intermediate goods will be
hindered. Therefore, China must strengthen the export of international trade, which will promote China's technological progress.

2. Measurement method of international trade and technological progress

2.1. Calculation method of capital labor substitution elasticity

Klump proposed a standardized system method to estimate the elasticity of capital labor substitution, which can be used to calculate the index of technological progress[6]. Through the simultaneous standardized CES production function, capital demand function and labor demand function, we can study the interaction of substitution elasticity and technological progress rate. By solving parameter identification, we can improve the reliability of measurement results, such as substitution elasticity, capital and labor technology progress rate. At the same time, through the standardized CES production function, we can also reflect the economic meaning of each parameter. The form of CES production function is shown in Formula 1.

\[ Y_i = (E_i^K \cdot K_i)^{\sigma \over 1} + (E_i^N \cdot N_i)^{\sigma \over 1} \]  

(1)

Among them, \( Y_i \) is the actual output, \( K_i \) is the express capital, \( N_i \) is the labor input, \( E_i^K \) is the capital enhanced technological progress and \( E_i^N \) is the labor enhancing technological progress.

We assume that \( t_0 \) represents the base period, \( K_{i0}, N_{i0} \) are the capital and labor input in the base period, and \( Y_{i0} \) is the output in the base period.

Assuming that the productivity of capital and labor increases exponentially, we can get formula 2.

\[ E_i^i = E_i^0 \cdot e^{\gamma (t - t_0)}, i = K, N \]  

(2)

\( \gamma \) represents the growth rate of factor enhanced technological progress.

We can get the capital demand function, as shown in Formula 3. At the same time, we can get the demand function of labor, as shown in formula 4.

\[ \log(r_i) = \log(\sigma Y_i K^{\sigma - 1}) + \frac{1}{\sigma} \log(Y_i K^{\sigma}) + \frac{\sigma - 1}{\sigma} r_i (t - t_0) \]  

(3)

\[ \log(w_i) = \log((1 - \sigma) Y_i N^{\sigma - 1}) + \frac{1}{\sigma} \log(Y_i N^{\sigma}) + \frac{\sigma - 1}{\sigma} r_i (t - t_0) \]  

(4)

\( \sigma \) is elasticity of labor substitution. When \( \sigma > 1 \), capital and labor can be replaced each other in the process of production. Therefore, according to the difference of relative price, enterprises can choose more technologies with lower price factors for production. When \( \sigma < 1 \), there is a complementary relationship between capital and labor.

2.2. The change rate of industry technology progress efficiency

Through Sato and Morita's technology progress rate measurement method, we can get the change rate of industry technology progress efficiency, as shown in formula 5.

\[ D = \frac{F_{i0} - F_{i}}{F_{i0}} = \frac{\sigma - 1}{\sigma} (r_i - r_{i0}) \]  

(5)

Among them, \( F_{i0} \) and \( F_i \) represent changes in marginal output of capital and labor caused by technological progress, respectively.
3. Analysis results of international trade and China's technological progress
We use the international trade data of China from 2010 to 2018 to analyze the formula respectively, which can get the results of both, as shown in Table 1.

| Table 1. Results on international trade and China's technological progress |
|---------------------------------------------------------------|
|                          | Model 1 | Model 2 |
| F Check                  | 11.659  | 12.442  |
| Hausman Check            | 117.554 | 172.690 |
| log(τr)                  | -0.060 * | -0.071 * |
| (-9.55)                  | (-9.724) |
| log(wr)                  | 0.010*  | -0.017* |
| (3.34)                   | (-3.553) |

4. Suggestions for the sustainable growth of international trade exports

4.1. Interaction between trade structure and industrial structure
With the industrial transfer of developed countries, China must vigorously develop industrial upgrading, which will increase the high added value and high-tech content of international trade products. In the market economy, the international competitiveness of products is an important standard to test the level of industrial technology, which can be reflected by the level of trade structure. In the international competition, the trade structure will be restricted by the industrial structure, which will drive China's technological progress. At the same time, industrial structure is the basis of trade structure, which determines the competitiveness of international trade. Advanced industrial structure can improve the competitiveness of foreign trade rapidly, which will improve the trade structure better. Therefore, industrial structure and trade structure need two-way interaction, which needs to improve the maintenance of technological progress. Therefore, China must strengthen technological progress, which will promote the growth of international trade. The growth of international trade will inevitably affect China's trade structure and industrial structure, which will promote the sound development of international trade and China's technological progress.

4.2. Accelerate the pace of technological innovation
China must speed up the pace of technological innovation. By mastering the core technology, China can occupy the commanding height of international trade, which will promote the technology introduction of China. By introducing foreign applicable technology, we can break the international technical barriers, which will improve the technological innovation of enterprises. In international trade activities, enterprises must master the core technology, which will have major technological innovation, including product design, technology, etc. Through technological progress, enterprises can change their production, sales, cost and profit, which is a way to enhance competitiveness. On the contrary, if lack of technological innovation, enterprises will be in a very passive position, which will not have the ability to resist risks. Therefore, China must speed up the pace of technological innovation.

4.3. Pay attention to the transformation of traditional industries
China's traditional industries are labor-intensive and resource intensive. Therefore, the production technology of traditional industries in China has been able to meet the needs of the international market. From the static comparative benefit analysis, the export of traditional industrial products has certain advantages, which will enhance the international competitiveness of China's traditional industries. Therefore, according to the current situation of resources, China's labor-intensive industries still have certain development space, which will promote the growth of China's national economy. However, we must be aware of the gap between China's traditional industries and international advanced production technology, which is still at a low level. Therefore, China's traditional industries are still vulnerable. At present, although China has established a relatively complete industrial system,
its basic industrial system is still weak. In the past, China only focused on the extension of traditional industries to expand reproduction, which ignored technological transformation. Therefore, there are many problems in traditional industries, such as outdated equipment, backward technology, low product quality, high energy consumption and material consumption. Therefore, we must attach importance to the transformation of traditional industries, which will improve our international trade.

4.4. Accelerate the development of high-tech industry

China must implement the strategy of developing trade through science and technology, which will improve the industrial structure optimization and industrial competitiveness. International trade can perfectly reflect the strength of industrial competitiveness, which is the basis of industrial structure evaluation. Through technological progress, China can improve its industrial structure and competitiveness. Obviously, the strategy of developing trade through science and technology will improve the industrialization of science and technology in China, which will also optimize the product quality and structure in China. Therefore, we must speed up the development of high-tech industries, which will promote international trade through science and technology.

5. Conclusions

China must adapt to the needs of international competition, which must speed up the pace of technological transformation and introduction of traditional export industries. Through the high-tech transformation of traditional industries, we can speed up the upgrading of products, which will improve the technical content and added value of traditional export commodities.

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