

Research on the International Competitiveness of China's Paper Industry From the Perspective of Global Value Chain

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ABSTRACT

The research on the international competitiveness of paper industry based on the perspective of global value chain is of great significance to the development of China's paper industry. Based on the perspective of global value chain, this paper analyzes the position quo of production, consumption and trade of paper industry in China and the world. This paper selects 10 representative countries as reference countries, calculates the participation degree of global value chain related to papermaking industry and new relative advantage index based on trade added value, and evaluates the international competitiveness of China's paper industry. The research shows that the international value chain position of China's paper industry has been significantly improved, but the overall international competitiveness is still at a disadvantage, and there is a certain gap with the paper-making power.

Keywords: Paper industry, Global value chain, Engagement, New comparative advantage index.

1. INTRODUCTION

The period of "13th Five-Year Plan" is an important strategic opportunity period for economic and social development, a critical period to build a moderately prosperous society in all respects, and a period when the contradiction between resources and environment is prominent in China. Paper is the basic raw material of the manufacturing industry. The level of paper production is an important indicator of a country's technological development level. And the level of paper consumption is closely related to the level of economic development. The paper industry is an important basic raw material manufacturing industry. Now Recycling, low carbon and green have become the new development themes of the paper industry.

In recent years, the international situation has been complex and changeable, and a new round of reform of the international industrial chain is imperative. The form of international division of labor is changing, from the specialization of products to the specialization of production links. The depth of participation in the global division of labor is an important factor in determining a

country's position in the global value chain. The new crown pneumonia epidemic will accelerate the trend of multi-polarization in the world, and the regional division of labor will accelerate the replacement of the global division of labor. Global value chains dominated by multinational corporations will change in size, scope, geography and form in the future. Therefore, how to connect the global value chain division of labor system has become the main determinant of the position of the international division of labor among countries.

Although rank and comparative advantage index in global value chain of China's paper industry continue to rise, and the development of China's paper industry has a great impact on the world paper market, its has low share in international trade. In the context of the restructuring of the global industrial chain, China's paper industry is in a critical period of strategic development opportunities. Understanding and researching China's paper industry and clarifying its position in the global value chain is of great significance to the industrial transformation of China's paper industry.

2. LITERATURE REVIEW

Global value chain (GVC) refers to a global cross-enterprise network that integrates the processes of production, sales, recycling and disposal, and integrates the value of goods or services. The entire process includes the procurement and transportation of raw materials, the production of finished products and intermediate products, sales, and final consumption and recycling (UNIDO, 2002).

Scholars have made valuable researches from multiple perspectives on the global value chain of domestic manufacturing. Based on the global value chain, Yang Yong (2019)[1] established an explicit comparative advantage index using the factorization method and measure the international competitiveness of the industry. The research results show that the competitiveness of China's manufacturing global value chain has improved rapidly, and the dominant comparative advantage of labor and physical capital has been weakened. Huang Guangcan, Wang Jue and Ma Lili (2019)[2] pointed out that China's manufacturing industry needs to change its thinking to build a development model of technological progress in the manufacturing industry chain with the upward movement of global value chain nodes. Niu Jianguo and Zhang Shixian (2019)[3] studied the global value chain position of Chinese textile, footwear and other labor-intensive manufacturing industries from the perspective of trade added value.

With regard to the market research of China's paper industry, Cao Pufang and Chen Youqing (2016)[4] pointed out that the paper industry in the world (including China) has entered the era of globalization. The raw materials, market and talents all show an international trend. The production and operation are basically stable and maintain moderate growth. Meanwhile, the world paper industry achieve the environmental protection goal of increasing production and reducing emissions. Jiang Yashu, Cheng Baodong and Miao Dongling (2016)[5] used the trade value-added method and the world input-output database to calculate the trade benefits of China's paper industry in the global value chain from 2000 to 2014. They pointed out that the domestic added value of China's paper industry and the actual profit showed a downward trend year by year. There are some problems in China's paper product market, such as low degree of internationalization, structural shortage under

quality conditions and so on. Wang lanhui and Liu Jie (2016)[6] pointed out that the industrial concentration of the paper industry is increasing constantly. Xu Hua, Liu Xin and Bai Jing (2016)[7] pointed out that although the international competitiveness of China's papermaking industry and paper products industry is relatively weak, the growth is strong. Under the new normal, China's paper products market will usher in an era of challenges and opportunities.

To sum up, China has become an important part of the global value chain of the paper industry. Although China's paper industry has the largest volume in the world, it is still in the middle and lower position in the overall global industrial chain, and there is an imbalance between supply and demand. Affected by the external economic recession and domestic policies, the domestic industrial growth began to slow down. It is an important research topic to comprehensively enhance the industrial competitiveness of China's paper industry and accelerate transformation and upgrading to the middle and high-end of the paper industry value chain.

3. ANALYSIS OF THE MARKET CURRENT SITUATION OF PAPER INDUSTRY

The paper analyzes the current situation of production, consumption and trade in the world paper market and the market structure of China's paper industry.

3.1 *Analysis of the Current Situation of Production and Consumption in the World Paper Market*

Against the backdrop of slowing global macroeconomic and international trade growth, the global paper market has been sluggish in recent years, with declining pulp growth and sharp declines in waste paper recycling, paper and board production. In 2018, production of global paper and board was 405.955 million tons, down 1.92% compared to 2017. India's apparent consumption increased by 21.6% in 2018 compared to 2017, while China, Japan and Germany experienced negative growth. "Figure 1" shows the top 10 countries in paper (paperboard) production and apparent consumption in 2018. It can be seen that China is both the largest producer of paper (board) and the largest consumer in the world.

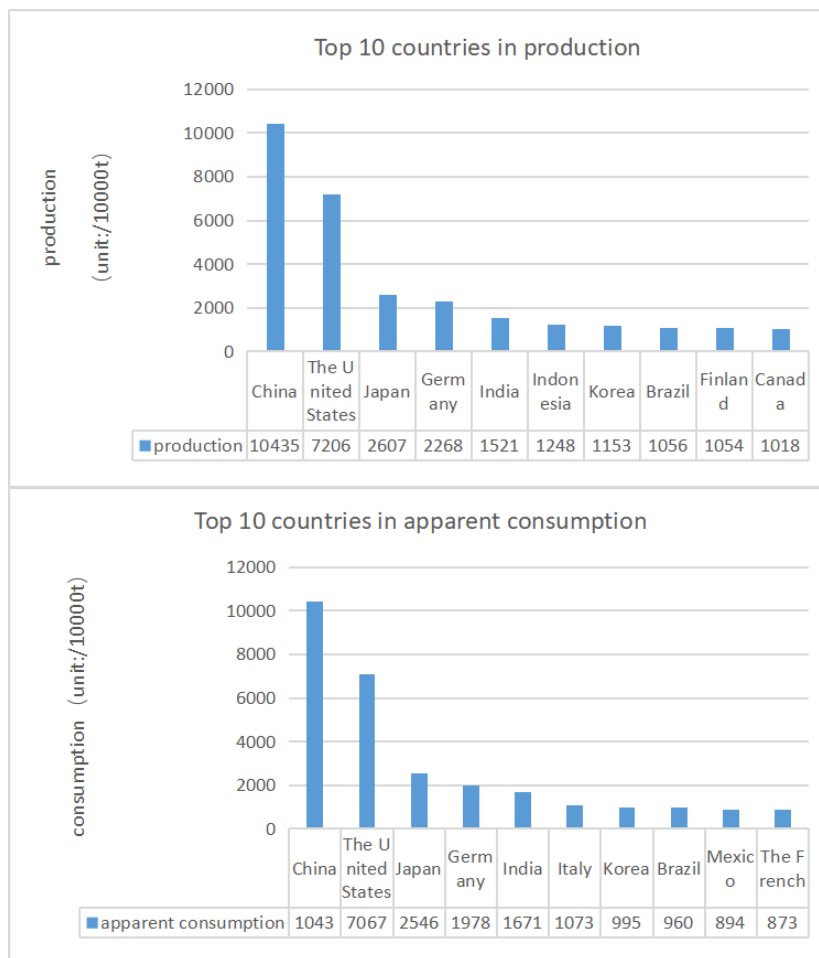


Figure 1 Production and consumption of paper (cardboard) in major countries in the world in 2018.

3.2 Trade Analysis of World Paper Market

Trade and production in the global paper market are partially deviated. "Figure 2" shows the net export and net import data for paper and paperboard by major countries in the world in 2018. With their abundant natural resources, Finland and Sweden become the largest net exporters of paper and paperboard. Finland's net exports of 9.51 million tonnes accounted for 90% of total paper and board production. Net exports from Sweden and Canada were 8.56 million tonnes and 4.55 million tonnes, accounting for 84% and 45% of total production, respectively. The UK has the largest domestic paper consumption and production gap, with 53.2% of its apparent consumption relying on imports, making it the country with the largest net import of paper and paperboard. Other countries which have high net imports were Mexico, Turkey and Italy, with net imports of 2.98 million tonnes, 1.64 million tonnes and 1.59 million tonnes respectively. Although China is a big producer and

consumer of paper market, it is not a big trade country in paper market.

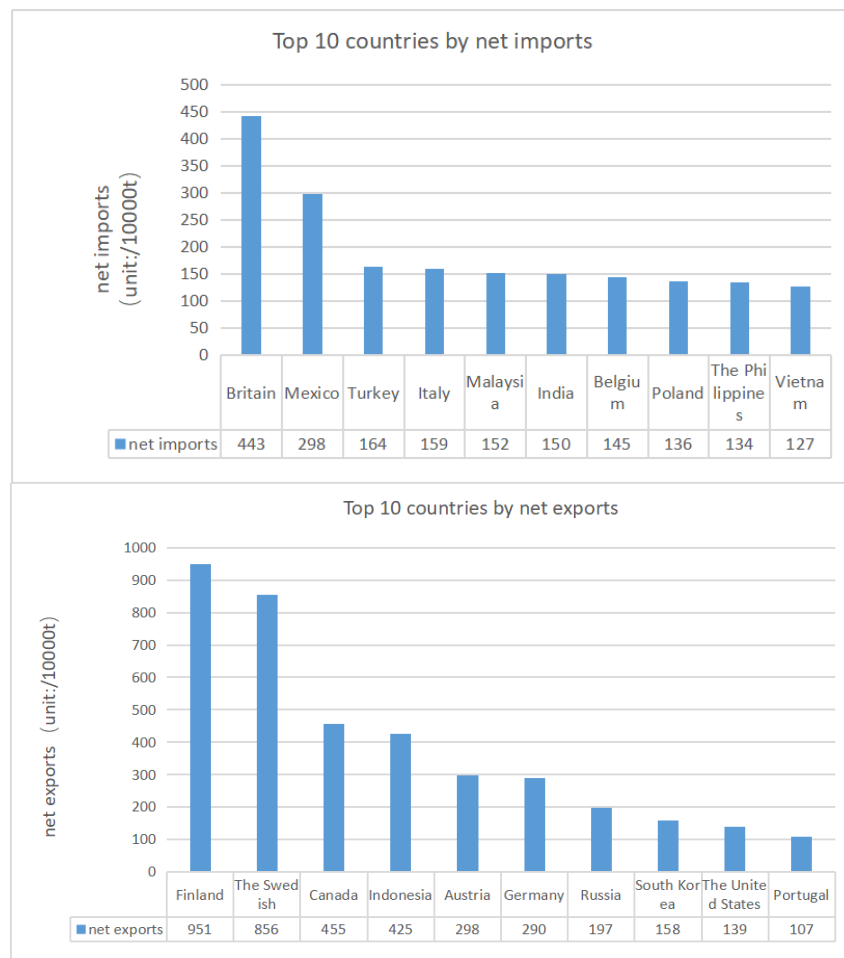


Figure 2 Data of the world's major importers and exporters of paper (paperboard) in 2018.

3.3 China's Papermaking Industry Market Structure

According to the survey data of the China Paper Association, in 2018, the output of paper and paperboard in 11 provinces in East China accounted for 74.2% of the national total production. The output of paper and paperboard in 8 central provinces in central China accounted for 16.3%; the output of paper and paperboard in the 12 western provinces accounted for 9.5%. Large-scale papermaking enterprises occupy the mid-to-high-end paper product market, and have strong bargaining power and control over raw material resources. Since 2001, Chenming Paper has successively established raw material forest bases in Guangdong, Hubei and Jiangxi Province. In 2019, self-made pulp production capacity of Chenming Paper was more than 4.3 million tons, which basically achieved a complete matching of pulp and paper production capacity, and improved the core competitiveness of the industry through the

integration of forestry, pulp and paper. Through the rational layout and implementation for the upstream and downstream industry chains, the industry concentration will be further improved in the future.

The main raw materials for papermaking are waste paper and pulp. The problem of raw materials in the papermaking industry has always been the biggest bottleneck restricting the development of China's papermaking industry. In 2017, the self-sufficiency rate of waste paper in China's paper industry was 63.8%, and the self-sufficiency rate of pulp was only 43.9%. With the gradual implementation of the "Waste Ban"¹ and "Plastics Ban"², the demand for wood pulp will further

1. From September 1, 2020, the National Law on the Prevention and Control of Environmental Pollution by Solid Waste will be fully implemented, adhering to the principles of reduction, recycling and harmlessness, and improving the system for the prevention and control of environmental pollution by industrial solid waste. It is expected that zero imports of waste paper will be achieved in 2021.

2. In January 2020, the National Development and Reform Commission and the Ministry of Ecology and

expand in the future. The forest-paper integration project vigorously promoted in China has not achieved the expected results as a whole, and the raw material structure needs to be further improved. The lack of raw materials directly affects the development of China's paper product market.

4. CALCULATION OF INTERNATIONAL COMPETITIVENESS OF CHINA'S PAPER INDUSTRY

In the context of global value chains, the total import and export value of industries in a country does not actually represent a country's real trade interests. Developing countries which participate in global value chains generally have a falsely high total trade volume but weak value-added capabilities. For a long time, China's labor cost advantage has been the main source of comparative advantage in traditional manufacturing. When the advantage of labor is gradually lost, China needs to find new sources of competitive advantage. Capital flow is the process of discovering the value-added opportunities of factors. The paper analyzes the competitiveness of China's paper industry from the position of the global value chain and the new comparative advantage index.

4.1 GVC Participation and GVC Position

4.1.1 Methods, Data and Calculations

The paper adopts the "KPWW" method proposed by Koopman et al., from the perspective of trade value added, to construct the GVC participation and GVC position indicators of the paper industry. i denotes industries or sectors, and c denotes countries.

Calculation formula of GVC participation indicator³:

$$GVC_{participationic} = IV_{ic}/E_{ic} + FV_{ic}/E_{ic}$$

Calculation formula of GVC position indicator:

$$GVC_{positionic} = \ln(1 + IV_{ic}/E_{ic}) - \ln(1 + FV_{ic}/E_{ic})$$

The calculated data in this part are from OECD-WTO Trade in Value Added (TiVA) database jointly released by OECD and WTO on the basis of WIOD. ("Table 1")

Environment issued "Opinions on Further Strengthening the Control of Plastic Pollution", stipulating that by the end of 2020, the catering industry nationwide will ban the use of non-degradable disposable plastic straws.

3. $GVC_{participationic}$ represents the degree of participation of i industry of country c in the division of labor in the global value chain. IV_{ic} represents exports of indirect domestic value added (or value added) of i industry of country c . FV_{ic} represents the foreign value added included in exports of i industry of country c . E_{ic} represents total exports of i industry

IV_{ic}/E_{ic} represents GVC forward participation. FV_{ic}/E_{ic} represents GVC backward participation. $GVC_{participationic}$ is, the higher degree of participation in the global value chain of i industry of country c .

Table 1. 2005-2015 China's paper industry global value chain participation and global value chain position

Year	Paper industry(D17T18)			
	forward participation	Backward participation	participation	positionic
2005	0.509	0.218	0.727	0.214
2006	0.510	0.213	0.723	0.219
2007	0.526	0.195	0.721	0.244
2008	0.514	0.186	0.700	0.244
2009	0.517	0.146	0.663	0.281
2010	0.488	0.156	0.644	0.253
2011	0.476	0.168	0.644	0.234
2012	0.490	0.151	0.641	0.258
2013	0.502	0.145	0.647	0.271
2014	0.504	0.141	0.645	0.276
2015	0.521	0.125	0.646	0.301

a Calculate according to OECD website TIVA database

4.1.2 Results Analysis

From 2005 to 2015, the participation of China's paper industry in the global value chain continued to decrease. But the position of the global value chain showed an inverted "V" shape. From 2005 to 2008, the division of labor in the international value chain continued to improve. The reason for the rise of the GVC position of China's paper industry is that China entered into WTO in 2003 and its continuous opening to the outside world have enabled China's paper industry to deeply participate in international production, and China's paper industry has gradually moved up in global value chain. From 2010 to 2011, the global economy was sluggish. Paper industry was affected by the international financial crisis. Compared with 2008, the output of major paper-making countries dropped significantly. China increased foreign direct investment which triggered a reverse technology spillover effect, which effectively improved China's global value chain position.

4.2 New Revealed Comparative Advantage Index(NRCA)

In the context of the division of labor in global value chains (GVC), product production goes through multiple links and spans multiple countries, resulting in repeated imports and exports of intermediate products. Therefore, intermediate product trade has gradually become the main trade mode. The new changes in international trade have led to changes in the connotation of trade interests, distribution subjects and distribution mechanisms.

Traditional trade statistics methods cannot effectively reflect the actual value increment of the trade participating countries, and the trade added value can more scientifically and reasonably reflect the actual interests of the trading countries participating in the international division of labor.

Based on this idea, the paper measures the scale of international trade with the new statistical caliber, deducts the benefit of foreign paper and paper products export trade in the value chain, and obtains the concept of net value, which truly reflects the real value added of the exporting country. Calculate the explicit comparative advantage index using the trade value-added index to obtain the New Revealed Comparative Advantage index (NRCA), which is used to measure the relative competitiveness of a country's industries in the global value chain.

The data used in the paper come from OECD and TIVA Database jointly published on the WIOD website. The data comes from TIVA database released in December 2016 (the data is updated to 2015), so the time of reference data in the paper is set between 2008 and 2015.

Table 2. 2005-2015 New revealed comparative advantage index of paper industry in major countries

COUNTRY	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CHINA	0.501	0.555	0.551	0.520	0.612	0.601	0.653	0.687	0.767	0.799	0.895
USA	2.193	2.043	2.087	2.269	2.237	2.436	2.415	2.499	2.560	2.566	2.688
JAPAN	0.351	0.446	0.471	0.492	0.525	0.548	0.469	0.570	0.596	0.638	0.722
GERMANY	2.106	2.091	2.047	1.969	2.213	2.159	2.134	1.995	2.064	2.064	2.047
KOREAN	0.934	0.891	0.863	0.872	0.843	0.828	0.869	0.867	0.906	0.850	0.830
FINLAND	4.318	4.417	4.583	5.011	6.612	5.907	6.114	6.206	6.553	6.680	5.727
CANADA	2.282	2.356	2.427	2.461	2.658	3.313	3.261	3.235	3.436	3.165	3.373
SWEDEN	3.840	3.918	3.947	4.166	4.280	4.326	4.344	4.477	4.896	4.648	4.447
AUSTRIA	2.340	2.303	2.264	2.797	2.867	3.205	3.194	3.087	3.174	3.148	2.530
PORTUGAL	3.281	3.213	2.225	2.941	4.056	4.179	4.113	4.207	4.181	4.174	3.984
FRANCE	2.023	2.161	2.370	2.371	2.559	2.539	2.454	2.322	2.367	2.296	2.327

a Calculate according to TIVA database on OECD website

Considering the top ten countries in global paper and paperboard production in 2018, taking into account the competitiveness of the industry and the availability of data, the paper selects OECD countries: the United States, Japan, Germany, South Korea, Finland, and Canada. Considering international market share and the rank of net exports of paper and paperboard countries, the paper adds several contrasting OCED countries, namely Sweden, Austria, Portugal and France. OECD has done a lot of work on statistical data. Although there are still missing data for some industry segments and update of time-sensitive data, it does not affect the calculation of the relative competitiveness of paper-making countries in recent years through these data.

NRCA is calculated as follows⁴ :

$$NRCA_{ij} = \frac{TV_{ij}}{\sum_{i=1}^m TV_{ij}} / \frac{\sum_{j=1}^n TV_{ij}}{\sum_{i=1}^m \sum_{j=1}^n TV_{ij}}$$

4. TV_{ij} indicates the domestic value added embedded in the exports of i industry of country j . $\sum_{i=1}^m TV_{ij}$ indicates the sum of the domestic value added of exports of all industries in country j as well as the gross value added of exports in country j . $\sum_{j=1}^n TV_{ij}$ represents the sum of the export value added of i industry in the world. $\sum_{i=1}^m \sum_{j=1}^n TV_{ij}$ represents the sum of the value added of all global industrial exports, that is, the total value added of global trade. The closer the NRCA index is to 1, it indicates the relative comparative advantage of the center, that is, the country's revealed comparative advantage in the industry's exports is at a medium level. If the NRCA index is greater than 1, it indicates that apparent comparative advantage of the country's industrial exports is at upstream level. If the NRCA index is less than 1, it indicates that comparative advantage of the country's industrial exports is lower than the average level.

From the data in the above "Table 2", it can be seen that China's New Revealed Comparative Advantage index based on trade added value has always been less than 1 from 2005 to 2015, which shows that my China's paper industry is still at a disadvantage in exports in the global value chain. Until 2010, it hovered around 0.5. But after 2010, with the increase of foreign direct investment, the index continued to rise with an annual growth rate of about 0.5.

5. SUGGESTIONS ON IMPROVING THE INTERNATIONAL COMPETITIVENESS OF CHINA'S PAPER INDUSTRY

Paper industry is a traditional civilian production industry. From the supply side, upstream forestry, midstream pulp, and downstream waste residue treatment are all important components of the national ecological environment chain. Under the concept of green development and sustainable development, the papermaking market is easily affected by systematic risks at the national policy level. From the demand side, due to the digital transformation of the social economy and the implementation of "plastic ban order", the impact on the consumer side is comprehensive, and the demand is relatively stable. Under the complex supply and demand environment, the main body of the papermaking market must have forward-looking awareness, innovation awareness and environmental protection awareness.

5.1 *Establishing the Concept of Environmental Protection Development*

The area of forest land in the world continues to shrink. "Low-carbon economy" has become a global consensus, and the public's awareness of environmental protection is getting higher. China's pulp is heavily dependent on imports, and industry security is under threat. Promoting the integration of forest paper and increasing the recycling of waste paper is the only way out. The state should actively promote garbage classification, establish a perfect waste paper recycling system and establish related laws and regulations.

5.2 *Improving Enterprise Innovation Ability*

Innovation is the soul of an enterprise's core competitiveness and the foundation of an industry's international competitiveness. Paper industry is characterized by a complex market and strong inter-subjectivity. In the process of technological innovation, it is necessary to actively organize various resources and carry out external innovation cooperation. The main body of technological innovation in paper industry should be enterprises, but the environment and conditions for technological innovation mainly lie in scientific research institutes, universities and government.

5.3 *Improving the Quality of Paper Products To Move Towards the High End of Global Value Chain*

State should actively support the domestic paper industry to achieve industrial and products upgrade. The improvement of the quality of domestic export paper products will help to expand new trade markets. Markets in developed economies such as the European Union, Japan and South Korea will be important two-way markets, and export target markets will be more diversified. Promote local paper product import and export enterprises to take the initiative to "go global", and utilize technological innovation and product quality to create new comparative advantages of paper products, to realize the reconstruction of the global value chain of paper products. Strengthen complementary cooperation with developing countries, utilize "Belt and Road" platform to establish unified industrial standards with countries along the route, and avoid the damage to global

value chain of paper products caused by Sino-US trade frictions.

6. CONCLUSION

China is a big country in the consumption and production of paper products in the world, but it is not a strong country in the paper industry. Among the major paper producing countries, the domestic added value of the paper industry in developed countries is relatively high. While the domestic added value of China's exports is at a relatively low position, and the space and ability to obtain trade benefits in the international division of labor is very limited. Judging from the New Revealed Comparative Advantage index measured by trade value added, although the international competitiveness of China's paper industry is still at a disadvantage as a whole, it is gradually improving. China's paper industry should adhere to the concept of sustainable development, continue to innovate, and continuously improve China's paper industry in international division of labor and international competitiveness in global value chain.

AUTHORS' CONTRIBUTIONS

Lihong Li contributed to the conception of the study and wrote the manuscript; Jiabin Chen contributed significantly to analysis and manuscript preparation; Yiqun Huang performed the data analyses and wrote the manuscript.

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