THE EVOLUTION OF INTELLECTUAL PROPERTY TRADE RESEARCH

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ABSTRACT

As an important growth point of the world economy, intellectual property trade is closely related to the division of labor and benefit distribution in the global value chain, and has become an important tool for countries to seek international competitive advantages. However, no systematic literature review has been made on intellectual property trade research. Taking the related research on patents as the object of trade as the research object, this study makes a literature review of the current situation and evolution of intellectual property trade, and its influencing factors. It can be concluded that since the 1980s, the global intellectual property market has expanded with increased transaction scale and international patent technology transactions. Developed countries dominate the market, while China and other emerging countries have risen. The influencing factors include intellectual property protection, economic scale, and geopolitics, amongst others. International protection is essential, and the degree of protection is related to the level of national development. The study found that the current literature on intellectual property trade is far from extensive and in-depth, and there needs to be a scientific framework and system for the research on the theoretical basis and influencing factors.

Keywords: Evolution Trend, Intellectual Property Trade, Influencing Factors, Intellectual Property Protection, Innovation

INTRODUCTION

The intellectual property regime is the product of modern science and technology development and the commodity economy. Intellectual property has become the core element of international competitiveness and a significant global trade resource in economic globalization. It

is also an essential part of international service trade. In the era of economic globalization, international cooperation and knowledge sharing are the general trend (Analysis Group on International Balance of Payment of SAFE 2021, 47). Intellectual property trade is the transnational exchange of knowledge and technology. Unlike the global trade in goods, the trade in intellectual property rights has emerged with the development of international technology trade. The World Intellectual Property Organization (WIPO) has issued a report every two years since 2011, focusing on the global innovation pattern and intellectual property trade.

From the content, international intellectual property trade can be traced back to the end of the 19th century and the beginning of the 20th century, when transnational licensing trade was more widespread (Xie 1994, 25). However, the intellectual property trade on a particular scale only developed in the 1960s. The research on intellectual property trade began in the 1970s. The first concern is the transfer of military technology, such as the United States with Japan (Hall, 1970), and the United States with the former Soviet Union (Sandberg 1991). Then, scholars focused on the strategy and mechanism of technology transfer from developed countries to developing countries through transnational corporations (Egea 1975).

At present, the first known document using the term "intellectual property trade" was found in Chen Changbai's book *International Intellectual Property Trade* in 1994 (Cheng 1994). Subsequently, in 1996, He Qiongjun published *The Resource Allocation Mechanism of Intellectual Property Trade* in the South China Journal of Economics (He 1996), but none of them defined intellectual property trade. In 2000, Xue Hong published *Conflict and Regulation: Legal Conflict of Intellectual Property Trade in the Network Environment* in Intertrade, which defined intellectual property trade for the first time:

> *International Trade in intellectual property is mainly manifested in the cross-border circulation of copyright products such as films, audio recordings, and computer programs, as well as the transfer or licensing of patents and trademarks related to technology introduction and capital introduction.*(Xue 2000, 52)

Five years later, Li Hao published *On Our Country's Intellectual Property Rights Trade: Problems and Countermeasures* in the Journal of International Trade (Li 2005), in which intellectual property trade is divided into a narrow and broad sense according to the definition of intellectual property rights in the Agreement on Trade-Related Intellectual Property Rights of the World Trade Organization (WTO):

***In a narrow sense**, intellectual property trade refers to the trade with intellectual property as the subject matter, mainly including intellectual property licensing, intellectual property transfer, and other contents, that is, a kind of trade behavior between enterprises, economic organizations, or individuals that sell or purchase the right to use intellectual property from each other according to general business conditions. **In a broad sense**, it also includes the trade of intellectual property products, which refers to the trade of products containing intellectual property rights (intellectual property products, intellectual products), especially high-tech products with high added value and high-tech technology, such as integrated circuits, computer software, multimedia products, video products, audio-visual products, literary works, etc.* (Li 2005, 118).

LITERATURE REVIEW

Evolution Trend of Intellectual Property Trade

Since the 1980s, one of the results of the in-depth development of the knowledge economy has been the vigorous development of the intellectual property market (Ashby 2009, 470) . The number of countries participating in global technology creation and technology transactions through the intellectual property market is growing (Suma and John 2007, 210), the transaction scale is expanding rapidly, and the proportion in the service industry is steadily increasing. WIPO statistics show that the volume of international technology trade among countries around the world, mainly in the form of licensing trade of patented technology, was US$2 billion in 1965, US$11 billion in 1975, US$50 billion in 1985, increased to US$250 billion in 1995, exceeded US$650 billion in 2000, and doubled in less than five years on average (Ye and Zhao 2008, 53). From 1980 to 1990, the growth rate of global intellectual property expenditure was 8.7%, and the revenue growth rate was 7%. From 1990 to 2003, the expenditure growth rate was 9.8%, and the revenue growth rate was 5.6%, higher than the global GDP growth rate of 3% in the same period (Ashish and Alfonso 2010,778). According to UNCTAD data, the world service trade in royalties and licensing fees increased from US$114.4 billion in 2003 to US $ 268 billion in 2012, with an average annual growth rate of 14.5% and 91% (Liu and Li 2016, 135). In 2015, the global trade revenue of intellectual property rights reached US$323.3 billion, making an increasingly obvious contribution to the development of the world economy (Wang and Gao 2021, 13). In addition, the proportion of start-ups making profits through intellectual property licensing and transfer has increased, and the number of companies and institutions specializing in intellectual property market intermediaries has also increased (Zhao and Du 2013, 154).

The distribution of international intellectual property trade is extremely unbalanced. Developed countries account for 80% of the world's intellectual property trade. The United States, Britain, Germany, France, and Japan account for more than 90% of developed countries' intellectual property trade volume. 85% of the global intellectual property trade is conducted among developed countries (Ye and Zhao 2008, 54). The proportion of developing countries and emerging economies in world intellectual property trade has increased rapidly, with some countries from Asia playing the most prominent role. The proportion of China, South Korea, ASEAN (Singapore, Thailand, Indonesia, and the Philippines), and India in international intellectual property trade has steadily increased from 5% in the mid-1990s to 12.4% in 2010, with Singapore accounting for 4.1%, China (including Hong Kong and Macao) 3.8%, and Korea 2.8% (Zhao and Du 2013, 154).

a. *International Competitiveness of Intellectual Property Trade*

The existing research on the competitiveness of intellectual property trade is mainly based on Trade Competitiveness Index (TC Index), Revealed Comparative Advantage Index (RCA Index), International Market Share (IMS) and other indicators, focusing on the development of intellectual property trade in the United States of America (US) and China.

Compared with the trade in goods, there has always been a surplus in the international trade of intellectual property rights in the US. With the rise of emerging economies and the increase of innovation sources, the dominant position of the US in the international trade of intellectual

property rights weakened, and its competitiveness has declined, with the Trade Competitiveness Index decreasing from 0.68 in 1990 to 0.51 in 2012 (Zhao and Du 2013, 155). The relative decline of the US intellectual property trade competitiveness index stems from the profound changes in the pattern of world intellectual property trade. Since the global economic crisis, the prominent feature of the international trade of intellectual property rights in the US is that the Asia Pacific region has become the most intensive region in using American intellectual property rights. In addition, the proportion of emerging economies in the American intellectual property market has increased significantly. In 2011, the Asia Pacific region's intellectual property exports in the US reached 48%, surpassing Europe for two consecutive years and becoming the largest intellectual property market in the United States (Zhao and Du 2013, 157).

From the perspective of the product structure in the international intellectual property market, the intellectual property categories with the largest proportion in the US intellectual property exports are industrial technology, general software, and film and television. The changing trend of the proportion of the three is that the proportion of industrial technology is stable at 1/4, the proportion of general software continues to increase from 1/4, and the proportion of film and television continues to decline. The change in the structure of intellectual property trade reflects the characteristics of the change in the economic structure of the United States to some extent. On the one hand, the US has maintained the core competitiveness of the industrial economy era and is still the source of industrial technology output. On the other hand, the economy has gradually turned to the information economy characterized by the Internet and software and has become the center of the global information economy (Zhao and Du 2013, 156). The IMS index value of soft technology trade in the US is about 22%, and the Export Sophistication (ES index) value of telecommunications, computer and information services, and intellectual property royalties reached 332.0 International Dollars and 3803.7 International Dollars in 2016, respectively (Shi and Tao 2019,119-122). The export technology complexity is high. The specialization of royalty and license fee services in the US is also very high, and it has a monopoly advantage in the world, which leads to the lack of competitiveness of other countries' services in the US. Hence, its degree of intra-industry trade is low. Japan's lafay index is also very high, indicating that Japan's royalty and license fee services are also highly specialized (Liu and Li 2016, 138).

The IMS index of China's soft technology trade grew from 0.68% to 3.30% (Shi and Tao 2019,119). However, few core technologies, low international patent levels, limited intellectual property development, and weak independent research and development characterize the situation. Although the ES index of China's telecommunications, computer and information services, and intellectual property royalties showed an upward trend, it was still low. By 2016, it was only 114.2 International Dollars and 17.6 International Dollars (Shi and Tao 2019,122). The development level of core technology lagged far behind that of the US, and intellectual property development remained low. Whether from the perspective of international market share, trade deficit, or various competitiveness evaluation indicators, China's global competitiveness of royalty and license fee services has been relatively weak in the past 10 years. Its international competitiveness is weak, far behind developed countries such as the US, Japan, and Britain, and only surpassing emerging countries such as Brazil, Russia, and India (Liu and Li 2016, 138). It also shows a downward trend, and the export volume fluctuates greatly, reflecting the lack of the ability of China's royalty and license fee service exports to continue to grow.

As the vast number of developing countries are still in the process of industrialization for a long time, and the demand for industrial technology will exist for a long time, the trade of intellectual property rights of industrial technology may only decline steadily. With the transition from an industrial society to an information society and the development of the cultural industry, the proportion of general software intellectual property trade will continue to increase, and the proportion of cultural intellectual property trade will also increase. However, due to the higher complexity and integration of general software intellectual property technology and closer relationship with production and life, the proportion of its international trade will rise faster. Emerging developing countries have obvious competitive disadvantages in intellectual property services trade, and the BRICs countries do not have professional advantages. The degree of specialization of Russia is close to that of China, which is very low, far behind developed countries such as the US and Japan.

b. Geographical Pattern and Network Evolution of Intellectual Property Trade

With the application of social network analysis in international trade, scholars began to build intellectual property trade networks to reveal the geographical pattern and network evolution of global or regional intellectual property trade.

From the global scale, the international intellectual property trade network mainly shows the following characteristics: 1) The trade ties and intensity have significantly increased, indicating the broadening and deepening of international intellectual property trade activities.; 2) The polarization is significant, characterized by a significant "core-edge" structure (Feng, Zhang and Liu 2022, 47); 3) The double arch pattern of "United States-Western Europe" and "United States-Japan" evolved into a cross-regional fireworks pattern centered on the United States, forming a typical small-world network, indicating increased activity and efficiency in intellectual property trade activities(Duan, Du and Chen 2019, 2119); 4) It has developed a pyramid structure with the United States at the top, showing a clear hierarchy. However, in recent years, there has also been a trend of decentralization (Duan, Du and Chen 2019, 2123; Wang and Meng 2023, 84); 5) From the perspectives of international intellectual property import and export patterns, imports show a development trend from concentration to dispersion. The intellectual property import volume of some emerging economies is proliferating, while the export pattern remains unchanged, locked in the "three pillars" pattern of the United States, Japan, and Western Europe (Duan, Du and Chen 2019, 2119).

Feng, Zhang and Liu (2022，44-45) also analyzed the geographical gravity center transfer of intellectual property trade and found that the import center had undergone four shifts in the order of Germany → Japan → the United States → the Netherlands → Ireland, and the transfer was frequent and accounted for a relatively low proportion, indicating that the import activities of intellectual property trade were affected by a country's policies related to technology import, intellectual property rights and economic development, and had been widely valued by many countries; While the export center has always been the United States, which has not been transferred, but its share continues to decline. The strong scientific and technological strength and innovation ability of the United States have kept it the most potent export country for a long time. Still, the increasing technology export ability of several major innovative countries/regions has diluted the share of the United States.

From the regional scale, the "Belt and Road" is characterized by marginalization and regionalization in the global intellectual property trade network, and its internal technology trade volume is far lower than that of external technology trade. At present, the "Belt and Road" technology trade is mainly controlled by Russia and the United States, which are the most significant technology sources of 19 and 21 " Belt and Road" countries (regions), respectively. At the same time, China is not the largest technology trading country of any "Belt and Road" countries (regions) (Duan, Chen and Du 2019, 1006).

From the perspective of the nodes in the network, the United States is the core of the global geo-technological pattern, and its core position has been continuously consolidated and strengthened. However, Central Asia, West Asia, and Africa are areas where the United States currently lacks scientific and technological power, which are the core areas of China's "Belt and Road" construction (Duan, Du and Chen 2019, 2126). China's position in the network has gradually improved, becoming a vital network hub (Wang and Meng 2023, 70), but the technology trade export capacity needs to be further improved.

METHODOLOGY

The concepts of intellectual property trade, technology trade, and technology transfer are cross-cutting, to avoid confusion and omission, the research object of this study is the related research with patents as the trade object. Using Web of Science (WOS), Scopus, and CNKI as retrieval platforms and using international intellectual property trade, international licensing of technology, and international technology trade as keywords, 26 articles of WOS, 7 articles of Scopus, and 120 articles of CNKI were found. Eliminating duplicate literature, a total of 149 articles were included. According to the main research topics, this study reviews the intellectual property trade's current situation, evolution, and influencing factors.

FINDINGS

Research on the Influencing Factors of Intellectual Property Trade

Robert W. (1977) was an earlier scholar who studied international technology licensing. He put forward the idea of expansion constraint and oligopoly view, believing that overseas expansion's financial and organizational constraints are more extraordinary than domestic expansion and that companies choose to license international technology to maintain their segmented geographical market (Robert 1977, 116-117). Subsequently, scholars studied the influencing factors of intellectual property trade from multiple dimensions.

a. Intellectual Property Protection

Intellectual property protection, such as patents, trademarks, service marks, and copyrights, is at the forefront of the globalization of markets in ideas, technology and economics. As intellectual property rights play an increasingly important role in promoting the development of the international economy and trade, protecting intellectual property rights has become the consensus of all countries (Wang, Tao and Zu 2018, 154). The relationship between intellectual property rights and international trade has also become the focus of scholars (Maskus and

Penubarti 1995; Primo Braga and Fink 1999; Branstetter, Fisman and Foley 2006). The trade of intellectual property rights itself is based on intellectual property rights, and the protection of intellectual property rights is bound to have a far-reaching impact.

The host country's degree of intellectual property protection is an important concern for scholars. The willingness of developed countries to exchange technology with developing countries mainly depends on whether the country has a legal framework of intellectual property rights that can protect the local interests of technology owners. Suppose the goal is to encourage the technology licensing of parent companies and subsidiaries abroad. In such a scenario, a strong and effective intellectual property law is essential, with successful implementation being of utmost importance. Strengthening the protection of intellectual property rights in a country is conducive to promoting the development of its technology import trade and its acquisition of advanced foreign technology, especially for developing countries (Weng, Ma and Dai 2018, 57). The patent system reform can increase the cost of imitators, reduce the risk of imitation (Ivus, Park and Saggi 2016,2-3) and the cost of technology licensing, and stimulate information transfer and technological innovation (Yang and Maskus 2001,170). The resulting introduction of a raft of IP laws has clearly given rise to a rapid increase in the flows of patent, trademark and design activity to the PRC by Western countries(Bosworth and Yang 2000, 454). Branstetter, Fisman and Foley (2006) investigated the impact of intellectual property reform in 16 countries on the technology transfer of U.S. transnational corporations from 1982 to 1999 and found that U.S. multinational corporations significantly increased the technology transfer to the reformed countries. Ivus (2010) discovered that substantial intellectual property rights in developing countries can increase the trade volume of developing economies in U.S. intellectual property-sensitive industries, resulting in a 13% annual growth in the import volume of high-tech goods.

Chinese scholars have reached similar conclusions and found that intellectual property protection can promote technology transfer through technology licensing (Lv 2007; Yu and Wang 2009). Ma Lingyuan (2014) empirically analyzed the impact of strengthening intellectual property protection on service trade imports from 2000 to 2011. The results showed that when the market expansion effect of intellectual property protection was pronounced, the impact on service trade imports was more significant. Dai, Liang and Sun (2015) analyzed that with the development of a knowledge-intensive service industry, strengthening the protection of intellectual property rights will promote the improvement of the technical complexity of service trade exports. However, some scholars have found that the impact of intellectual property protection on outward technology transfer is negative (Wang and Tan 2012, 20 ; Gu and Shi 2014, 100). In addition, some scholars believe that only the strong intellectual property protection of exporting countries can bring about the intensive export of goods, primarily intellectual property-intensive products (Paweł and Kuź nar 2013, 10-12).

In addition, the impact of intellectual property protection on intellectual property export revenue in developed and developing economies is significantly different. In developed economies, improving intellectual property protection forms a monopoly on knowledge innovation (Maskus and Penubarti 1995, 228; Chin and Grossman 1988, 3), which is not conducive to introducing innovative technologies. Furthermore, countries with technological advantages can leverage intellectual property protection to secure a favorable position in international competition and seek greater influence in other domains (Duan, Du and Chen 2019, 2117), greatly increasing the

economic growth of the home country and expanding the income sources of the parent companies of transnational corporations (Park and Ginarte 1997, 57; Sattar and Mahmood 2011, 174-179). In developing economies, strengthening intellectual property protection can deter imitation, suppress imitation-based production, and boost the demand to adopt new technologies (Maskus and Penubarti 1995, 243).

Weng, Ma and Dai (2018) used the cross-border panel data of 71 countries from 2006 to 2015 to study the impact of intellectual property protection on technology import trade. The results indicate an inverted U-shaped relationship between intellectual property protection and technology import trade in the global sample. That is, with low levels of intellectual property protection, technology imports increase as intellectual property protection improves. When the level of intellectual property protection reaches a critical point, technology imports decrease as intellectual property protection improves. For developing countries, intellectual property protection has a linear relationship with their technology import trade volume, resulting in a significant positive impact. However, it has no significant impact on developed countries. One possible reason is that intellectual property protection in developed countries has already been strong, and no imitation enterprises are operating. Therefore, further strengthening intellectual property protection will not reduce the number of imitation enterprises and, as a result, will not increase the volume of technology import trade. Simultaneously, developed countries possess advanced technology levels and primarily require high-end core technology, which is typically not easily transferable. Therefore, intellectual property protection may have a relatively minor impact on the technology trade of developed countries.

Wang and Meng (2023) also discovered that as the gap in intellectual property protection levels between two countries widens, the volume of intellectual property exports from nations with stronger protection to those with weaker protection increases. There is a "U"-shaped relationship between the overall level of intellectual property protection and the export volume of intellectual property between these countries. The higher a nation's level of development and innovation, the more influential intellectual property protection becomes in promoting intellectual property trade. Enhancing state-level intellectual property rights protection is beneficial for facilitating the signing of trade agreements, thereby stimulating the growth of intellectual property trade relations.

b. Innovation and Technology Absorption Capacity

The host country's innovation and technology absorption capacity will also affect the intellectual property trade relations. The greater the technological gap between local and multinational companies, the smaller the possibility and proportion of the advanced technology of international companies transferred to local companies. In the case of a large technology gap, developing countries cannot meet the capital and production scale requirements for the effective use of TNCs' advanced technology, so the technology employed by TNCs' subsidiaries and their affiliates may not disseminate to local enterprises in developing countries (Lun 2007, 67). In the high-tech sector, excessive technological gap will hinder the transfer and dissemination of technology.

Blind and Jungmittag (2005) studied the impact of innovation and technical standards on trade between developed countries and found that British standards have a more substantial

positive impact on imports and exports than international standards. Germany's export performance can be explained mainly by its innovation ability, and only a small part is related to the strength of technical measures. China's high-tech industry has steadily enhanced its independent innovation capabilities, and the scale of technology transactions has consistently grown thanks to technology transfer policies. This technological innovation has driven the growth of China's intellectual property trade, resulting in a rising proportion of intellectual property trade activities (Gu and Liu 2014, 50). While the number of patents granted in Beijing is increasing, there remains a significant gap when compared to developed countries. Additionally, the quality of some patents may be low, hindering the promotion of intellectual property export trade (Wang, Tao and Zu 2018, 154). Moreover, notable variations exist in the inverse relationship between a company's capacity to assimilate innovation and the exportation of U.S. intellectual property rights in countries at various stages of economic development. In developing economies, this negative impact is statistically significant at the 1% significance level, whereas it lacks significance in developed economies. This suggests that the absorptive capabilities of developing economies have reached a certain threshold, thereby fostering enhancements in their innovation prowess. The progression of indigenous innovation endeavors spurs the emergence of novel technologies, diminishing reliance on U.S. intellectual property rights. This phenomenon is less pronounced in developed economies (Wang and Gao 2021, 17).

However, some scholars believe that the impact of productivity level on technology import is not significant. On the one hand, the higher the productivity, the stronger the imitation ability, thus inhibiting the transfer of advanced technology to it. On the other hand, improving productivity has created conditions for the application and popularization of technology (Weng, Ma and Dai 2018, 54). The two effects may offset each other in general.

The intensity and scale of a country's R&D activities are essential indicators to reflect its innovation ability. To secure and sustain a competitive edge, attention must be devoted to R&D with a corresponding boost in investment. Pawel and Kuźnar (2013) found that the export of more intensive intellectual property-intensive industries was accompanied by higher total expenditure on R&D of exporting and importing countries (but the coefficient related to the cost of exporting countries was much higher than that of importing countries). Therefore, overall, the total R&D expenditure seems to have a greater impact on the export of intellectual property-intensive industries. In comparison, it has a smaller impact on the export of all commodities. Beijing's investment in R&D remains notably insufficient and has yet to contribute significantly to advancing its intellectual property trade (Wang, Tao and Zu 2018, 154). There are also differences between developed and developing economies in this regard. The company's R&D investment significantly negatively impacts the intellectual property import of developing economies, mirroring the overall sample. In contrast, it positively impacts developed economies, although the effect is not obvious (Wang and Gao 2021, 17). In developing economies with weak innovation capabilities among enterprises, increasing R&D investment is highly effective in improving R&D capabilities, enhancing independent innovation capacity, promoting technological innovation, reducing reliance on foreign technology, and minimizing the introduction of intellectual property rights. The interaction between R&D investment and enterprise absorptive capacity increases the absorption of imported intellectual property rights, which contributes to the formation of internal innovation ability. In developed economies, where R&D capabilities have already reached a certain level, increased R&D investment may not lead to developing a high-level innovation

capacity. Instead, it may need to be introduced to some extent, but the effect is not particularly significant.

c. Political and Economic-Related Factors

Trade is closely related to political and economic policies. The relevant research on intellectual property rights mainly involves geopolitics, economic scale, economic policy, foreign direct investment, etc.

From a geopolitical perspective, countries or regions can promote trade, investment, and economic ties among Member States to achieve shared economic growth and development goals by reducing trade barriers, enhancing economic cooperation, and coordinating policies to form a close economic alliance or cooperation system. Baldwin (1997) believed that the regional trade integration arrangements between the European Union and North America positively impacted the living conditions of their members. Regional trade integration arrangements promote the growth of trade among members, which is faster than the growth of trade among nonmembers (Bhagwati 1992, 543-544). Luo, Luo and Liu (2014) made empirical research showing that the free trade area positively impacts member trade, but the statistical effect is insignificant.

Secondly, the economic scale also significantly impacts the amount of technology imports. Generally speaking, the larger the economic scale, the greater the technology imports. Weng, Ma and Dai (2018) discovered that a 1% increase in economic scale led to a significant 0.4046% average increase in technology imports, which was significant at 5%. Import trade also has a significant positive impact on technology imports. Specifically, a 1% increase in the import volume of goods and services resulted in a significant 0.6381% average increase in the import volume of technology, which was significant at 1%.

Thirdly, economic policy also exerts an influence. Riker (2014) demonstrated a negative correlation between enterprises' total tax rate and intellectual property rights export revenue. However, the negative correlation between the total tax rate of the host country and the export revenue of U.S. intellectual property trade varies for economies with different levels. In developed economies, an increase in the host country's corporate tax reduces the import of intellectual property from developed economies to the United States, and this effect is significant at the 1% level. However, this negative correlation effect in developing economies is not significant (Wang and Gao 2021, 17).

In addition, the relationship between foreign direct investment and intellectual property trade is also very close. Generally speaking, there is a substitution relationship between foreign direct investment and technology transfer. An enterprise either invests directly in the host country or transfers technology to the host country. According to U.S. Bureau of Economic Analysis (BEA) data, over 60% of U.S. intellectual property exports are directed towards institutions affiliated with the United States. U.S. Outward Foreign Direct Investment (OFDI) is closely interconnected with intellectual property exports. Intellectual property plays a role in reducing the cost of technology transfer (Maskus 2004, 20), and multinational corporations enhance technology dissemination through Foreign Direct Investment (FDI) and licensing agreements (Smith 2001, 416;Branstetter *et al.* 2011, 30-32). Developing economies with robust intellectual property rights can leverage technology licensing via the FDI channel, thereby altering the operational dynamics of

transnational corporations (Ivus, Park and Saggi 2016, 1075). Wang and Gao (2021), based on panel data encompassing U.S. intellectual property exports to 32 economies between 2006 and 2015, examined the influence of the host country's FDI inflow stock on the exporting country's intellectual property exports. The export of intellectual property is FDI-driven, with this driving effect being particularly pronounced in developing economies as host countries. However, Weng, Ma and Dai (2018) found that the impact of FDI on technology import is insignificant. One possible explanation is that, when considering the overall volume of technology trade, the substitutive relationship between the two countries' direct investment and technology transfer becomes less apparent. Import trade also plays a crucial role in international technology spillover. In the case of developing countries, there is no substitutive relationship between imports and technology trade.

d. Human-Related Factors

Intellectual property is the crystallization of human wisdom. The development of intellectual property trade must also be closely related to human factors.

Scholars generally believe that human capital can promote economic growth, and many studies have proved that human capital plays a more significant role in promoting economic development than material capital. The current era is an era of knowledge economy. As the main body of knowledge and technological innovation, human capital is a critical factor of production in intellectual property-related industries, which plays a vital role in improving the international competitiveness of intellectual property trade (Wang, Tao and Zu 2018, 154). Paweł and Kuźnar (2013) found that more students in higher education are accompanied by more intensive export of intellectual property-intensive goods and all goods in exporting countries. However, the statistical results of the number of students in importing countries are insignificant.

In addition, the importance of the global diasporas to contemporary economic development is a new research field that has not been paid enough attention. Global diasporas refer to a common nation, ethnic group, country, or cultural group distributed worldwide. These diaspora groups usually leave their motherland or place of origin for historical, economic, political, and other reasons and settle in other countries or regions. These groups maintain their own cultural, linguistic, religious, and other characteristics overseas and often keep in touch with the original country or culture. Nurse (2016) discussed the impact of the economy of the diaspora on trade, enterprises, and investment in the Commonwealth countries and found that it could deliver and receive the needs of the Diaspora and supply goods, services, and intellectual property rights, and promote financing, investment, and knowledge transfer. Akinori (2019) used Japan's bilateral trade data and Japan's bilateral trade data with OECD countries (Akinori 2023) and found that immigration networks can reduce the information cost of transactions and promote intellectual property trade. Still, intellectual property revenue negatively correlates with the number of Japanese immigrants in developing countries.

CONCLUSION

From the perspective of the current situation and evolution of intellectual property trade, since the 1980s, the global intellectual property market has developed rapidly, and the volume of transactions has expanded. Intellectual property trade has a significant impact on the economy.

The volume of international patent technology transactions continued to grow, with developed countries taking the leading position and developing countries taking up an increasing proportion of intellectual property trade. The competitiveness index of intellectual property trade reflects the international competition pattern. The United States continues dominating, but emerging countries like China are growing. The global intellectual property trade presents a network structure with the United States as the core. Central Asia, West Asia, Africa, and others lack scientific and technological power, while China gradually improved its status by constructing the "Belt and Road."

The United States attaches great importance to strategic research and information monitoring of intellectual property trade. The "Patent Scoreboard' system of CHI Research Company of the United States, which uses the bibliometric analysis method to carry out annual analysis of scientific papers and patent indicators, has been cited by many countries. The Bureau of Economic Analysis of the United States has established a cross-border service, including intellectual property services and a service trade statistics database of affiliated institutions, to conduct statistical monitoring and analysis of the trade in intellectual property services between the United States and countries worldwide. The Global Intellectual Property Center (GIPC) of the American Chamber of Commerce regularly publishes the international Intellectual Property Index report every year, which evaluates the development of intellectual property in 50 economies worldwide by 40 indicators from 8 aspects, including patents, copyrights, trademarks, trade secrets, commercialization of intellectual property, law enforcement, system efficiency, accession to and ratification of international treaties (Cui 2019, 75).

Chinese scholars have proposed various opinions and suggestions for developing China's intellectual property trade. To fully leverage the government's role, there should be a promotion of an innovation-driven strategy and the establishment of a policy system oriented towards the quality of intellectual property trade. Various platforms should be established to enhance intellectual property protection and enforce compliance reviews. Industrial policies conforming to international practices and not violating WTO framework agreements should be formulated. Attention should be given to introducing and training technical trade talents (Liu 2016, 31;Song and Zhang 2018, 64).

Regarding the influencing factors of intellectual property trade, Robert (1977) focused on international technology licensing, emphasizing expansion constraints and oligopoly. The subsequent research analyzes the impact of intellectual property protection, economic scale, geopolitics, and foreign investment on intellectual property trade from the perspectives of institution protection, innovation ability, political economy, and manpower. Among them, the international trade protection of intellectual property rights has become the focus of global attention and is crucial to international economic development. Countries have strengthened the protection of intellectual property rights to promote technology transfer and innovation. However, the degree of protection is closely related to the level of national development, and the impact of intellectual property protection on technology import trade shows an inverted U-shaped relationship. Technology trade in developed countries may be less affected by protection, while the difference in the degree of intellectual property protection can affect intellectual property trade.

The current literature on intellectual property trade is far from extensive and in-depth compared with its importance, and there is no scientific framework and system for the research on

the theoretical basis, influencing factors, and economic consequences. As intellectual property trade involves many fields, including political, economic, legal, trade, management, and other related knowledge, it is bound to be comprehensive interdisciplinary research in the future.

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