Principle of International Factor Cooperation and China's Direct Investment in SCO Countries

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Abstract: International direct investment is the international cooperation of advantageous elements of various countries. In essence, it flows the advantageous elements of the home country to the host country through factor flow, and combines them with the advantageous elements of the host country to produce investment projects. In recent years, the trend of intra regional trade and investment integration of the Shanghai Cooperation Organization (hereinafter referred to as the SCO) has gradually strengthened. China's direct investment in SCO countries has increased geometrically, which essentially reflects the international factor cooperation under the condition of in-depth development of globalization. The results of mathematical models show that China's investment in SCO countries conforms to the principle of international factor cooperation.
***Keywords*:** factor cooperation, international direct investment, factor flow, SCO

1. Raising questions

Contemporary international cooperation is based on the flow of factors. In recent years, the trend of trade and investment integration within the SCO region has gradually strengthened, which essentially reflects a new type of international cooperation under the condition of in-depth development of globalization. Because the current globalization has evolved from trade liberalization to investment liberalization, that is, international factor cooperation in the sense of factor flow, Investment projects are generated by the combination of home country advantage elements and host country advantage elements. This is a kind of globalization cooperation with more depth than previous trade liberalization, so it has more vitality. The geometric growth of China's direct investment in SCO countries proves this.

SCO countries are vast in territory and rich in resources, and there are abundant stocks of advantageous elements such as mineral resources, energy resources and tourism resources. However, there are common problems of low national economic level and arduous task of economic development. Not only are the advantageous elements passively idle and can not be well utilized, Even the construction of transportation and logistics infrastructure such as highway and railway is very scarce due to the large capital gap. As the world's second largest economy, China has a rich stock of capital factors and has comparative advantages in infrastructure construction. Its advantageous factor supply is just complementary to the demand of SCO countries, which determines the necessity and reality of China's direct investment in SCO countries. Among them, China and Central Asian countries started early in energy cooperation. In 2006, the China Kazakhstan crude oil pipeline was officially opened. The 2800 km China Kazakhstan crude oil pipeline has become the main artery of energy transmission between China and the Caspian Sea since it was put into use. China's investment in the infrastructure of Central Asian countries is also prominent. It is mainly completed in the form of project cooperation, funded by China and directly dispatched construction teams. The agreement on international road transport facilitation among the governments of SCO member states signed in Dushanbe, the capital of Tajikistan, in September 2014 is the foundation work for the multilateral development of infrastructure in the SCO region.

OFDI was the first economic phenomenon unique to developed countries. Due to the weak economic foundation, developing countries were mainly the recipient countries of OFDI before the 1980s, and more than 90% of the world's OFDI came from developed countries. After the mid-1980s, due to the rapid economic development of developing countries, especially emerging market economies, OFDI began to grow rapidly and become an important source of world capital (UNCTAD, 2006). The emergence of this phenomenon has attracted extensive attention of researchers in academia, especially in developing countries. Ramamurti (2009) believes that investors from non-traditional FDI source countries have accumulated rich experience through production and operation in their relatively backward political and economic environment, so they have "adversity advantages" in investing in emerging market economies and other developing countries with relatively backward political and economic environment and infrastructure. One belt, one road, China and the other countries in the world, are all involved in a wide range of investment. The diversity of investment entities, industries, ways

and channels has been increasing rapidly. The traditional foreign investment theory is difficult to accurately describe the deep-seated nature of China's current foreign investment, resulting in some problems to be solved: what is the current law guiding China's foreign direct investment? Is this law universal? Through what mechanism? Is the impact consistent across host countries? Is China's investment in SCO countries affected by this? This paper attempts to explain these problems.

2. Related literature review

The existing literature on China's foreign direct investment mostly starts from the medium and macro perspective. Although some scholars have pointed out the relevance between China's foreign direct investment and the cooperation of production factors (SHENG Bin et al., 2016), the micro basis of global economic development, that is, the international flow of production factors, is still ignored in the vast majority of literature. Factor flow theory is the basic theory for analyzing the contemporary world economy. Factor flow determines the starting point of the economic process of resource allocation. Due to the existence of investment and trade barriers and differences in national policies, factor flow is limited, the world economy and the national economy will only converge rather than be the same, and there is still a gap in economic and trade development and factor structure among countries around the world, Therefore, even in today's era of globalization, adhering to the international flow of factors is still the basic idea to study various practical problems of the world economy (ZHANG You-wen, 2020). In view of the different international mobility of production factors, the mobility of capital, technology and other factors is strong, while the mobility of general labor, land and other factors is weak or even unable to flow. Therefore, the appearance is reflected in the rapid development of international investment. In essence, economic globalization is a process from highly mobile factors to weakly mobile factors, On the surface, it is reflected in the rapid development of international investment (ZHANG You-wen, 2017). The main body of international direct investment is basically multinational corporations. Due to the difference of factor prices, multinational corporations allocate resources all over the world, and each country or region participates in it by providing specific production factors (Baldwin and Lopez Gonzalez, 2013; Los et al., 2015). In other words, countries participate in international division of labor, international competition and international cooperation with factor advantages rather than product advantages (DAI Xiang,ZHANG Er-zhen, 2017).

Since the implementation of reform and opening up to the outside world, China has only attracted a large number of foreign capital inflows as an attracting country for a long time, and formed a foreign capital led processing trade. *** Capital and technological advantages, etc. (SHENG Bin et al., 2016). One belt, one road, one belt, one road initiative, and the SCO regional cooperation mechanism are mutually beneficial and interactive development. The SCO will stimulate China's potential cooperation with other countries and regions. China's one belt, one road investment in the SCO, is mainly greenbelt investment. Ifzal Ali and Hyun H. Son (2007) is a significant indicator of the infrastructure construction and interconnection of the countries along the belt and road (SHENG Bin, 2019). The new form of international division of labor formed at this time is called "factor cooperative international specialization" (ZHANG You-wen, 2017), which mainly includes two meanings: first, factor cooperation, that is, countries around the world provide their own production factors and realize the common production of products through collaborative cooperation; Second, international specialization, that is, through the cross-border flow of production factors, countries gather the factors they provide in a country to realize specialized production for a product. In addition, Zhang Erzhen and his research team earlier referred to the current new international division of labor as "factor division of labor" in domestic academic circles. (DAI Xiang,ZHANG Er-zhen, 2017) their economic meaning is clear, that is, they strive to reveal the essence of international division of labor from the level of factor cooperation rather than the level of products. In essence, the advantageous elements of a country under the condition of factor division of labor constitute the basis of trade and division of labor.

In the study of foreign direct investment with the basic characteristics of cross-border flow of factors, ZHANG Er-zhen and others put forward the concept of "factor division of labor". Compared with ZHANG You-wen's concept of "factor cooperation", on the surface, they are two completely opposite concepts. In fact, they are consistent and complementary. The formulation of "factor division of labor" strictly continues the core concept of "division of labor" in the world economy and international trade, and reflects the development of world development from industrial division of labor between countries, product division of labor and intra product division of labor to a deeper level, that is, the level of production factors, while "factor cooperation" means that the production at this time is carried out on the basis of the combination of factors of various countries, Different from the previous production, all the factors used come from their own countries. Therefore, "factor division of labor" and "factor cooperation" are two expressions of the same phenomenon, but they are different in research perspectives. The essence of factor division of labor is that multinational corporations integrate and utilize resources on a global scale. It is to bring the advantageous factors of different countries and regions into the global production network, that

is, countries participate in the international division of labor with advantageous factors. The "one belt, one road" initiative will give priority to the development of interconnection and interconnection of infrastructure so as to help China and the less developed countries to accelerate access to the global economic system and international market, reduce trade costs, gain development opportunities, achieve win-win cooperation between developed and developing countries, and promote inclusive growth of the global economy (ZHANG Yu, DAI Xiang, ZHANG Er-zhen, 2019).

Relatively speaking, the limitations of previous international investment theories are as follows: (1) the theoretical analysis takes the investing country or enterprise as the main body and the investing country as the main body, which actually assumes that the motives of all foreign direct investment enterprises are consistent and are the motives of the investing country. This assumption is too simple to explain the foreign investment behavior of enterprises in a complex international environment. Taking enterprises as the main body often only considers microeconomic factors and is limited to the monopoly advantage of multinational corporations. (2) The orientation of foreign direct investment and international division of labor proposed by Kojima Qing is one-way, that is, from developed countries to developing countries. As a developing country, it is always in a passive position. It is impossible to explain the reverse trade-oriented direct investment from developing countries to developed countries and the horizontal investment among developing countries. (3) The background of comparative advantage theory is the foreign direct investment of Japanese small and medium-sized enterprises in the early stage after World War II. Today, the situation of China's foreign direct investment has long changed, and the large enterprises of foreign direct investment have increased significantly. Not only the reverse investment in developed countries has increased rapidly, but also the horizontal investment among developing countries has developed rapidly. The previous international investment theory can not explain these new investment behaviors, which has great limitations and does not have general significance.

International direct investment is the international cooperation of advantageous elements between different countries. Breaking the limitations of countries or enterprises, from the perspective of production factors closest to the essence of international investment, it is bound to explain various investments under different conditions and in different forms. The conclusion should be the closest to reality, because this itself is a specific description of the objective law.

3. Principles of international factor cooperation

3.1 Overview of the principles of international factor cooperation

The principle of international factor cooperation not only refers to the advantageous factor cooperation between countries with different factor endowments, but also includes the cooperation between countries with similar factor endowments. The reason lies in the technical differences of production factors, which is specifically defined as the value differences caused by the factors themselves or the use of specific technologies. Including absolute advantage technology difference and comparative advantage technology difference. The so-called absolute advantage technology difference refers to the technology difference owned by the investing country but not by the host country, and the technology between different departments cannot be used in general. Comparative advantage technology difference refers to that both the investing country and the host country have the same technology in the same sector, but there are grade differences. The technology of the investing country is relatively high and that of the host country is relatively low. At this time, the "advantage" is reflected in the utilization level of factors and the value provided, rather than the structure and quantity.

The traditional factor endowment theory holds that a country's factor endowment structure will affect its comparative advantage and international division of labor. As the main forms of a country's participation in international division of labor, international direct investment and international trade will be affected by a country's factor endowment structure, especially when there is distortion in the domestic factor market. The rapid development of China's foreign direct investment is not only affected by domestic policies, but also by the change of domestic factor structure. The low price distortion of domestic factor prices increases the probability of enterprises' foreign direct investment.

Foreign direct investment involves different investment subjects. Efficient cooperation and coordination among subjects will make the investment task better completed. However, due to the different levels of economic development, the different structure of endowment factors and the technical differences of the same production factors of the participating countries, there are great differences in the understanding of the objectives of foreign direct investment, which also leads to the deviation of the behavior of different actors and various speculative behaviors, such as the increasing number of factors due to the low efficiency of factor utilization technology; Distorting the price of some factors in order to improve the economic profit margin. Relevant scholars have pointed out that whether members can build a smooth and coordinated cooperative relationship in the process of foreign direct investment cooperation will have an important impact on the overall investment performance. For example, the communication level, relationship commitment and innovation trust of partners in the process of cooperative innovation will improve the quality of cooperative innovation.

In addition, the behavior deviation of investors leads to the distortion of production factor pricing. Leaving aside the investment subject and going deep into several production factors of the investment object, we can actually find that the willingness of the investment subject may be the initial condition for promoting the beginning of investment, but the long-term foreign investment, especially the necessary and sufficient condition similar to China's all-round investment at the present stage, is the international cooperation of advantageous elements. To recognize this, we must understand the three-level classification of production factors.

3.2 Three level classification of production factors

The theory holds that international direct investment can not only rely on the monopoly advantages of multinational corporations starting from microeconomic factors, but also consider the principle of international division of labor starting from macroeconomic factors. The principle of international factor cooperation is an appropriate supplement and innovation to the three-level classification of production factors on the basis of factor endowment theory and factor flow theory. The first level is to divide production factors into three categories: capital, labor and land according to natural attributes; The second level is to subdivide the production factors subordinate to the same natural attribute according to whether they have the same technology in the same department according to the technical attribute, and pay attention to that the technologies between different departments cannot be used instead of each other; The third level is to further subdivide the production factors with the same technology in the same department according to the difference of technology level on the basis of the second level. The dominant factors mentioned in the factor endowment theory, such as capital, land and labor force, reflect the first level classification of production factors, the absolute advantage technology difference in the principle of international factor cooperation reflects the second level classification of production factors, and the relative advantage technology difference reflects the third level classification of production factors.

The three-level classification of production factors makes the structure of the same kind of production factors more detailed, and a realistic problem that has been ignored for a long time emerges - the problem of factor heterogeneity. Although the factor structure is similar, due to the existence of technological differences, the same factor still has heterogeneity, and the heterogeneous factors between countries often have the possibility of reconciliation and matching. In fact, international direct investment is often based on the matching of specific heterogeneous factors, such as considering the heterogeneity of partners' innovation ability, Sammarra's research confirms that through cooperation with these heterogeneous partners, countries can draw cooperative resources from them and then serve to improve their own economic and trade development level. Considering that not all countries participating in international investment can find ideal partners and corresponding resources, the heterogeneity elements in the process of national investment cooperation often extend to the second and third levels.

4. Mathematical model construction and proof

4.1 Basic model construction

Assuming that there are a large number of countries participating in foreign investment, each investing country will not have a decisive impact on other countries. The transaction is completed at the rate of φ. The total number of countries is a constant. The advantage factor of the host country at time point t is Y_t, the advantage factor consumed by the investing country at time point t is πY_t, and the advantage factor stock of the host country is $(1-\pi)Y_t$. This is because the advantage factor stock of the country will change with the factor flow. The project under construction at time point t is L_t, and the countries participating in the investment will consume the advantageous elements and projects under construction. The interest rate level in the investment market is i_t. The only capital trading channel in the investment market is called "trading box". The investment profit that the investing country can obtain from it is equal to the profit of advantageous elements πY_t plus the profit of projects under construction $\dot{L}$. The mathematical formula is expressed as:

$$i_t L_t = \pi Yt + \dot{L} \tag{1}$$

Use G_t to represent all the profits of the host country from the initial investment to the time point t. When the investor country ends the transaction and leaves the market, its investment profit will automatically decrease, and the new investor country will still introduce new capital elements and generate accumulated investment profit.

$$\dot{G}_t = -\varphi G_t + \left(1-\pi\right) Y_t + i_t G_t \tag{2}$$

Under normal conditions, the investment profit should be at least the same as the profit obtained by the investing country by retaining the funds for domestic use and consumption, that is, at least the same as the profit of the project under construction. At this time, the host country does not use its advantageous factors to attract capital inflows.

$$G_t = L_t \tag{3}$$

Further, substituting equation (3) into equation (1) and substituting the result into equation (2), we get:

$$G_t = \frac{Y_t}{\varphi} \tag{4}$$

Return to equation (1) and equation (3) again, and combine the two equations to obtain:

$$i_t = \frac{\dot{Y}_t}{Y_t} + \pi\varphi \tag{5}$$

As can be seen from the above equation (5), at this time, only the interest rate in the market can be used as the only criterion to judge whether the investing country is profitable or not. Under the condition of foreign investment Y_t, the income will increase with the increase of investment, because the increase of investment will increase the demand for financial assets G in the host country, so as to improve the expectation of profit return in the trading box of the host country. After the capitalization of income and asset supply will rise along with π , and the demand for financial assets in the host country will be limited. This led to an increase in asset prices. Then the φ value rises.

Above, we have established a minimalist model that only includes two parts: advantageous elements and investment gains, which needs to be further expanded.

It is assumed that the growth rate of the dominant factor of the host country Y_t is ε, and when it does not participate in foreign investment, i_t is i_{equ} , and there is $i_{equ}=\varepsilon+\pi\varphi$. Domestic interest rates in all economies are uniformly fixed i.

Precondition 1: the difference between capital and financial account and the expression of capital account at time t are CB_t and KA_t , and $CB_t \equiv Y_t - \varphi G_t$, $KA_t \equiv \dot{G}_t - \dot{L}_t$.

The definition of capital and financial account balance and capital account follows the standardized paradigm. The current account is defined as the increase in the demand for products and services.

Integrate the derivatives of (1) (2) two equations, then:

$$L_t = \int_t^{\infty} \pi Y_s e^{-i(s-t)} d_s \tag{6}$$

$$G_t = G_0 e^{(i-\varphi)t} + \int_0^t (1-\pi) Y_s e^{(i=\varphi)(t-s)} \tag{7}$$

Main proposition 1:For all countries, the advantageous factors will lead to international direct investment, and the investment path that can be followed is $\{i_t\}_{(t\geq 0)}$,When time tends to infinity, converges i_t to the constant i, that is, $\lim_{t\to\infty} i_t = i$, $\varepsilon<i<\varepsilon+\varphi$.

At this time, the expression of advantageous elements and projects under construction will fully meet the following progressive formula:

$$\frac{L_t}{Y_t} \xrightarrow[t\to\infty]{} \frac{\pi}{i-\varepsilon} \tag{8}$$

$$\frac{G_t}{Y_t} \xrightarrow[t\to\infty]{} \frac{1-\pi}{\varepsilon+\varphi-i} \tag{9}$$

The above two formulas prove that in the process of open economic development, the supply of capital factors is equation (8), and its asymptotic formula is the decreasing function of i, while the demand of capital factors is equation (9), and its asymptotic formula is the increasing function of i. The two equations jointly determine the size of the equilibrium interest rate, i.e. $i=i_{equ}$.

The equilibrium level and conditions of interest rate in the capital market are jointly determined by the demand and supply of capital factors. Equation (8) and (9) represent the demand curve and supply curve respectively. The intersection of these two curves is the equilibrium interest rate i_{equ}. If there is , then $\frac{\pi}{i-\varepsilon} > \frac{1-\pi}{\varepsilon+\varphi-i}$ means that the supply of capital factors is greater than the demand. The development process of setting equilibrium interest rate can be expressed as $\dot{G}_t = \varepsilon G_t$ or $\dot{L}_t = \varepsilon L_t$, that is, when the domestic interest rate is higher than the international interest rate, the supply of capital factors is greater than the demand, the capital flows back to the domestic of the investing country, and there is a capital account surplus in the capital market for a long time.

$$\frac{KA_t}{Y_t} \xrightarrow[t\to\infty]{} -\varepsilon \frac{\left(i_{equ}-i\right)}{\left(\varepsilon+\varphi-i\right)\left(i-\varepsilon\right)} \tag{10}$$

In addition, the gradual balance between capital and finance also shows that the economy is in a capital surplus, the actual return on capital in the capital market is lower than expected, and most of the funds stay in the investment country, which not only affects the development of the host country's economy, but also inhibits the investment spillover effects such as technology export of the capital country.

$$\frac{GB_t}{Y_t} \xrightarrow[t\to\infty]{} \frac{i_{equ}-i}{\varepsilon+\varphi-i} \tag{11}$$

However, if $i<i_{equ}$ and equation (10) and equation (11) still maintain the above table, there is a capital account deficit. At this time, the domestic interest rate is lower than the international interest rate, the supply of capital factors is less than the demand, the capital flows out to the host country, and there is a capital account surplus in the capital market for a long time.

Let's return to main proposition 1:

The way to realize the interest rate is $\{i_t\}_{t\geq 0}$. when time tends to infinity, i_t approaches the constant i infinitely, that is, $\lim_{t\to\infty} i_t = i$, $\varepsilon<i<\varepsilon+\varphi$, then there is a gradual satisfaction as follows:

$$\frac{L_t}{Y_t} \xrightarrow[t\to\infty]{} \frac{\pi}{i-\varepsilon} \quad \frac{G_t}{Y_t} \xrightarrow[t\to\infty]{} \frac{1-\pi}{\varepsilon+\varphi-i} \quad \frac{CA_t}{Y_t} \xrightarrow[t\to\infty]{} -g\frac{\left(i_{equ}-i\right)}{\left(\varepsilon+\varphi-i\right)\left(i-\varepsilon\right)} \quad \frac{TB_t}{Y_t} \xrightarrow[t\to\infty]{} \frac{i_{equ}-i}{\varepsilon+\varphi-i}$$

Prove:

$$\because\ L_t = \int_t^\infty \pi Y_s e^{-\int_t^s i_u du} d_s = \pi Y_t \int_t^\infty e^{-\int_t^s (i_u-\varepsilon)d_u} d_s \ ; \tag{a}$$

$$G_t = G_0 e^{\int_t^s (i_s-\varphi)d_s} + \int_0^t (1-t) Y_s e^{\int_t^s (i_u-\varphi)d_u} d_s = (1-\pi) Y_t \left[\frac{G_0 e^{\int_s^t (is-\varphi)ds}}{(1-\pi)Y_t} + \int_0^t e^{\int_t^s (i_u-\varphi-g)d_u} d_s \right] \tag{b}$$

And only when $\varepsilon < i < \varepsilon+\varphi$, can there be:

$$\lim_{t\to\infty} \int_t^\infty e^{-\int_t^s (iu-\varepsilon)du} d_s = \frac{1}{i-g} \tag{c}$$

$$\lim_{t\to\infty}\int_0^t e^{\int_t^s (i_u-\varphi-\varepsilon)d_u} d_s = \frac{1}{\varepsilon+\varphi-i} \tag{d}$$

$$\lim_{t\to\infty}\frac{G_0}{(1-\pi)Y_t}\int_0^t e^{\int_0^t (i_s-\varphi)d_s} = 0 \tag{e}$$

If (a) (b) (c) (d) (e) are combined, then

$$\frac{L_t}{Y_t}\xrightarrow{t\to\infty}\frac{\pi}{i-\varepsilon}\quad \frac{G_t}{Y_t}\xrightarrow{t\to\infty}\frac{1-\pi}{\varepsilon+\varphi-i}\quad \frac{CA_t}{Y_t}\xrightarrow{t\to\infty}-\varepsilon\frac{\left(i_{equ}-i\right)}{\left(\varepsilon+\varphi-i\right)\left(i-\varepsilon\right)}\quad \frac{TB_t}{Y_t}\xrightarrow{t\to\infty}\frac{i_{equ}-i}{\varepsilon+\varphi-i}$$

In other words, countries have different levels of advantageous factor structure, but they tend to pursue high factor gains. The difference of advantageous factors leads to the difference of economic growth rate and capital return rate. Capital factors are affected by interest rate fluctuations, and capital inflow and outflow become the norm, that is, international direct investment exists for a long time. Main proposition 1 is proved.

4.2 Model construction considering technical differences

Next, the model will further discuss the situation after adding the absolute advantage technology difference and comparative advantage technology difference. If q is the technology difference, then q = {AA, CA}. Among them, AA represents the absolute advantage of different sectors among countries, and the technical difference is the absolute advantage. CA represents the comparative advantage of the same sector among countries, and the technical difference is the comparative advantage. The two technical differences are based on the basic model composed of the above advantageous elements and investment profits. The real-time rebate of trading boxes with different types of technical differences is i_t, and there are:

$$i_t L_t^q = \pi^q Y_t^q + \dot{L}_t^q \tag{12}$$

L_t^q represents the trading box value of class q technical difference at time point t. In addition, suppose that there are two same coefficients ε and π in the absolute advantage technology difference and comparative advantage technology difference. G_t^q represents the cumulative trading volume of q-type technology difference at time point t, then:

$$\dot{G}_t^q = -\varphi G_t^q + \left(1-\pi^q\right)Y_t^q + i_t G_t^q \tag{13}$$

Combine the above two equations (14) (15) to obtain:

$$i_t L_t = \left(\pi^{AA} - Y^{CA}\left(\pi^{AA}-\pi^{CA}\right)\right)Y_t + \dot{L}_t \tag{14}$$

$$\dot{G}_t = -\varphi G_t + \left(1-\pi^{AA}+Y^{CA}\left(\pi^{AA}-\pi^{CA}\right)\right)Y_t + i_t G_t \tag{15}$$

In addition, the following formula will be satisfied:

$$G_t = G_t^{AA} + G_t^{CA}, L_t = L_t^{AA} + L_t^{CA}, Y_t = Y_t^{AA} + Y_t^{CA}, Y^{CA} = \frac{Y_t^{CA}}{Y_t} \tag{16}$$

If and only if:

$$i_t = \varepsilon + \left(\pi^{AA} - Y^{CA}\left(\pi^{AA}-\pi^{CA}\right)\right)\varphi \tag{17}$$

Then there are:

$$\varphi G_t = Y_t \tag{18}$$

In particular, the specific details of absolute advantage, comparative advantage and advantage elements are described as follows:

When international investment does not exist and all countries use their own advantageous elements, there is $\pi^{AA} \equiv \pi^{CA} \equiv \pi$. The investment structure ratio is the same. $G_t^{CA} \big/ Y^{CA} = G_t^{AA} \big/ Y^{AA} = L_t^{CA} \big/ Y^{CA} = L_t^{AA} \big/ Y^{AA}$.

Suppose at time t = 0, π^{CA} drops to $\pi^{AA} > \pi^{CA}$. The main reason for the analysis should be that most countries with strong economic strength have obvious absolute advantages, and the factors of foreign investment with countries with weak economic strength focus on comparative advantage.

Prerequisite 2: in order to prove the main proposition 2, the following countries with absolute advantages are further defined as countries with strong economic strength, abundant capital factors and slow industrial growth. Correspondingly, countries with comparative advantages are defined as countries with weak economic strength, abundant labor and energy factors and fast industrial development.

Precondition 3: usually, a country still has local preference when investing abroad, that is, on the premise of having the same trading opportunities, investors will first consider investing in domestic projects, and will choose to invest abroad only when domestic projects cannot meet their needs (including quality and quantity).

Main proposition 2: the difference between absolute advantage technology and comparative advantage technology leads to different demand for capital factors. The capital factor gap of one party can be supplemented by the spillover of the other party, that is, the flow of capital factors, and one country completes its direct investment in other countries.

Under the above preconditions, if the value of a country with comparative advantage falls to $\pi^{AA} > \pi^{CA}$, the country will be in the state of absorbing foreign capital for a long time, $CA_t^{AA} \big/ Y_t^{AA}$ converges to a negative level, and the interest rate is always lower than i_{equ}^{AA}. In addition, the role of comparative advantage of technical level is not fully played.

It is proved that the economic growth rate of countries with different technological level advantages is basically the same at the initial stage of investment. When the time point t = 0, the interest rate drops sharply and remains unchanged for a long time. Y^{CA} is a constant:

$$i_t = i^+ = i_{equ}^{AA} + Y^{CA}\left(\pi^{AA} - \pi^{CA}\right)\varphi < i_{equ}^{AA} \tag{19}$$

Based on the fact that the interest rate remains unchanged for a long time, the change of the value of the trading box will lead to the change of the original balanced growth path as follows:

$$L_t^{CA} = \frac{\pi^{CA} Y_t^{CA}}{i^+ - \varepsilon}, L_t^{AA} = \frac{\pi^{AA} Y_t^{AA}}{i^+ - \varepsilon} \tag{20}$$

It can be inferred from main proposition 1 that in the path of balanced growth, there are:

$$G_t^{CA} = \frac{\left(1-\pi^{CA}\right) Y_t^{CA}}{\varphi + \varepsilon - i^+}, G_t^{AA} = \frac{\left(1-\pi^{AA}\right) Y_t^{AA}}{\varphi + \varepsilon - i^+} \tag{21}$$

and

$$\frac{CA_t^{AA}}{Y_t^{AA}} = -\varepsilon \frac{i_{equ}^{AA} - i^+}{\left(\varphi + \varepsilon - i^+\right)\left(i^+ - \varepsilon\right)} < 0 \tag{22}$$

Assuming that $\dot{G}_t^{CA} = \left(i^+ - \varepsilon - \varphi\right) G_t^{CA} + \left(1-\pi^{CA}\right)$, together with the equilibrium growth value is $\left(1-\pi^{CA}\right) \big/ \left(\varepsilon + \varphi - i^+\right)$,

as long as $i^{+} > i_{equ}^{CA}$, there is an equilibrium growth path of G_t^{CA} at time point t=0^{+}

In addition, since there is $i^{+} < i_{equ}^{AA} < \varepsilon + \varphi$, there is $\dot{G}_t^{KE} > 0$. At this time, G_t^{CA} is in an equilibrium and stable state:

$$\dot{G}_t^{CA} > \varepsilon G_t^{CA}$$

So far, because countries with absolute advantages generally meet $CA_t^{AA} = \dot{L}_t^{CA} - \dot{G}_t^{CA}$, the investment status is often foreign investment. In reality, countries with comparative advantages have a capital factor gap and cannot make good use of it in combination with domestic advantageous factors. Therefore, it is necessary to conduct investment and trade exchanges with countries with abundant capital factors to make their domestic savings growth rate basically consistent with the net income growth rate ε. if their domestic capital factor accumulation continues to be at a low level. Then the cumulative rate will be higher than the economic growth rate, and the capital factor rate flowing to the investing country will exceed the ε level.

However, the change of π^{CA} will break the original equilibrium state. Assuming that π^{CA} decreases significantly, the countries with comparative advantage will lose a large amount of capitalized income share, and then reduce the market capital supply. The interest rate will drop, and affected by this, the dividend yield will also be reduced from π^{AA} to $\pi^{AA} - Y^{CA}\left(\pi^{AA} - \pi^{CA}\right)$. The world's overall economic wealth and total capital have not changed, but there are differences in the distribution of wealth and capital. The sharp decline of π^{CA} represents the rise of $L_0^{AA} \big/ L_0^{CA}$. The dividend yield of countries with complete advantages has suffered a discount due to the low interest rate. In addition, on the premise of the above local preference, the rate of $G_0^{AA} \big/ G_0^{CA}$ is bound to accelerate.

Generally speaking, at the initial stage of investment, countries with absolute and comparative advantages are at their economic equilibrium points A and respectively. At this time, the equilibrium interest rate is i_{equ}^{AA} . Due to the decline of π^{CA} in countries with comparative advantages, $L^{AA} \big/ Y^{CA}$ moves left and $G^{CA} \big/ Y^{CA}$ moves right, resulting in a large shortage of capital factors. The new equilibrium point is D^{*}, the equilibrium interest rate is i_{equ}^{CA} , and the overall market gap is $NA^{CA} \equiv G^{CA} - L^{CA} > 0$. In addition, countries with absolute advantages have not affected the domestic financial market because of the decline of π^{CA} . The equilibrium interest rate is still i_{equ}^{AA} . The overall market supply exceeds demand, and the spillover part is $NA^{AA} \equiv G^{AA} - L^{AA} < 0$. the demand for projects of countries with comparative advantages makes their capital elements flow to countries with absolute advantages, and the gap of the former can be supplemented by the spillover part of the latter, that is $NA^{AA} + NA^{CA} = 0$ .There have been financial exchanges between the two countries. Main proposition 2 is proved.

It should be noted that what is described here is an ideal state. Under real economic conditions, such hedging between market gap and market spillover may not be realized. Countries with absolute and comparative advantages usually flow capital factors among different countries due to differences in economic growth rate and return on capital. In practical examples, countries with comparative advantage and technological differences attract capital factor inflows and combine them because of their abundant energy factors, Countries with absolute advantages and technological differences can enjoy the relatively high rate of return on capital obtained by placing capital elements in comparative advantage countries. Therefore, the advantageous elements are maximized among different countries through factor flow, forming a win-win balance between the host country and the home country.

Through the theoretical derivation from the traditional advantageous elements to the advantageous elements after adding technological differences, this paper proves the principle of international factor cooperation, that is, the cooperation of advantageous elements between countries is the essence of China's direct investment in SCO countries.

5. Main conclusions

Economics has been deepening its research in the direction of how to realize the optimal allocation of resources. The essence of resource allocation is the international cooperation of production factors under the flow of factors. The "one belt, one road" initiative, from the point of view of the establishment of the SCO economic platform, essentially provides a more effective way to achieve the mobility of factors. At present, many SCO countries are in the initial stage of industrialization

and have a huge demand for their domestic infrastructure construction, which will be followed by a huge demand for consumer goods. China's existing advantageous factor supply is just complementary to this, which determines the necessity and reality of China's direct investment in SCO countries.

The essence of international direct investment is the international factor cooperation formed under the international flow of production factors. The formation basis of China's investment in SCO countries lies in the difference of advantageous factors. Through the factor flow in the form of international direct investment, the advantageous factors of the home country flow to the host country and optimize the allocation among departments, so as to achieve a higher utilization level. The traditional foreign direct investment theory mainly sums up the motivation of multinational corporations' foreign direct investment as follows: monopoly advantage theory (absolute advantage theory), comparative advantage investment theory, factor endowment theory, market internalization theory, product life cycle theory, International Production Compromise Theory and so on. In view of the gradual enhancement of the international liquidity of production factors, which has fundamentally changed the basic assumption that the traditional international trade and investment remain unchanged on the endowment factors, and the relatively fixed factor endowment structure of various countries has changed due to the impact of factor flows, the theory originally explaining the dominant position of International trade and investment is no longer adapted to the reality. For example, factor endowment theory refers to that under the condition that countries have the same technical level of producing the same product, the price difference of the same product between the two countries comes from the price difference of the production factors used in the production process, and the price difference of the production factors comes from the relative abundance of the production factors in each country. We can understand that "the same level of technology" is a modest sacrifice made to simplify the actual situation. In fact, the technical level of all countries, whether among industries, within industries, or individual products, or even production factors, is very different. For another example, the earliest independent research on the theory of foreign direct investment, the monopoly advantage theory or absolute advantage theory, is based on multinational corporations. It is considered that the sufficient condition for multinational corporations' foreign direct investment is their existing absolute advantage, which can be regarded as a fixed value. In fact, due to the strong value capture ability of multinational enterprises in the process of foreign direct investment, they gradually cultivate other absolute advantages other than capital by absorbing and utilizing the advantageous elements of the host country, so their absolute advantage is not a fixed value, but a dynamic variable.

In view of the limitations of the research focus of this paper, there are still some defects in the article. The future research direction can take the international advantageous production factors as the key indicators for empirical analysis under the above theoretical framework. In addition, the article can reduce the investment cost Risk differences as explanatory variables to further enrich the research framework.

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