

The development strategy and mode based on advantage integration

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Abstract

This paper proposed the advantage integration based development model applied to the regional development, which is helpful to promote the regional development become more balanced. First, we explained what advantage integration oriented economic development strategy and mode means, what distinguishing feature does it has comparing with the comparative advantage theory. Then, from the perspective of marginal productivity of economic development elements, we demonstrated that the whole world would eventually form the pattern of multi-win situation, if the advantage integration oriented development strategy and mode was formulated and implemented by the countries all over the world. In this situation, every country input and output advantage with each other, and established coordinated development mode. This economic development model is beneficial to achieve the sustainable balance of regional development, since the imbalance of regional development is the primary cause of global problems humanity faced.

Keywords

Development Model, Advantage Integration, Comparative Advantage, Regional Development, Model Analysis

1. Introduction

Although said Adam Smith put forward the theory of absolute advantage and international division of labor, and demonstrated the mutual trade benefit for the first time, but absolute advantage theory can't show if the productivity of a country's production of any commodity is lower than another country, that the former has no absolute advantage, whether there will be trade happen among them at this time. With the principle of comparative advantage proposed by David Ricardo, the issue has been resolved. The comparative advantage theory indicated that even the productivity of a country's production is in the absolute disadvantage, you can still make the labor division and mutually beneficial trade. Any country can produce and export the commodities that they have relatively small absolute disadvantage (that they have comparative advantage), while import the goods that they have relatively large absolute disadvantage. Therefore, the core of comparative advantage theory can be summarized as take the first one if the two is all good, take the second one

if the two is all bad. And the absolute advantage theory, as a special case, can also be incorporated into the comparative advantage theory.

After Ricardo, many classical economists had some further development on the comparative advantage theory. In 1844, follow Ricardo's idea, John Stuart Mill put forward the famous rule of mutual needs in international trade, which decided the commodity exchange price relationship. He believed that the value of imported goods depend on the required number of exported goods in exchange for the imported one. And this international exchange conditions depend on the mutual strength and elasticity of demand for each other.

To the 1870s, the marginal revolution in economics extended to the international economy. The first generation of neo-classical economists, such as Alfred Marshall, Vilfredo Pareto, Enrico Barone, had been further developed the theory of comparative advantage and international trade. They built strict mathematical model of the trading conditions John Stuart Mill proposed, and described the trade balance and trade gains of a country using the standard neoclassical paradigm^[1].

Although many scholars had been made important contributions for the development of comparative advantage theory, but for a long time, they were failed to form a mature trade theory to explain why some country would like to export or import some specific goods. So the comparative advantage theory based on factor endowment was proposed by Heckscher and Ohlin. From the view of differences in national factor endowment, Heckscher-Ohlin theory explored the relationship between the national factor endowment and its participation in the international division^[2]. It indicated that one country tended to export the goods whose producing process involved abundant production factors of its own, and import the one whose producing process involved large amount of resources which is scarce in this country. Then the country could get the maximum welfare effects. This conclusion has a strong practical significance, since the external comparative advantage based on the production of certain goods was turned into the internal comparative advantage based on the factor endowment. So it is more helpful to select the path of industrial development for a country. Since then, many economists further refined the H-O theory, and raised some other new theories and models, for instance, FPE theorem proposed by Paul A. Samuelson^[3], S-S theorem by Stolper and Samuelson^[4], Rybczynski theorem^[5], H-O-V theorem by Vanek^[6] etc.

The comparative advantage proposed by Ricardo or the one based on factor endowment discussed here, was exogenous and static, and they were all mainly determined by the inherent technical differences and differences in factor endowment. After half of the 20th century, some scholars have recognized that the exogenous comparative advantage theory is not sufficient to explain the international trade and guide the economic development, so they began to study the endogenous comparative advantage from different points of view, such as economies of scale, learning effect, knowledge production, human capital and specialized division.

In summary, the foothold and starting point of the research activities mentioned above, is mainly focused on how to cultivate and play their own comparative advantages. It is lack of systematic research on how to recognize and utilize the advantages of all aspects of the global. There has been a lot of disharmony phenomenon emerged in many developing countries playing extensively comparative advantage, such as resource depletion, environmental degradation, ecological imbalance, bloated city, traffic congestion, irrational industrial structure, have long been locked in low-end industries and bottom of the world's industrial value chain. In a word, the sustainable economic development and multi-win cooperation pattern was not established. How to achieve sustainable balance of regional development in the world is one of the biggest problems facing humanity, since the imbalance of regional development is the primary cause of global problems. Only the ideas of advantage integration adopted by all the countries, it is probably to established coordinated development mode and achieve the balanced development of regional economy in the world, by input and output advantage with each other.

2. Advantage Integration Oriented Development Strategy and Mode

With the continuous development of globalization, the different advantages is often scattered in different economies. It is good to have initial advantages for some country, but it is more important to dynamically congregate, accumulate and innovate different advantages all of the world. The traditional economic growth theories tend to focus on and emphasize one's own comparative advantages, but in reality, the development of some country doesn't depend on its inherent comparative advantage in static factor endowment and manufacturing, but the ability to gather all kinds of advantages across the globe. In the open economic environment, the advantage integration oriented economic development strategy was formulated and implemented, the advantage integration oriented economic development mode was formatted and the advantage integration oriented economic behavior was made, it is helpful to accelerate economic development and achieve harmonious balance of regional development in the world.

Here so-called advantage, it means the needful element or ability by which some country participates in cooperation and competition, and obtains economic growth in the open economic environment. Here the needful element includes the natural resource, like land, and other traditional production factors, such as energy, capital and labor. Besides that, the need element also contains the generalized elements of science and technology, human resources, systems, knowledge, information, location, brand and so on. The needful ability consists of management, education, innovation, etc. According to the preponderance of the object, element or ability, the advantage can be further subdivided into element oriented advantage and ability oriented advantage. Therefore, the meaning of advantage proposed in this paper can be summarized as follows: on account of preponderance on the needful element or ability, some country deserves the favorable situation in the open cooperation and competition environment, namely the potential energy of development surpassing other similar economies.

Here so-called advantage integration, it has two meanings. First, it means to find, explore, absorb and utilize all kinds of advantages in the short term. Conducting advantage integration, we need to discover and examine them, and then to incorporate and make use of them. Through this process, we will get the power to exploit the advantages and achieve the goal of "having them work for me". For example, exploiting the advantage of capital, we have the ability to improve the quantity and quality of the available capital, and it helps to expand economic output and promote the realization of economies of scale. Second, it means to accumulate, interiorize and refine the exploited advantages in the long run. For the exploited advantages tend to disperse by degrees with the time goes, we should facilitate the accumulation and internalization of advantages, and then, we can deal with the exploited advantages with strong predominance and eventually, we will create our own new advantages. Through

this process, we will get the power to internalize the advantages and achieve the goal of "having them belong to me". For example, interiorizing the advantage of capital, on the one hand, it helps us to strengthen the domination over external capital, and avoid sharp fluctuations in the flow of capital. On the other hand, it helps to accelerate the accumulation of our own capital, and raise the total factor productivity (TFP) by economies of scale and "learning by doing" effect.

Advantage integration oriented economic development strategy, which means that going beyond the limitations of the static factor endowment and productive comparative advantage, and according to the future trends and opportunities, to maximize the comprehensive benefits of economic, social and ecological environment, the established objectives, priorities and paths to achieve the goal of rapid development by exploiting and internalizing the global advantages in all aspects. Accordingly, the economic development model based on advantage integration oriented development strategy, which was called advantage integration oriented economic development mode.

Some view of the advantage integration theory is partly inherited from endogenous and dynamic comparative advantage. Both advocated that the comparative advantage is dynamic and reconstructive, but the former mainly emphasized the accumulation, internalization and integration. Speaking of static exogenous comparative advantages, the advantage integration theory stressed that we should overstep the limitations of the static factor endowment and productive comparative advantage, but didn't negate its effectiveness. In factor, fully making use of the factor endowment and appropriately following the static comparative advantage is the important way to integrate advantage.

Here, "going beyond the limitations of the static factor endowment and productive comparative advantage", which actually means that we should not simply or overly depend upon the inherent comparative advantage in static factor endowment and manufacturing. There is no denying that the inherent comparative advantage in static factor endowment and manufacturing is the important foundation to integrate advantage. If used properly, it will provide vital support for the process of advantage integration. If lack of it, it will be the objective constraints to integrate advantage. But conversely, even if abounding with the comparative advantage in static factor endowment and manufacturing, one is not necessarily able to integrate all kinds of advantage perfectly. If it was not advantage integration oriented in the strategy and system, the "resource curse" would emerge with great probability, and one would fall into "the trap of comparative advantage". For example, in some areas of China, the goal of economic growth came true by mining and selling rich natural resources, but the vast majority of the benefits were possessed by some very few people, and extremely limited revenue occupied by the rank-and-file. For another example, some coal quarries simply rely on plenty of cheap labors, for the relatively low level of technology and weak efforts for environmental protection, not only polluted the local ecological environment, but had a great

harm on production worker's health. In some extreme cases, the mine disasters brought great misfortune to the workers and their families, and then lead to all types of mass incidents. All these had serious breakage on social stability and people's daily lives.

Here, "fully making use of the factor endowment", which means that for the limited endowment condition and advantage, one should handle them in higher-end way, and made it the inherent important support to integrate advantage, but not simply or overly utilization. To achieve this goal, the key is that from the perspective of promoting advantage integration interests, rather than simply grabbing economic benefits, one need to reconsider the utilization of the factor endowment and static comparative advantage. For example, Diqing Tibetan Autonomous Prefecture of Yunnan Province in China, whose main sources of income has long been relied on the deforestation of the forest. The deforestation of natural forests was strictly prohibited since the serious flood in 1998, the "wood finance" of Diqing was on the brink of collapse. In this case, the Diqing state government has gradually put forward the basic principles of development---"Environment First, Culture First, Industry First", and then, the tourism industry of Diqing was developed relying on the local rich forest resources. The Potatso National Park in Diqing was started to build by the end of 2003, and whose building process has very distinct color of advantage integration. On the one hand, a large number of top-notch talent people were involved in the construction and management. On the other hand, the enormous experience in project development and management from the United States, Australia, and other advanced areas, was introduced and integrated. When completed, the Potatso National Park brought approximate billion in tourism revenue every year. Now, the economic development mode of Diqing has turned from "the deforestation of the forest" to "the appreciation of the forest". Accordingly, it can be seen that facing with the same factor endowment---rich forest resources, very different results appeared based on very different starting-point and ideas.

In short, comparing with the development mode of simply or overly depending upon the inherent comparative advantage in static factor endowment and manufacturing, the advantage integration oriented development strategy and mode has significant differences as below:

(1) Development goals. It more cares about the long-term economic growth, improving of the economic structure and progress of the long-term economic status. In addition to the economic benefits, it pays more attention to the social and ecological benefits. In a word, it has great emphasis on the comprehensive effectiveness of economic growth.

(2) Discernment of advantage. It not only concerns with the deep exploitation of its inherent advantages, but also the integration of external advantages. For example, one country with relatively abundant natural resources, comparing to simply mining and selling the primary raw materials, which will pay more attention to the deep processing and high-tech services sectors with higher added value. In this way, it will not vulnerable by the fluctuations in resource prices, and not

easily falling into the "resource curse". For the economy with abundant low-skilled labor, whose development mode of simply or overly depending upon the inherent comparative advantage, reflected the trend that it tends to develop the general assembling manufacturing or other labor-intensive industries, which always lives at the bottom of the "Smiling Curve" and has low added value. This development mode maintains the international competitiveness just relying on the comparative advantage of cheap labor costs. The advantage integration oriented development mode has greater emphasis on the accumulation of human capital, improvement of management and innovation of technology. So it is not easy to lose the inherent traditional advantage and drift into crisis on account of price competition from the late-developing economies.

(3) Advantages oriented. It tends to have wide vision in the process of economic cooperation, and is not easy subject to other institutional constraints due to its focus on the advantage oriented feature. It will take the initiative to cooperate with the economies, which have higher degree in goal advantage and stronger integration effect, so the advantages disruption effect may be avoided.

(4) Direction of industrial development. It is not only concerned about the development of industries with static comparative advantage, but pays more attention to the dynamic nature and new opportunities. It tends to pursue more high-end industrial targets and keep away from serious industrial path dependence. In addition, as a result of integration for the external advantages, the TFP of industry will increase rapidly, and the power of industry upgrading will be more stronger, and eventually, the economic structure tends to avoid being locked in the low-end level for a long time.

In brief, the advantage integration oriented development strategy and mode, which helps to avoid the impact of unbalanced international supply and demand and the challenge of the late-developing economies. And in addition, it is conducive to keep away from some serious problems that easily be caused by the mode of simply or overly relying upon static comparative advantage, such as resource depletion, environmental degradation, ecological imbalance, traffic congestion, irrational industrial structure, and so on and so forth.

There are diverse ways to integrate advantage. Depending on the object of integration, it can be divided as the special advantage integration and the combined advantage integration. Here so-called special advantage integration, which mainly means to integrate some particular element or ability advantage. And so-called combined advantage integration, which mainly means to integrate a number of advantages for the combination. For example, when introducing some good quality foreign direct investment, it is often at the same time the advantage of capital, technology and management are all put into integration. Depending on the location, it can be divided as inward integration and outward integration. Here so-called inward integration, which mainly means to import the external advantages and implement locally accumulation,

internalization and re-innovation. And so-called outward integration mainly means to integrate the local advantages in other economies. Depending on the sponsor, it can be divided as the initiative integration and spontaneous integration. Here so-called initiative integration, which mainly means to take the initiative to look for partners to start the advantage integration. And so-called spontaneous integration mainly refers to that one country with favorable initial conditions, tends to be attracted to spontaneously participate the process of advantage integration. Depending on the case of conversion over ownership, it can be divided as property shifted integration and property unconverted integration. For the former, the ownership of element or ability occurred conversion. And for the latter, one integrated all kinds of advantages from others, but doesn't own the property of them. For example, the host country actually made use of foreign advanced technology by introducing a large number of foreign-invested enterprises, but the proprietary right of the technology is still in the hands of the foreign.

Naturally, in the process of advantage integration, in order to complete different strategic objectives for different stages of development, the target advantage to be integrated will be different accordingly. And consequently, the ways to integrate advantage will be different based on different conditions. Thus, the process of advantage integration is a constantly adjusted and updated dynamic process according to changing situation. Advantage integration required that the full interaction and cooperation within and among the economies should be active and deep, and the multi-win development pattern should be established to ensure the sustainability of the process. One integrating advantage tends to output advantage simultaneously to build the two-directional or multi-directional integration relationship with other economies. In the process of multi-directional integration, one and the partner will input and output advantages from and into with each other at the same time, which is helpful to enhance the formation of multi-win situation, and eventually the welfare effect of both will grow gradually.

The mentioned above included the basic connotation of advantage integration oriented economic development mode and the main difference with the mode of simply or overly depend upon the inherent comparative advantage. Now we will discuss the probability of the former promoting harmonious regional economic development.

3. Harmonious Economic Development Based on Advantage Integration

For the reasons of economic growth, the classical growth theory emphasized the decisive role of physical capital accumulation^[7]. The neoclassical growth theory considered the technological progress as the key factor in promoting economic growth^{[8][9]}. The new growth theory thought that advances in technology, human capital accumulation, institutional change and evolution of labor division and other

factors worked together to promote economic growth^[10]^[11]. While we believed that physical capital, technological progress, human capital, labor division, institutional changes are the objects and models of advantage integration. In one paper^[12], we have established the model of advantage integration oriented economic growth, and analyzed the economic equilibrium and balanced growth path based on advantage integration factor, and finally discussed the stability of economic equilibrium point and economic convergence problems based on economic equilibrium point.

From the point of view of economic growth, we have demonstrated that if some country formulated, implemented and formatted advantage integration oriented economic development strategy and mode, one would obtain great achievement in the economic and social development^[12]. Advantage integration is a two-directional or multi-directional process, in which one and the partner will input and output advantages from and into with each other at the same time. Now from the perspective of the marginal productivity of economic development elements, we will demonstrate that if all of the countries in the world simultaneously adopt the ideas of advantage integration, the win-win or multi-win development model will be formatted eventually.

Now, take two countries as example, let's see their input and output when both of them simultaneously adopt the ideas of advantage integration. Based on the same mathematical model and principles of economics, it is also applies to multiple countries.

To be representative, now only considering the single input and single output, the production function satisfied the basic assumptions of neoclassical production function. Now there are five assumptions shown as below:

Condition One: There are two basic factors of production ---capital and labor, and the influence of the other elements, such as technology, talent, management, system, was unified into the TFP. The two basic factors of capital and labor were synthesized as one single input factor of production. Let $X(t)$ be the input in period t , $L(t)$ be the output in period t , then production function can be expressed as $Y(t)=F[X(t)]$

Condition Two: There are two economies, namely country A and country B. The factors of production meet the law of diminishing marginal output. And the marginal productivity function can be expressed as $y_i=f(x_i)=a_i x_i^{b_i}$, $0 < a_i < 1$, $b_i > 0$, $i=1,2$.

Condition Three: The two economies conduct advantage cooperation, input and output advantage from and into with each other at the same time, which can be represented by the resources allocation proportion.

Condition Four: The influence of technological progress, human capital, management, system, investment and trade et al, was unified into the TFP. In this model, the influence is mainly reflected in the impact on the marginal productivity.

Condition Five: Ignoring the influence of population growth and mobility of simple labor.

Under the open economic environment, country A and country B carry out advantage cooperation, which has different forms and different welfare effects. And now we will analyze their advantage integration oriented cooperation

development model and the welfare effects based on three policy scenario assumptions shown as below:

Scenario (1): The total amount of input and the respective marginal productivity was fixed. Country A tends to integrate the capital advantage from country B in the form of international lending, and the country B will get economic benefits through capital export. The resources allocation proportion changed according to the advantage cooperation between the two sides.

Scenario (2): The respective marginal productivity was fixed and the total amount of input increased. The resources allocation proportion changed according to the advantage cooperation between the two sides.

Scenario (3): The total amount of input increased and the respective marginal productivity changed as well. The resources allocation proportion changed according to the advantage cooperation between the two sides.

3.1. Scenario (1): The Total Amount of Input and the Respective Marginal Productivity was Fixed

The total amount of resources in initial period was fixed as I_0 , which is shown as O_1O_2 in figure 1. The available resource is relatively scarce in country A and relatively abundant in country B. The initial demarcation point of resources allocation proportion in two countries is N_0 shown in figure 1. The marginal productivity of the two economies is y_1 and y_2 respectively, and $y_1 > y_2$, then $b_1 > b_2$. The respective marginal productivity is fixed, so $a_1 = a_2$. At this moment, country A got N_0 units of the inputs, and country B got $I_0 - N_0$, so the outputs of the two economies was shown as below respectively.

$$Y_1(0) = F(X_1) = \int y_1 = \int_0^{N_0} (a^x + b_1) dx = \frac{a^{N_0}}{\ln a} + b_1 N_0 + c \quad (1)$$

$$Y_2(0) = F(X_2) = \int y_2 = \int_0^{I_0 - N_0} (a^x + b_2) dx = \frac{a^{I_0 - N_0}}{\ln a} + b_2 (I_0 - N_0) + c \quad (2)$$

So the total outputs of the two economies in initial period is

$$P(0) = Y_1(0) + Y_2(0) = \frac{a^{I_0 - N_0} + a^{N_0}}{\ln a} + b_2 I_0 + (b_1 - b_2) N_0 + 2c \quad (3)$$

This moment, from figure 1, we can see that the actual capital used by country A is O_1N_0 , and the actual outputs is $F_1E_1N_0O_1$. The actual capital used by country B is N_0O_2 , and the actual outputs is $DF_2O_2N_0$.

Now the two economies conduct advantage cooperation, input and output advantage from and into with each other. And the resource was allocated to the one with higher marginal productivity until the marginal productivity of the two economies is equal. It was then $y_1 = y_2$, and $b_1 = b_2$. Reflecting in resources allocation proportion is that the boundary point in two countries is N_t shown in figure 1. In the period of t , country A got N_t units of the inputs, and country B got $I_0 - N_t$, and $N_t > N_0$, so the outputs of the two economies was shown as below respectively.

$$Y_1(t) = F(X_1) = \int y_1 = \int_0^{N_t} (a^x + b_1) dx = \frac{a^{N_t}}{\ln a} + b_1 N_t + c \quad (4)$$

$$Y_2(t) = F(X_2) = \int y_2 = \int_0^{I_0-N_t} (a^x + b_2) dx = \frac{a^{I_0-N_t}}{\ln a} + b_2(I_0 - N_t) + c \quad (5)$$

So the total outputs of the two economies in period t is

$$P(t) = Y_1(t) + Y_2(t) = \frac{a^{I_0-N_t} + a^{N_t}}{\ln a} + b_2 I_0 + (b_1 - b_2) N_t + 2c \quad (6)$$

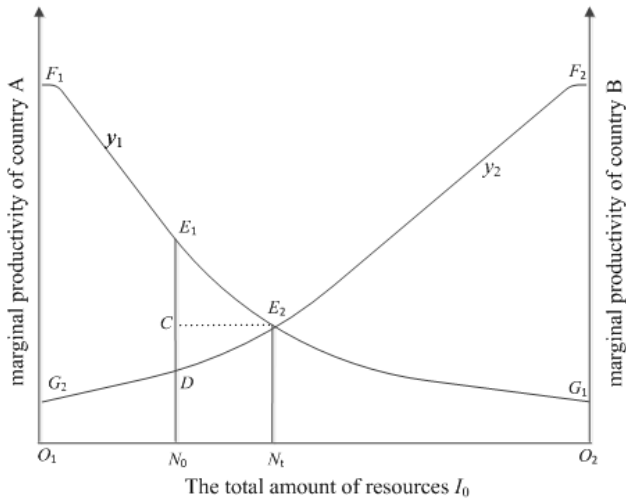


Fig. 1. The short-term effects of cooperation development based on advantage integration

This moment, from figure 1, we can see that the actual capital used by country A is $O_1 N_t$, and the actual outputs is $F_1 E_2 N_t O_1$. The actual capital used by country B is $N_t O_2$, and the actual outputs is $E_2 F_2 O_2 N_t$. Now let's compare the total outputs of the two economies in period t with that in initial period.

$$M = P(t) - P(0) = \frac{a^{I_0-N_t} + a^{N_t} - a^{I_0-N_0} - a^{N_0}}{\ln a} \quad (7)$$

We can see that M is a monotonically increasing function, if $N_t = N_0$, $M = 0$, and for $N_t > N_0$, so $M > 0$. The actual capital used by country A increased from N_0 to N_t , and the actual capital used by country B decreased from $I_0 - N_0$ to $I_0 - N_t$. It means that the two economies conducted advantage cooperation, input and output advantage from and into with each other, the total outputs of the two economies raised.

Now let's analyze the input and output of the two economies. For country A, the inputs increased $N_t - N_0$ units, the outputs increased $Y_1(t) - Y_1(0) = \int_{N_0}^{N_t} (a^x + b_1) dx$. And for the country B, the inputs decreased $N_t - N_0$ units, the outputs decreased $Y_2(t) - Y_2(0) = \int_{N_0}^{N_t} (a^x + b_2) dx$. After cooperation, the total outputs increased M units, and it should be distributed to the two economies. According to the respective marginal productivity, $(a^{N_t} + b_1)(N_t - N_0) - \int_{N_0}^{N_t} (a^x + b_2) dx$ should be allocated to country B, and the rest $\int_{N_0}^{N_t} (a^x + b_1) dx - (a^{N_t} + b_1)(N_t - N_0)$ should be allocated to country A.

So the total outputs of country A is:

$$Y'_1(t) = \int_0^{N_t} (a^x + b_1) dx - (a^x + b_1)(N_t - N_0) \quad (8)$$

The total outputs of country B is:

$$Y'_2(t) = \int_0^{I_0-N_t} (a^x + b_2) dx + (a^x + b_1)(N_t - N_0) \quad (9)$$

From the figure 1, we can see that the total outputs of the two economies increased $E_1 E_2 D$ more than that before their advantage cooperation. Under the principle of equivalent exchange, the capital gains paid by country A is $CE_2 D$, and eventually, the disposable income of the former is $F_1 E_2 C N_0 O_1$, and the latter is $F_2 E_2 C N_0 O_2$. Thus, the short-term welfare effects of the two countries are all enhanced due to advantage cooperation.

3.2. Scenario (2): The Total Amount of Input Increased and Respective Marginal Productivity was Fixed

With the accumulation of capital, the total inputs of the two economies in period t increased to $I_0 + I'$, we can technically handle the axis to make N_0 still the initial demarcation point, and N_t still the final equilibrium point of the resources allocation proportion in two countries. Based on the same mathematical model and calculation method with scenario (1), we can demonstrate that the respective total outputs of the both countries creased and the welfare effects of the two countries were all improved.

In the process of advantage cooperation, the capital advantage integration reflected in two aspects. First, the output was expanded and the capital accumulation was accelerated as the result of obtaining the power to utilize the external capital. Second, the power to dominate the external capital was enhanced thanks to the increasingly close cooperation with foreign countries. The latter is particularly important, for there are not only two countries in the world. If we can't improve the power to attract and control the external capital advantage, the foreign capital might flow to other economies with higher marginal productivity. We won't use tough measures to limit capital transfers, but we could continuously strengthen the cooperation through some mechanism to avoid random and violent capital flows.

3.3. Scenario (3): The Total Amount of Input Increased and Respective Marginal Productivity Also Changed

In addition to promoting the capital accumulation, capital advantage integration also has beneficial effect on the TFP. According to the endogenous growth theory, capital expansion is helpful to promote the progress of the TFP through economies of scale and "learning by doing" effect. Thus, even if in a closed condition, the level of TFP will be improved after a period of time. If considering the foreign capital advantage integration and endogenous innovation, the capital marginal output curve of country A will be carried to a higher level shown in figure 2. And for the same reason, the capital marginal output curve of country B also will be carried to a higher level shown in figure 2. The final equilibrium point of the resources allocation proportion in two countries changed, because they were different in in capital accumulation rate and the TFP enhancing speed.

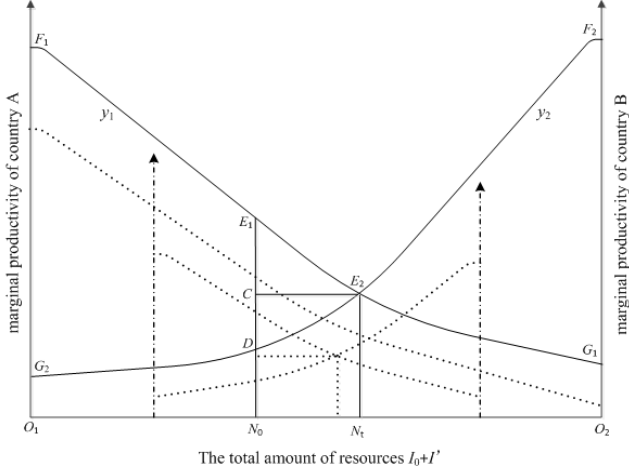


Fig. 2. The long-term effects of cooperation development based on advantage integration

The marginal productivity of the two economies is y_1 and y_2 respectively, and $y_1 > y_2$, then $a_1^x + b_1 > a_2^x + b_2$. The total inputs of the two economies in period t increased to $I_0 + I'$, and in initial period, country A got N_0 units of the inputs, and country B got $I_0 + I' - N_0$, so the outputs of the two economies was shown as below respectively.

$$Y_1(0) = F(X_1) = \int y_1 = \int_0^{N_0} (a_1^x + b_1) dx = \frac{a_1^{N_0}}{\ln a_1} + b_1 N_0 + c \quad (10)$$

$$Y_2(0) = F(X_2) = \int y_2 = \int_0^{I_0 + I' - N_0} (a_2^x + b_2) dx = \frac{a_2^{I_0 + I' - N_0}}{\ln a_2} + b_2(I_0 + I' - N_0) + c \quad (11)$$

So the total outputs of the two economies in initial period is

$$P(0) = Y_1(0) + Y_2(0) = \frac{\ln a_1 a_2^{I_0 + I' - N_0} + \ln a_2 a_1^{N_0}}{\ln a_1 \ln a_2} + b_2(I_0 + I') + (b_1 - b_2)N_0 + 2c \quad (12)$$

Now the two economies conduct advantage cooperation, input and output advantage from and into with each other. And the resource was allocated to the one with higher marginal productivity until the marginal productivity of the two economies is equal. It was then $y_1 = y_2$, and $a_1^x + b_1 = a_2^x + b_2$. Reflecting in resources allocation proportion is that the boundary point in two countries is N_t in figure 2. In the period of t , country A got N_t units of the inputs, and country B got $I_0 + I' - N_t$, and $N_t > N_0$, so the outputs of the two economies was shown as below respectively.

$$Y_1(t) = F(X_1) = \int y_1 = \int_0^{N_t} (a_1^x + b_1) dx = \frac{a_1^{N_t}}{\ln a_1} + b_1 N_t + c \quad (13)$$

$$Y_2(t) = F(X_2) = \int y_2 = \int_0^{I_0 + I' - N_t} (a_2^x + b_2) dx = \frac{a_2^{I_0 + I' - N_t}}{\ln a_2} + b_2(I_0 + I' - N_t) + c \quad (14)$$

So the total outputs of the two economies in period t is

$$P(t) = Y_1(t) + Y_2(t) = \frac{\ln a_1 a_2^{I_0 + I' - N_t} + \ln a_2 a_1^{N_t}}{\ln a_1 \ln a_2} + b_2(I_0 + I') + (b_1 - b_2)N_t + 2c \quad (15)$$

Now let's compare the total outputs of the two economies in period t with that in initial period.

$$M = P(t) - P(0) = \frac{a_2^{I_0 + I' - N_t} - a_2^{I_0 + I' - N_0}}{\ln a_2} + \frac{a_1^{N_t} - a_1^{N_0}}{\ln a_1} + b_1(N_t - N_0) + b_2(N_0 - N_t) \quad (16)$$

We can see that M is a monotonically increasing function, if $N_t = N_0$, $M = 0$, and for $N_t > N_0$, so $M > 0$. The actual capital used by country A increased from N_0 to N_t , and the actual capital used by country B decreased from $I_0 + I' - N_0$ to $I_0 + I' - N_t$. It means that the two economies conducted advantage cooperation, input and output advantage from and into with each other, the total outputs of the two economies raised.

Now let's analyze the input and output of the two economies respectively. For country A, the inputs increased $N_t - N_0$ units, the outputs increased $Y_1(t) - Y_1(0) = \int_{N_0}^{N_t} (a_1^x + b_1) dx$. And for the country B, the inputs decreased $N_t - N_0$ units, the outputs decreased $Y_2(t) - Y_2(0) = \int_{N_0}^{N_t} (a_2^x + b_2) dx$. After cooperation, the total outputs increased M units, and it should be distributed to the two economies. According to the respective marginal productivity,

$(a_1^{N_t} + b_1)(N_t - N_0) - \int_{N_0}^{N_t} (a_2^x + b_2) dx$ should be allocated to country B, and the rest $\int_{N_0}^{N_t} (a_1^x + b_1) dx - (a_1^{N_t} + b_1)(N_t - N_0)$ should be allocated to country A.

So the total outputs of country A is:

$$Y'_1(t) = \int_0^{N_t} (a_1^x + b_1) dx - (a_1^{N_t} + b_1)(N_t - N_0) \quad (17)$$

The total outputs of country B is:

$$Y'_2(t) = \int_0^{I_0 + I' - N_t} (a_2^x + b_2) dx + (a_2^{N_t} + b_1)(N_t - N_0) \quad (18)$$

From the figure 2, we can see that the total outputs of the two economies increased much more than that before their advantage cooperation. The increased profit should be distribution to the two countries in the principle of equivalent exchange. Thus, the long-term welfare effects of the two countries are all improved due to advantage cooperation.

All in all, due to the improved efficiency of capital allocation, the overall economic well-being of both countries has been enhanced and it is a win-win situation. But in the promotion of TFP, we will receive the additional "learning by doing" effect. Since there are many economies in the world, how much welfare effect a country can obtain from advantage integration, which depends largely on how many and how big the scale of the economies who cooperated with. If one possessed more enthusiasm and actual results beyond other economies, it is possible to get more welfare effect and catch up with the world economic pace.

From the mentioned above, advantage integration is a two-directional or multi-directional process, in which one and the partner will input and output advantages from and into

with each other at the same time. From the perspective of marginal productivity, we have analyzed the advantage integration based cooperation model of two countries. And based on the same mathematical model and principles of economics, it is also applies to multiple countries. Therefore, if all of the countries in the world simultaneously adopt the ideas of advantage integration, the whole world will eventually achieve the win-win or multi-win situation.

4. Conclusion and Prospect

At first, this paper briefly commented the history and development of comparative advantage theory. And then explained what advantage integration oriented economic development strategy and mode means, and its distinguishing features. Finally we have demonstrated that the whole world would eventually form the pattern of multi-win, if the advantage integration oriented development strategy and mode was formulated and implemented by the countries all over the world.

This proposed economic development model is beneficial to achieve the sustainable balance of regional economic development, and then to achieve harmonious balance of regional development in the world, since the imbalance of regional development is the primary cause of global problems humanity faced. In this situation, every country established coordinated development mode, and input and output advantage with each other and the whole world will eventually achieve the win-win or multi-win situation.

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