Comparative advantages evolution and economic development: the case of China

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Abstract
Changes in comparative advantage are closely related to the corresponding stage of economic development, and in developing countries the dynamic evolution of export commodity comparative advantage can be reasonably analyzed and determined from two distinct levels: factors and products. Using data from the United Nations Statistics Division Com-trade database from 1998 to 2008, this thesis adopts the Normalized Revealed Comparative Advantage (NRCA) index to conduct an empirical survey of the dynamic evolution characteristics of Chinese exports' comparative advantage. The results suggest that China's export commodity comparative advantage, from the macro perspective of factor endowment and after adjusting for the cross-border flow of production factors, is still largely attributable to the low-end labor factor, such that conflicts exist between export expansion and the structural upgrading of the economy. However, from the micro perspective of products, significant change in the comparative advantage model can be observed. This mainly presents as the rapid expansion of certain export commodities' comparative advantages, pushed by the integration and further interaction of the labor factor with capital and technological factors. The upgrade of Chinese exports' comparative advantages has reached a turning point. Therefore, an important and urgent question is how to fundamentally promote a benign interaction between export expansion and economic structure upgrading.

1. Introduction

Change in exports' comparative advantage is a sensitive indicator reflecting a country's economic development and often directly measures technological enhancements and changes in industrial structure. The evolution of export commodity comparative advantage also has an important guiding function in resource allocation because it significantly affects the direction a country takes in making structural upgrades and future improvements in national welfare. It is also noteworthy that as exports' comparative advantage markedly changes in some countries, the trade direction and balance of payments in other countries are often affected, triggering major changes in the global economy. For these reasons, marked changes in export commodity comparative advantage in emerging countries often becomes a hot topic of discussion. Currently, the trends and possible influence of changes in China's export commodity comparative advantage has become a major issue of concern both in China and abroad.

China's remarkable export scale achievements since 1978 have received worldwide recognition while inside China the discussion on how to make the transformation from a big trading country to a major trading power continues to develop. The underlying issue is concern about the backwardness of the Chinese export commodities' comparative advantage model. Practical and academic circles have long been concerned with problems such as low-level technology, high resource and energy consumption, high environmental costs, poor national welfare, and the sustainability and coordination of economic structure upgrades.

Recent years have exhibited a gradual increase of the changing comparative advantages of Chinese exports. Amiti and Freund (2008) assert from their research that the structural changes in Chinese export commodities has been dramatic, with electromechanical products replacing primary commodities and light industrial goods while increasing rapidly in terms of total export volume ratio. However, when it comes to the labor skill content of the export commodities, there has been little change for quite a long time. Hinloopen and van Marrewijk (2004) indicate that although China's comparative advantage (including Hong Kong and the Taiwanese district) from 1970 to 1997 reflected a tendency for resource-intensive products to evolve into capital-intensive products, mainland China would continue to lag behind for many years. Widodo (2008) conducts a comparative analysis of the change in comparative

advantage between China and India from 1988 to 2003, and concludes that the comparative advantages of the two countries were generally expanding (except for China during 1998-2003), and that China's enhancement of comparative advantage was more prominent than that of India. International research has begun to identify the characteristics of China's changing exports' comparative advantage, yet a lack of clarity persists regarding its particular phases and potential influence.

There are quite a few economic theories that address the trends and causes of changes in export comparative advantage. Balassa (1965) believes that rapid economic development often causes shifts in factor endowment within a country, therefore bringing about changes in export commodity structure and thus changing the comparative advantage model. In the preliminary stages of economic development, a country's more abundant production factors are usually labor and natural resources, and the export commodities with comparative advantage are mainly from resource- and labor-intensive industries. With economic development, the country's capital factor grows and its level of technology advances, which in turn causes the factor endowment status to change. Changes in export commodity structure take place accordingly as the export scale of capital and technology intensive products expand. Wörz (2005) believes that in a given period, the rate of change in a country's comparative advantage model is closely related to its economic development. The more developed a country's economy is, the more stable its import and export structure, i.e., the more stable its comparative advantage model will be. In contrast, the comparative advantage model of developing countries will undergo relatively greater and more rapid changes during the process of export growth.

The relationship between export comparative advantage change and economic development is essentially interactive, with the former both passively reflecting and significantly influencing the latter. Hausmann, Hwang, and Rodrik (2005) indicate that export comparative advantage models definitively influence long-term economic development, such that a country's economic and export structures tend to mutually converge. Matsuyama (1991) points out that from the perspective of technical innovation and scale of economy, products (industries) have very different endogenous growth potential and developing countries that use existing static comparative advantage to elect which products it will manufacture are likely to fall into Ricardo's trap of sluggish growth. Similarly, Almeida (2010) notes that when opening up to outside world and participating in international trade, developing countries' exploitation of comparative advantage tends to benefit from lower-level labor resources despite the fact that market mechanisms may cause the country's labor capital to "downgrade" rather than "upgrade," as might be expected.

In constructing a theoretical model for the route of comparative advantage evolution in developing countries, we adopt an empirical approach through which to discuss the basic characteristics of dynamic change in Chinese export commodity comparative advantage from 1998 to 2008. Section II proposes criteria for analyzing the comparative advantage change of export commodities in developing countries at two levels: factor endowment and specific products. Data sources are then referenced to make a theoretical assumption regarding the dynamic evolutionary route of export comparative advantage in emerging countries. Section III investigates the main trend of change in the comparative advantage for export commodities in China by focusing on the macro perspective of factor endowment classification, hence drawing the conclusion that the comparative advantage in Chinese exports continues to be that of developing countries. Section IV examines the extent and rate of change in the comparative advantages of China's export commodities from the micro perspective of specific products. Section V summarizes the overall findings of this thesis and offers a discussion of policy implication.

2. Evolutionary Route of Comparative Advantage in Developing Countries at Two Levels

A country's comparative advantage is usually reflected through its export commodities. A larger export scale indicates prominent overall comparative advantage while changes in export commodity structure over a given period indicate the evolution of the country's comparative advantage, which particularly influences its overall economic development. A country's export commodity structure and its comparative advantage model as reflected through that structure can be observed to be not only the result of its prior economic development, but also an important variable affecting its future economic development. Economic development level differs among countries and so it follows that the changing

comparative advantage trends likewise differ and, in turn, affect economic development in various ways. In underdeveloped countries, the stage characteristics of economic development often cause the dynamic change of comparative advantage to manifest a unique moving track, compared with those of developed countries.

Developing countries certainly cannot change their comparative advantage overnight, and transitioning from labor-, to capital- and technology-intensity is a long process. In real world economics, developing countries can opt to expand the extent of commodity export with the internal factor endowment condition as is, making the best advantage of current resource and labor factors. Another option is to accelerate the accumulation of capital, technology, and other high end production factors through the expansion of exports, thereby prompting a gradual change in the ratio of the current factor endowment and an eventual comprehensive upgrade in export commodity structure. The evolution of comparative advantage at the product level should be more readily noticeable in developing countries, with changes in factor endowment proving less apparent.

Factor endowment and specific products can and should be considered as separate perspectives or levels in the observation of dynamic change in the comparative advantages of developing countries. Research at the factor endowment level, in particular, is relevant in the global economic system to the positioning of comparative advantage in developing countries, and offers useful insight into important signs of long-term development and trends. Analyses at specific product levels can offer objective views of differences in developing countries' comparative advantage at various points in time while offering an assessment of short-term changes in production and export. Analyses at these two distinct levels cannot replace one another, as one will inevitably result in either an over- or under-estimation of these aspects. Considering the levels of factor endowment and specific products in concert with export trade and economic development, long-term dynamic changes in the comparative advantages of developing countries can and should be streamlined into three basic stages as follows (refer to Fig. 1):

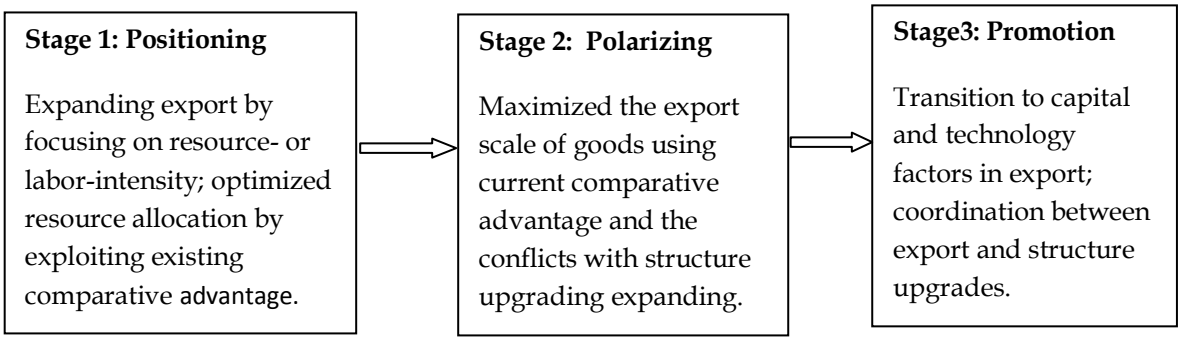

Fig. 1 Dynamic Evolutionary Stages of Export Comparative Advantage in Developing Countries

The first stage is "positioning," using the existing factor endowment to guide production decisions while accelerating the adjustment and optimization of the country's internal economy. Underdeveloped countries in the early stages of opening up promote their own economic growth primarily by identifying a comparative advantage, by correcting the prior distortion of resource allocation, and by expanding participation in the international division of labor. This is also the time when changes in comparative advantage appear as the expansion of export scope and scale, and when export commodity structure is dominated by low-end production factors.

The second stage is "polarizing," or the exploitation of the comparative advantage generated by the existing factor endowment. As long as the ratio of existing factors remains consistent, major effort is exerted to maximize the specialization of export production to the extent that conflicts between export comparative advantage enhancement and economic structure upgrades gradually begin to manifest. Over a certain period of relatively rapid development after opening-up, the income per capita in underdeveloped countries will increase considerably, notably improving their position in the world market. At this stage, the dynamic change in export commodity comparative advantage manifests as a higher degree of convergence between resource and labor factors and capital and technology factors, with the former two factors continuing to dominate.

The third stage is "promotion," which is when new production specialization simultaneously enables factor endowment status upgrades and the evolution of exports and industrial structures. In the process of marketization and with the considerable enhancement of the overall economic development level in developing countries, the cost of resource and labor factors increases while the quality of labor likewise improves. Meanwhile, the accumulation of capital and technology factors accelerates and production specialization increasingly focuses on the more high-end industries. Then, in the comparative advantage decision-making process, capital and technology factors are upgraded to a dominant position and industrial upgrades are actively promoted through export expansion.

Shifts in developing countries' export comparative advantage exhibit unique characteristics at various stages, primarily reflected in the mutual relationship between factor endowment and specific product levels. Regardless of whether comparative advantage change at the product level and comparative advantage determined by existing factor endowment follows the same direction, various evolutionary tracks take shape at different stages. The growth of export products in the first stage is realized mainly through the exploitation of current resource endowment. The expansion of export scale in the third stage consolidates and strengthens resource endowment ratio changes. Although the evolutionary direction in the two stages appears to be the same, they are substantially and fundamentally different in content. It is worth noting in the second stage that export comparative advantage maximizes the use of the current factor endowment, thereby creating demand to potentially neutralize the restraint of the current factor endowment. Meanwhile, it fosters conditions that support upgrades in factor endowment.

The second stage in the dynamic evolution of export comparative advantage is inevitable and the most challenging for developing countries. The influence of external demand on internal resource allocation becomes stronger at this stage and the market system automatically generates a resource locking effect. This in turn hampers, or at least does not directly promote, upgrades in industrial structure (Chen Feixiang, 2010). There are many factors in the dynamic evolution of comparative advantage in developing countries that combine to form a classic stage with distinctive characteristics; that is, the overall backwardness compared to developed countries, special combinations of various production factors, and conflicts between export growth and structure upgrading.

After thirty years of outstanding and effective reform and opening-up, China's GDP advanced to second in the world in 2012 and its export trade has maintained continuous and rapid expansion for years, playing a strategic role in the acceleration of economic growth and in the increased use of foreign capital. Whether viewed from the perspective of export trade scale, or from the perspective of export commodity structure, China's comparative advantage has undergone significant changes. At the factor endowment level, China's export comparative advantage is clearly that of a developing country. Upgrades to export commodities in recent years have been made rapidly, and changes in comparative advantage have been prominent at the product level. An objective assessment can be made only through comprehensive analysis of the dynamic change in the comparative advantages of Chinese exports, whereby the means of upgrading export models and coordinating the relationship between opening-up and internal economy can be better promoted in the future.

All of the Chinese export commodity data used here was taken from the UN Comtrade database for the 11-year observation period from 1998 to 2008. According to the Standard International Trade Classification (SITC. Rev 3), China's export data in each year are selected at both one- and four-digit number classification levels. For the one-digit number, SITC classifies all of the export products into 10 types and at type No. 9, China's export volume is rather low, which accounts for a small part of China's total export volume that it is ignored here. At the four-digit number level, SITC classifies all of the Chinese export commodities into 1,033 groups. In this thesis, 935 of these groups with relatively complete export data are selected and their products with very low export volume or relatively fewer yearly data are removed. Such treatment does not affect the validity of the results of the empirical analysis.

3. Changes in Chinese Export Comparative Advantage at the Factor Endowment Level

Current SITC is assigned on the basis of product performance and provides useful information for the analysis of factor content in export commodities. Following the product classification method based

on different technical levels developed by Lass (2000), and the export commodity classification method based on labor skill content suggested by Trefler and Zhu (2005), we re-classify export commodities from the perspective of actual factor input, separating the 935 Chinese products under SITC four-digit numbers into four factor-intensive types.

Initially, we determine the factor input intensity of export commodities according to regular technical features, and then we make the necessary adjustments as per the actual domestic factor input of the export commodities in question. In particular, we classify one-digit number SITC types, Nos. 0-4 (primary products), as resource-intensive products and types No. 6 (finished products classified by material) and No. 8 (miscellaneous products) as labor-intensive products. Types No. 5 (chemical products) and No. 7 (machinery and transportation equipment) are classified as capital or technology-intensive products in principle, with some commodities in both types being classified as labor-intensive commodities (for detailed product classification, please refer to Table 1). Although these export commodities are typically classified by international practice as capital or technology-intensive, they are mainly produced by foreign investment enterprises via a process of trade for export. Therefore, the actual domestic input factor for these products is merely primary labor.

The classification of Chinese electronic products (7511, 7581, etc.) into labor-intensive exports is based on the obvious fact that the industrial transfer prompted by international capital flow has caused the "deviation" of production factor intensity, where factor intensity is inconsistent with the actual factor endowment condition of the export country. For example, many products with capital or technology-intensive characteristics are exported from developing countries in large scale, not because the developing countries have the corresponding capital or technology advantage, but because the multi-nationals transfer their production site to save costs and so the developing countries' inputs are still very primary factors.

In recent years, the proportion of electronic and informational products in China's total export volume has rapidly increased from 15.4% in 1998 to 27.4% in 2008, but those playing dominant roles are still foreign investment enterprises that mainly adopt the processing trade method. For example, in 2005, foreign enterprises accounted for 89% in China's export of electronics and informational products, and the top three with the biggest export scale were all foreign enterprises. After China's entry into the WTO, the electronics and information industry has attracted the largest amount of foreign investment, directly resulting in its rapid growth in export. These foreign enterprises do not do the related technology research and development in China, so of course the ownership of capital belongs to the foreign party, who merely reaps the benefit of China's cheap labor for assembly or low-end processing. Therefore, from the perspective of actual factor input, for China, the large export of electronics and informational products are in fact not capital and technology-intensive products. They should instead be rightfully classified as labor-intensive products.

During the period from 1998 to 2008, the export scale of the four factor types in China generally maintained relatively rapid growth but still exhibited large differences in growth rates (Table 1), with two notable characteristics. First, the comparative advantage of the low-end factor type continued to dominate. The proportion of resource and labor factor-intensive export commodities in the overall export volume in 1998 was 65.23%, and remained about 50% in 2008. The proportion of both types showed rather large decreases, but considering that China's export scale had multiplied during this period, its export competitiveness was still derived from its static comparative advantage through the exploitation of congenital factors. Second, the comparative advantage formed by high-end factors displayed a trend of steady growth. In 2008, the proportion of export capital and technology-intensive commodities was slightly over 50%. From a growth rate perspective, both of these types had surpassed the labor-intensive commodities since 2003, and showed a clear trend of year-to-year acceleration, indicating that China's use of low-end factors had reached its limit and was approaching a point of overall conversion in factor endowment conditions.

Table 1: Proportion and Growth Rate of Export Commodities Based on Factor Endowment Classification

	Resource-intensive products	Labor-intensive products	Capital-intensive products	Technology-intensive products

Year	Proportion	Growth	Proportion	Growth	Proportion	Growth	Proportion	Growth
1998	14.73%	-5.92%	50.56%	0.69%	15.51%	6.02%	19.20%	11.78%
1999	13.81%	-0.17%	49.51%	4.21%	15.20%	4.30%	21.48%	19.08%
2000	13.18%	20.99%	47.36%	21.27%	15.88%	32.46%	23.58%	39.17%
2001	13.08%	6.47%	46.10%	4.44%	15.71%	6.09%	25.11%	14.22%
2002	11.96%	12.24%	45.84%	22.09%	14.98%	17.08%	27.22%	33.13%
2003	10.91%	22.73%	46.02%	35.07%	15.24%	36.88%	27.83%	37.55%
2004	10.54%	30.81%	43.75%	28.71%	15.63%	38.93%	30.08%	46.35%
2005	10.12%	22.93%	42.65%	24.80%	15.95%	30.65%	31.28%	33.13%
2006	9.77%	22.60%	42.03%	25.13%	16.33%	29.91%	31.86%	29.32%
2007	9.25%	16.98%	42.01%	23.49%	17.65%	33.56%	31.08%	20.51%
2008	9.18%	15.96%	41.20%	14.61%	19.31%	27.91%	30.30%	13.95%

Source: Calculation based on the relevant data from the UN Comtrade database.

The NRCA index (Fig. 2), which is calculated based on the four factors classification, indicates that among the various Chinese export commodities, labor-intensive types have consistently measured the greatest comparative advantage index. From 1998 to 2008, the NRCA index of labor-intensive export commodities not only held a steady first place, it was substantially higher than the export commodities of other factor-intensive types. Because this thesis subjects the RCA index to normalization, it makes direct comparisons among exports on common grounds and thus these comparison values are relatively accurate. The NRCA index of labor-intensive type export commodities in 1998 was 1.09, and increased to 2.36 in 2008, reflecting a trend of continuous increase during the entire 11 years studied, with the export volume being significantly higher than other export commodities and the gap gradually expanding. Of course, growth of the NRCA index of labor-intensive export commodities, while generally maintaining an upward trend, did begin to slow down in 2005.

Fig. 2 also reveals that the NRCA index of capital factor-intensive commodities during the observation period was rather low. In terms of value, it has always been in the negative area and has neither approached the threshold of 0, nor has it shown an obvious downward trend, which is in sharp contrast to that of the labor-intensive export commodities. For example, in 1998, the NRCA index of Chinese capital factor-intensive commodities was -0.35, and decreased to -0.64 in 2008. On a yearly basis, it began decreasing in 2000 and stabilized in 2007, but it never recovered to the 1998 level. The NRCA index of China's resource-intensive type export commodities also remained in the negative and displayed a more obvious downward trend, decreasing from -0.12 in 1998 to -1.06 by 2008. Judging from this decrease, it might ultimately prove to be China's commodity type with the lowest export comparative advantage.

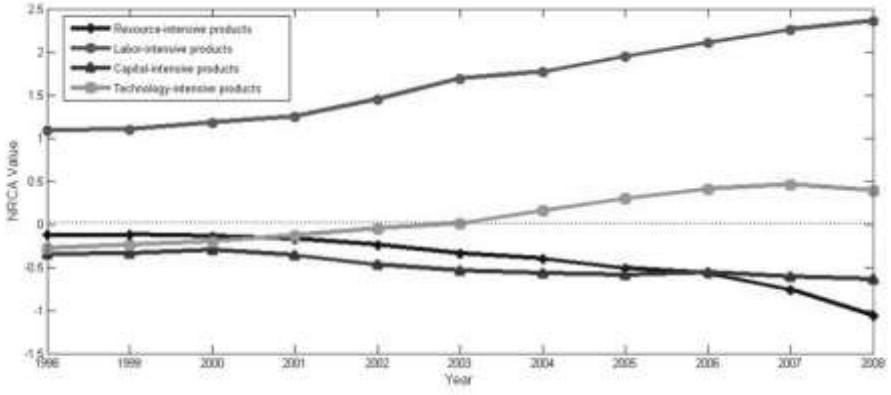

Fig. 2: Normalized Revealed Comparative Advantage Index of Export Commodities with Different Factor Intensity

During the period under study, the NRCA index of China's technology factor-intensive commodities reflected the most dramatic change from among the four types. The NRCA index of this

export type as seen in Fig. 2 was -0.28 in 1998, and increased to 0.39 in 2008, triggering a qualitative transformation from negative to positive. Relevant trade volume data also indicate a prominent change in comparative advantage from another aspect. Namely, the proportion of total export volume for technology-intensive commodities in 1998 was 19.20%, and by 2008 it had increased to 30.30%, contributing to the rapid expansion of the Chinese export scale. For this commodity type, 2003 was a crucial turning point as its NRCA index exceeded the threshold of 0, then subsequently continued in the following three years to show fairly fast growth, maintaining a steady upward trend. Technology-intensive products in China experienced an earlier dynamic change in comparative advantage compared to capital-intensive commodities as the result of continuous government investment in technology and China's advantageous geographic size.

In summary, labor factor-intensive commodities assessed by factor endowment level currently continue to dominate in China's export trade. Considering the deviation phenomenon of factor intensity caused by the international division of production, the comparative advantages currently exploited by China are still the low-level production factor types with static comparative advantage. Of the export commodity total volume, the labor-intensive type commodities still constitute the largest share, have the greatest NRCA index, and display the most obvious changes. This all indicates the following: that the labor factor plays a bigger role in China's rapid development of export trade than capital and technology factors, that China's production specialization under opening-up conditions is still fully concentrated in the direction of low-end production factors, and that conflict between export growth and economic structure upgrading is inevitable.

4. Comparative Advantage Evolution of China's Exports at the Product Level

Examining the changes in China's export comparative advantages at the specific product level has important value in two respects. First, it is conducive to grasping the variety and sensitivity of export comparative advantage evolution at the micro level. Second, it can help in the assessment of future directional changes in export comparative advantage. It should be noted that with factor endowment remaining unchanged, rapid change in export commodity structure is usually an important characteristic in developing countries. Countries with similar factor endowments may have very different export commodity structures, and a country with unchanged factor endowment may differ significantly in export structure at various points in time.

Using NRCA indices calculated at the beginning and end of the observation period as coordinate axes, the comparative advantages of China's 935 export commodities are described by adopting the method of scatter distribution. For detailed results, please refer to Fig. 3 in which the vertical axis is the NRCA index of a certain commodity in 2008, and the horizontal axis is its NRCA index in 1998. The two parameters determine the specific position of a certain export commodity in the chart. For example, if the NRCA index of a certain commodity was negative in 1998, but then positive in 2008, it will be located in the upper left area of the chart. Thus, the chart is divided into six sections, with the NRCA indices of the commodities located on the upper left side of the alignment going up, and those of the commodities located on the lower right side of the alignment going down. Of course, the patterns of change in different sections vary. For example, if the original NRCA index of a commodity is located in section A it is positive and its absolute is increased. If it is located in section B, the NRCA index remains positive but its absolute value decreases.

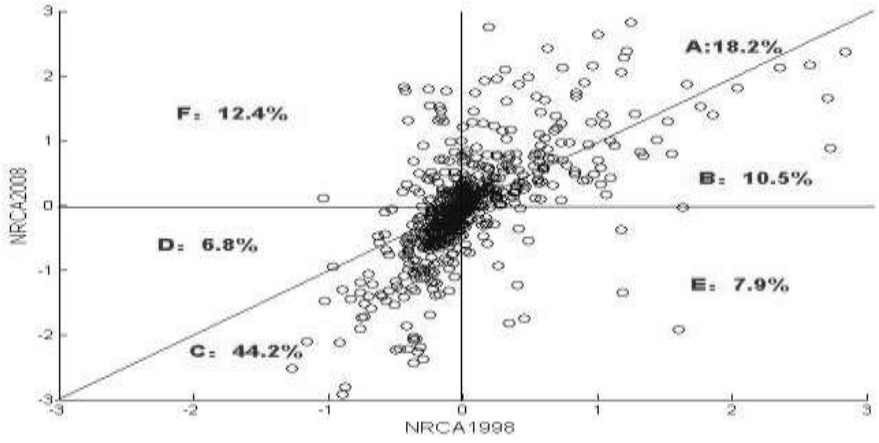

Fig. 3: Scatter Distribution Chart of NRCA Index Changes in Export Commodities from 1998 to 2008

Analyzing purely from the perspective of commodity types, the proportion of commodities with an increased NRCA index (upper left side of the alignment) is not high, only accounting for 37.4% of all of the commodity types. This is far lower than the commodities with decreased NRCA indices (lower right side of the alignment). The commodities with negative and then further decreased NRCA indices during the observation period account for 44.2% of all of the commodities while the commodities with positive and then further increased NRCA indices only account for 18.2% of all of the commodities. However, when analyzing from the perspective of commodity export volume, the opposite is the case. Compared with the number in 1998, the commodities with increased NRCA indices in 2008 account for 78% of all of the commodities, which is far higher than the proportion of commodities with decreased indices.

Specifically, the export commodities with positive and further increased NRCA indices from 1998 to 2008 were mostly technologically advanced electronic and informational products. The top five export commodities in terms of NRCA indices in 2008 were, respectively, telecommunication equipment and components at 1.708; LCD, laser, and other optical equipment at 1.231; voice and video recording equipment at 1.129; input and output components of automatic data processing equipment at 1.096; and amusement gaming products at 0.658. The NRCA indices of these export commodities in 1998 were very low: 0.188, 0.026, 0.141, 0.372, and 0.059, respectively, but increased over ten times on average over the following 10 years.

Table 2: Proportion and Growth Rate of Export Commodities Classified by NRCA Index Changes (Unit: %)

	NRCA index is positive and increases		NRCA index is positive but decreases		NRCA index is negative and decreases		NRCA index is negative but increases		NRCA index changes from positive to negative		NRCA index changes from negative to positive	
1998	45	6	29	-4	9	-2	2	2	7	3	8	11
1999	46	10	27	-2	9	6	2	32	7	-4	9	21
2000	46	26	24	16	9	28	3	45	6	19	12	60
2001	47	9	22	-3	9	9	3	3	5	-6	14	28
2002	48	25	20	8	9	22	3	37	5	2	16	45
2003	48	36	17	15	9	29	3	51	4	14	19	61
2004	48	35	14	12	9	43	4	60	3	19	22	52
2005	47	26	13	18	10	33	4	38	3	17	23	37
2006	45	23	12	15	10	36	5	48	3	8	25	37
2007	45	21	10	10	11	34	5	28	2	5	27	31
2008	44	16	9	7	12	23	5	16	2	-6	28	21

Source: Calculation based on the relevant data from the UN Comtrade database.

Accordingly, the 12.4% of export commodities whose NRCA indices changed from negative to positive from 1998 to 2008 accounted for only one fifth of the total export volume in 2008. Nearly all of the international standard classification codes for these commodities begin with the number "7" and boast rising NRCA indices from among all of the Chinese export commodities over the same period in addition to the most significant enhancement to China's comparative advantage. The top five commodities in terms of NRCA indices in 2008 were, respectively, digital automatic material processors at 4.456; wireless phones and radios, telegraphs, and televisions at 1.804; digital automatic data processor parts and components at 1.231.

From 1998 to 2008, the commodities whose NRCA indices had changed from positive to negative accounted for 7% of all Chinese exports, but amounted to only 2% in total export value because they were mainly resource-intensive commodities. Specifically, the NRCA index of soft coal and coal dropped from 0.063 in 1998 to -3.38 in 2008. Correspondingly, iron and unfinished products of unalloyed steel dropped from 0.34 to -1.29. Corn went from 0.46 to -1.74, rice from 1.19 to -1.35, and electricity from 0.33 to -1.61. The comparative advantages of these commodities in China's export trade had declined most significantly, and with continuous decline in export competitiveness, their export scale also dramatically decreased. The total export volume of these commodities dropped 6% in 2008 and in 4 of the 11 years between 1998 and 2008.

5. Conclusion

As a major developing economic power, the dynamic evolution of China's export commodities' comparative advantages should be assessed at two distinct levels: factors and products. This analysis provides a better understanding of the restraints established by internal and external conditions on the development of China's export trade while increasing focus on the mutual relationship between export trade expansion and economic structure upgrading. China is currently at a crucial stage and displays the comparative advantage transformation characteristics that are typical of a developing country. After the positioning of comparative advantage in the early stages of opening-up, in recent years China has pushed the use of traditional comparative advantage to the extreme, but has yet to establish a new comparative advantage model based on high-end factors.

From the micro perspective at the factor endowment level, measured by actual factor input, labor-intensive products in China continue to dominate and hold a significantly larger comparative advantage than other factor-intensive type export commodities. Yet, the comparative advantages of technology-intensive export commodities have recently started to exhibit extraordinarily rapid growth. From the micro perspective at the product level, the changes in export commodity comparative advantage have been common and rapid. The convergence of labor, capital, and technological factors in the production of export commodities is strengthening, and the comparative advantages of export commodities that rely purely on labor or resource factor input is rapidly decreasing.

An issue in need of attention at this time is the discord between export-oriented production specialization based on current comparative advantage, and industrial structure upgrades required by changes in the national economic development model. The dynamic evolution of export comparative advantage may be hindered in China due to the difficulty of accelerating the accumulation of high-end factors through sole reliance on the guiding effect of market demand and factor inflow from external markets. A necessary and wise choice at this time would be to properly strengthen government influence on resource allocation and enhance the role of domestic market demand in the adjustment of overall resource allocation.

References

Almeida, R. K 2010, 'Openness and Technological Innovation in East Asia: Have They Increased the Demand for Skills?', *Asia-Pacific Development Journal*, vol.17, no.1, pp.63-95.

Amiti, M., & Freund, C 2010, 'The anatomy of China's export growth', in *China's growing role in world trade*, University of Chicago Press, Chicago and London, pp. 35-56.

Balassa, B 1965, 'Trade liberalisation and "revealed" comparative advantage', *The Manchester School*, vol.33, no.2,pp. 99-123.

Chen Feixiang, & Yu Zhaoyun 2010, 'Lock-in Effect and Industrial Structure Evolvement of China: 1992-2006', *Economist*, vol.5, pp.54-61. (In chinese)

Hausmann, R., Hwang, J., & Rodrik, D 2007, 'What you export matters', *Journal of economic growth*, vol.12, no.1, pp. 1-25.

Hinloopen J., & van Marrewijk, C 2004, 'Dynamics of Chinese Comparative Advantage', Tinbergen Institute Discussion Paper, No. 2004-034/2.

Hinloopen, J., & Van Marrewijk, C 2001, 'On the empirical distribution of the Balassa index', *Weltwirtschaftliches Archiv*, vol.137, no.1,pp. 1-35.

Lall, S 2000, 'The Technological structure and performance of developing country manufactured exports, 1985-98', *Oxford development studies*, vol. 28, no.3, pp.337-369.

Lv Guojun 2006, 'Globalization, Transfer and Restructuring of East Asia Manufacturing since 1990', *Quarterly Journal of Economics*, vol. 5, no.2, pp.551-578. (In Chinese)

Matsuyama, K 1991, 'Increasing returns, industrialization, and indeterminacy of equilibrium', *The Quarterly Journal of Economics*, vol.106, no.2, pp.617-650.

Trefler, D., & Zhu, S. C 2010, 'The structure of factor content predictions', *Journal of International Economics*, vol.82, no.2, pp.195-207.

Wörz, J, 2005, 'Dynamics of trade specialization in developed and less developed countries', *Emerging Markets Finance and Trade*, vol.41, no.3, pp. 92-111.

Widodo, T 2008, 'Shifts in Pattern of Specialization: Case Studies of India and China', Gadjah Mada International Journal of Business, vol.10, no.1, pp.47-75.

Yeats, A. J 1985, 'On the appropriate interpretation of the revealed comparative advantage index: implications of a methodology based on industry sector analysis', *Weltwirtschaftliches Archiv*, vol.121, no.1, pp. 61-73.