China's Economic Development and Sino-Japanese Economic Relationships: Beyond the Flying Geese Pattern Theory

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Abstract

This article is aimed at exploring China's development process and Sino-Japanese economic relations in terms of the Akamatsu flying geese pattern (FGP) theory. On the basis of dynamic comparative advantage, the theory predicts that China's trade advantage lies primarily in labor-intensive products and industries. However, the trade pattern has shifted relatively from such products to more capital-/technology-intensive ones. The article tests the changes in China's comparative advantage utilizing the RCA index, International Competitiveness coefficient and trade similarity index. It concludes that China's development path and Sino-Japanese economic relationships cannot be explained by the FGP theory alone, though the theory is still basically adaptable to the Chinese scene; deviations from that theory could be derived from various functions of FDIs, particularly importation of new technologies, that China has extensively enjoyed.

Keywords

China's economic development, Sino-Japanese economic relationships, flying geese pattern, trade structure

Introduction

China, of an economic scale merely one fourth of Japan's in 2000, caught up with and then surpassed Japan in 2010. The very structure of the Chinese economy underwent significant transformations, and in terms of Japan and China's economic relationships, it appears that the conventional scheme of Japan as an advanced country and China as a developing country has begun to change. Here, the ways in which the economic relationship between the two countries has proceeded from the end of the 1980s to the present day will be examined

in the limited aspects of trade and investment. Until now, the Japanese and Chinese economies have been viewed not as being substitutes but as being in a complementary relationship; the problem pursued in this paper is whether it is possible to apprehend the current and future Sino-Japanese economic relationship solely through such a framework or viewpoint.

This paper comprises the following. Section One will provide an overview of the flying geese pattern (FGP) theory, which has served as the basis of conventional arguments, as well as a theory on the stages of economic development in the form of a catch-up industrialization theory. Based on several studies, Section Two will consider whether or not the FGP theory can sufficiently explain China's economic development. Next, the progression of the Sino-Japanese economic relationship will be viewed from both trade and investment perspectives in Section Three, and Section Four will determine whether Sino-Japanese trade is in a subsutitute or in a complementary relationship using a measure called the export similarity index. In Section Five, it will be asserted that although Japan and China are in a unidirectional relationship in terms of investment and technology, there is no way this relationship will continue in all fields and area in the future. Finally, the article will conclude that the Sino-Japanese economic relationship is shifting from a complementary to a competitive complementary relationship.

1. The Flying Geese Pattern Theory and the Theory of Catch-up Industrialization[1]

China has enjoyed over 30 years of remarkable economic growth and development since its economic reform. Numerous methods for organizing and describing this kind of development pattern have been prepared, but perhaps the quickest method is to use existing development models as a frame of reference. For example, describing China's development pattern and stage of development around Arthur Lewis's dualism has been done, and Petty-Clark's law has been used to discuss changes in China's industrial structure. These are both models and hypotheses of stage theories, and they attempt to determine and analyze the trends up to now and the current state of China based on a kind of international reference of the stages a country passes through in the process of economic development.

However, the most stimulating model among the many theories of stages of economic development would probably be the flying geese pattern theory. This model, created by Kaname Akamatsu and developed by Kiyoshi Kojima, links a

[1] The following two sessions are a summary of Nakagane (2012) Chapter 5.

theory of comparative advantage as well as the Heckscher-Ohlin theorem, which are the most fundamental propositions in international trade theory, with a theory of capital accumulation, and dynamically develops their arguments. This theory changed in appearance and developed into the Fei-Ohkawa-Ranis phase transition theory of economic development.[2]

There are three patterns in the flying geese pattern theory. One is the dynamic, sequential development process relating to production and trades that is importing → domestic production → exporting. Akamatsu called this the fundamental type of the flying geese pattern. When a developing country attempts to start developing, it cannot produce modern goods domestically, and so it must import them. However, when imports increase and domestic demand is satisfied, the technology of those goods is introduced into the country, and enterprises (entrepreneurs) that also wish to enter the market arise and enter domestic production of those goods. As domestic production grows and comes to satisfy domestic demand, imports begin to dwindle, and when production capacity expands enough to have reserves, exports begin. To put it another way, the comparative advantage structure of that country changes over that period. Here, let us call this type of dynamic change in the comparative advantage structure the first type of the flying geese pattern.

Another phase of development is the change in the comparative advantage structure from more labor-intensive goods to more capital-intensive goods, or from consumer goods to producer goods. Capital becomes relatively abundant in a developing country that began accumulating capital during the development process in the first type of FGP model. Here, the country gradually starts to gain a relative comparative advantage for capital-intensive goods for which there initially was absolutely no comparative advantage. As a result, these goods progressively come to be produced domestically, resulting in export capacity. Thus, a development pattern like the first is eventually exhibited with respect to capital-intensive goods as well. If a country has a comparative advantage in capital-intensive goods, it comes to have a comparative disadvantage in labor-intensive goods, leading to a progressive decrease in the production and export of the latter, which gives way to production and export of the former. A dynamic structural change in production and export goods incorporating this kind of shift in industrial structure represents the second type of the flying geese pattern.

Based on the development experience of East Asian countries, Fei *et al.* state that economic development proceeds through the following sort of process. In

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[2] John Fei, Kazushi Ohkawa and Gustav Ranis, "Keizai hatten no rekishiteki pasupekutibu: Nihon, Kankoku, Taiwan" [Economic Development in Historical Perspective: Japan, Korea and Taiwan], in Kazushi Ohkawa, ed., *Japan and Developing Countries* (Tokyo: Keiso Shobo, 1986).

the first phase of economic development, when modern consumer goods are imported, domestic production is stimulated and starts, leading to primary import substitution, or the substitution of domestic production for imports. Next, a second phase of primary export substitution arises, in which export goods shift from conventional, traditional products to modern consumer goods. In the third phase, when there is importation of producer goods, domestic production steps into its place and secondary import substitution proceeds. If this continues, the phase of secondary export substitution arises in which the export products, once consumer goods, are substituted by producer goods. In the above phases, modern technology was entirely imported from abroad, but in the fourth phase, self-development of technology begins and secondary import and secondary export substitution continue to develop with the new locally-developed technology. This transition of phases truly parallels the first and second type of the FGP theory using the notions of import and export substitution.

If development in the style of the flying geese pattern applies to all countries, when one advanced country A has a comparative advantage for capital-intensive goods, a less-advanced country B that has a trade relationship with country A would have a comparative advantage for labor-intensive goods. After more time passes and the less-advanced country B chases A to have a comparative advantage in capital-intensive goods, advanced country A would come to have a comparative advantage for goods that are still more capital intensive, while a less-advanced country C that is further behind country B would now come to have a comparative advantage for labor-intensive goods. This billiard-ball phenomenon that arises in accordance with the development stage of countries shall be called the third type of the flying geese pattern. Normally, the development process in the style of the flying geese pattern in Asia refers to this third type of the flying geese pattern. For example, what is often called the flying geese pattern is the successive process of economic development with Japan as the leading goose, followed by the NIEs, then ASEAN, and finally China chasing from behind.[3] This pattern is theoretically derived from the first and second types of the FGP theory. As will be noted later, the theory of "catch-up" industrialization relating to economic development can, separately from the intentions of its creator, be considered to be fundamentally based on this third type of flying geese pattern. As Fei *et al*. state, Japan has experienced all of these phase transitions of theirs, behind which Taiwan and South Korea have also been developing via these transitional phases. In other words, their model suggests that the third type of the flying geese pattern is valid by these countries.

Afterwards, Akamatsu's FGP theory was refined and developed by Kiyoshi

[3] Toshio Watanabe called this the "telescoping catch-up process." See Watanabe (1985).

Kojima. In particular, we should pay attention to the fact that Kojima incorporated foreign direct investment (FDI), largely ignored during the Akamatsu period, into this model. In the phase of the first type, domestic accumulation of capital and the introduction of technology by domestic enterprises (or the government) play a central role in Akamatsu's model. The same is applicable to the phase of the second type. Here, suppose that capital and technology are brought in from abroad by foreign companies. As a result, in the first type, the import phase is skipped and from the beginning, domestic production and furthermore exports become possible. In the second type, the stage of producing labor-intensive goods or consumer goods is skipped, and from the beginning, production of capital-intensive goods or producer goods and furthermore exports becomes possible. Thus, when FDI enters a framework like the FGP theory, theoretically and practically speaking there is the possibility of the basic framework itself falling apart. Naturally, this would also affect the model of the third type, as "leap-frogging" development becomes possible.

Kojima seems to have believed that FDI reinforces and complements Akamatsu's FGP theory. He classified FDI into two types, one which is pro-trade oriented, and the other which is anti-trade oriented. He called the former "Japanese-style," and the latter, "US-style" direct investment. Pro-trade oriented FDI is the investment in industries that have a comparative disadvantage in the receiving country (host country), corresponding to its factor endowment. In this process, superior administrative resources shift from the investing country to the receiving country, the efficiency of the industry with a comparative advantage in the receiving country is improved, and more profitable trade expands. In the phase of the first type of FGP model, domestic production becomes more active by receiving investment from abroad, export power further expands, and trade is promoted. On the other hand, anti-trade oriented FDI is characterized by the investment by industries with a comparative advantage in the investing country in industries, not corresponding to the factor endowment of the receiving country (*e.g.*, investment of a sort that is for building capital-intensive factories in a developing country with an abundance of labor). This type of investment does not result in expansion of that developing country's exports.[4]

With perhaps a greater impact on international economics than the FGP theory was Vernon's product cycle theory.[5] According to Vernon, products produced and

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[4] Kiyoshi Kojima, "Gankou-gata keizai hattenron" [FGP-type Economic Development Theory], in Makoto Ikema, ed., Kokusai keizai no shinkozu: Gankou-gata keizai hatten no shiten kara [New Perspectives of International Economies: From the View of FGP-type Economic Development] (Tokyo: Bunshindo, 2009).

[5] Raymond Vernon, "International Investment and International Trade in the Product Cycle," *Quarterly Journal of Economics*, 20 (1966), pp. 190-207.

exported under a technological revolution in an advanced country progressively become obsolete, and their production and export shift to countries that are less developed than the advanced country. Then, a new technological revolution occurs in the advanced country, and new products are created that come to be produced and exported. It was Akira Suehiro who incorporated these arguments, as well as the FGP theory of Akamatsu and others, to develop the theory of catch-up industrialization.[6] He depicts producing/exporting countries shifting in tandem with technological revolutions in a simple model (see Figure 1). First, if a new product A is created in the US, that technology would eventually be conveyed to Japan and the two countries would compete with each other with respect to product A. Eventually the US will lose its comparative advantage for that product and develop a new, more sophisticated product B. The technology for product A would then be conveyed to the NIEs such as South Korea or Taiwan, and this time Japan would lose its competitive power for that product, with a new comparative advantage in the production and export of product B vis-à-vis the US. Thus, in Japan, the comparative advantage for product A would give way to that for product B, and in the US the way to produce and export an even more sophisticated product C would be found. Similarly, product D (not shown in the figure), E, F, *etc.*, would be created in the US, be transmitted to Japan, and the country of production and export would shift to the NIEs, ASEAN, and finally to country X (for example, China), filled below by ASEAN. It can be said that this process—continual product sophistication, transfer of technology, shifts in the comparative advantage structure, and catch-up of less-advanced countries to advanced countries—represents the second and third type of development in the style of the flying geese pattern as seen above.

Of course, models differ from reality, and in the real world not all new technology is born in the US; there should be cases in which Japan is the starting point. Also, it is not as though all technology flows cleanly from high-income to low-income countries, nor does the country of production transfer in such a fashion. Suehiro himself comments on the limitations of his model. What is important is to ask about the extent to which these models are valid when applied to China in the real world as a frame of reference, and, if there are areas that resist explanation using these models, to determine why that is the case. By doing so, it will no doubt be possible to apprehend the par-ticularities of the Chinese economy and its development.

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[6] Akira Suehiro, *Kyattchi-appu-gata kogyokaron: Ajia keizai no kiseki to tenbo* [Catch-up Industrialization: The Trajectory and Prospects of Asian Economies] (Nagoya: Nagoya University Press, 2000).

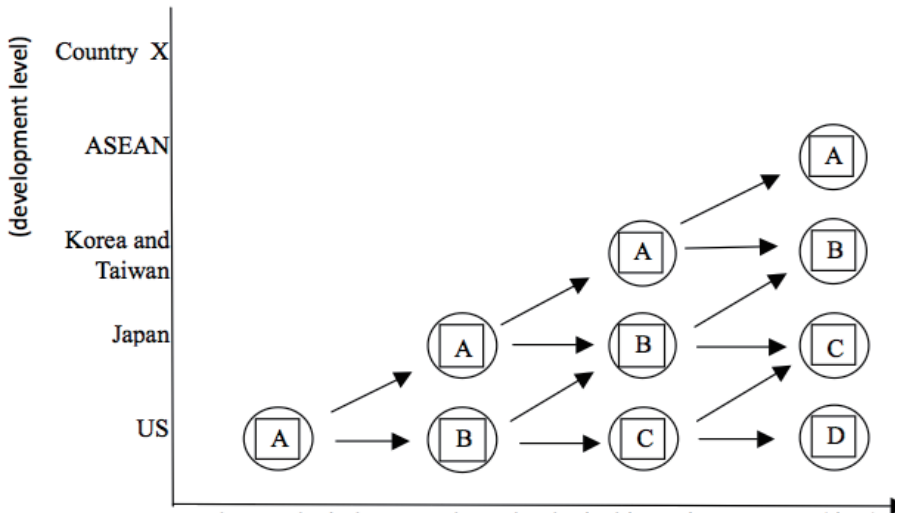

Figure 1: Technological Innovations and Movement of Producing and Exporting Countries
Source: Suehiro (2000), p. 51, Figure 2-4B

2. Chinese Economic Development and the Flying Geese Pattern Theory

Has China followed a development pattern like that described by the FGP theory? Alternatively, is it possible to sufficiently depict or explain the pattern of Chinese development using this theory? To answer these questions, it is important to consider a number of major goods and to illustrate their development patterns, as Akamatsu did. In that case, however, the selection of goods becomes an issue. In order to determine whether or not the economy has overall been developing in such a manner as shown by this theory, it is easier to investigate China's trade patterns and to observe changes in the comparative advantage structure. In other words, as stated above, development in the manner of the flying geese pattern represents dynamic changes in the comparative advantage structure, and so in order for a country's economic development to fit the FGP model, the trade and domestic production of that country must, as a prerequisite, be based on a comparative advantage.

The simplest methods for investigating the comparative advantage structure of a country are to measure the specialization coefficient (or the international competitiveness (IC) coefficient) or Balassa's revealed comparative advantage (RCA) index. If a country's trade is conducted based on the principle of

comparative advantage, it is expected that more of the goods for which the country has a comparative advantage would be exported, while more of the goods for which there is a comparative disadvantage would be imported. Thus, we may be able to see the comparative advantage structure of the country through the relative quantity of exports. Let us, then, look at China's IC and RCA coefficients as well as their movements .[7]

First, Kong[8] provides an example of calculating and observing the movement of the IC and/or RCA of China at a very broad classification. By simply classifying SITC (Standard International Trade Classification) 6 and SITC 8 as labor-intensive goods and SITC 5 and SITC 7 as capital-/technology-intensive goods, she calculated the IC coefficients and RCA indexes from 1995 to 2004. As a result, while China's comparative advantage in labor-intensive goods continued to be seen in its exports, it was understood that the level of advantage of goods in SITC 8 started to drop in 1997; meanwhile, although the level of advantage of goods in SITC 6 among the capital-intensive goods continued to be low, China clearly came to have a comparative advantage in SITC 8 goods after 2003 and was especially internationally competitive for goods including machinery and transportation facilities.[9]

However, classification based on the one-digit SITC number is too broad to accurately apprehend the characteristics of the goods. Thus, Yang and Zhu went down to the three-digit SITC and classified products into four types: resource intensive, labor intensive, capital intensive, and technology intensive. They then investigated the trends in China's international competitiveness based on the RCA index, IC coefficient, export structure and the like from the period of "reform and openness" until 2006, obtaining the following results.[10] Namely, in the beginning,

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[7] If we take the exportation of product i of Country J as Xij, and importation as Mij, then the specialization coefficient, or international competitiveness coefficient, can be expressed as (Xij—Mij) / (Xij+Mij). When we consider the world as a whole, with the world's exportation of product i represented by Wi, where W represents the entire world's exports, the RCA coefficient can be expressed as (Xij/Xj) / (Wi/W). While both of these formulas are understood to be measurements of the level of comparative advantage for product i in country j, they do not measure "comparative production cost" and thus should be used merely as proxies of comparative advantage. Needless to say, all trade is assumed to occur under the assumption that the principles of comparative advantage are being followed, and should that assumption be abandoned, these coefficients and indexes may not accurately represent comparative advantage.

[8] Jiongjiong Kong, "Woguo gongye zhichengpinde guoji jingzhengli fenxi" [Analysis of International Competitiveness of Our Industrial Products], *Tongjiyu Juece*, 2 (2007), pp. 59-61.

[9] This fact is supported by the findings of Li and Qing (2007) in a comparison of China's export competitiveness in 1995 and 2004. Further, Shen and Gu (2007) calculated China's RCA achieved through Sino-US trade between 1995 and 2006, indicating that China came to gain a comparative advantage in SITC 6 goods from 2004 on.

[10] Rudai Yang and Shie Zhu, "Zhongguo duiwai maoyi jiegouyu jingzhengli yanjiu:

China had an advantage for resource-intensive and labor-intensive products, but progressively came to have a comparative advantage for capital-intensive and technology-intensive products. Meanwhile, resource-intensive products became comparatively disadvantageous, and along with labor-intensive products, although at a somewhat lower level, capital-intensive products and technology-intensive products came to maintain a corresponding advantage (see Table 1). To generalize, this study suggests that although China continues to have a comparative advantage in labor-intensive goods, it has started to have thorough international competitiveness in at least a portion of capital- and technology-intensive goods.

Type of products	1980	1985	1990	1995	2000	2006
Resource intensive	0.21	0.47	0.31	0.04	-0.16	-0.32
Labor intensive	0.4	0.55	0.68	0.72	0.75	0.67
Capital intensive	-0.63	0	-0.25	-0.14	0.04	0.08
Technology intensive	-0.47	-0.49	-0.03	0.18	0.18	0.17

Table 1: International Competitiveness Coefficients of China's Trade, 1980-2006
Source: Rudai Yang and Shie Zhu, "Zhongguo duiwai maoyi jiegou yu jingzhengli yanjiu: 1978-2006" [Study on Structure and Competitiveness of China's External Trade: 1978-2006], *Caimao Jingji*, 2 (2008), pp. 112-119.

How, then, did China come to have a comparative advantage in capital- and technology-intensive goods? One key to unlocking the answer to this is the development of intra-industry trade. For example, if China handles a portion of the production process for certain advanced countries (countries with abundant technology and capital) and exports those goods to them, it would be exporting China's capital-/technology-intensive goods. This is a result of so-called fragmentation of industrial production by the developed economies. Alternatively, if China imports capital-/technology-intensive goods as components from advanced countries' processes or assembles the components in China before exporting them overseas, this would also constitute an exportation of capital-/technology-intensive goods. As is well known, processing trade makes up an extremely large fraction of China's trade.

If the export similarity index[11] is calculated, China's export structure in 2000

1978-2006" [Study on Structure and Competitiveness of China's External Trade: 1978-2006], *Caimao Jingji*, 2 (2008), pp. 112-119.

[11] This index is calculated as follows. If the export ratio of product p in two countries (regions)

was more similar to those of South Korea and Taiwan in 1990 than to that of ASEAN in the same year.[12] In other words, when seen in terms of trade structure, China, which is still at a low level of development with respect to per capita income, has "leap-frogged" over ASEAN and is approaching South Korea and Taiwan. A similar conclusion was derived by Schott (see Table 2). At least according to this indicator, China was a "normal developing country" in 1983, but approached the NIEs such as South Korea, Taiwan and Singapore in 1994, and became nearly equivalent to the NIEs in 2005.[13]

1983		1994		2005	
Mexico	0.20	Mexico	0.28	Korea	0.33
Korea	0.18	Korea	0.25	Mexico	0.33
Taiwan	0.17	Taiwan	0.22	Taiwan	0.22
Israel	0.16	Brazil	0.19	**China**	**0.21**
Brazil	0.16	Hong Kong	0.17	Brazil	0.20
Hong Kong	0.13	Singapore	0.16	Poland	0.17
Singapore	0.13	**China**	**0.15**	Israel	0.17
Argentina	0.09	Malaysia	0.15	India	0.16
Yugoslavia	0.09	Israel	0.14	Singapore	0.15
Hungary	0.08	Thailand	0.14	Hong Kong	0.15
Poland	0.08	Argentina	0.09	Thailand	0.15
Saudi Arabia	0.08	Poland	0.09	Argentina	0.13
China	**0.08**	India	0.09	Hungary	0.13

Table 2: Countries with High Export Similarity Indexes with the OECD
Note: For export similarity indexes, refer to note 11 of the text.
Source: Peter Schott, "The Relative Sophistication of Chinese Exports," *Economic Policy* (2008), pp. 5-49; Table 12.

It has been verified that with regard to a subset of products, China has departed from the third type of FGP development and caught up with and even surpassed a number of countries that had been ahead. For example, Tung used global trade statistics to calculate the RCA indexes and IC coefficients for trade in electronics for Japan, the NIEs, ASEAN and China for the period 1970-1998, and although

c & d in year t are s^s_{tp} and s^d_{tp}, then the export similarity index (ESI) = $\Sigma_p \min(s^s_{tp}, s^d_{tp})$. Here, if c is China and d represents OECD countries, we can measure the level of similarity between China and OECD's export structures, use OECD as a standard to calculate ESI for other countries or regions, and upon comparison with China also find the level of similarity between China and other countries and regions.

[12] Sanjaya Lall and M. Albaladejo, "China's Competitive Performance: A Threat to East Asian Manufactured Exports?" *World Development*, 32 (2004), pp. 1441-66.

[13] A similar conclusion is reached in Yang and Zhu (2008).

China is indeed chasing behind ASEAN by aggregate amount, it has surpassed ASEAN with respect to individual products.[14] Hiratsuka[15] has also noted this fact.

By contrast, there is also the view that even today when China's IT trade has made progress, it still plays second fiddle to ASEAN; in other words, the FGP theory does apply to China after all. For example, Ginzburg and Simonazzi[16] were inspired by Tung, but using a different database have asserted that this theory does hold in East Asia with respect to the electronics industry.[17] Kwan[18] calculated the IC coefficient and RCA index for international trade goods imported by the US from each country in Asia, and although the comparative advantage of intellectual-/capital-intensive industries in China did increase in 2000 compared to 1990, when calculating the trade sophistication index of Lall *et al.*, it was discovered that China has a comparative advantage over ASEAN in labor-intensive goods; thus, it has been asserted that the FGP theory is still valid for China.[19] Also following Kwan's methods, Zhu and Teramachi extended the investigated time period to 2006, comparing the IC and RCA of goods imported by the US as well as the level of competition by country. While basically supporting Kwan's discoveries and assertions, they noted that China's exports to the US have been growing competitively with those from Japan.[20] From this point

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[14] An-chi Tung, "Beyond Flying Geese: The Expansion of East Asia's Electronics Trade," *German Economic Review*, 4 (2003), pp. 35-51.

[15] Daisuke Hiratsuka, "Competitiveness of ASEAN, China and Japan," in Ippei Yamazawa and Daisuke Hiratsuka, eds., *ASEAN-Japan Competitive Strategy* (Institute of Developing Economies, 2003).

[16] Andrea Ginzburg and Annamaria Simonazzi, "Patterns of Industrialization and the Flying Geese Model: The Case of Electronics in East Asia," *Journal of Asian Economics,* 15 (2005), pp. 1051-1078.

[17] While they also calculated the RCA index for the electronics industry and individual products, they differed in that they used tons as a measure of comparison, focusing not on the world as a whole but on East Asia and America. While the movement of RCA was nearly the same using tons, the interpretation was quite different.

[18] Chihung Kwan, "Chugoku no taito to IT kakumei no shinko de ganko keitairon wa kuzuretaka: Beikoku shijo ni okeru Chugoku seihin no kyosoryoku niyoru kensho" [Has the Flying Geese Pattern Collapsed as a Result of China's Rise and IT Revolution? Inspection of Competitiveness of Chinese Products in the US Market], *RIETI Discussion Paper Series*, 02-J-006 (2002).

[19] Lall's trade sophistication index is represented as $Sli = \Sigma(Xik/Xiw)*Yk$. Here, Xik is the volume of export of product i from country k, Xiw is the volume of export of that product on the international level, and Yk is the level of income of country k. Kwan (2002) termed this sophistication index the "value-added indicator" (Lall et al. 2005). But Kwan's target of analysis is limited to exports to the US, and it is necessary to be aware that there may be fluctuation in the RCA index and other such measures between countries. For example, Tung (2003) discovered that differences between these indices arise upon separating international trade from trade with Japan.

[20] Lifeng Zhu and Nobuo Teramachi, "Nicchukan ASEAN no taibei yushutsukozo no hikaku: Kan shiyu ronbun no kakucho" [Comparison of US Export Structure among Japan, China, Korea and ASEAN: An Extension of Kwan's Paper], *Kyoto Sangyo University Discussion*

of view, as Hiratsuka notes, it is quite possible to say that "[with respect to China,] the flying geese pattern theory has partially collapsed."[21]

These facts imply the following. First, China rapidly attained capital accumulation as well as technological development and has started to compete with advanced countries in terms of trade. China has an enormous population with an abundance of labor, and the era of using low wages as a weapon to gain comparative advantage solely for labor-intensive products is becoming a thing of the past. Second, nevertheless, China does not have an advantage only in capital-and technology-intensive goods in the manner of an advanced country, but continues to show its strength in labor-intensive products. From these facts, it seems that it is not appropriate to view China as a (relatively) low-income country by measuring only per capital income. China has a broader area and larger population than the EU, and similarly has an abundance of diversity. Altogether, China contains "advanced countries" like Shanghai, "middle income countries" like Henan Province and Hebei Province, and "poor countries" like Guizhou Province, and so it is a mistake to measure the factor endowment status of China as a whole solely through the average income level or capital labor ratio. Third, one factor that caused and is in fact one of the most powerful factors behind this diversity has been the presence of FDI from abroad. It is because of FDI that capital could be accumulated more easily and new technology introduced so rapidly.

When this happened, the FDI that China received was certainly not just pro-trade in Kojima's sense of the term. There were many cases of FDI in capital-intensive and technology-intensive industries, such as the automobile and semiconductors industries, that were thus anti-trade with respect to China's factor endowment. This is because foreign capital was not necessarily invested in China solely because of its low cost of labor. One of the factors behind capital-intensive industries entering China in force was due to an agglomeration of industries which would beckon to such industries that had already formed in China, and because a portion of the processes from the advanced countries had shifted to China in order for foreign capital to evince the process fragmentation effect. Also significant is the FDI inducing effect of the domestic market, which has been expanding in China.

The mechanism operating in China, with its large population and high ability to achieve quantitative expansion of the domestic market, was such that its economy's expanding market drew in much foreign capital, which then brought

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[21] Daisuke Hiratsuka, "Competitiveness of ASEAN, China and Japan," in Ippei Yamazawa and Daisuke Hiratsuka, eds., *ASEAN-Japan Competitive Strategy* (Institute of Developing Economies, 2003).

along advanced technology that, with the spillover effect, greatly improved China's level of technology and thus resulted in an even greater ability to grow. This mechanism was one powerful factor behind China's new development pattern, one that would leapfrog FGP development.

3. Trends of the Sino-Japanese Economic Relationship

Against the above backdrop, let us now examine the characteristics of China's international economic relations and economic development focusing on the Sino-Japanese economic relationship (rather than taking a general look at China's external economic relationships). Here, as preparation for the arguments in the next section, the Sino-Japanese economic relationship and its trends since China's "reform and openness" will be examined solely from the point of view of trade and investment.

It must be stressed here that our analysis focuses on the situation until 2010 when the Sino-Japanese economic relationship was quite normal. After 2012, when the Senkaku islands issue occurred, a new and irregular relationship surrounding the two countries happened to take place, resulting in a dramatic drop in Sino-Japanese trade, which is beyond the scope of our studies in this article.

(1) Trade

To Japan and China, each country is an indispensable trade partner to the other, but this position has changed over time. First is an examination of China's dependence on trade with Japan.

	1981	1995	2000	2005	2010
Total trade	25.4	20.5	17.5	13.0	10.0
Export	22.1	19.1	16.7	11.0	7.7
Import	28.6	22.0	18.4	15.2	12.7

Table 3: China's Dependence on Trade with Japan (%)
Source: *China Statistical Yearbook* 1981, 1995, 2000, 2005, 2010.

At the beginning of the 1980s, the degree of dependence on trade with Japan constituted 25% of the overall value of trade, but this progressively decreased, falling to 10% in 2010. While this drop indeed marked a relative decrease in the importance of Japan as a trade partner, it actually indicates that as the Chinese economy has developed and expanded in scope, its trade partners have become more diverse. It goes without saying that the absolute value of trade with Japan

has continued to grow, and as will be discussed below, from a qualitative viewpoint the importance of Japanese trade has not at all declined. In 2010, China's trade with Japan ranked just below trade with the US at the number two spot. From Table 3, it can be understood that China has consistently had a trade deficit with Japan until 2010. On the other hand, China has accrued a massive trade surplus with the West, particularly the US. The trade deficit with Japan is far smaller than the trade surplus with the US, and so the former is completely cancelled out by the latter.

Now, what proportion of Japan's trade has been rerouted to China? Here, the proportion of trade with China until 2010 will be examined using Japanese trade statistics.

	1981	1995	2000	2005	2010
Total trade	3.5	7.4	10.0	17.0	20.7
Export	3.3	5.0	5.2	13.5	19.4
Import	3.7	10.7	13.2	21.0	22.1

Table 4: Japan's Dependence on Trade with China (%)
Source: Japanese Ministry of Finance Trade statistics, 1981, 1995, 2000, 2005, 2010.

Standing exactly opposite to the situation with China's trade dependence on Japan, the proportion of trade with China has progressively increased, and starting in 2009, China passed the US to become Japan's largest trade partner. In 2010, combined imports and exports rose to a level exceeding 20% of the total.[22] There is no consistency at a glance between this and Table 3. Table 3 shows that Japan has a current account surplus with China, but by contrast it appears from Table 4 as though Japan had a trade deficit with China. However, when Hong Kong is added as a partner in Japan's trade with China, Japan nearly consistently tallied a trade surplus.

The above point indicates that relatively speaking, China's trade importance to Japan has increased, and China's market is becoming indispensable to Japan. In order to determine why this occurred, it is necessary to delve into the structure of Sino-Japanese trade[23] (See Section 4 below).

(2) Direct Investment

Next, the Sino-Japanese economic relationship and its movements will be examined from the point of view of FDI. Here, too, both Chinese statistics and Japanese statistics (both have conceptual differences and do not match) are used

[22] Including Hong Kong, China became the greatest trade partner in 2007.
[23] The international input-output table can be useful if we want to know how Sino-Japanese trade has impacted on domestic industries in each country, but such a study remains to be seen.

primarily to investigate the relative importance of Japanese capital to China.

First, the share of Japanese capital (utilized) in China capital is much less than that is from Hong Kong. Even in 2010, it failed to exceed 4% of the overall amount of foreign capital received by China, and was less than 10% of Hong Kong capital. Of course, there was an investment boom by Japanese corporations in China in the mid-1990s and the first half of the 2000s, with many enterprises investing large quantities in China, but even then it remained below investment from Hong Kong[24] (see Table 5).

	1994	1995	1999	2000	2004	2005	2009	2010
Total	3394584	3780569	4031871	4071481	6062998	6032459	9003267	10573235
Hong Kong	1982268	2018511	1636305	1549998	1899830	1794879	4607547	6056677
Japan	208616	321247	297308	291585	545157	652977	410497	408372
% of total								
Hong Kong	58.4	53.4	40.6	38.1	31.3	29.8	51.2	57.3
Japan	**6.1**	**8.5**	**7.4**	**7.2**	**9.0**	**10.8**	**4.6**	**3.9**

Table 5: Direct Investment in China by Region (10,000 US dollars and %)
Source: China Statistical Yearbook, 1994~1995, 1999~2000, 2004~2005, 2009~2010.

External investment from China is rapidly expanding along with China's economic development, but much of it is investment related to resources; for example, China has been investing large quantities with the aim of extracting as well as importing petroleum and natural gas from Africa and Central Asia. Although Chinese direct investment in Japan has increased little by little over the past 10 years, it is far less than Japan's investment in China (See Table 6).

	Outward	Share of world total (%)			Inward	Share of world total (%)		
	Total	Manu-facturing	Total	Manu-facturing	Total	Manu-facturing	Total	Manu-facturing
Asia	199,941	127,973	26.7	35.7	20,689	2,826	11.8	4.6
China	**64,677**	**48,017**	**8.6**	**13.4**	**435**	**209**	**0.2**	**0.3**
USA	213,708	95,135	28.6	26.5	55,003	7,097	31.3	11.5
Europe	179,188	95,607	23.9	26.6	79,078	46,949	45.1	75.8
World	748,280	358,887	100.0	100.0	175,482	61,942	100.0	100.0

Table 6: Japan's Direct Investment by Region, end of 2011 (100 million yen)

[24] If investment in China via Hong Kong, the total volume of Japanese investment in China may become much larager.

Source: Bank of Japan Balance of Payment Statistics, at http://www.boj.or.jp/statistics/br/bop/index.htm

Looking at the investment balance outstanding at the end of 2011, Japan's investment in China is about 6.5 trillion yen, while China's investment in Japan is 43.5 billion yen, or a mere 0.7% of the previous figure. In other words, investment differs from trade in that it has not been a bidirectional relationship; rather, up to the present time, it has been a unidirectional relationship with Japan investing and China receiving.

In a sense this is quite natural. Since distance is an important determining factor in the case of trade: As indicated by the gravity model of trade, with other conditions being held constant, the value of trade increases with proximity. In the case of investment, however, funds do not have any weight: If there are resources, if there is a market, or if there is a need for production, then necessity outweighs distance. Moreover, the relationship between trade and investment is very different in China and in Japan. When investing in China, a structure exists wherein Japanese corporations move a portion of their production sites to China, exporting the intermediate products and final goods produced there to Japan. By contrast, there are many cases in which investment in Japan occurs through corporate acquisitions for Chinese companies to obtain technology owned by Japanese corporations, the aim of which is not the pure expansion of trade.

4. The Substituting/Complementary Relationship in Sino-Japanese Trade

It is frequently said that the Sino-Japanese trade relationship is not substituting, but complementary.[25] Consequently, if Sino-Japanese trade is developed, a win-win relationship would develop rather than Chinese products driving out Japanese products in the Japanese or global market . Behind this argument lies the understanding that China's economic development fits the form of the flying geese pattern, and that it is following a process of catch-up industrialization, as seen in Figure 1.

Therefore, in order to investigate whether Sino-Japanese trade is in fact complementary rather than competitive, the similarity index of the trade structures of both countries and its movements will first be examined. Here, a similarity index is calculated in a form slightly different from, but essentially same as that of Lall *et al.* above.[26] As one possibility, it may be that if Chinese and Japanese trade

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[25] Chihung Kwan, "Chugoku kyoiron ni igi ari" [Against the China Threat Argument] (2001), at http://www.rieti.go.jp/users/china-tr/jp/010910ntyu.htm.

[26] More specifically, the export similarity index is defined as $(ESI)=100-\Sigma_p \mid S^s_{tp} - S^d_{tp} \mid$. Here, s represents the Sino-Japanese export structure (with shares of individual goods in

structures are very similar, they are very substituting/competitive, but if not, they are complementary. What has the similarity relationship been between Japanese and Chinese export structures from the beginning of the 1980s to the present day? (See Table 7)

	1981	1985	1990	1995	2000
Foods	15.0	12.2	7.2	4.4	3.4
Textile	22.0	26.0	25.4	19.6	14.9
Pulp, paper, wood	7.3	5.0	7.7	10.1	7.6
Stone, clay, glass	1.3	0.7	1.0	1.1	1.0
Oil and gas	22.0	26.0	6.1	1.8	1.6
Iron and steel	5.6	4.4	1.9	0.5	0.9
Chemicals	1.3	0.7	1.5	2.4	3.4
General machinery	11.3	14.0	19.1	19.4	12.7
Electrical machinery	18.6	22.5	13.4	15.5	10.7
Household electric appliances	6.6	7.0	1.6	4.7	4.0
Precision machinery	2.3	1.9	2.3	1.8	1.8
Transport equipment	25.9	24.9	23.0	17.5	17.8
Toys and Miscellaneous goods	1.3	4.1	12.2	15.3	14.7
Total	140.7	149.3	122.4	114.0	94.5
Similarity index (100-Total)	-40.7	-49.3	-22.4	-14.0	5.5

Table 7: Similarity Index of Trade Structure between China and Japan (%)
Note: For similarity index of trade structure, see footnote 26 of the text.
Source: Author's calculation based on RIETI-TID 2011 data

It has already been noted that the level of similarity between OECD and Chinese exports has been progressively rising, but the table illustrates that in the relationship with Japan, a member of the OECD, the level of similarity with the Chinese export structure has risen rapidly since the start of this century. The primary products among China's exports shifted from oil and gas, foods, and textiles, which are resource- and labor-intensive products, to general machinery, electrical machinery and household electrical appliances, or machine products. This change has been a major factor in the increase of the level of similarity between the export structures of Japan and China.

However, a high level of similarity in exports does not guarantee a sub-

percentages). Where both countries' trade structures correspond perfectly, ESI=100, and in zero correspondence, ESI= -100.

stituting relationship. Suppose a horizontal division of labor proceeded between Japan and China. For example, if Japan had an advantage and competitive export strength in large household electrical appliances, and China had an advantage in small household electrical appliances, it would be possible to see a substituting relationship progressing despite a high level of similarity in the exports of both countries. On the other hand, if Japan exported components for household electrical appliances and China exported finished products, the components and the finished products would be complementary, and so it could be determined that there are strong complementarities between these two countries from the point of view of a vertical division of labor despite the high level of similarity in export structure. Thus, a high similarity index in the exports of household electrical appliances can be interpreted as indicating both a substituting relationship and a complementary relationship, and the conclusion would depend on what SITC level was used to measure the similarity.

What can be said about the complementarities between Japanese and Chinese trade from the level of similarity of the countries' export structures to the world is extremely limited. Then, take a look at the similarity between the export structures of the two countries limited to just Sino-Japanese trade. Due to the availability of data, it is only possible to compare the 20-year period starting in 1990, while excluding resource-intensive industries such as petroleum and gas where the export products of the two countries is completely different, and further excluding labor-intensive industries such as foods and textiles in which China has an overwhelming advantage. The calculation of the similarity index was limited to the industries of steel and iron, chemicals and machinery, in which the complementary/substituting relationship within the industries is relatively clear.

	1990	1995	2000	2005	2010
Chemicals	95.42	95.64	92.08	93.67	95.47
Iron and steel, Nonferrous metals	90.80	94.89	94.61	96.34	95.71
General machinery	87.15	80.29	89.95	98.76	97.60
Electrical machinery	82.53	90.02	86.36	89.94	96.28
Household electric appliances	99.48	99.46	97.56	95.36	92.88
Precision machinery	99.12	98.73	98.48	96.55	96.24
Transportation Equipment	92.36	98.77	98.02	97.67	93.83
Total	46.87	57.79	61.94	77.57	82.25

Table 8: Export Similarity Index for Sino-Japanese Trade (%)
Source: Author's calculation based on RIETI-TID 2011 data

The following conclusion seems derivable from Table 8. First, the entire export structure from each country to the other is becoming progressively similar. This movement indicates that China is also exporting to Japan what Japan is exporting to China, in other words, Japan started importing the similar sorts of products from China. Rather than a substituting, competitive relationship between the markets of both countries proceeding, a complementary relationship is developing in these industries. As is implied by the first type of the flying geese pattern, it is generally uncommon that the exactly same goods could be imported as are exported.[27] This trend is seen specially in general machinery and electrical machinery, and it suggests that Japan's investment in China was quite active in these areas. On the other hand, in steel and iron and chemicals, as well as in transport equipment and precision machinery, the similarity index of exports by each country to the other was high at the outset, with no major changes observed over the 20-year period. This is likely a result of an intrinsic segregation in these sectors, in which the competitive relationship between the products of both countries was weak.

In order to further investigate this point, let us analyze the structure and changes of the export products with respect to steel and iron, which had a high export similarity index (see Table 9).

	1990	1995	2000	2005	2010
Primary goods	93.66	99.86	97.92	91.01	90.74
Processed goods	92.22	95.78	89.16	98.73	99.04
Capital goods	99.79	99.90	97.78	98.51	98.65
Consumption goods	99.04	95.60	89.99	92.40	92.13
Parts and components	99.73	99.58	99.31	98.62	99.09
Total	84.45	90.72	74.16	79.26	79.65

Table 9: Export Similarity Index for Sino-Japanese Iron and Steel Trade (%)
Source: Author's calculation based on RIETI-TID 2011 data

The export products are divided into primary goods, processed goods, capital goods, consumption goods, and parts and components. Among these, the similarity index barely budged for capital goods or for parts and components over the 20-year period of inquiry, and for the other categories, the similarity index has been

[27] Certainly, depending on time and price, it is possible that two countries will import and export the same type of good in the same year. For example, Japan may happen to import the same goods that it has usually exportd to China when its domestic demand for the goods cannot be satisfied by local production. However, because import-export is by nature doing business with the international competitive market, when price conditions, quality and other factors are similar, it is uncommon for same goods to be imported and exported at the same time.

decreasing.[28] Overall, the level of similarity between Japan and China in steel and iron exports has decreased slightly, and with detailed research on this reserved for the future, it seems there is a trend towards stronger complementarities in the steel and iron trade between the two countries. To put it another way, a likely interpretation probably is as follows; while the level of export similarity between the two countries in the iron and steel industry as a whole is high, its internal structure of exports is becoming progressively more different to the extent that complementarity is strengthening.

	1990	1995	2000	2005	2010
Primary goods	-35,620,186	47,434,528	174,292,526	1,226,392,919	2,159,329,093
Processed goods	982,243,736	1,756,794,625	2,415,598,894	4,185,711,049	10,405,064,013
Capital goods	3,087,854	12,596,277	-41,289,560	-73,654,359	-58,349,920
Consumption goods	-788,202	-93,125,324	-222,902,844	-483,984,850	-638,213,103
Parts & components	2,173,363	29,751,781	24,680,368	309,501,912	522,259,962
Total	951,096,565	1,753,451,887	2,350,379,384	5,163,966,671	12,390,090,045

Table 10: Japan's Net Export of Iron and Steel to China (yen)
Source: Author's calculation based on RIETI-TID 2011 data

However, the similarity index is not only a benchmark for observing relative relationships. Then, net exports within steel and iron exports/imports between the two countries will be examined (see Table 10).

In terms of total value, Japan's trade surplus has been expanding, but most of this has been due to semi-finished product exports. On the other hand, Japan is a net importer of consumption goods, indicating that China is gaining competitive strength in this direction. In the realm of capital goods as well, Japan was once a net exporter but has recently become a net importer. This shift also signifies China's increasing competitive strength, with a substituting relationship starting to develop between Japan and China.

In other words, with industry as a whole strengthening and maintaining its complementarity, there are areas at the level of individual products in which substituting and competitive relationships are increasing. This tendency may serve as indication that Sino-Japanese trade is developing in a complicated complementary/substituting relationship.

[28] Because the nature of the similarity index described here differs somewhat from the index above, it is dictated by the proportion of various iron and steel products to the total amount of iron and steel exports.

5. Asymmetry in Investment and Technology

In the case of trade, a competitive (substituting) relationship is strengthening between Japan and China, but in investment and technology, a complementary, or rather a unidirectional relationship, is continuing. Namely, Japan is the side making transfers, and China is the side being transferred to in this case. As stated above, China's investment in Japan is gradually growing, but it cannot compare in size to Japan's investment in China. When it comes to technology, Japan has an overwhelming excess in exports to China.

Nevertheles, this trend is not expected to continue into the future. China's economy which stood at only one-fourth the size of Japan's in the year 2000, grew so rapidly that it surpassed Japan in 2010. If China continues to grow at this rate over the next 10 years, it is plausible that investment in Japan would skyrocket as China's technological progress advances to the point of outstripping South Korea and Taiwan. One barometer for this may be found in a comparison of the number of approved patent applications submitted to the US Patent and Trademark Office by country/region of Asia.

As is clear in Table 11, Japan holds the top position in Asia by far, but South Korea is swiftly rising upwards. China is far below South Korea and Taiwan, but looking at growth rate, it is expected to surpass Taiwan in less than five years. Further, if the flying geese pattern of development applies to technology as well, it is conceivable that China, racing from behind, will have already passed the ASEAN countries and be rapidly closing in on Taiwan.

	1995	2000	2005	2010	2010/1995
Japan	21764	31295	30341	44814	2.06
Korea	1161	3314	4352	11671	10.05
Taiwan	1620	4667	5118	8238	5.09
Hong Kong	86	179	283	429	4.99
Singapore	53	218	346	603	11.38
Indonesia	4	6	10	6	1.50
The Philippines	4	2	18	37	9.25
Malaysia	7	42	88	202	28.86
Thailand	8	15	16	46	5.75
China	**62**	**119**	**402**	**2657**	**42.85**

Table 11: Number of US Patents Granted as Distributed by Year of Patent Grant
Source: US Patent and Trademark Office (December 2011) at http://www.uspto.gov/web/offices/ac/ ido/oeip/taf/cst_utl.pdf

Of course, the level of technology cannot be represented by patents alone. Also, the number of patent applications in the US does not represent the entirety of patent application ability. However, even if another indicator with a deep connection to the level of technology were to be introduced—for example, the number of patent applications in other advanced countries aside from the US, the total number of engineers in the country, the number of graduates from departments of science and engineering, or the number of technical research centers—it is certain that such measures of China's latent ability would not downgrade China's status in technological level.

Compared to China, where the technology to design and produce high speed trains was introduced or copied from Japan and Germany, and sophisticated technology to reach the international standard was learned within a short period of time, the higher income countries like Malaysia, Thailand, *etc*., and even the advanced country of Singapore do not have China's level of technical ability. Of course, the population scales of these countries differ, and so it may be that this simple comparison of countries' technological levels is not appropriate. However, in China's case, it is not just that there is a large population; the technological accumulation since the Maoist era, as well as the powerful policy of using foreign capital to bring in advanced technology, have been crucial.

It can be understood from comparing the history of the development of automobile industries in Taiwan and China that technological level and speed of advancement are not simply determined by the income level of a country. Namely, Taiwan has been striving to nurture its own automobile industry for many years but is without any completely homegrown companies, all of them existing under the umbrella of Japanese and American automobile capital. However, in China there are companies such as Qirui, which was founded in 1997 and has now grown to the point of exporting automobiles with its own brand, and there is Geely, which acquired the powerful brand Volvo and is attempting to gain technological strength. In searching for the background behind why this "reversal phenomenon" occurred between China and Taiwan, one arrives at the differences in government policies and a disparity in technology accumulation strength, as mentioned above. In China, the state is central and served as an actor in a financial role in the development of the automobile industry, whereas Taiwan's actors were small-scale private firms. What is important, though, is that it is not the fact that they were state-owned that the corporations became large and were able to develop. If the arrangement were such that a state-owned corporation monopolized the automobile industry during the Maoist era, there would not have been such rapid development in the automobile industry. It was the competition among state-owned enterprise and creation of ties to foreign capital along with the allowance of participation by private companies that the dynamic strength within

the development of China's automobile industry arose.

With respect to the technological level, there is a very large gap between Japan and China, as indicated by the figures in Table 11, and it will not be easy for China to catch up with Japan. However, as seen in China's leap-frogging development in trade, there is a thorough possibility that the same phenomenon is partially occurring in technology as well. For example, China has already gained a global share in the production of solar panels and is making new research and development investments in that direction. Although China is still currently at the stage of increasing its global share through mass production, relying on low-wage labor and using low cost as a weapon, it is not impossible that the technology for solar panels of higher quality and lower cost than those from Japan will arise in China and sweep the globe. This is reminiscent of South Korea's Samsung, which succeeded in developing scaling-up technology that still surpasses that of Japanese companies in the organic EL television business, in which Sony had originally succeeded in development and commercialization. Technology is not only created in countries with high income and then transferred to lower income countries in such a way as Figure 1 indicates. We must not forget that China has been rapidly gaining strength in technological development, behind which lies the strong tailwind provided by the state, and that there is intense market competition between numerous private corporations.

Conclusion: From a Complementary to a Competitive Complementary Relationship

It was approximately ten years ago that the majority came to view the economic relationship between Japan and China not as the competitive, substituting relationship proposed in the "China threat" argument, but as a completely complementary relationship. However, it seems that these optimistic views must be re-examined. A correction must be made to the traditional, commonly-held view that, as the flying geese pattern theory and the theory of catch-up industrialization suggest, there is a hierarchy in comparative advantage and technological level that is in accordance with a country's stage of economic development, and that even if the gap between countries shrinks due to differing speeds of development, a less-advanced country would never leapfrog an advanced country. There is indeed a clear difference in comparative advantage and a huge technological gap between Japan and China. Consequently, this is not to say that the FGP theory and the theory of catch-up industrialization have become completely obsolete. These models remain valid basically for understanding the development pattern of China. The point is that these models do not completely explain phenomena that

are appearing more and more in a variety of industries and areas.

Now that China has developed economically, increased its technological level and enabled diverse industries, the economic relationship between Japan and China cannot be completely complementary. Much as the FGP pattern theory has partially collapsed, trade between Japan and China has also progressively expanded into substituting and competitive areas. In the past, Japanese enterprises were entirely reluctant to extend advanced technology to China in fear of a boomerang effect, but a situation is arising in which China has either developed that technology itself or imported it from countries other than Japan, rendering Japan unable to be the country to sell it to China. Faced with this fact, Japanese enterprises must determine, in extending technology and making investment decisions, what to yield to China, when to compete with China, and where to cooperate with China.

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