Competence Center money trade finance and development

Berlin Working Papers on Money, Finance, Trade and Development

Working Paper No. 07/2014

Production Sharing in East Asia: China's Position, Trade Pattern and Technology upgrading

Laike Yang

June 2014

In cooperation with

DAAD partnership on economic development studies

Hochschule für Technik und Wirtschaft Berlin
University of Applied Sciences

Production Sharing in East Asia: China's Position, Trade Pattern and Technology upgrading

Laike Yang[1]
East China Normal University, School of Finance and Statistics, 200241, Shanghai, China

ABSTRACT

International production sharing and trade fragmentation has become a key feature of East Asian economic development in recent decades. China has taken advantage of this process and has transformed into a global manufacture center within a thirty-year period. The emergence of China has led to the restructuring of the Asian production network and changed the trade pattern in the region. Firms in advanced Asian economies have relocated their production to China, using it as an assembly base and exporting their final products to the US and Europe. This paper analyzes these trends and changes in the region, studying China's position in East Asia's production sharing and trade fragmentation, as well as ascertaining how it influences China's industrial and technological upgrading. We find that China has moved to the Center of East Asia's production network and become the key partner of its neighboring countries. China's manufacturing technology has significant upgraded. There is a technology convergence between China and ASEAN-4, although the gap between China and Japan and South Korea remains fairly large and noticeable.

Key words: Production Sharing; Intra Industry Trade, East Asia, China

JEL Classification: F14; F15; F19

1. Introduction

East Asia has followed a so-called "Flying Geese" development model since around the 1950s. Under this model, the GDP of many economies in this region has more than tripled. Led by Japan, followed by Asia's Newly Industrialized Economies (NIES) and later joined by ASEAN 4 (Thailand, Malaysia, Indonesia and Philippines) and China, the economies took off one after another across around half a century.

[1] This paper has been presented on the the Workshop "Development Strategies: Country Studies and International Comparisons" which was held in Shanghai between November 11 and 16, 2013, organized by the East China Normal University and HTW Berlin within the framework of the DAAD partnership on Economic Development Studies.The paper is supported by China National Social Science Fund (Grant No. 11BGJ036), Research Project of Ministry of Education of China (Grant No. 10YJA790221) and Research Project of Shanghai Municipal Government (Grant no. 2010BGJ001). However, viewpoints of the article are of the author and not of any of mentioned organizations. All errors solely remain to the author. Corresponding e-mail: lkyang@bs.ecnu.edu.cn. Tel.: +86-13585828580. Fax: +86-21-52068520.

During the same period, East Asia experienced an unprecedented change in its industrial relationship and international trade patterns. Until the 1980s, East Asian trade was clearly dominated by a typical North-South vertical division of labor, with trade between China, South Korea, Taiwan, Hong Kong characterized as typical inter-industry trade. The developing East Asian economies exported resource-based and labor-intensive products to Japan, while Japan exported a wide range of final manufactured goods to its neighbors. This trade pattern is well explained by classical trade theory (Mitsuyo Ando, 2006). However, in the last two decades, and particularly in last 10-15 years, two important changes have emerged in East Asia. First, international production sharing has become a unique feature of the region's economic landscape. Trade in parts and components (fragmentation trade) has not only grown faster than that in other part of the world, but also faster than Asia's trade in final goods. Production is vertically fragmented between East Asian economies, with each country/economy specializing in a particular stage of the production sequence and each picking one slice of value chain within an industry. The consequence of this phenomenon is the increased inter-dependency between developed and developing Asia nations. Developed and newly-industrialized Asia economies depend on developing Asia's cheap labor, rich resources and attractive market while Asian developing countries depend on the importation of high-technology parts and components from Japan, Korea and Taiwan. Secondly, China has moved from a periphery country to the center of the production network in Asia. China has transformed from a primary good supplier to a major manufacturing and assembly center within the regional production network.

Many questions have arisen from these changes. For instance, what is the impact of the production fragmentation on the trade balance in East Asian countries? Has China successfully upgraded its technology level by moving upward in the value chain? What is the impact of the production sharing on China's export competitiveness? What are the new trends of trade and production in East Asian?

This paper analyzes the development and trends of production sharing and trade pattern in East Asia, as well as China's role in this network and the impact of the production fragmentation on China's competitiveness and technology upgrading. The study focus on trade in machinery and transport equipment (SITC7) and miscellaneous manufactured articles (SITC8), given that they account for more than 70% of China's exports and about 50% of China's import. Moreover, they are the most integrated industries in East Asia and represent the production sharing network in the region. The data that we use is mostly from the UN Comtrade database. The remainder of this paper is structured as follows. Section 2 reviews existing literature on this issue and related topics. Section 3 analyzes the evolution and current situation of production sharing and trade fragmentation in East Asia, while Section 4 examines China's role in the network and how it has changed. Section 5 discusses the impact of this phenomenon on China's trade balance and technology upgrading, before Section 6 presents the key policy implications.

2. Literature Review

International production sharing, namely the cross-border splitting of the production process within vertically integrated manufacturing industries, has been a key facet of economic integration over recent decades, particularly in East Asia. The associated spatial diversification of production activities has been the main driver of the rapidly growing trade in parts and components between developed and developing countries, largely motivated by taking advantage of cheap production costs in developing countries. Many alternative names have been coined for such a phenomenon, including "slicing the value chain" (Krugman, 1995), "vertical specialization" (Hummels, Ishii and Yi, 2001), "international production sharing" (Ng. and Yeats, 1999 & 2003) and "outsourcing" (Hanson, et al., 2001).

There is a sizeable body of theoretical literature examining the causes and modalities of international product fragmentation, as well as its implications for trade flow analysis and trade policy (Cantwell, 1994; Venables, 1999; Jones, 2000, Jones and Kierzkowski, 2001; Jones, R.W., Kierzkowski, H., and Lurong, C., 2004; Baldwin, 2001; Deardorff, 2001). This literature assumes that this form of international trade is much more sensitive to inter-country differences in technology, labor supply, logistic efficiency and the overall production costs.

Although trade in parts and components has generally grown faster than total world trade in manufacturing goods, the degree of East Asia's dependence on this new form of international specialization is proportionately larger than in North America and Europe (Athukorala, 2003, 2006, 2011and 2012; Ng. and Yeats, 2001 and 2003; Athukorala and N. Yamashita, 2008;). Accordingly, literature on Asian production networks and trade fragmentation has mushroomed since the early-2000s. Most of the literature focuses on: a) the evolution and features of the East Asia production network (Ando, 2006; Kimura and Ando, 2005; Kimura et al., 2007; Athukorala, 2006 &2010; Ando and Kimura, 2003 and 2010); b) the causes of East Asian production sharing and fragmentation (Ando and Kimura, 2003; Kimura, 2009; c) the determinants of East Asian trade in parts and components (Athukorala, 2006; Kimura, 2007); and d) China's role and impact upon East Asian production networks (Mona Haddad, 2007; Yu Chunjiao & Xu Ling, 2010; Yu Chunjiao & Wang Xuefei, 2012).

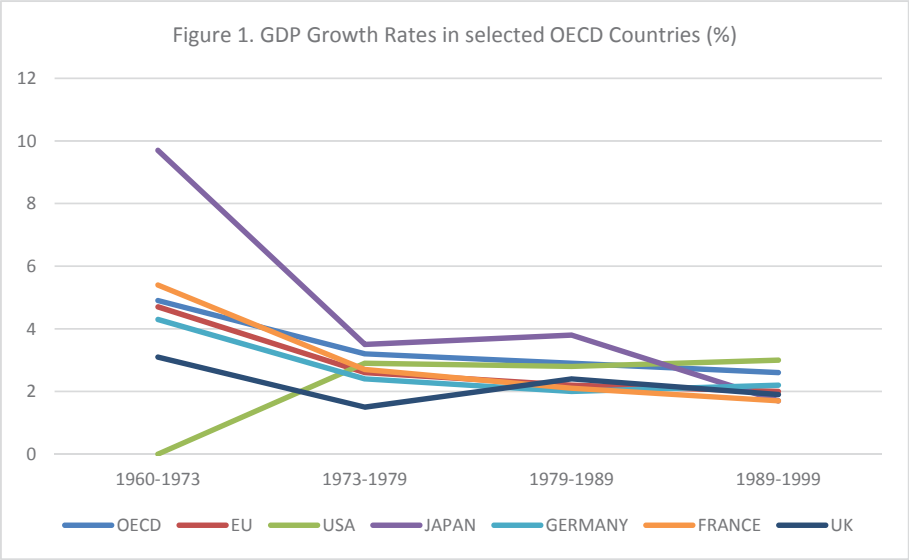
From a methodology perspective, three main methods have been applied to analyze the international production sharing. The first such method involves measuring vertical specialization using input-output data, as developed by David Hummels, Jun Ishii and Kei-Mu Yi (Ishii, J., & Yi, Kei-mu, 1997, Hummels, D., Ishii, J., & Yi, Kei-Mu, 1998 and 2001); The second methodology is to analyze trade in parts and components flow, identifying the vertical inter industry trade relationship between countries and economies (Ando, 2006; Athukorala, 2006 &2010; Ando and Kimura, 2008; Falgni P. Desai, 2012). Finally, the third methodology is to analyze the intra firm trade of multinational enterprises, identifying its impact on economic integration (Hanson, G.H., R.J. Mataloni and M.J. Slaughter, 2005; Miroudot, S., R. Lanz and A.

Ragoussis, 2009). This paper follows the second methodology, using the United Nation Commodity Trade Statistics Database (UN Comtrade).

3. East Asia Production Network and Trade Pattern: from the Flying Geese Model to Production Sharing and Trade Fragmentation

From the 1950s to the 1990s, East Asia followed a so-called "flying geese model" in which one economy can lead other economies towards industrialization, like the first goose in a V-shaped formation, passing older technologies down to the followers as its own income rises and it moves into newer technologies. The "Flying geese model" was led by Japan, immediately followed by the Newly Industrialized Economies (NIEs) and subsequently by the ASEAN-4[2], and more recently China and Vietnam. The main driver in the model is the "leader's imperative for internal restructuring" due to increasing labor costs. As the changes in comparative advantages of the "lead goose" cause it to shift increasingly further away from labor-intensive production to more capital-intensive activities, it sheds its low-productivity production to nations further down in the hierarchy in a pattern that reproduces itself between the lower tier countries. The cornerstone of "flying geese model" is the waterfall technological hierarchy between East Asian countries, which allows vertical inter-industry division of labor in the region. However, since the end of the 1990s, and triggered by the Asian financial crisis, the flying geese model has been destructuralized. One reason is the slowing down of the Japanese economy (show in figure 1), which consequently narrowed the technology gap between Japan and the East Asia NIEs. Indeed, this has been narrowed to such an extent that the NIEs are no longer receivers of the production activities shifted from Japan, but rather competitors to Japan in high-technology products market.

[2] ASEAN-4 refers to the 4 major economies in ASEAN, Indonesia, Thailand, Malaysia and the Phillipines.



Source: OECD database.

The second reason is that China's technology has not only caught up the ASEAN-4, but is close to the first and second tier countries in some industries, such as electronics and electrical machinery. China is competing with ASEAN-4 in labor-intensive and medium-low-technology product markets. Consequently, the similarity of export products has increased between Japan and NIEs, as well as between China and ASEAN-4 (see tables 1 and 2).

Table 1. China's Export Similarity with ASEAN-4, 1993 – 2008[3]

	1980	1985	1993	1996	1999	2002	2005	2008
Malaysia	25.32	25.06	20.09	21.72	22.00	31.35	40.07	30.95
Indonesia	25.52	29.37	32.04	31.60	31.48	37.63	31.56	19.03
Philippines	33.50	33.49	33.63	44.84	25.22	36.91	36.10	26.11
Thailand	39.26	43.10	48.95	43.62	41.73	41.93	43.55	35.29
Japan	n/a	n/a	6.40	10.64	11.66	13.15	14.89	n/a
South Korea	n/a	n/a	31.86	22.21	24.33	25.58	25.10	n/a

Source: Xu Xinpeng, Song ligang, 2002, Wai-heng Loke, 2009.

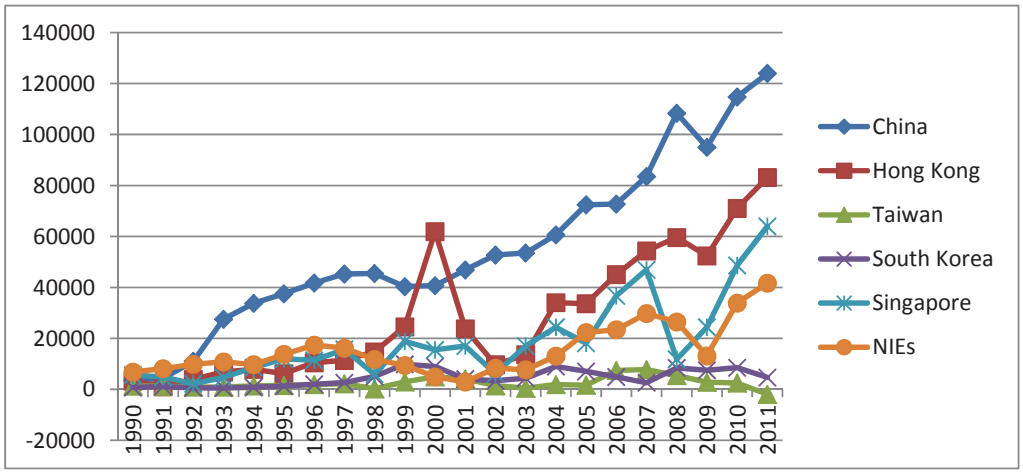
[3] The figures for 1980s are from Xu and Song's study, those from 1990s and 2000s are sourced from Wai-heng Loke's study. Since Xu and Song calculates the gross export similarity whilst Loke calculates the net export similarity, there is a bit inconsistensy with the numbers.

Table 2. Japan's export similarity with East Asia NIEs: 1960s-1990s

year	1965-67	1968-70	1971-73	1974-76	1977-79	1980-82	1983-85	1986-88	1989-91	1992-94	1995-97
S. Korea	29.68	24.10	31.88	35.96	39.29	39.34	38.97	45.42	45.92	51.86	58.41
Taiwan	35.01	30.61	35.95	34.56	38.12	39.14	40.26	40.83	45.71	49.84	53.94
Singapore	48.13	44.77	45.42	45.72	47.22	45.31	48.52	50.75	56.53	56.01	54.97
NIEs	41.3	39.1	41.6	47.2	49.1	51.6	52.0	48.4	47.9	47.5	45.6

Source: Xu Xinpeng, Song ligang, 2002.

Figure 2. FDI inflow in East Asia



Source: UNCTAD database.

Due to the destructuralization of flying geese model, "vertical intra-industry" labor division, or "production sharing", has replaced the "vertical inter-industry" as the new feature of the labor division in East Asia. The trade pattern in the region has also transformed from "vertical inter-industry trade" to "vertical intra-industry trade". Since the early-1990s, production sharing, has become a widespread phenomenon in East Asia, mainly reflected in the trade in parts and components. It has been driven by multinationals relocating their production factories and reorganizing their business activities across different countries in order to reduce costs and improve their production and technological capabilities. The FDI flow has followed the technology hierarchy from Japan and NIEs to China and ASEAN. It has improved labor productivity and technology in receiving countries, as well as changing the industrial geography in the region. While the trade pattern between developed and developing Asian countries was previously characterized as the exchange of primary goods and manufacturing good, in the 1990s and 2000s, it transformed to a domination of trade in parts and components within manufacturing industries (see tables 3 and 4).

Table 3. East Asia's Trade in Parts and Components (100million USD, %)

	P&C Export	Total Export	% of P&C in total	P&C Import	Total Import	% of P&C in total
1992	743	3068	24.21	764	3107	24.59
1997	1584	5513	38.74	1633	5301	30.81
2002	2315	6458	35.86	2345	6498	36.09
2007	3477	14958	23.25	3309	14630	22.62

Source: Compiled and calculated from the UN Comtrade database.

Table 4. World trade in Parts and Components, (1992-2012, %)

	Exports					Imports				
	1992	1996	2000	2005	2010	1992	1996	2000	2005	2010
East Asia	34.5	38.3	39.5	40.8	42.1	33.5	32.8	33.1	34.1	35.3
NAFTA	28.2	24.0	23.9	23.4	22.8	33.5	25.8	27.5	27.0	26.3
EU	32.8	38.0	30.9	30.3	28.3	35.1	33.8	31.5	30.3	29.1
Latin America	0.6	0.6	2.1	3.8	4.6	1.3	2.2	3.7	4.2	4.5
South Asia	0.2	0.2	0.1	0.2	0.3	0.7	0.4	0.5	0.5	0.5
Africa	0.1	0.2	0.1	0.1	0.2	0.4	0.9	0.4	0.4	0.5
World	100	100	100	100	100	100	100	100	100	100

Source: Compiled and calculated from the UN Comtrade database.

Another noticeable change in East Asia is that China has moved from being a peripheral country to the center of the East Asia production network. Due to the massive FDI inflow, East Asian multinationals has relocated a large percentage of their manufacturing bases to China, thus making China a world factory. From the early-1970s to the end of the 2000s, China's share in world non-oil trade increase from 0.8% to 12.7%, while its share in world manufacturing trade increased from 0.5% to 14.9%. China has replaced Japan as Asia's largest trader, accounting for more than 40% of East Asia's non-oil trade (see table 5).

Table 5. China's importance in world non-oil trade and manufacturing trade

	Total non-oil trade (%)			Manufacturing trade (%)			Manufacturing share in total exports (%)		
Export									
	1969/1970	1989/1990	2007/2008	1969/1970	1989/1990	2007/2008	1969/1970	1989/1990	2007/2008
China	**0.8**	**2.9**	**12.7**	**0.5**	**3**	**14.9**	**45.1**	**83.6**	**93.4**
Japan	6.3	10.4	4.6	8.9	12.7	7.4	93.4	98.0	93.2
Korea	0.3	2.2	3.0	0.3	2.6	3.5	75.4	93.6	87.6
Taiwan	0.6	2.7	2.0	0.6	3.1	2.4	71.5	91.9	91.8
Indonesia	0.3	0.5	0.9	0	0.4	0.6	3.8	55.6	41.5
Malaysia	0.8	1.0	1.6	0.1	0.7	1.6	7.2	60.4	70.9
Philippines	0.5	0.3	0.6	0.1	0.3	0.6	10.3	62.8	83.8
Thailand	0.3	0.8	1.3	–	0.6	1.3	7.7	59.6	76.5
East Asia	11.0	23.8	30.7	12.0	26.7	34.8	72.5	90.3	86.6
World	100	100	100	100	100	100	66.5	80.6	68.3
Import									
China	**–**	**2.3**	**7.8**	**–**	**2.3**	**7.7**	**–**	**81.0**	**70.0**
Japan	6.5	7.0	0.6	3.0	5.0	3.6	30.4	57.7	49.3
Korea	0.9	2.3	2.2	0.8	2.2	2.2	59.9	74.8	59.2
Taiwan	0.6	1.7	1.4	0.6	1.7	1.4	69.7	80.1	76.2
Indonesia	0.4	0.7	0.6	0.5	0.8	0.6	80.7	83.0	57.7
Malaysia	0.5	1.0	1.1	0.5	1.0	1.1	63.9	85.6	72.3
Philippines	0.5	0.4	0.4	0.6	0.3	0.4	77.3	76.4	65.3
Thailand	0.5	1.1	1.1	0.7	1.1	1.1	85.9	84.1	68.5
East Asia	11.6	19.9	24.4	8.3	18.3	24.6	47.6	74.1	67.0
World	100	100	100.0	100	100	0.0	66.5	80.6	67.8

Source: Prema-chandra Athukorala, 2012.

Figure 2. China and Japan's position in East Asia and world trade (export, %)

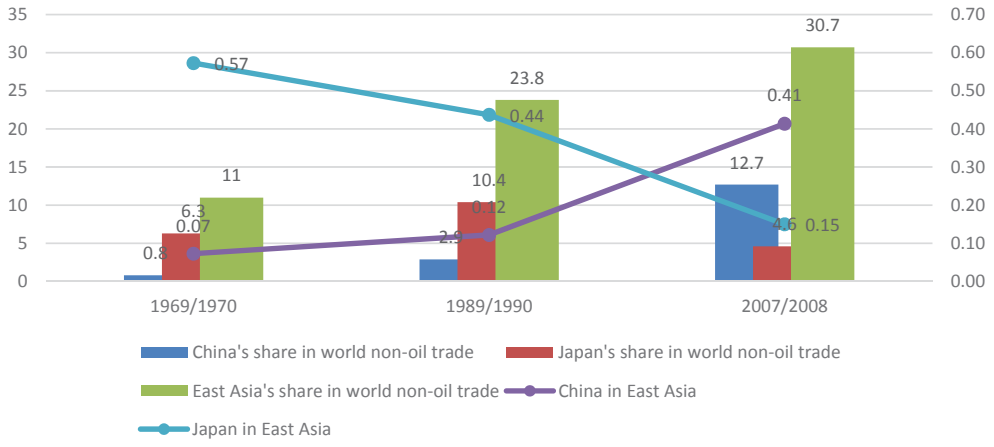
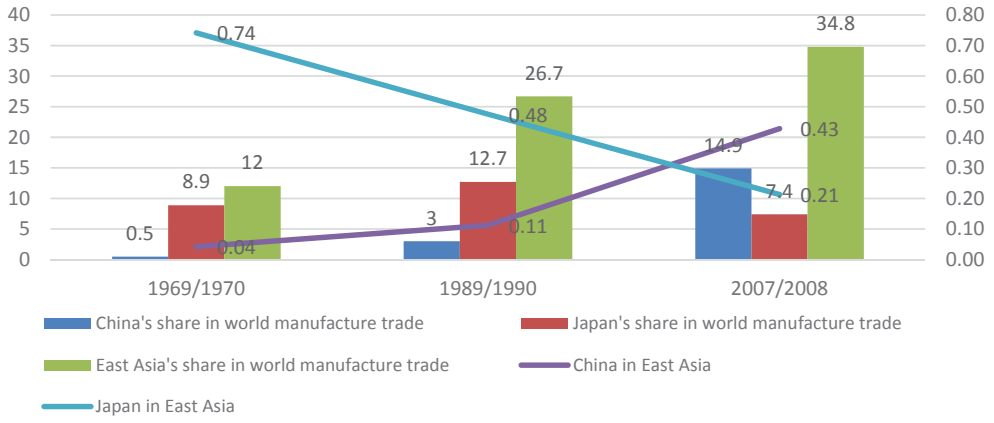


Figure 3. China and Japan's position in East Asia manufacture trade (export, %)



4. The impact on China's export competitiveness and technology upgrade

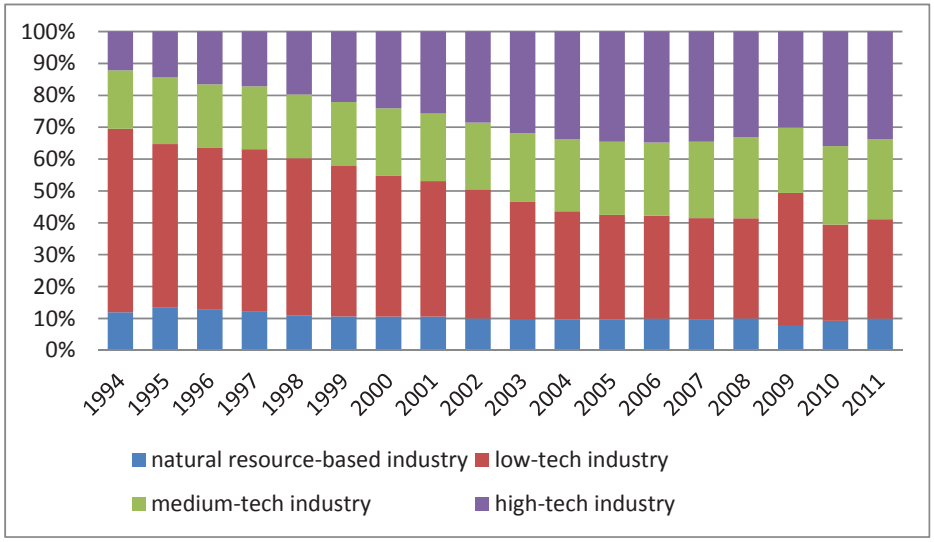
In the transition from the flying geese model to production sharing, China has moved from being a peripheral country to the center of the East Asia production network. China has overtaken Japan as Asia's largest economy and most important trade partner. This prompts the question of whether China has also successfully moved upwards on the technology ladder in East Asia. Does this transformation improve China's export competitiveness and upgrade its technology? In this section, the paper analyzes the technology embodied in China's foreign trade.

There are a few methodologies to calculate a country's technology level of trading products. Lall (2000) developed a classification system in which manufacturing

products were grouped by technology-intensiveness. According to Lall's classification, there are four types of manufactures: natural resource-based manufactures, low-tech manufactures, medium-tech manufactures and high-tech manufactures. This system is based upon the Standard International Trade Classification (SITC Revision 2), in which 18 out of 161 "3-digit" coded products are marked as high-tech manufactures. OECD (2003) has a different, broader classification system, based on the third revision of the International Standard Industrial Classification of All Economic Activities (ISIC Rev.3). In this system, manufacturing industries are grouped by their R&D intensities in production. The third methodology is to measure a country's technology level by computing the share of parts and components (P&C) among total exports, based upon the understanding that the parts and components have higher technology contents and R&D intensity. Aside from these three methods, some scholars have developed a so-called export sophistication index to exam a country's technology development (Michael Michaely, 1984; Hausman at el. 2006; Fan Gang, 2006). Since the OECD method is a coarse classification and the formula of export production sophistication is questionable, this paper uses the first and third methods to exam China's technology structure of export products.

Generally speaking, China's has been fairly successful with technology upgrading in manufacturing sectors during the Asian economic transformation. As shown in figure 3, the share of natural resource-based manufactures in China maintained a relatively constant proportion of 10% from 1994 to 2011, while the share of low-technology manufactures decreased from 58% to 31%. By contrast, the share of high-technology manufactures increased from 12% to 34% and medium-technology manufactures increased from 18% to 25%.

Figure 3. Technological structure of China's manufactured exports, 1994—2011



Source: compiled from from Un Comtrade database.

Given that natural resource-based industries do not reflect the technology intensiveness and is only a very small part of China's exports, we gain a clearer picture of China's technology embodied in exports when we omit such industries from our study. From 1994 to 2011, the share of both high-tech product exports and low-tech product exports decreased, while the share of medium-technology industries (both medium-high-tech and medium-low tech) significantly increased (see figure 4).

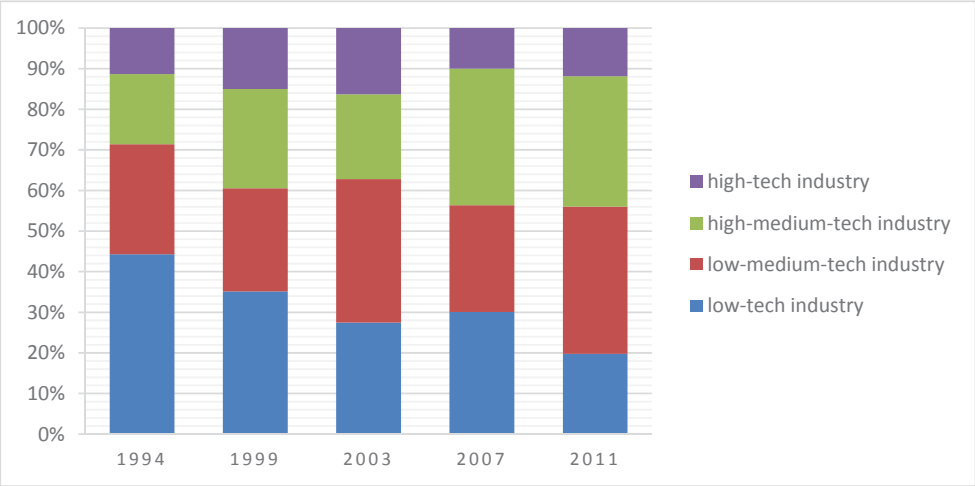
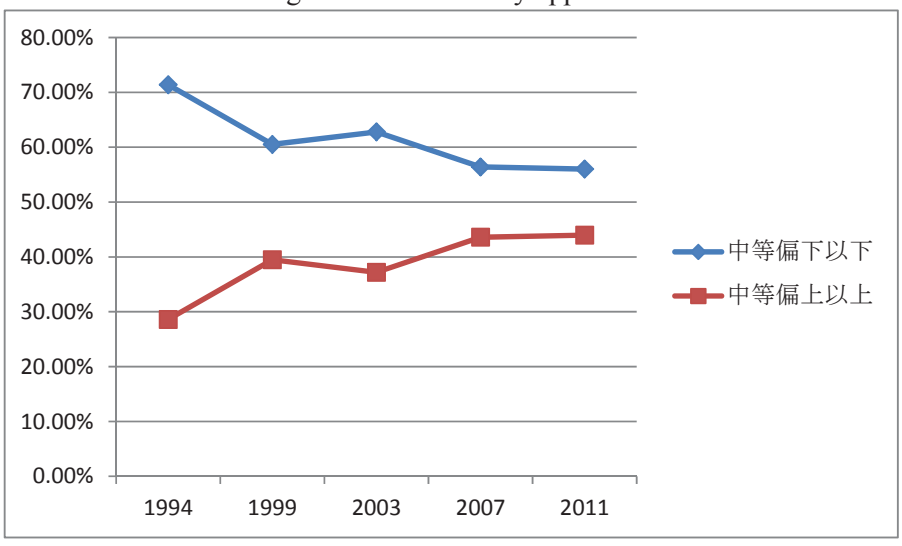


Figure 4 Technology structure of China's export manufacturing industries

When we dichotomize Chinese manufactures into high-technology industry and low-technology industry, the trend becomes quite clear and interesting (shown in figure 5): the share of high-tech product exports continuously increased, while the share of low-tech product exports steadily declined.

Figure 5. A dichotomy approach



The second approach to exam China's technology upgrade and its position in East Asia's production network is to look at the trade in parts, components and accessories. Upon first glance, we find that China's importance in East Asia's trade of input and capital goods has become increasingly significant, with its share of parts, components and accessories having caught up with Malaysia and Thailand, although it remains behind the Philippines, Singapore and South Korea (see table 6). East Asia's import of parts and components from China has increased greatly, while Japan's share has constantly decreased.

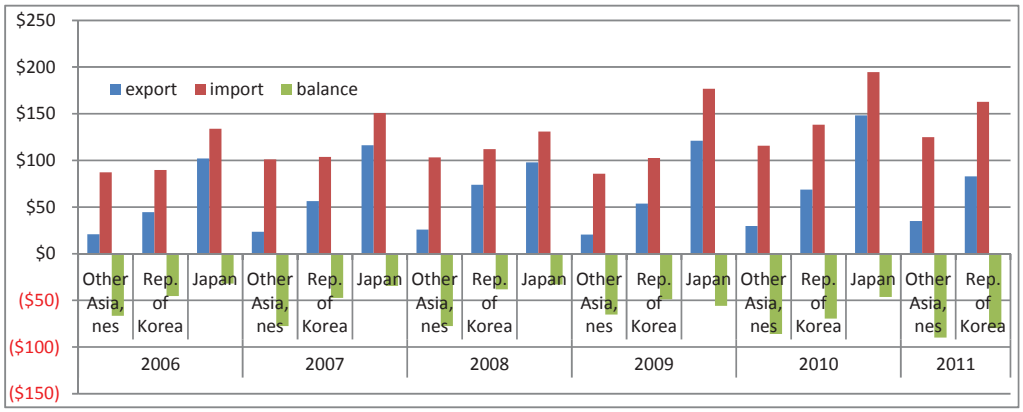
Table 6. Share of parts, components & accessories in total exports in selected countries, 1994 – 2009.

Country	1994	1998	2002	2006	2009
China	4.8	7.8	12.8	14.2	9.9
India	2.4	2.4	3.4	3.7	3.2
Indonesia	2.4	3.7	6.3	4.6	3.9
Malaysia	28.0	32.5	35.9	28.8	16.1
Philippines	11.2	55.3	54.6	50.3	41.9
Singapore	29.1	34.5	38.8	40.3	16.1
Rep. of Korea,	19.9	19.5	21.6	22.4	11.4
Thailand	13.1	25.2	20.5	17.5	9.8
Argentina	3.5	2.6	2.8	2.4	1.9
Brazil	5.7	6.3	5.4	5.1	3.5
Mexico	14.7	15.4	16.5	15.1	11.0

Source: Author's calculation based on Un Comtrade

However, if we explore the details of the region's trade in parts and components, we find that China's trade with its neighbors is highly imbalanced. For instance, China reports large trade deficits with Japan, South Korea and Taiwan in the parts and components trade. Accordingly, China heavily depends on the import of parts and components from developed Asian economies to support its massive exports in manufacturing industries, particularly machinery and electronics (see figure 6).

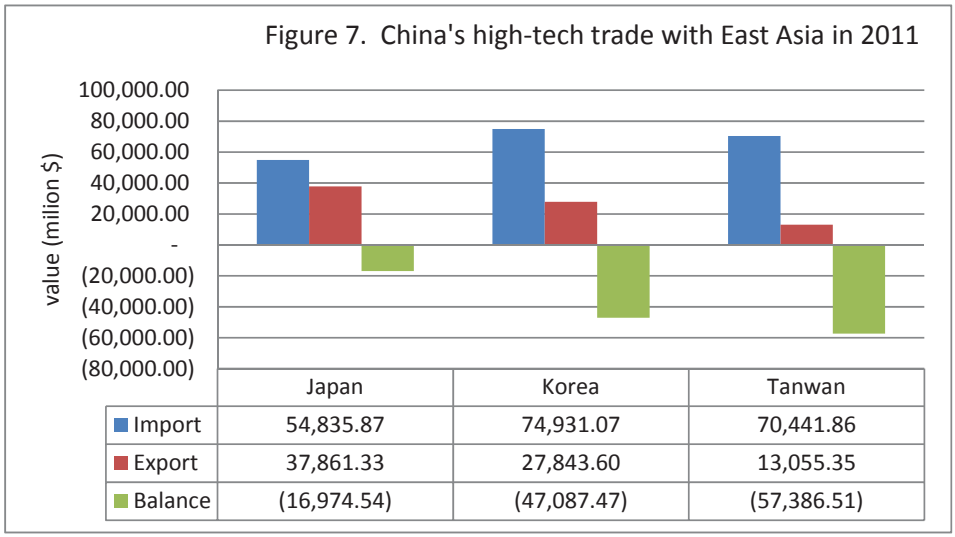
Figure 6. China's trade in Parts and Components with East Asia (SITC7)[4]



Source: Author's calculation based on Un Comtrade

Further detailed study shows that China's trade with East Asia in parts and components is very concentrated in five subsections: SITC759, SITC764, SITC772, SITC77689 and SITC 784. In 2010, the share of those five subsections accounted for almost 70% of China's trade with East Asia in parts and components. According to Lall's classification, the first four subsections belong to high-tech parts and components. Our calculation again shows that China reported huge trade deficits with Japan, Korea and Taiwan in those five categories. The trade between China and ASEAN-4 in these products is more diversified, with China reporting a trade surplus in parts of components of office equipment, telecommunications and transport equipment, but trade deficits in semi-conduct. Moreover, there is also divergence between ASEAN countries: China holds a trade surplus with Indonesia and Vietnam, but has deficit with the Philippines, Malaysia and Thailand. The data shows that China has caught up the ASEAN countries, although its innovation capability and manufacturing technology remains far behind Japan, Korea, Taiwan and Singapore.

[4] China's foreign trade is very much concentrated in SITC7 and SITC8, particularly SITC7. Therefore we use the statistics of SITC7 to exam of China's trade in Parts and Components.



Source: Author's calculation based on Un Comtrade

Regarding China's export and the technology upgrade, one important factor that should not be ignored is the foreign content in the exportation. Indeed, more than 50% of China's foreign trade is processing trade and more than 60% of China's exports are conducted by foreign-invested enterprises. Foreign companies not only dominate China's export but also play a much more important role in high-tech sectors than in Japan, the USA and the EU. As we can see from table 7, foreign content accounted for 48.5% of China's high-tech export in 2005. Although China's high-technology products exports have generally increased, it remains uncertain to what extent this reflects Chinese innovation and technology.

Table 7. Foreign content in exports, comparing China with Japan, the US and the EU (%)

	China		Japan		USA		EU	
	1995	2005	1995	2005	1995	2005	1995	2005
In gross export	15.5	27.4	8.2	15.2	9.5	12.3	20.8	27.8
In high-tech sectors	20.1	48.5	10.0	21.5	16.6	17.4	24.1	31.4

Source: IMF.

5. Conclusion

In recent decades, production sharing has become the new feature of East Asia's production network due to the destructuralization of the flying geese model. Regional trade is fragmented and characterized as vertical intra-industry Trade. Compared to other parts of the world, trade in parts and component occupies a much larger share in East Asia's total trade value, particularly in the manufacturing sectors of machinery, electrics and electronics.

Our study shows that China has moved from being a peripheral country to the center of the East Asia production network. China has replaced Japan in becoming the largest economy and most important trade partner for the region. Generally speaking, China has upgraded its technology of manufacturing products, while its share of exports in high-technology and medium-high-technology manufacturing goods having constantly increased, while the share of low-technology and medium-low-technology products has steadily declined.

Considering that 50-60% of China's foreign trade is conducted by foreign invested enterprises, and that China is in the final stage of the sliced international value chain, its increased high-tech exports do not necessarily always reflect technology upgrades. In this paper, we have found that China reports huge trade deficits against Japan, South Korea and Taiwan in terms of high-tech parts and components. Accordingly, this shows that the country is still very dependent on importing high-tech parts and components from its East Asia neighbors.

References:

Ando Mitsuyo (2006), "Fragmentation and vertical Intra-industry Trade in East Asia" Journal of Economics and Finance. Vol. 17, pp. 257–281.

Ando, M., Kimura, F., (2003), "The Formation of International Production and Distribution Networks in East Asia", *NBER Working Paper*, no. 10167, December.

Ando, Mitsuyo and Fukunari Kimura (2005). "The Formation of International Production and Distribution Networks in East Asia," in *International Trade in East Asia*, eds. Takatoshi Ito and Andrew K. Rose, NBER-East Asia Seminar on Economics, Volume 14, Chicago: The University of Chicago Press, pp.177-213.

Ando, Mitsuyo and Fukunari Kimura (2008). "Production Fragmentation and Trade Patterns in East Asia: Further Evidence," presented at the Ninth Global Development Network Conference, Research Workshop on "Emerging Trends and Patterns of Trade and Investment in Asia." Brisbane, Australia. February 1-2, 2008.

Ando, M., Kimura, F., (2010). The special patterns of production and distribution networks in East Asia. In: Athukorala, P. (Ed.), The Rise of Asia: Trade and Investment in Global Perspective. Routledge, London, pp. 61–88.

Athukorala, P. (2003), 'Product Fragmentation and Trade Patterns in East Asia', Trade and Development Discussion Paper 2003/21, Division of Economics, Research School of Pacific and Asian Studies, The Australian National University, Canberra.

Athukorala, P. (2006) , "Production fragmentation and trade integration: East Asia in a global context", North American Journal of Economics and Finance. Vol. 17, pp. 233–256.

Athukorala, P., & Yamashita, N. (2008). Patterns and determinants of production fragmentation in

world manufacturing trade. In F. Mauro, W. McKibbin, & S. Dees (Eds.), Globalisation, regionalism and economic interdependence. Cambridge, MA: Cambridge University Press.

Athukorala, P. (2011), "Production networks and trade patterns in East Asia: regionalization or globalization?" Asian Economic Papers 10 (1), pp65–95.

Athukorala, P. (2011), "Asian trade flows: Trends, patterns and prospects", Japan and the World Economy 24 (2012) 150 – 162.

Athukorala and N. Yamashita, 2008; Global Production Sharing and US-China Trade Relations Departmental Working Papers 2008-22, The Australian National University, Arndt-Corden Department of Economics.

Baldwin, Robert E. (2001), 'The Implications of Increasing Fragmentation and Globalization for the World Trade Organization' in Leonard K. Cheng and Henryk Kierzkowski (eds.), Global Production and Trade in East Asia, Boston: Kluwer Academic Publishers, 249-271.

Cantwell, John (1994), 'The Relationship between International Trade and International Production' in David Greenway and L. Alan Winters (eds.), Survey in International Trade, Oxford: Basil Blackwell, pp. 303-328.

Deardorff, Alan V. (2001), 'Financial Crisis, Trade, and Fragmentation', in Leonard K. Cheng and Henryk Kierzkowski (eds.), Global Production and Trade in East Asia, Boston: Kluwer Academic Publishers, 9-31.

Falgni P. Desai (2012), "Trends in fragmentation of production: A comparative study of Asia and Latin America", *Procedia - Social and Behavioral Sciences,* 37 (2012) 217 – 229

Haddad, Mona (2007), "Trade Integration in East Asia: The Role of China and Production Networks", World Bank Policy Research Working Paper No. 4160.

Hanson, Gordon H., Raymond J. Mataloni Jr., and Mathew J. Slaughter (2001), 'Expansion Strategires of U.S. Multinational Firms', in Susan M. Collins and Dani Rodrik (eds), *Brookings Trade Forum 2001*, Washington DC: Brookings Institution Press, pp. 245-282.

Hanson, Gordon H., Raymond J. Mataloni Jr., and Mathew J. Slaughter (2005), "Vertical Production Networks in Multinational Firms", *The Review of Economics and Statistics*, 87(4), pp. 664-78.

Hummels, D., Ishii, J., & Yi, Kei-Mu (1998), "Vertical specialization and the changing nature of world trade," Economic Policy Review, Federal Reserve Bank of New York,

issue Jun, pages 79-99.

Hummels, D., Ishii, J., & Yi, Kei-mu, (2001), "The Nature and Growth of Vertical Specialization in World Trade". Journal of International Economics, 54 (1): 75-96.

Ishii, J. and Yi, Kei-Mu (1997), "The Growth of World Trade." Federal Reserve Bank of New York, Research Paper no. 9718, May.

Jones, R. W. (2000), Globalization and the theory of input trade. Cambridge, Mass: MIT Press.

Jones, R.W., & Kierzkowski, H. (2001), "Globalization and the consequences of international fragmentation". In R. Dornbusch, G. Calvo,&M. Obstfeld (Eds.), Money, factor mobility and trade: The festschrift in honor of Robert A. Mundell , pp. 365–381. Cambridge, Mass: MIT Press.

Jones, R.W., Kierzkowski, H.,& Lurong, C. (2004), "What does the evidence tell U.S. about fragmentation and outsourcing." International Review of Economics and Finance, 14(3), 305–316.

Kimura F. and Ando M. (2005) Two-dimensional fragmentation in East Asia: Conceptual framework and empirics. I nternational Review of Economics and Finance 14 (3): 317–348.

Kimura F., Takahashi Yuya, and Hayakawa Kazunbu (2007), Fragmentation and Parts and Components trade: Comparison between East Asia and Europe. The North American Journal of Economics and Finance 18(1) :23-40

Krugman, Paul (1995), Growing world trade: causes and consequences. Brookings Papers on Economic Activity, 25th Anniversary Issue, pp. 327-377.

Miroudot, S., R. Lanz and A. Ragoussis (2009), "Trade in intermediate goods and services", OECD Trade Policy Working Paper No. 93, TAD/TC/WP(2009)1/FINAL.

Ng, F. and Yeats, A. (1999), "Production Sharing in East Asia: Who Does What, for Whom and Why?", World Bank Policy Research Paper Working Paper Series, 2197.)

Ng F. and Yeats, A. (2001) Production Sharing in East Asia: Who Does What for Whom, and Why? In Global Production and Trade in East Asia(edited by Leonard K, Cheng and H Kierzkowski) pp. 63-109, Kluwer Academic Boston.

Ng, F. and Yeats, A. (2003), "Major trade trends in East Asia: what are their implications for regional cooperation and growth?" Policy Research Working Paper 3084, World Bank, Washington, DC.

Venables, A. J. (1999). Fragmentation and multinational production. European Economic

Review, 43(3), 935–945.

Yi, K. (2003). Can vertical specialization explain the growth of world trade. Journal of Political Economy, 111(1), 52–102.

Yu Chunjiao and Xu Ling (2010), "China's position in East Asian production network". *International Trade (in Chinese)*, No. 5, pp. 12-18.

Yu Chunjiao & Wang Xuefei (2012), " Does East Asia's production fragmentation improves export competitiveness of China's manufactures", *Issues on international Trade(in Chinese)*, No. 5. Pp. 53-63.

Publisher: Competence Center "Money, Finance, Trade and Development "
HTW-Berlin – Treskowallee 8, 10318 Berlin
Prof. Dr. Sebastian Dullien, Prof. Dr. Jan Priewe

http://finance-and-trade.htw-berlin.de

Hochschule für Technik und Wirtschaft Berlin
University of Applied Sciences

ISSN: 2192-7790