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# *Policy Effect on Structural Change: A Case of Chinese Intermediate Goods Trade*

by

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# Policy Effect on Structural Change: A Case of Chinese Intermediate Goods Trade

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**Abstract:** We attempt to explain the dynamics of China's intra industry trade (IIT) development spanning over three decades from the perspective of institutional changes. We present two hypotheses after reviewing series of policy documents and related organizational adjustment descriptions. First, we argue that China's pro-liberal reform in trade and FDI institutions helped trade to take off. Second, China is ambitious in acquiring advanced technology and building up a sophisticated system to promote technological capability. An analysis of Grubel and Lloyd IIT index on intermediate goods trade belonging to SITC 7 and SITC 8- the key components of regional value chain in East Asia- suggests that the structural changes taking place in China's intermediate goods trade are in agreement with the stated hypotheses. China's institutional arrangements also help to explain the factor behind China's success in becoming a major player in the regional production network in East Asia.

**Keywords:** Institutional change, Intermediate goods trade, Intra industry trade (IIT), Regional production network, Technological progress

**JEL codes:** F13, F14, L52

## 1. Introduction

Trade in intermediate goods that gives rise to regional production networks has been a hallmark of East Asia's trade pattern. China played an important role in building this network by engaging in high levels of trade with all key members involved. In this paper, we look into the various aspects of Chinese government policies and their corresponding effects on China's trade. Firstly, we examined the policy changes relating to manufacturing industries and linked them to specific industries. Secondly, data work was conducted to see if the impact of these policies were reflected in China's intermediate goods trade with ten of her Asian counterparts.

Many economic variables have been examined as causes of trade patterns between countries. They include the size of a country (Amiti, 1998), technology transfer (Lemoine and Ünal-Kesenci, 2004), commercial policy (Falvey, 1981), regional economic integration (Khalifah, 1996), production differentiation, labor intensity of production, economies of scale, foreign direct investment (FDI) (Aturupane et al., 1997; Markusen and Venables, 1999) and intra-firm trade (Becuwe and Mathieu, 1992). In line with those literatures, published studies explain China's trade in intermediate goods typically from those conventional perspectives (Hu and Ma, 1999; Dean et al., 2009; Xing, 2007; Chirathivat, 2002; Prime and Park, 1997; Manova and Yu, 2012). However, the role of institutional factors has been largely ignored, which results in a partial explanation or a misinterpretation of the mechanism by which they affect China's trade pattern. We argue that most of the above economic determinants could be the consequences of China's continuous institutional changes. To our knowledge, this paper is the

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first to explain China's intermediate goods trade from an institutional perspective. In this paper, 'institution' refers to the stable mechanism that governs the incentives of agents. In China, institutional change often takes two forms, the top-down state policy implemented by specialist ministerial departments to guide regional administration, and the bottom-up regional institutional experiment that are replicated nation-wide after the regional experiment (Xu, 2011).

We found that the Chinese government had taken two major policy shifts that have resulted in the structural changes in intermediate goods trade. Firstly, before the global financial crisis (GFC) of 2008, there was an emphasis on external demand and shifting from low technology-intensive industries to medium technology-intensive ones. Secondly, in the onset of the GFC, Chinese government tried to reduce the dependence on external demand by increasing domestic demand and by pushing further for the upgrading of industries to high technology-intensive. We employed Grubel-Lloyd index to measure China's intra-industry trade (IIT) in various disaggregated levels. Our finding of data work was in line with China's policy changes. In other words, the structural change in China's intermediate goods trade was shaped by policy changes.

The rest of this paper is organized as follows. In section 2, we explain China's intermediate goods trade by focusing on the importance of institutions. In particular, we concentrate on certain fundamental institutional changes made in the 1980s and in the beginning of the 1990s. China's policy response in the aftermath of GFC and its potential effect on her intermediate good trade is also reviewed in the section. Section 3 portrays the evolution of China's intermediate goods trade with 10 of her Asian partners over the past two decades using data work generated from the IIT index. In particular, we look at SITC section 7 and 8 as these sections fall under the manufacturing sector and contain majority of the intermediate goods. Section 4 concludes with some remarks on policy consideration for the future development of regional value chains.

## 2. An Institutional Framework

### *2.1 Explanation of the Framework*

Soon after her founding in 1949, the People's Republic of China transplanted the planned foreign trade system. It was a highly monopolized state running system designed to control trade. A cohort of monopolist foreign trade corporations (FTCs) dominated foreign trade in specific sectors, few opportunities for new entrants, and limited room was left for the practice of conventional trade policy instruments (Ianchovichina and Martin, 2001). Under this regime, China isolated herself from the world market and economic ties between China and other East Asian economies were minimal. When China launched the Reform and Opening-up policy by the end of the 1970s, this system was incapable to serve China's new ambition of economic development. The promotion of foreign trade had been central to China's efforts to modernize her economy since the launching of the reform agenda (World Bank, 1994).

In a transition economy like China, some basic pre-requisites for a market economy was absent, instead, the state played an active role in the early stages of transition. Before the transition, China was a developing country with scarce capital, abundant labor and outdated technology in most of her industries. During that time, capital deepening and technological progress were two policy targets. Firstly, foreign capital and trade surplus are two main sources of capital accumulation. Studies have found that China's FDI fueled her growth in terms of the size of trade (Lardy, 1995). Besides, some authors showed that the East Asian regional production network was mainly achieved through regional FDI (Fukao et al, 2003; Kimura et al., 2008; Thorbecke and Salike, 2011, 2013), which may be affected by China's foreign investment policy. Our concern is whether China's policies on foreign investment and trade could have affected her trade pattern. Secondly, China's industrialization-driven growth model required continuous industrial efficiency improvement, technology policies were practiced continuously during the whole process of China's economic development. As technological difference among countries is a key determinant to their position in the regional production

network and then the pattern of trade, our second focus is whether China's technological policies affected her intermediate goods trade. To the basic level, all these policies were subject to administrative system adjustments and regional experimentation (Figure 1).

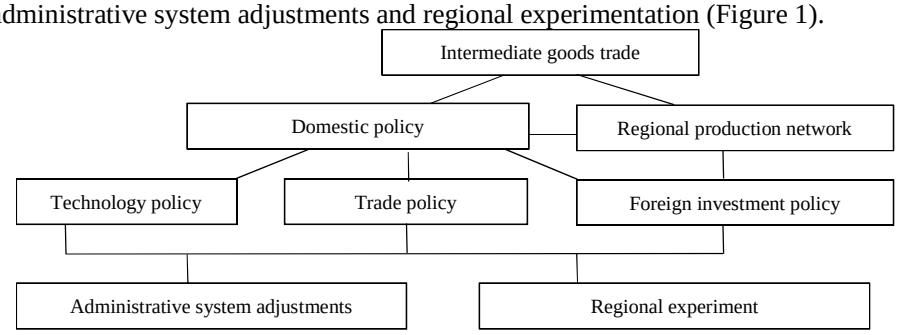


**Figure 1 Explanatory Framework of China's Intermediate Good Trade**

### *2.2 Organizational Change and Policy Practice*

#### *2.2.1 Administrative system adjustments and regional experimentation*

Chinese government had to make regular adjustments every 5 to 10 years to implement the state's updated blueprint for development. This routine makes it feasible to trace the formal institutional changes by observing the adjustments of ministerial departments at the national level. Regarding trade institution, two new administrative departments were established to promote foreign investment, trade and technological progress at the onset of Chinese economic transition. They were the Foreign Investment Administration Commission of China (FIACC) and the State Office for Import and Export of Machinery and Electronics Products (SOIEMEP).

FIACC was established in 1979 as a super-ministerial department[1] and had another name to the public, the Foreign Trade Administration Commission of China (FTACC). This kind of organizational design had two obvious advantages. One is that its establishment reflected the government's strong ambition to gain access to the global economy. In the Chinese bureaucratic hierarchy, the higher the rank of a department would ensure the more empowerment and stronger capacity in mobilizing resources. The other advantage was that foreign investment and trade could be facilitated within a coordinated policy process, which strengthened the 'foreign investment-trade nexus'. The mandate of FIACC was fulfilled by its technical sub-departments that were responsible in promoting foreign trade, introducing advanced technology and equipment, utilizing foreign capital, and promoting international cooperation. In order to promote high-tech production trade, SOIEMEP was established in 1993 to take charge of coordination, administration, inspection and supervision of the import of machinery and electronics products, and to guide regional and departmental administration of machinery and electronics products, which are marked as technology-intensive products according to the state's standard. Following the installation of SOIEMEP, many ministries and state-owned key enterprises set up parallel offices to encourage the trade of high-tech products. Even though the mission of FIACC and SOIEMEP were to accumulate foreign trade surplus and facilitate technological progress rather than to promote intermediate goods trade, many of their policies affected China's trade patterns in the later years.

Besides FIACC and SOIEMEP, an array of supporting institutions was created to facilitate foreign trade and the investment of technological intensive products. The state policy bank, the Export-Import Bank of China (EIBC), was founded under the State Council of China in 1994 in order to financially facilitate the export and import of mechanical and electronic products and high-tech products. Moreover, a nation-wide semi-administrative organization, the China Chamber of Commerce for Import & Export of Machinery & Electronics Products (CCCME),

[1] This Commission was first presided by the Deputy Premier of the State Council.

was set up in 1988 to promote the foreign trade of machinery and electronics products with export-related business services to its member enterprises. Under the guidelines and coordination of CCCME, more than 20 industry-based branches were responsible to promote foreign trade and investment in areas such as automobiles, rail transport equipment, electrical elements, metalworking equipment and electric power equipment.

China's Special Economic Zone (SEZ) experiment was a pillar to the development of East Asian regional production network. Firstly, East Asian regional production network had been carried out by regional capital flows, SEZs provided a relatively relaxed investment environment for FDI and became a prominent spatial location of regional production networks. Secondly, thousands of FTCs were set up in SEZs, which improved transaction efficiency in regional production networks. More importantly, a great number of export-oriented foreign joint venture enterprises were set up within SEZs. Consequently, the typical economic activity in SEZs was processing imported intermediate goods, which had limited local content and were export-oriented.

The development of the processing activity model in SEZs was vital to China's intermediate goods trade. On the one hand, the processing activity model of SEZs was replicated nation-wide due to the 'demonstration effect'. Furthermore, after the fiscal decentralization reform in 1994, the increasing fiscal expenditure responsibility drives sub-national governments compete for FDI by offering cheap land, financial resources, preferential tax reductions and weak environmental regulations. As such, the processing model prevailed in China with the popularity of FDI. On the other hand, state policies for stimulating processing activity took effect. As will be explained later, the pattern of China's trade development echoes the processing activity evolution and is a reflection of the FDI-driven East Asian regional production network.

#### *2.2.2 Persistent policy efforts in promoting trade-FDI nexus*

After reviewing crucial Chinese policy documents to identify the effects of policy changes, we found that there were persistent policy efforts to encourage foreign investment and trade as well as the promotion of technological capability until the occurrence of GFC.

In 1979, *Law on Chinese-Foreign Equity Joint Ventures* (hereafter the *1979 Law*) was promulgated which permitted foreign agents to establish joint-equity ventures, 'with a view to expand international economic cooperation and technological exchange'. Thereafter, foreign investment was initially allowed in China after decades of prohibition. This institutional change was fundamentally reinforced in China's 1982 Constitution. Although due to ideological reasons, there were no *de jure* private property right protections until the 2004 Constitution amendment, the interests of foreign investments were *de facto* protected. *Provisions on the Encouragement of Foreign Investment* in 1986 (hereafter the 1986 *Provisions*) provided systematic preferential policies for FDI and exporting enterprises with the standards of SOEs, such as priority of access to public utilities, loans and credits, income tax exemption or reduction, tax refund for reinvestment, free duties for intermediate goods and final products exports, *etc*. Hence, the 1979 *Law* and 1986 *Provisions* served as a stable incentive for FDI and trade.

Supplementary to these laws, China's ministerial departments implemented a basket of policies to encourage foreign investments (see Table 1), including deregulating barriers to investment and trade, encouraging foreign investment by offering factors of production, various tax discount policies, tariff exemption and duty reduction, easier credit and loan accesses, and capital account deregulation. In this process, the FIACC/FTACC played a prominent role in coordinating state departments and policy implementation. The policies of various sub-national governments, which were drafted with reference to state policies, further reinforced the attraction to draw foreign investors.

In addition to attracting FDI, there were two other policy priority aspects. One was to increase processing activities through tariff reductions or rebates for imported materials and parts. This fervent support could be demonstrated by the total tax rebates for exports, which

increased from 4.4 billion *yuan* when it was firstly practiced in 1985 to 125.9 billion *yuan* in 2002. For example, the 1986 *Provision* stipulated a rate of 95% exemption on imported parts for machinery and electrical products and certain specific intermediate goods, 85% for materials and components and duty reduction in the trading of machinery parts. The other concern was the introduction of advanced technology, equipment, and new products to accelerate industrial upgrading. Once a foreign enterprise was approved as technologically advanced, it had access to favorable tax rebates and great access to financial resources. For example, the 1979 *Law* stipulated that the type of technology and equipment contributed by a foreign joint venture must be advanced and suited China's needs. An equity joint venture equipped with advanced technology by international standards could apply for a reduction from income tax for the first 2-3 years of operation. Another regular policy of this type was the *Catalogue of Industries for Guiding Foreign Investment*, which listed the types of FDI that were encouraged or prohibited, and encouraged foreign investments in machinery and transportation equipment manufacturing. Its first version was implemented in 1995 and then subsequently amended in every 2-4 years in accordance with China's dynamic industrial demands for advanced technologies and equipment.

In particular, there were some specific industrial policies targeted to machinery and electronics products. As early as 1985, the State Council approved the *Report to Expand the Export of Machinery and Electronics Products* (hereafter the 1985 *Report*). Since then, machinery and electronics products were classified as major exporting items and policies were implemented to 'support as a pivot'. The *Report* set sequential targets for growth and for the share of export of machinery and electronics products to total export for 1990, 1995 and 2000. Systemic 'basic tasks' were deployed to achieve these goals, such as enhancing industrial technological and management, building up the export and production system of machinery and electronics products and employing professionals in international marketing and sales networking. About 100-200 advanced firms were approved as 'exporting basis enterprise' that were encouraged to enter world market; about 500 key SOEs were listed as 'foreign trade authorized enterprises' which were encouraged to increase export; and more 'general enterprises' were planned for export by product quality improvement. Favorable policies were drafted for those exporting firms (especially for 'exporting basis enterprises') to increase incentives. These included fiscal subsidies to deal with the risk arising from for foreign exchange, tax exemption and rebates in order for them to compete with joint venture enterprises, retention of foreign exchange which enterprises earned from exports so as to increase exports, bonuses for the employees of such exporting firms, supplier credit and export credit issuance. Discounts on export bills were given to encourage research and development (R&D). Besides, machinery and electronics products exporting firms were given priority access to raw materials, parts and components, fuels, energy, packing stuffs and transportation. Correspondingly, sub-national governments allocated resources to increase the export of machinery and electronics products under this policy. In 1991, another state policy, initiated by the SOIEMEP, was implemented to further increase the export of machinery and electronics products. Most of the policies listed in the 1985 *Report* were prolonged, some were upgraded and strengthened, such as various financial supports for the technological upgrading and R&D of exporting firms. This policy was amended and extended in almost every Five-Year-Plan (1994, 1999, 2001 and 2006). The latest effective version was updated in 2011.

**Table 1 Selected favorable policies for foreign investment**

| Category | Title/ Department, year | Policy Description |
|---|---|---|
| Deregulation and encouragement of foreign investment | Law on Chinese-Foreign Equity Joint Ventures/ Standing Committee of the National People's Congress (NPC), 1979 | Approval of foreign agents to invest in China, protection of basic rights under the law; trade promotion to technologically advanced foreign investors. |
| | Provisions on the Encouragement of Foreign Investment/ The State Council (SC), 1986 | Favorable treatment for exporting firms and technological advanced firms |
| | Implementation Measures on Enterprises with Foreign Investment Applying for Import and Export Licenses/ Ministry of Foreign Trade and Economic Cooperation (MOFTEC), 1987 | Deregulation of foreign trade administration |
| | Circular Concerning the Extension of the Limits of Power Vested with the IPs, ARs, MSLSP and the Departments Concerned under the State Council in Examining and Approving Foreign Investment Absorption/ The SC Circular No. 42, 1988 | Barriers to investment were lifted. |
| | Implementation Concerning the Confirmation and Assessment of Export Enterprises and Technologically-Advanced Enterprises with Foreign Investment/ MOFTEC, 1987 | Promotion of foreign capital investments in areas such as goods exports, foreign trade, introduction of advanced technology |
| | Some Rules Concerning Speeding-up and Deepening the Reform of the Foreign Trade System/ The SC Circular No. 12, 1988 (updated in 1990) | Local government foreign trade and currency responsibility; trade surplus sharing system between central-local governments; deregulation of Foreign Trade Companies to local governments. |
| | Some Supplementary Provisions of the State Council on the Coastal Areas of the Development of Export-Oriented Economy/ The SC Circular No. 22, 1988 | Deregulation of FDI and foreign trade |
| | Trial Measures for Control of the Inspection of Imported/Exported Commodities of Foreign Investment Enterprises & Ventures Involving Processing &Assembly with Supplied Materials & Parts or Compensation Trade/ State Administration of Entry-Exit Inspection and Quarantine, 1988 | Promotion of processing activity |
| | Interim Measures for Import Administration of Machinery and Electronics Products/ The SC Circular No. 135, 1993 | |
| Tax | Regulations Concerning the Collection and Remission of Industrial and Commercial Taxes on Import and Export Commodities/ SC, 1980 | |
| | Announcement on Taxation of Joint Ventures and Cooperative Operations with Chinese and foreign investment/ SC, 1982 | |
| | Circular Concerning Taxation of Industrial and Commercial Consolidated Tax and Enterprise Income Tax on Land Development and Compensatory Land Use Right Transfer Undertaken by Enterprises with Foreign Investment/ Ministry of Finance (MOF), General Administration of Custom (GAC), 1995 | |
| | Interim Provisions Concerning Reduction and Exemption of Enterprise Income Tax and Consolidated Industrial and Commercial Tax for the Encouragement of Foreign Investment in China's Open Coastal Economic Areas/ MOF, 1988 | Preferential tax rate of 15% if FDI is technology-intensive or knowledge-intensive enterprises; enterprise income tax at a 20% discount for investment in certain materials and parts |
| | Income Tax Law for Enterprises with Foreign Investment and Foreign Enterprises/ NPC, 1991 | Overall tax reduction for foreign enterprises which led sub-national governments to compete for foreign investment by offering favorable tax rates |
| Tariff | Provisions for the Collection and Refund of Product Tax and Value Added Tax on Import and Export Products/ SC, 1985 | 95% tax exemption on imported parts for machinery and electrical products and 12 other intermediate goods; 85% tax reduction for materials and components; duty reduction in the trading of parts |
| | Regulations on Import and Export Duties/ SC, 1987 | Tariff exemption for intermediate goods processing, tariff exemption or reduction for SEZ and foreign-involved enterprises |
| | Foreign Trade System Reform for 1988/ SC, 1987 | Comprehensive tax reimbursement, tariff refund for exported goods |
| | Measures for Bonded Warehouse Factory Engaged in Processing Trade/ GAC, 1988 | Tariff exemption for exported goods |
| Credit & Loan | Regulations on Provision of Loans to Enterprises with Foreign Investment/ Bank of China, 1987 | |
| | Provisional Measures Concerning Mortgage by Enterprises with Foreign Investment of Foreign Exchange for Renminbi Loans/ People's Bank of China, 1986 | |
| Foreign exchange | Administrative Regulations Governing the Use of Foreign Currency by Foreign Investment Enterprises when Computing Prices and Settling Accounts within China/ State Administration of Foreign Exchange (SAFE), 1989 | |
| | Provisions on the Purchase and Export of Domestic Products by Enterprises with Foreign Investment to Balance Foreign Exchange Accounts/ MOFTEC, 1987 | |
| | Foreign Trade System Reform for 1988/ SC, 1987 | Increase foreign currency surplus retention ratio |
| | Provisions for the Control of Bank Accounts Opened Abroad by Foreign-Funded Enterprises/ SAFE, 1989 | |

Source: Collected by authors.

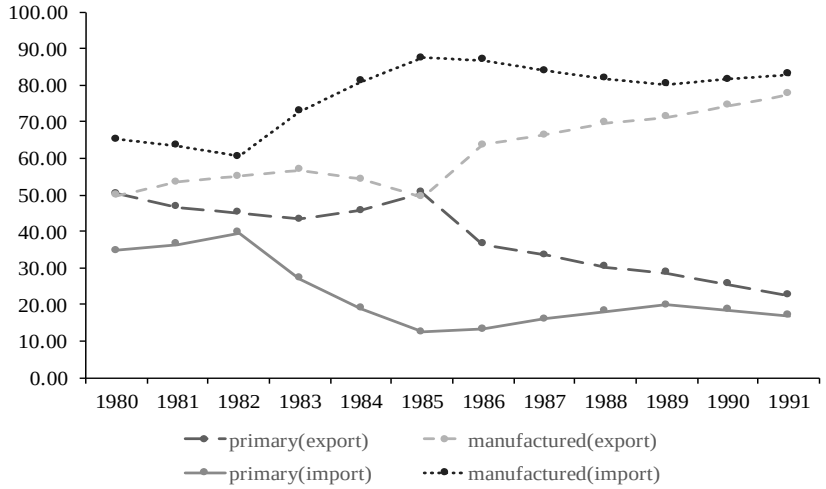


**Figure 2 Trade structure of China by SITC standard (1980-1991)**
Source: China Customs Statistics.

As a response to those preferential policies, China's foreign investment and trade pattern underwent an enormous structural change. Firstly, foreign investment increased by 51 times from 1983 to 1991 in real terms, with a significant increase after the implementation of the *1986 Provisions*. Most of the FDI was concentrated in SEZs where processing activity thrived. Secondly, China's export structure underwent a structural change since 1986, the year after which manufactured products outpaced primary products and became the prime driving force of China's impressive export expansion (Figure 2). Thirdly, it is evident that China's import of machinery and transportation equipment (SITC 7) had expanded since the mid-1980s. By 1991, it accounted for 35.9 percent of China's total imports (Figure 3).

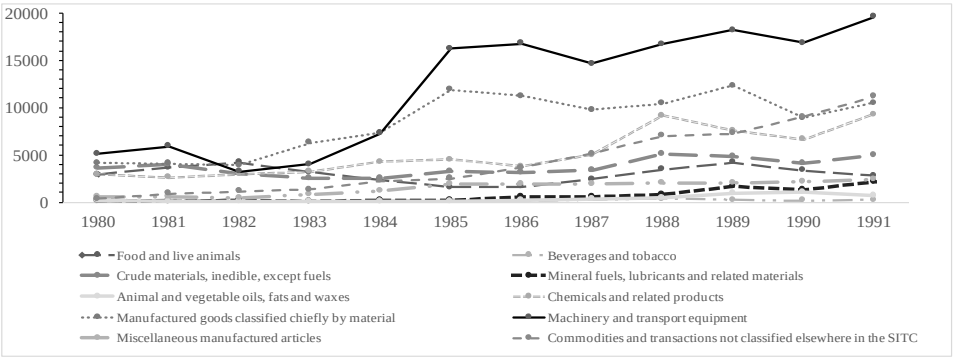


**Figure 3 Import of China by SITC classification (1980-1991)**
Source: China Customs Statistics.

Although it is very difficult to identify the policy effects on trade for specific industries, we can find evidence in certain strategic industries. Taking the automobile industry as an example, China implemented the first national industrial policy for the automobile industry in 1994. It encouraged local automobile enterprises to utilize foreign capital in the form of joint-venture enterprises. According to the Japanese Automobile Manufacturers Association (JAMA), major Japanese automobile firms started to establish manufacturing facilities in China from 1993 to 1998, thus benefitting from this policy (JAMA, 2014).[2] For some time, China technologically lagged behind in this industry and relied heavily on imported technology-

[2] Including Suzuki, Toyota, Nissan, Honda, Mazda, Mitsubishi, Yamaha, Kawasaki, Subaru and UD Trucks.

intensive components[3] while exporting low technological and environmentally unfriendly products (such as tires, brake linings). This contributed to China's intermediate goods trade on the one hand and mirrored the formation of regional production networks on the other hand.

### *2.2.3 East Asian Production Network*

China's SEZ institution is an important institutional pillar to the East Asian regional production network. In light of previous studies on the East Asian regional production network, the role of JFDI is often deemed as one of the driving forces, especially after the 1985 Plaza Accord (Kimura et al., 2008; Ando and Kimura, 2009; Thorbecke and Salike, 2011, 2013). Driven by her policy of trade openness, China became the largest recipient country of regional JFDI, then the regional production network was quickly spread throughout China. Once again, we can see that China's policy towards JFDI was an essential catalyst for the expansion of the East Asian production network.

Japanese companies began to establish branches or make green-field investments in China's SEZs in the 1980s. According to the Japanese Ministry of Finance, JFDI in China experienced a great rise in 1984, from nearly US$ 3 million in 1983 to over US$ 114 million in 1994. JFDI flow into China's manufacturing had outpaced non-manufacturing since 1988 with widening gap over the consequent years. This structural change could be largely explained by that year's milestone policy, when China signed a bilateral investment treaty (BIT) with Japan, which improved China's credibility and commitment in attracting FDI. When Japan started industrial upgrading in the 1990s, China became a major overseas destination for Japan to outsource her manufacturing processes, as demonstrated earlier in the case of the automobile industry.

The largest JFDI recipient industry was electric machinery, followed by industries of fiber, machinery, and transportation equipment. Most of them are categorized in the SITC section 7 at the 2-digit level. Taking machinery, electric machinery and transportation equipment together, which are treated as medium and high-tech manufacturing accounted for about 70% of JFDI in manufacturing sectors (Figure 4) and the highest record of 78.6% took place in 2000. This level was maintained until 2004. After that, this share decreased gradually to nearly 50%. The export of intermediate products in section 7 experienced a great increase from the early 1990s to the late 2000s.

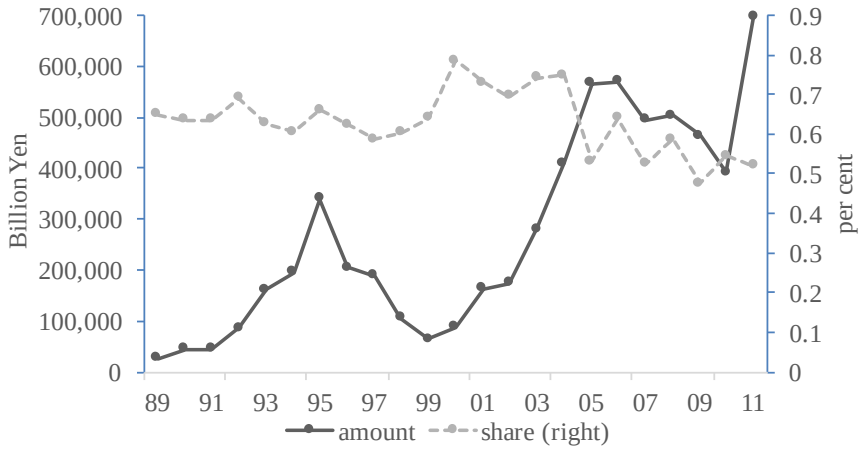


**Figure 4 Japanese FDI in medium and high technology industries in China (1989-2011) (billion Japanese Yen)**

Source: Ministry of Finance, Japan.

[3] In 2011, Japan was the largest source of China's automobile parts and components of engines, steering systems, braking systems, vehicle systems, transmission systems and accessories and the second largest source of automobile electrical and electronics.

### *2.2.4. China's Anti-GFC policy adjustments*

After the 2008 GFC when the international market melted down and foreign investment became sluggish, China's policy concerns for foreign investment and trade started to change. To ensure sustained economic growth, China's macroeconomic policy towards demand changed from being outward looking to inward looking. A series of policies were implemented to serve two purposes. One was to increase domestic demand to counter the shrinking external demand. To this end, the Chinese government introduced a massive fiscal stimulus amounting to RMB 4 trillion (US$ 586 billion) in 2008, which was 12.5% of the 2008 Chinese GDP. China's fiscal stimulation package covered public expenditure in infrastructure construction (e.g., railway, road and airports, rural public service), social services development (e.g., public housing, health, education and culture) and environmental projects (e.g., energy-saving, industrial pollution treatment, ecological recovery). Those policies on encouraging infrastructure construction and real estate were likely to accelerate the growth of their related intermediate goods trade.

The other policy objective was to promote industrial development by encouraging industrial innovation and the development of technology-intensive emerging industries. In the beginning of 2009, Chinese government selected ten key industries for 'restructuring and revitalization', including steel, automobile, shipbuilding, equipment manufacturing, ICT, and non-ferrous metals, *etc*. Most of these industries produce products that are categorized in SITC 7 and 8. The motivation behind was to promote technological upgrading and indigenous innovation so as to substitute imported sophisticated products, parts, and components with local suppliers. This would like to bring structural changes to intermediate goods trade.

In this section, we illustrated China's institutionalized efforts to promote the FDI-trade nexus that accelerated the East Asian regional production network and the accumulation of technological capability. These efforts could be traced through the regular specialized administrative organizational adjustment and major policy documentations. While these efforts were not deliberately designed to boost China's intermediate goods trade with her regional neighboring economies, we predict that structural changes would be made in the trade of intermediate goods.

## 3. Data Work

In this section, we endorse the arguments made in section 2 with some data work and propose following two hypotheses.

Hypothesis 1: China's macroeconomic policy which favored FDI and technological upgrading after the opening up of the economy, shifted China's structure of intermediate goods trade from primary products (low technology-intensive) towards manufacturing products (medium technology-intensive).

Hypothesis 2: China's anti-GFC policy, which was achieved by stimulating domestic demand and shifting towards an innovation-driven growth model, is likely to bring about a structural change in the intermediate goods trade through the increase of domestic demand and the drive to develop the high-technology-intensive sectors.

The basic framework to test these hypotheses is by looking into changes in the structure of China's IIT index in the intermediate goods. Given the vital role China plays in regional production network in Asia, the shifts in the index would indicate how the focus of China in manufacturing changed over the time. For e.g., the more integrated China is one range of product over certain period would indicate that China is specializing in that particular product range to contribute to the network.

### *3.1 Data Description*

The Grubel-Lloyd index for intra industry trade is used as a measure to assess how China was being integrated in the intermediate goods trade in Asia. This intra industry trade (IIT) index takes the following form:

$$IIT_{s,t} = 1 - \frac{\left|X_{s,t} - M_{s,t}\right|}{X_{s,t} + M_{s,t}}$$

where $IIT_{s,t}$ is intra industry trade index of China for SITC basic heading "*s*" in time "*t*". $X_{s,t}$ is Chinese exports of "*s*" to 10 partner economies at "*t*". $M_{s,t}$ is Chinese imports of "*s*" from 10 partner economies at "*t*". The IIT index lies between 0 and 1. 0 represents complete inter-industry trade while 1 represents complete intra industry trade. Therefore, from the perspective of integration, a higher number would imply that China is better integrated in the region.

The database used for this study is the UN Comtrade- SITC Revision 3 (UN, 1991) and includes bilateral trade data of China with her 10 Asian partners[4] which spans from 1991 to 2011. In particular, we looked into two section codes- SITC section 7 (Machinery and transport equipment) and section 8 (Miscellaneous manufactured articles). The reason for focusing on these two sections is that these are primarily manufacturing products and the majority of intermediate goods trade took place in these two sections. Several studies have been carried out to highlight the intermediate goods trade based on these sections (Athukorala, 2003; Athukorala and Yamashita, 2006; Kimura and Obashi 2010; Sturgeon and Memedovic, 2011). The data was collected up to its finest level of code, i.e. 5-digit level (basic heading).

Section 7 consisted of 653 basic headings whereas section 8 consisted of 442 basic headings. Since we are interested only in intermediate goods trade, our task was to build a comprehensive list of basic headings belonging solely to intermediate goods and this was an arduous undertaking. With the help of previous studies, we first pulled all the basic headings belonging to sections 7 and 8 and then tallied them with those included in the three studies[5]. There were circumstances when the categorization was not clear and easy. Hence, we consulted with the experts in the relevant fields to clarify them. By doing so, we identified 347 basic headings belonging to intermediate goods with 277 in section 7 and 70 in section 8[6]. Therefore, our main analysis falls within these 347 basic headings.[7]

We calculated the IIT index for all 347 basic headings from 1991 to 2011. In order to smooth out the short-term fluctuations and clearly identify the long-term structural changes, we took the moving average of 3 years. The IIT index calculated for these 347 basic headings were then narrowed down to the 2-digit level (division code) by taking the average of all the basic headings that belonged to that specific division codes. Since the trade volume of each basic heading within the division codes was different, the division code IIT index was calculated using the weighted average with weights being the proportion of the trade volume of each basic heading to the trade volume of division code. This would leave us with nine section 7 division codes and seven section 8 division codes[8]. It is notable that division codes 71, 72, 74 and 77 constituted broad basic headings, which imply that these division codes comprised more intermediate goods in trade compared to others.

[4] They are Hong Kong, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand and Vietnam.

[5] Both Athukorala (2003) and Sturgeon and Memedovic, (2011) used SITC codes in their studies, whereas Kimura and Obashi (2010) used the HS classification. The HS classification has been tallied with SITC Revision 4 and then with Revision 3 using Comtrade's correspondence tables.

[6] 224 came from Athukorala (2003); 111 came from Kimura and Obashi (2010) and 12 came from Sturgeon and Memedovic (2011).

[7] The full description of these basic headings is available upon request.

[8] The 347 basic headings within the division codes are as follows: 31 from SITC level 71; 31 from SITC level 72; 9 from SITC level 73; 82 from SITC level 74; 5 from SITC level 75; 4 from SITC level 76; 95 from SITC level 77; 14 from SITC level 78; 6 from SITC level 79; 6 from SITC level 81; 3 from SITC level 82; 2 from SITC level 84; 1 from SITC level 85; 21 from SITC level 87; 22 from SITC level 88; 15 from SITC level 89.

### *3.2 Data Analysis: 2-digit level (division code) observations*

As mentioned above, there are altogether sixteen division codes (nine from section 7 and seven from section 8) that belongs to the intermediate goods, which are listed in SITC Revision 3. Figures 5 and 6 show China's 3 years' moving average IIT index from 1991-2011 for product categories listed in Sections 7 and 8 respectively[9]. It is evident that, compared to 1991, the IIT index of these intermediate goods shows a significant rise in trade in almost all division codes. This is particularly distinct for the division codes: 71, 72, 73, 74 and 78, althoughthere has been a decline in some product categories such as 76 and 79. Another noticeable occurrence is that almost all the division codes saw a decline in indices in the more recent years of 2009-11.

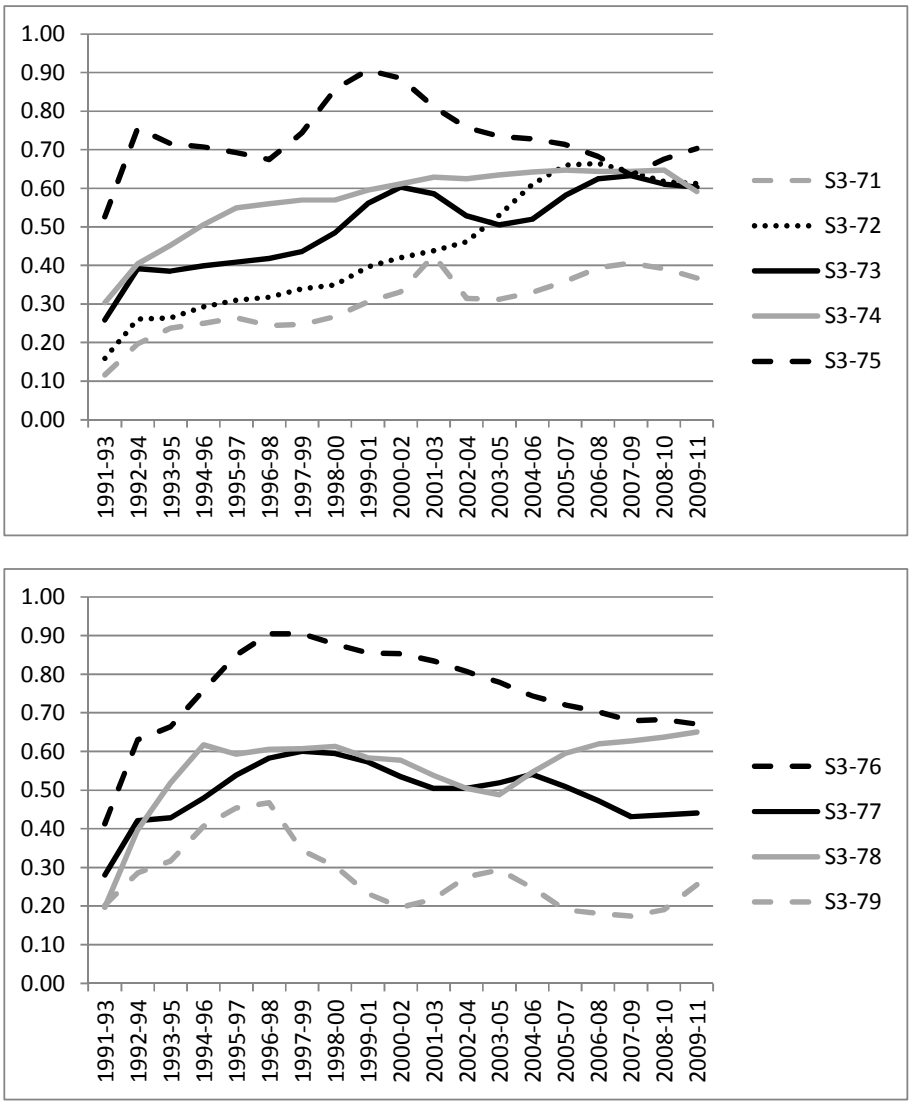


**Figure 5 Three years' moving average IIT index for China for section 7.**
Source: Authors' calculation based on UN Comtrade database.

In the case of section 8, we can see from Figure 6 that most of the IIT indices declined over the years. Although there was a big jump from 1991 to 1996, thereafter however, there

[9] Data of these figures are available upon request.

has been a consistent drop in China's intermediate goods trade to Asia and this is particularly true for division codes 81, 84 and 85[10]. Another interesting observation for this section is that in the recent years of 2009-11, there has been a rise in the indices for division codes 81, and 82 and 87.

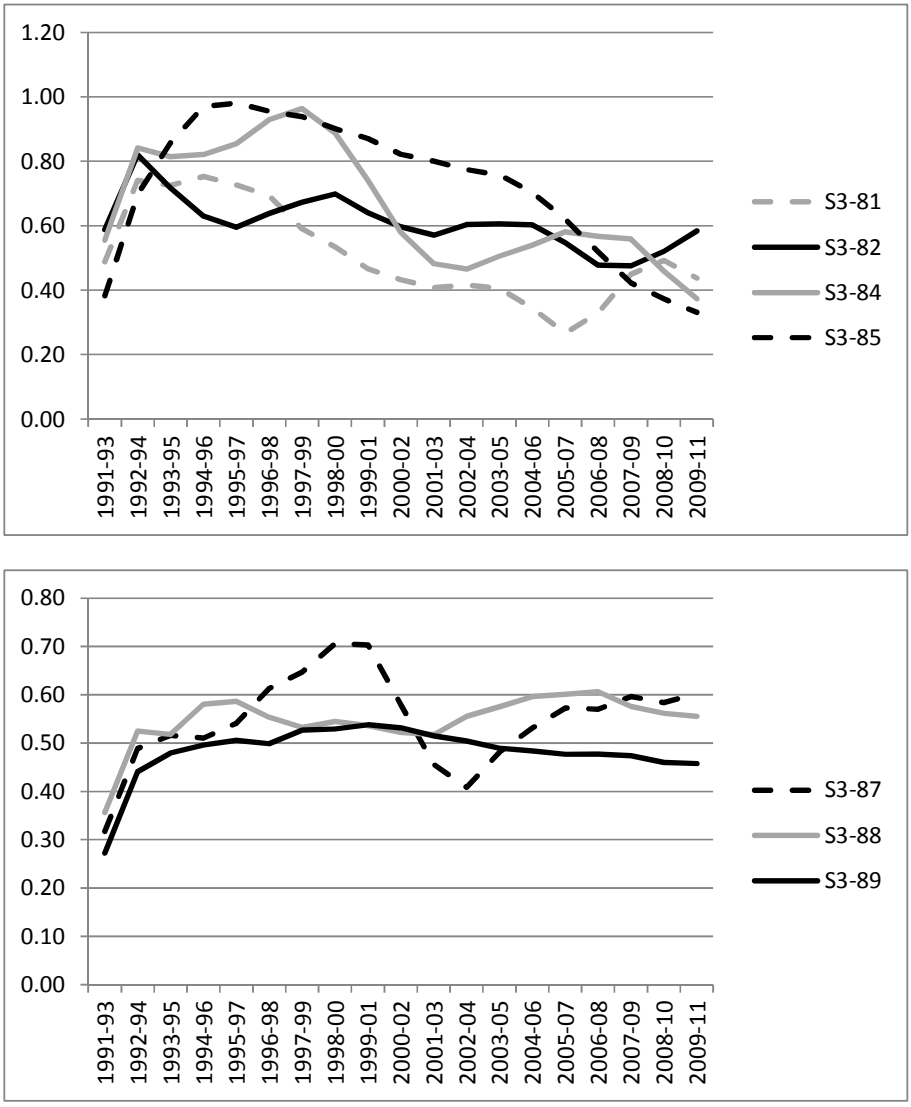


**Figure 6 Three years' moving average IIT index for China for section 8**
Source: Authors' calculation based on UN Comtrade database

### *3.3 Discussion*

Looking at the findings of China's IIT index at the division code level, we argue that the structural change in the behavior of the intermediate goods trade of China in Asia took place in two stages.

[10] Note however that division codes 84 and 85 contained only 2 and 1 basic heading respectively. Therefore, caution is needed in making meaningful conclusions.

***Stage 1: 1991-2008***

During this stage, the IIT index for China increased for most of the section 7 division codes. The most significant rise could be attributed to division codes: 71, 72, 73, 74, whereas 76 and 79 registered a drop. Division code 71 refers to power-generating machinery and equipment; 72 refers to machinery specialized for particular industries; 73 refers to metalworking machinery; and 74 refers to general industrial machinery and equipment. On the other hand, division code 76 refers to telecommunications and sound-recording items while 79 refers to other transport equipment. For section 8, major drops were seen in the IIT index for China, in particular: 81, 84 and 85. Division code 81 refers to prefabricated buildings, sanitary, plumbing, heating and lighting fixtures and fitting; 84 refers to apparel and clothing accessories; and 85 refers to footwear. Others division codes remained more or less consistent over the years. It is notable that all the division codes which saw a decline in the IIT index were from low technology, high labor-intensive industries.

We argue that these trends suggest a possible shift in the China government's policy direction towards prioritizing specific industries as discussed in section 2. The decline in the indices for section 8 indicates that there was a clear shift from these industries to some other industries. This could be attributed to the product categories of section 7 particularly 71, 72, 73 which are relatively technology-intensive (Lall, 2000). Therefore, our premise is that the policy changes have brought upon the change in the composition of these division codes, both in production as well as in the trade of intermediate goods. Clearly, for intermediate goods, there has been a distinct shift from low technology industries towards higher technology-intensive (medium tech) industries. This supports our first hypothesis that there has been a structural change in the intermediate goods trade from primary and/or low technology industries towards medium technology industries. We see this as the changes in China's policies on export orientation and the regional production network for which China has been actively reforming since the 1980s. Also, China's accession to WTO (Dec. 2001) was another factor that had helped to achieve the policy changes undertaken by the Chinese government. We would further argue that these changes in the component of intermediate goods trade was brought about mainly by foreign investment (particularly from Japan), as these investments have been key to the industrial upgrading of China.

***Stage 2: 2008-2011***

The most notable feature of this stage is that there has been drop in China's IIT index for both sections 7 and section 8 (the exception being division codes 81, and 82 and 87) including division codes 71, 72 and 73. The main reason for this could be attributed to the GFC of 2007-09 which had a lagged effect on Asia. While America and Europe were affected largely through the financial sector, the effects of which were rather immediate, Asia was particularly affected through the trade channel. Although most of the intra industry trade that China conducted was with other Asian economies, the final demand for the finished product was in US and Europe. After the drop in global GDP growth and purchasing power, the consumer demand in these external markets for Asian products were drastically weakened after 2008. This is clearly visible in our data work as well.

From the viewpoint of China's policy shift, there has been two major policy shifts during this period: firstly, an inclination towards boosting domestic demand; and secondly, undertaking an upgrading of the industries. While the first policy shift could be directly linked with the GFC, for the latter, Chinese government has been trying to upgrade its industry from medium tech to relatively higher tech from the mid-2000s. In response to the threat of GFC, Chinese government speeded up its pace for industrial upgrading.

We argue that the policy shift by the Chinese government in preference of higher-end technological intermediate goods may also be the reason for the drop in some of these division codes. Furthermore, we can see that although division codes 71, 72, 73 and 74 registered a

decline, the drop was not substantial for division codes 73 and 74. Hence, this may hint that the structural changes happened only for division codes 71 and 72.

The increase in the division codes 81, 82 and 87 could be explained by China's policy of boosting domestic demand. Division code 81 refers to prefabricated buildings, sanitary, plumbing, heating and lighting fixtures and fittings; division code 82 refers to furniture, bedding, mattress, mattress supports, cushions and similar stuffed furnishings; and division code 87 refers to professional, scientific and controlling instruments and apparatus. One of the most effective ways in China to boost the domestic demand has been through investment in the real estate sector. Both division codes 81 and 82 are related to the real estate sector whereas division code 87 is for relatively high-end equipment products.

The policy adjustments adopted after GFC resulted in the structural change of China's IIT index in SITC 7 and SITC 8. The 3 years' average IIT index (2009-2011) for China with her Asian counterparts in most product categories of SITC 7 and 8 started to decline after years of persistent growth since the 1990s and suggests that China's demand for foreign medium and high-tech products was decreasing. This is a result of the Chinese government's preference to invest in research and development in the area of science and technology due to her drive to build an innovative country, a strategy, which began in 2006. Following this reasoning, the rise of the IIT index for S3-87 is logical. These findings are in line with our second hypothesis that China is trying to upgrade its industries towards high technology industries in the aftermath of GFC.

Although the above are plausible explanations for structural changes in the intermediate good trade in the second stage, one need to be careful in making any conclusion, as this time frame is very short (only four years) and no considerable effects could have been seen yet given that policy adjustments usually take time.[11]

## 4. Conclusion and Recommendations

China is an important player in the East Asian production network and is heavily involved in the trade of intermediate goods in the region. We argue that, this is the result of a series of policy changes and adjustments, which the Chinese government had undertaken over the years, since her opening up in the 1980s. In this paper, we looked into these changes from two aspects. Firstly, we reviewed the Chinese government policies from an intuitionalist point of view. Looking into various policy documents related to China's inward foreign investment, trade and technology, we present two hypotheses. i) The policy adjustments were critical in successfully transforming China from a country that was previously primary product-based to one that is largely manufacturing-based that are medium technology intensive. This was the first structural change that had happened since her opening up. ii) In the aftermath of GFC, China is trying to climb further up the technology ladder by targeting high technology industries. This is the second structural change that is currently underway.

Our second aspect was a focus on the supporting data work, based on the calculation of the intra-industry trade (IIT) index proposed by Grubel and Lloyd. The IIT index analysis was conducted for both the 2-digit (division code) level and 5-digit (basic heading) level. We showed though our data work that the structural changes did take place in the behavior of intermediate goods trade of China. Firstly, during the period of 1991-2008, the Chinese government was successful to shift industries from low technology-intensive to medium technology-intensive. This could be observed through the big increase in the IIT index of the latter (related to division codes 71, 72, 73, 74) and a drop in the former (such as those related to division codes 81, 84, 85). Secondly, in the aftermath of GFC, we argue that, in the more recent years of 2009-11, the Chinese government policy reallocated demand from external to domestic and further fostered high technology-intensive industries. This policy shift was captured by the IIT index of some certain industries.

[11] We also conducted IIT index analysis on 5- digit level for all respective division codes. These also indicate towards similar conclusions made in 2- digit level analysis. The IIT index for all 347 basic heading levels is available upon request.

We observed that the Chinese government had been successful in upgrading her industry since the 1990s. As China had already achieved success in most medium technology-intensive industries, which were vital towards China's exceptional economic growth since her opening up, it is recommended for China to strive for further industrial upgrading. This would also be crucial in moving away from the concept of "Made in China" to "Created in China". To achieve this aim, China's policy that originated in 1980s must be reconstructed and further institutional changes are expected.

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