

Print ISSN: 2288-4637 / Online ISSN 2288-4645
doi: 10.13106/jafeb.2016.vol3.no3.39.

China's Ascent in World Trade and Associated Shift in Its Trade Structure*

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Received: February 27, 2016 Revised: May 12, 2016 Accepted: July 19, 2016

Abstract

The rapid expansion of China's trade surplus since the mid-eighties and picking up until the onset of 2008-09 global financial crisis has been a key development in the world economy. While growing trade surplus of China has been viewed with cynicism borne out of an undervalued Yuan and for having being a member of WTO since 2001, many others argue that China's trade surplus reflect changes in China's economic and trade structure and associated shifts in its role within regional and global production chains. We address this issue by analyzing: (i) China's growing and changing trade structure as well as changing structure of trade surplus with the rest of the world, USA, Europe, Japan and rest of Asia, (ii) China's revealed comparative advantage (RCA) with the rest of the world, and (iii) how China's trade policies resulted into a shift in China's trade structure. We find that, not only China has made significant inroads in the world trade since its admission to WTO, but also there has been a noticeable shift in China's trade structure with specialization in high-end technology industries wherein China's exports aided by a well calibrated FDI policy.

Key Words: Trade Structure, Current Account, Exchange Rate, Revealed Comparative Advantage

JEL Classification: F100, F140, F320

1. Introduction

The rapid expansion of China's trade surplus is a key development in the world economy. It poses one of the most intriguing open-economy macroeconomic question of how has China been able to sustain such massive trade surplus along with an ever growing stockpile of foreign exchange reserves for over two decades? After more than a decade of exports growth, China is world's third largest exporter after USA and Germany. Consequently, over the past decade with import growth lagging behind that of exports, China's trade surplus has widened very sharply. Whereas the empirical regularity has been that of developing countries tend to run current account deficits in tandem with capital

account surpluses; implying thereby a net import of both goods and capital investment. Thus, the excess savings of developed countries stokes up domestic investment and growth of developing countries (Buera & Shin, 2010). While China treaded on the this orderly path at the beginning of reforms and opening up of the economy in the 80s, however with the fall of domestic demand beginning in the 90s, the economy shifted towards exports and China began running trade surplus (Huang & Tao, 2010). Specifically, the size of its trade surplus increased by 10 folds during 2004 to 2009. This has resulted an uncanny "twin surpluses" i.e., current account and capital account surpluses.

China's rapidly increasing current account surplus was widely attributed by the world to China's low technology manufacturing engineered by cheap labor and an undervalued currency. While the growing trade surplus has been viewed with cynicism in some quarters as a clear sign of unfair price competitiveness of Chinese exports with an undervalued Yuan, many others have argued that China's trade surplus reflects changes in China's economic and trade structure and associated shifts in its role within regional and global production chains. Since its entry into WTO, China is gaining specialization in many high technology industries and this threatens to shift the industrial clusters from other countries to China.

* This paper is part of Seed Money Project, SM 230, 2014, taken up by the author at Indian Institute of Management Lucknow and the financial support is gratefully acknowledged. Thanks to Ankita Sajjan for the assistance. The views are personal and don't reflect the views of the organizations wherein the authors are working.

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Therefore, to address this issue, first we analyze: (i) China's growing and changing trade structure (exports and imports) with the rest of the World, USA, Europe, Japan and rest of the Asia. This to ascertain whether or not China has moved up in the trade-value chain? Further, how have changing Chinese export and import structure contributed to the current account deficit of US beginning of China's Yuan depreciation policy of 1994 and its admission to WTO in 2001? Also, has Yuan depreciation and China's entry into WTO propelled a change in China's export structure from labor-intensive industries to towards technology-intensive industries? (ii) Secondly, we analyze the growth as well as change in the structure of China's trade surplus with respect to its major trading partners including US, Europe, Japan and Asia since its admission into WTO. (iii) And third, how China's trade policies resulted into a shift in China's trade structure. At the outset, we first review and comment on China's exchange rate regime and growth in trade

2. China's Exchange Rate Regime and Trade Structure

Prior to 1994, China followed a different kind of fixed and semi-fixed exchange rate system. In 1994 the Chinese government decided to peg its currency to the US dollar with an exchange rate of 8.28 Yuan per US dollar. Many have perceived that the pegging of Yuan to US dollar in 1994 was undervalued by an order of 15 per cent to 35 per cent (Frankel 2006, Zhang and Pan, 2004, Chang and Shao, 2004, and Goldstein and Lardy, 2003). After an intense international pressure and allegations for dumping goods at a cheaper price through currency devaluation, China finally revalued Yuan by 2.1 per cent in July 2005. While the currency remains effectively pegged to a basket of hard currencies, it is allowed to fluctuate against the US dollar by less than 0.3 per cent per day in either direction. The Chinese Yuan depreciation resulted into an increasing number of foreign companies to invest in China by shifting the production base to China to take advantage of China's abundant low cost labor.

Although studies such as, Cheung, Chin and Fujii (2009) using cross country purchasing power parity found evidence of undervaluation of renminbi in 2006, yet these tests throw up statistically insignificant results and lack econometric robustness (Dunaway, Legih, & Li 2006). While the extent of depreciation of Yuan is debatable, The US Treasury department Bi-Annual Report to Congress on International Economic and Exchange Rate Policies, released as recently as on November 27, 2012, finds that China has not manipulated its exchange rate (Weiwen, 2012) and manipulation of renminbi has little to do with the emergence

of China's trade surplus. It is only when the renminbi began to appreciate that Chia's trade surplus increased while the renminbi was pegged to the US dollar until 2005. Therefore, the explanation for the buildup of trade surplus may lie in structural factors including, US consumption spree fueling import demand, maturation of the East Asian production sharing network centered on China, and ratcheting up of China's savings rate. Therefore, a mere appreciation of the renminbi by itself would do a very little to curb China's trade surplus with the west since much of the impact is negated by the lower cost of imports in to China.

Besides, currency revaluation may likely to decrease imports from Southeast Asian economies that would accompany an increase in exports from the West. A lesser demand for finished goods from China would force China to import fewer intermediate goods and raw materials (Garcia-Herrero & Koivu, 2007). China's large trade surplus beginning the 90s focused on industry and investment relocation with the movement of manufacturing sectors from Southeast Asia to China, especially in final goods production (Huang & Tao, 2010). But this does fail to explain empirically the rise in the magnitude of China's current account surplus well over in the 2000s.

Examining China's trade structure, Lemoine and Unal-Kesenci (2002) finds that China's specialization pattern has enhanced technological transfer, including through increased local content in its processing trade. Hiratsuka (2005) finds that China already had advanced in its "catching up" process by 2001 (becoming an exporter) in manufacturing sector mostly in nondurable and light machinery. Gao and Ha (2006) showed earlier that China's trade has gone through large structural changes, with exports now consisting of a growing share of technologically sophisticated products such as, machinery and transport equipments whereas more natural resource-based and high-tech products being imported.

A number of studies have explored the differences in growth patterns of China and other Asian countries. Inter-country comparison studies show a significant similarity of component shares in manufacturing exports and imports has been seen across most of the East Asian countries except China. The manufacturing trade patterns of China differ from its East Asian neighbors. In particular, the components share in the total manufacturing imports of China (44 per cent in 2006) is much higher compared to the corresponding share in its manufacturing exports (25.6 per cent). This difference between China and the other East Asian countries in this region is coherent with an earlier observation in other studies that China's rise in the world trade has brought about a significant shift in the division of labor within regional production networks. Asian countries in the region are increasingly playing a role in producing parts

and components for the fast growing final assembly activities in China.

China was granted membership of WTO in 2001, which was expected to provide China with protection from substantial barriers (import quotas, etc.) that impede the exporting of so-called sensitive goods to developed countries. Joining the WTO would not only confer rights on transition economies like China, but would also require them to meet certain obligations, such as maintaining low or moderate tariffs and abolishing nontariff barriers. Easier access to attractive foreign markets will boost China's labor-intensive exports in a number of industries, including electronics etc. In particular, China's WTO accession has led to the removal of quotas against its textiles and clothing exports. It is expected that this removal will give a significant boost to China's exports. Also, upon accession to WTO, many of China's trading partners have eliminated restrictions on imports from China.

3. Methodology, Data Structure and Data Source

3.1. Technological Classification of Trade Industries

First, we analyze the overall export/import structure of China vis-à-vis the rest of the world (RoW). Following, Lall (1998) and OECD Secretariat Trade Classification of 1994, we have adopted a five-way technological classification of trade categories. This categorization is based on direct R&D intensity (R&D expenditure as a percentage of output production) weighted by sector and country. Accordingly, as

has been given in <Table 1>, all the export/import industries were classified and listed in these five categories in terms of technological intensity. The low technology (LT) products tend to have relatively simple skill requirements and many traded products are undifferentiated and compete on price. Thus, labor costs tend to be a major element of cost in competitiveness. Resource Based (RB) products are simple and labor intensive and their competitive advantages arise generally from the local availability of natural resources. RB and LT products together can be classified under low technologies, with the main drivers of competitiveness being natural resource endowments in the former case and low wages in the latter.

Industries classified in a higher technology category have higher median intensity than industries in a lower category. Medium-Low Technology products have lower R&D intensity as compared to Medium-High Technology products. Industries in a higher technology intensive group are more R&D-intensive than those in a lower group over a long period (1980-92). High Technology products are becoming the largest and fastest growing export earner in the world (Hatzichronoglou, 1997).

3.2. Data Source & Data Structure

The trade data from 1995-2010 was obtained from two main sources. China's exports and imports with the RoW data obtained from WTO statistical database are classified into 16 trade categories. Further, these trade categories are broadly put under five-way technological classification based on the extent of technology intensity as has been

<Table 1> Five-Way Technological Classification of Traded Goods

Technical Codes	Category	Industries
0	Primary and Resource-Based Products	Fresh Fruit, Meat, Rice, Cocoa, Tea, Coffee, Wood, Coal, Crude Petroleum, Gas, Agro/Forest based products Prepared Meat/Fruits, Beverages, Wood products, Vegetable Oils, other Resource-Based products, Ore Concentrates, Petroleum/Rubber products, Cement, Cut Gems, and Glass
1	Low-Technology Products	Paper Printing, Textile and Clothing, Food, Beverages, and Tobacco, Wood and Furniture, Textile/Fashion, Headgear, Footwear, Leather Manufactures, Pottery, simple Metal Parts/Structures, Furniture, Jewelry, and Toys
2	Medium-Low Technology Products	Rubber and Plastic products, Shipbuilding, other Manufacturing Non-Ferrous Metals, Non-Metallic Mineral products Fabricated Metal products, Petroleum Refining, Ferrous Metals, Synthetic Fibres, Chemicals and Paints
3	Medium-High Technology Products	Scientific Instruments, Motor Vehicles & Parts Electrical Machinery, Chemicals, Other Transport Equipment, Non-Electrical Machinery TVs, Transistors, Turbines, and Power Generating Equipment
4	High-Technology Products	Office, Data Processing Equipment Telecommunications Equipment, Pharmaceuticals, Aerospace, Optical/Measuring Instruments

<Table 2> Definition and Data Sources of Trade Metrics

Trade Metrics	Definition	Data Source
Exports & Imports (for China's Trade with the Rest of the World)	Measured in Tradable US\$ Value of the Products	Statistical Database of World Trade Organization
Trade Balance (only for Tradable Commodities between US & China)	Measured as "Custom Value of Imports" Subtracted from "Total FAS Value of Exports"	USITC Interactive Tariff and Trade DataWeb

<Table 3> Specialization and Competitiveness Measures

	Metrics
Degree of Specialization in an Industry	Export/Import Ratio (or, Net Account Surplus)
Overall Trade Competitiveness of the Country	Export/GDP and Import/GDP Ratios

mentioned in <Table 1> and each of the categories are assigned technical codes.

The trade data from 1995-2010 is analyzed to study the change in China's trade structure since the Yuan's one time devaluation was in 1995 and China's entry into WTO was in 2001. First, the export-import ratios are computed for all the industries for the above period to study the change in China's degree of specialization in different industries. Secondly, the percentage share of each of the industry in total exports is calculated for the same period. The changing share of each of the industry in the total exports would reflect China's changing trade structure and trade competitiveness. Also, percentage increase in exports of each of the trade industry since 1995 and 2001 would show the impact of China's policy of Yuan devaluation and entry into WTO respectively.

We have also analyzed the change in trade account surplus for the 99 tradable categories between China and USA during 1996-2009 for which the data was obtained from the Harmonized Tariff Series (HTS2) of United States International Trade Commission (USITC). This is to understand China's emerging specialization and expertise in bilateral trade in different sectors. The details about the classification of these 99 tradable items into five-way technological classification is given in Appendix I and the details of the data source is given in Appendix II. <Table 2> defines data structure and provides data source with respect to the trade metrics whereas <Table 3> presents the trade metrics that is used to evaluate specialization and competitiveness of a tradable industry.

4. Data Analysis and Findings

We analyze China's trade statistics with the RoW followed by specific trade statistics of China with USA,

Europe and Asia. The empirical results are discussed in the following.

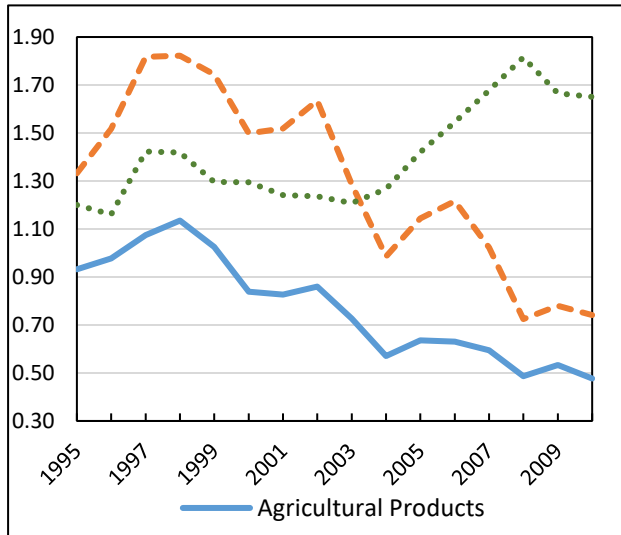
4.1. Growth in China's Trade with RoW

4.1.1. Export-Import Ratios during 1995-2010

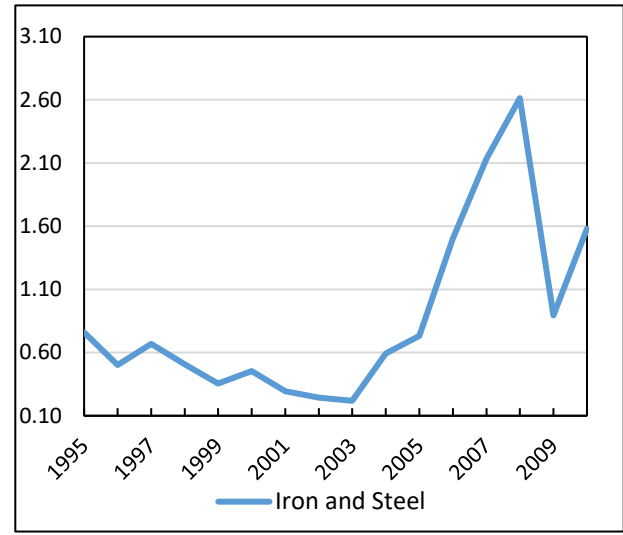
The export/import ratios are calculated for the 16 industrial trade categories. The growth in these ratios indicate the increasing specialization and relative export growth of the specific tradable industries in China. China's simple exports-to-imports ratios soared for virtually all manufacturing industries <Figure 1.A>. The trade data reflects that exports of primary products have decreased relative to imports from 1995 to 2010. The export-import ratio for agricultural and food product exports declining sharply relative to imports. The decline in export-import ratio for agricultural products being the most sharp and the export-import ratio for food falling below 0.5 in 2010. Comparatively, the export-import ratio of manufacturing which comprises of medium-low technology products has jumped from 1.2 in 1995 to 1.65 in 2010. As compared to 1995, China currently has low export-import ratios in all the primary and resource based industry categories such as agriculture, mineral fuels, ores, plastic and packing materials, organic chemicals, and etc.

The export-import ratio of iron and steel, with medium requirement of technology, showed a sharp increase from 0.75 in 1995 to 1.58 in 2010 <Figure 1.B>. Over the last decade, China has invested heavily in steel capacity and has now become one of the biggest exporter of steel products from a steel importer with a net import of iron ore. The automotive products, which require medium to high use of technology, saw the export-import ratio improving from 0.23 to 0.53 during the period of 1995-2010 <Figure 1.C>. In the high technology industries of electronic data processing and telecommunication equipment, China has shown a continuous improvement with export-import ratios jumping to 3.62 and 4.4 in 2010 from 1.68 and 1.1 in 1995 respectively <Figure 1.D>. However, in the integrated circuit and electronic components category, the export-import ratio has remained almost stagnant at 0.33 in the past 15 years. This shows an industry where China is yet to gain specialization

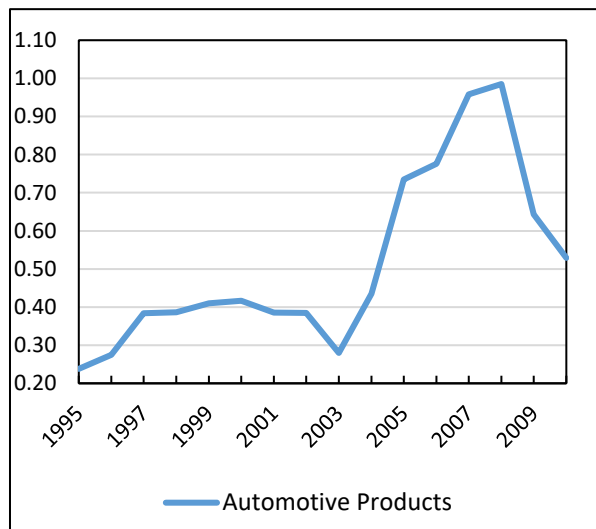
Trends in Export / Import Ratios (1995-2010)



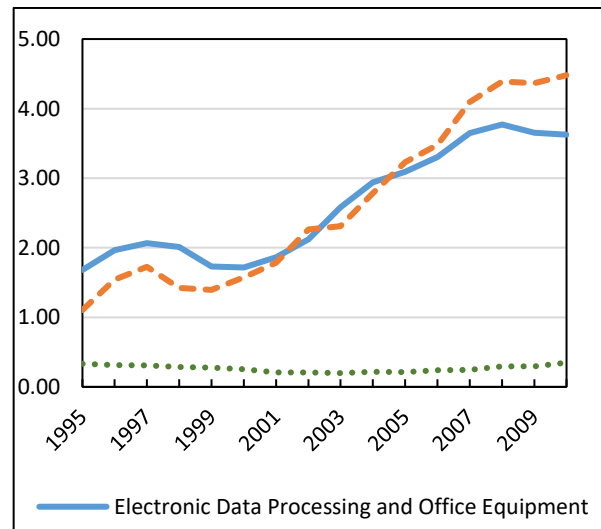
<Figure 1A> Primary and Manufacturing Products



<Figure 1B> Iron & Steel industry



<Figure 1C> Automotive Products



<Figure 1D> High Technology Industries

4.1.2. Contribution of Various Trade Categories to Total Exports

In this section we analyse the change in the structural composition of Chinese exports of various trade categories in terms of differing technological classification of products. We analyze the percentage contribution of each of the 16 trade categories to overall exports of China for the period of 1995-2010. This is to understand the evolution of China's trade structure.

4.2. High Technology Products in China's Export basket

The percentage contribution of the four industries classified under high technology products from 1995 to 2010 is shown in <Figure 2.A>. Pharmaceutical category has shown almost no change in the last 15 years with its contribution remaining constant in range of 0.3% to 0.5%. Office and telecom equipment forms more than 12% of the whole export basket of China in 2010 as compared to 5% in 1995. The size of telecommunication products basket has increased from 3% to 5%, with a small increase in size of integrated circuits and electronic products. Overall, these four industries contributed 9.18% of total exports in 1995 and in 2010 their share has increased to a staggering 19.01%. Office and telecom equipment forms more than 12%

of the whole export basket of China in 2010 as compared to 5% in 1995. The size of telecommunication products basket has increased from 3% to 5%, with a small increase in size of integrated circuits and electronic products.

4.3. Medium Technology Products in China's Export Basket

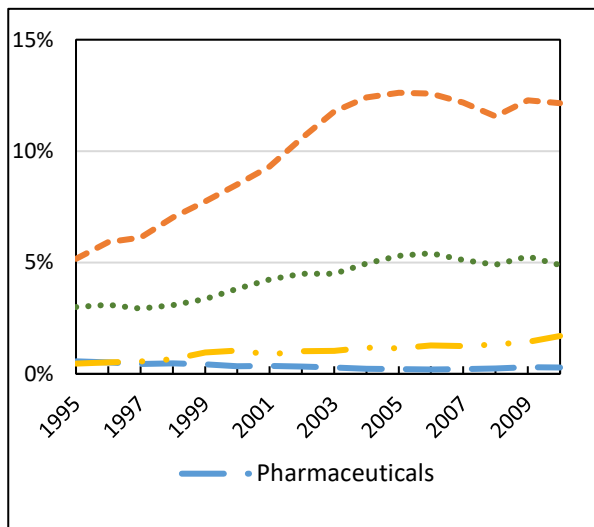
The share of medium-high technology industries increased to 69.72% in 2010 from 60.84% in 1995. Excluding manufactures, which constitute of some medium-low technology industries too, the remaining industries in this segment saw an export share of 29.81% in 2010 from

16.35% in 1995. <Figure 2.B> shows the increase in size of machinery and transport equipment, and electronic data processing office equipment in the Chinese export basket from 11% and 2% in 1995 to 21% and 6% in 2010 respectively.

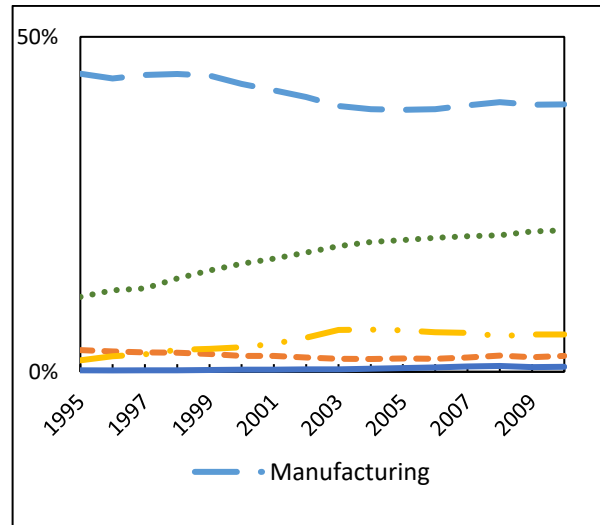
4.4. Low Technology Products in China's Export Basket

<Figure 2.C> and <Figure 2.D> shows that the share of low technology industries such as, textiles & clothing and agricultural and food products in the overall exports has dropped precipitously over 1995-2010. Since both these

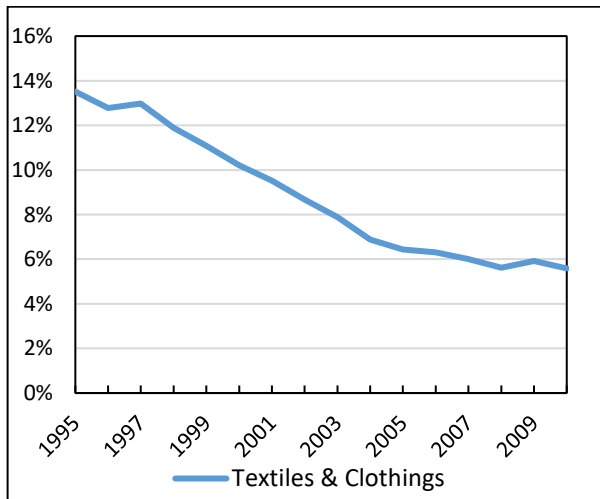
Contribution of Trade Categories to Total Exports (1995-2010)



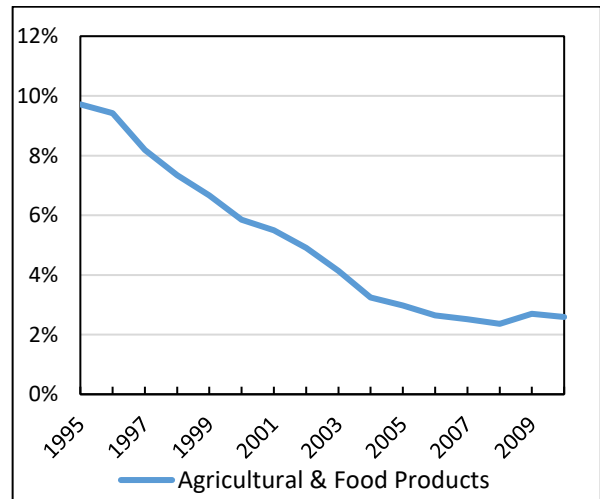
<Figure 2A> High Technology Products



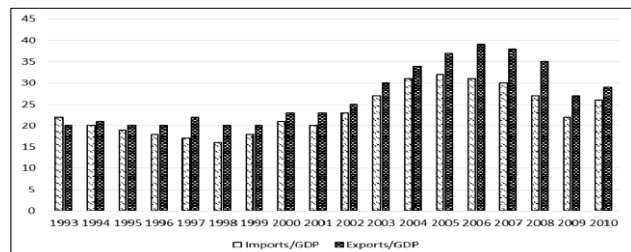
<Figure 2.B> Medium-High Technology Products



<Figure 2C> Textile & Clothing's



<Figure 2D> Agricultural & Food Products



<Figure 3> Imports and Exports as a Percentage of GDP from 1993-2010

industries fall in the category of low technology and primary products industry categories, with China's growing expertise in other high technology industries, it was inevitable to have low exports of these categories. This shift reflects the changing structural composition of exports towards medium-high technology products

4.4.1. Growth in China's Exports and Imports Proportion to GDP

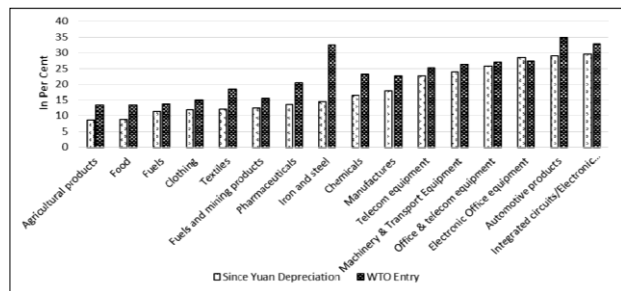
<Figure 3> shows the variation in China's exports and imports as a percentage of GDP between the years 1993-2010. The data clearly exhibits that there is a significant increase in exports/GDP & imports/GDP after China's entry

into WTO in 2001. More importantly, a continuous rise in exports/GDP over imports/GDP ratio, and thus, resulting in a sustained trade surplus. China's exports touched a high of 39% of GDP in 2006 and fell down to around 30% after 2008 economic recession. China's GDP grew at more than 10% in each of the year between 2001 and 2010 and which depends a lot on its export performance. Therefore, exports slowdown can create an adverse impact on the growth.

<Table 4> shows how China's exports have increased since 1995 Yuan depreciation and its WTO entry in 2001. It can be seen that almost all medium to high technology industries have grown by more than 25% annual cumulative average growth rate (CAGR), while some high tech industries such as, integrated circuits and electronic components showing growth of more than 30% <Figure 4>. Also, we can see that growth in these industries after WTO entry has been far higher than the cumulative growth since 1995, with each of the industry categories registering growth in excess of 13% and medium and high technology industry categories registering in excess of 20%. It can be noted that China's GDP has grown more than 10% CAGR since 2001 and this was a result of its export engine churning out exports at a higher pace than the country's growth in GDP. Thus our analysis also lends support to the fact that China's

<Table 4> Growth in Exports (CAGR) of All Industries during 1995 and 2001

Technology Classification	Category	Since Yuan Devaluation (1995-2010)	Since China's Entry to WTO (2001-2010)
Low Technology	Agricultural products	8.59%	13.42%
Low Technology	Food	8.90%	13.42%
Low Technology	Fuels	11.34%	13.71%
Medium-Low Technology	Clothing	11.90%	15.09%
Medium-Low Technology	Textiles	12.07%	18.39%
Low Technology	Fuels and mining products	12.33%	15.60%
High Technology	Pharmaceuticals	13.58%	20.62%
Medium-Low Technology	Iron and steel	14.45%	32.46%
Medium-High Technology	Chemicals	16.30%	23.24%
Medium-High Technology	Manufactures	17.89%	22.61%
High Technology	Telecommunications equipment	22.68%	25.27%
Medium-High Technology	Machinery & transport equipment	23.89%	26.39%
High Technology	Office & telecom equipment	25.72%	27.01%
Medium-High Technology	Electronic data processing & office equipment	28.48%	27.23%
Medium-High Technology	Automotive products	28.92%	34.93%
High Technology	Integrated circuits and electronic components	29.56%	32.71%



<Figure 4> Growth of Trade Industries since Yuan Depreciation (1995) and WTO Entry (2001)

high technology industries have shown remarkable growth since 2001 and China's trade structure is quickly moving towards high technology products.

5. China's Relative Comparative Advantage (RCA) with RoW

Revealed comparative advantage (RCA), an index for measuring the relative trade performance of individual countries in particular commodities, is defined as a country's share of world exports of a commodity under consideration divided by its share of total world exports that are of that class i.e., a ratio of relative export structure. It is based on the assumption that the commodity pattern of trade reflects the inter-country differences in relative costs as well as in non-price factors and thus "reveal" the comparative advantage of the trading countries. Thus the index for country *i*, and commodity *j* can be calculated as:

$$RCA = (X_{ij} / X_{it}) / (X_{nj} / X_{nt})$$

Where, X = Exports
i = Country index
n = Set of countries
j = Commodity index
t = Set of commodities

The result implies that a comparative advantage is "revealed" if $RCA > 1$. If RCA is less than unity, the country is said to have a comparative disadvantage in production of that commodity. Here in the table depicted below, RCA infers that China reveals a comparative advantage in High Technology Products over Low technology products.

The relative comparative advantage (RCA) of China with the RoW was calculated for 16 industry categories during the period of 1996-2010. Table 6 captures a snapshot of China's RCA in these industry categories at four significant time periods: (i) the year 1996 that reflects the post-Yuan devaluation, (ii) the year 2001 when China joined WTO, (iii)

the year 2008 that represents peak of the world's economic cycle, and (iv) the year 2010 for global financial crisis and economic slowdown.

The RCA analysis also supports our previous analysis that China has gained specialization in high technology industries since Yuan's devaluation in 1995 and more so after China's entry to WTO in 2001. China's RCA in integrated circuits and telecom equipment improved from 0.47 and 2.03 in 2001 to 1.01 and 2.65 respectively in 2008. The RCA in other high technology industries such as, electronics & office equipment, and machinery and transport equipment increased while RCA in low technology industries of agricultural products, food and clothing saw a decrease in 2008 as compared to 2001.

<Table 5> RCA of China's various industries at 1996, 2001, 2008 and 2010

Industry	1996	2001	2008	2010
Agricultural products	0.86	0.69	0.31	0.31
Food	0.91	0.73	0.31	0.32
Fuels	0.45	0.32	0.11	0.09
Fuels and mining products	0.48	0.38	0.15	0.13
Clothing	5.25	4.32	3.23	3.03
Iron and steel	0.89	0.55	1.18	0.77
Textiles	2.76	2.61	2.57	2.52
Automotive products	0.04	0.08	0.23	0.21
Chemicals	0.63	0.51	0.46	0.42
Electronic data processing and office equipment		1.62	3.16	3.11
Machinery and transport equipment	0.60	0.87	1.23	1.26
Manufactures	1.15	1.19	1.25	1.22
Integrated circuits and electronic components		0.47	1.01	1.08
Office and telecom equipment	0.94	1.42	2.39	2.30
Pharmaceuticals		0.34	0.19	0.19
Telecommunications equipment		2.03	2.65	2.55

6. China's Trade with USA

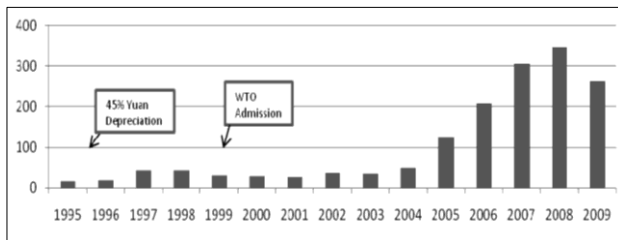
China's export/import data with USA of 99 trade categories classified under HTS2 system of USITC is analysed. As the largest trading partner of China, USA runs a huge current account deficit that has continuously growing since China's entry into WTO in 2001. Our analysis shows that USA's growing trade deficit is spread across many high

technology industries reflecting China’s changing export structure. Based on the extent of technology intensity, each trade category has been assigned a technical code as has been given in Appendix II.

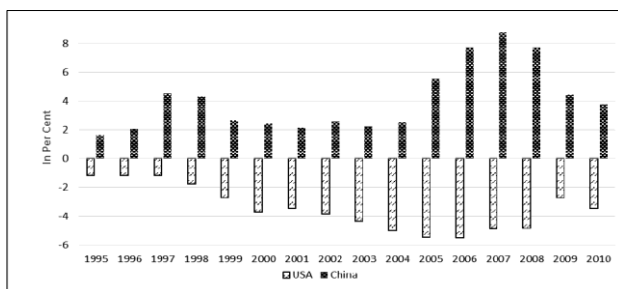
6.1. USA’s Trade Deficit with China

China’s current account surplus with USA shot up after Yuan depreciation and greatly increased after 2001 WTO accession, as can be seen from <Figure 5>. China’s trade surplus skyrocketed from \$ 28 bn in 2001 to \$262.18 bn in 2009. China’s trade balance as a per cent of GDP went up from 2.1% in 2001 to 7.69% in 2008, while that of US slipped from -3.6% to -4.94%, as has been shown in <Figure 13>. The absolute change in China’s overall trade balance with respect to US during 1994-2009 also can be seen in <Figure 5> and <Figure 6>.

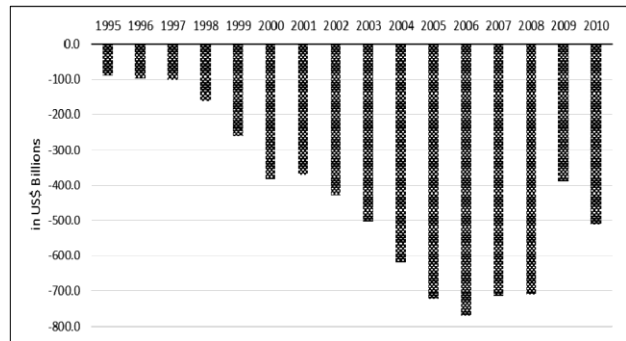
The annual trade deficit of US with the world more than doubled after 2001. Before 2000, the worst US current account deficit was 3.4% of GDP in 1987 and the worst 7-year period of deficits averaged 2.5% from 1984 to 1990. However, after China’s entry into WTO, the trade deficit of US averaged 5.02 % during the 2002 to 2008. China’s low cost products spread across various industries and a rise in the consumption of US led to unprecedented trade deficits of USA since 2001. <Figure 7> also refutes the claims of previous studies which point out that US trade loss to China merely offsets the losses to other countries of the world. China’s entry into WTO was thus appears to be the major reason for increase in US trade deficits.



<Figure 5> China’s Current Account Surplus with USA since 1995



<Figure 6> China and USA Trade Balance with RoW as Proportion of GDP (1995-2010)



<Figure 7> USA’s Trade Deficit with the RoW (1995-2010)

<Table 6> Tradable Industries wherein China Lost its Trade Surplus with USA between 2001 and 2008

HTS-22	Beverages, Spirits and Vinegar
HTS-24	Tobacco and Manufactured Tobacco Substitutes
HTS-34	Soap etc., Lubricating Products, Waxes, Polishing or Scouring Products, Candles etc.
HTS-43	Fur Skins and Artificial Fur, Manufactures thereof
HTS-52	Cotton including Yarns and Woven Fabrics thereof
HTS-78	Lead and Articles thereof
HTS-79	Zinc and Articles thereof

6.2. The Changing Structure of China’s Exports to USA

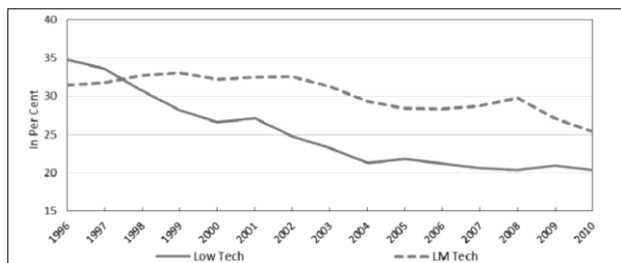
The detail list of tradable industries with technological classification between China and USA is given in Appendix - I. In 2008, at the peak of the economic cycle, US held a trade surplus in 21 trade categories out of the 99 tradable industries. This number was 27 in the year 2001, just before the entry of China into WTO. The USA lost competitiveness in six industry categories to China since 2001 along with an increase in overall deficit from \$83 bn to \$263 bn in 2008. The industries where China lost its competitiveness to US between 2001 and 2008 are given in <Table 6>.

<Figure 8> shows the change in composition of China’s exports to US over the period 1996-2010. The share of China’s exports in low technology category has dropped from 35% in 1996 to 20% in 2010, whereas low-medium technology products saw their share in total exports falling from 31.5% to 25%. During the same period, China’s medium-high technology exports have increased their share from 20% to 28%, while in the high technology products category, Chinese exports have risen from a meager 11% to 25% <Figure 8>.

The gain in specialization in high technology and medium-high technology products comes out to be an

<Table 7> Tradable Industries wherein USA Lost its Trade Surplus with China between 2001 and 2008

HTS-1	Live Animals
HTS-8	Edible Fruit and Nuts, Peel of Citrus Fruit or Melons
HTS-11	Milling Industry Products, Malt, Starches, Inulin, Wheat Gluten
HTS-32	Tanning or Dyeing Extracts, Tannins and Derivatives, Dyes, Pigments and Other Coloring Matter, Paints and Varnishes, Putty and other Mastics, Inks
HTS-54	Manmade Filaments including Yarns and Woven Fabrics thereof
HTS-59	Impregnated, Coated, Covered or Laminated Textile Fabrics, Textile Articles suitable for industrial use
HTS-60	Articles of Apparel and Clothing Accessories, Knitted or Crocheted
HTS-10	Cereals
HTS-21	Miscellaneous Edible Preparations
HTS-35	Albuminoidal Substances, Modified Starches, Glues, Enzymes
HTS-23	Residues and Waste from the Food Industries, Prepared Animal Feed
HTS-72	Iron and Steel
HTS-31	Fertilisers

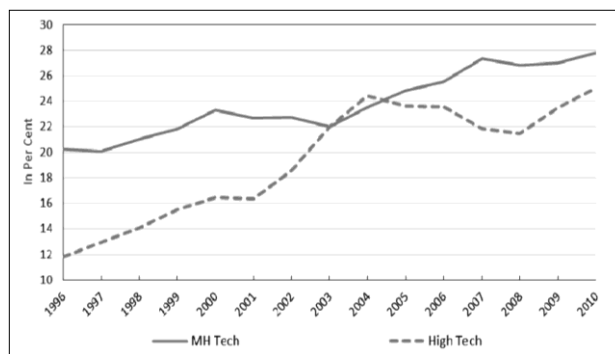


<Figure 8> Share of Medium-Low Technology and Low Technology Products in China's Exports to USA (1996-2010)

important factor in China's account surplus over USA during 1996-2010. As a country endowed with cheap labor, China is expected to export labor intensive low technology products to US and US is expected to provide high technology products to China. However, China seems to have gained expertise in high technology products and combined with its cheap labor it has created a trade surplus against US in most of the tradable commodities.

6.3. Components of China's Trade Account Surplus with USA

The share of trade surplus contributed by each of the



<Figure 9> Share of Medium-High Technology and High-Technology Products in China's Exports to USA (1996-2010)

<Table 9> High Technological Product Classification

HTS 30	Pharmaceutical Products
HTS 84	Nuclear Reactors, Boilers
HTS 88	Aircraft, Spacecraft and Parts
HTS 89	Ships, Boats and Floating Structures
HTS 90	Optical, Photographic, Cinematographic, Measuring, Checking, Precision, Medical or Surgical Instruments
HTS 93	Arms and Ammunition

Low technology, low-medium technology, medium-high technology and high technology is shown in <Figure 8>. China's high tech industries which used to contribute only 4% of surplus in 1996 are contributing 25% of 2010's trade surplus against USA as is shown in <Figure 9>. This depicts a major change in the trade of China with USA and shows China's specialization and competitiveness vis-à-vis US products in high technology products too.

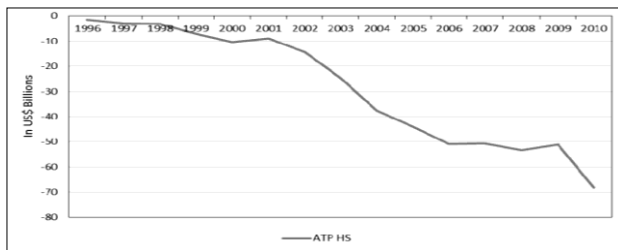
The medium-high tech products have increased their share of surplus from 22% to 31% in the same period, showing China's increasing surplus in high-technology products. The contribution of low technology and low-medium technology products declined from 40% and 34% in 1996 to 22% and 24% respectively in 2010.

Generally, increase in technological intensity of a product is correlated with higher profit margins. China's transformation into a high technology exporter seems to be the major factor in its burgeoning trade surplus with USA and also for China's rapid GDP growth in the past decade. Here, it should be noted that as technological intensity of a product increases, the margin earned on that product increases generally. With such advances in technology, China has increased its trade surplus as well as growth in GDP at a faster pace. The analysis shows that one of the major reason for China's GDP growth is their quick transformation from a low technology economy to a high technology oriented industrial structure.

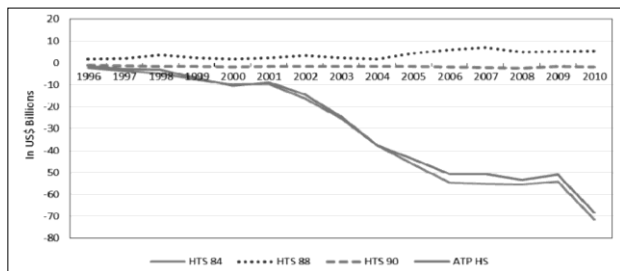
6.4. China-US Trade in High Technology Products

The following list shows the industries labeled under high technology products with their corresponding HTS codes (as given by USITC):

<Figure 10> shows how trade account deficit of US in high technology products has worsened against China during the period 1996-2009. It is striking to note that even in 1996 China ran a small account surplus over US in these high technology products. US trade deficit has worsened with each passing year and stands at US\$ 68.2 billion in 2010. Further, it can be seen from <Figure 11> that except for HTS 88 (aircraft and spacecraft), China runs a trade surplus in all other high tech products.



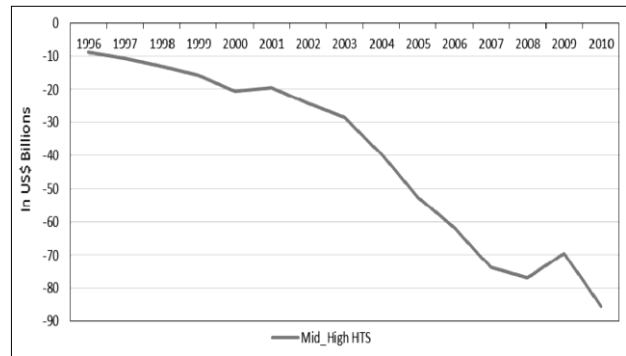
<Figure 10> USA's Trade Account Deficit with China in High Technology Industries



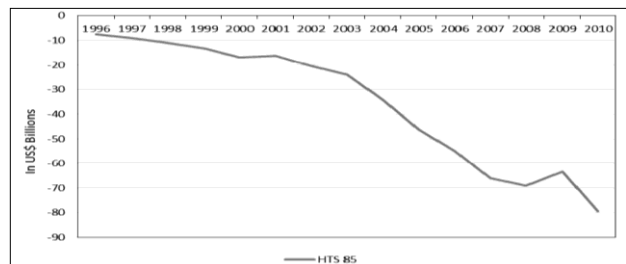
<Figure 11> USA's Trade Account Deficit with China in HTS 84/88/90 (1996-2010)

<Table 10> Trade Classification of Medium-High Technology Products

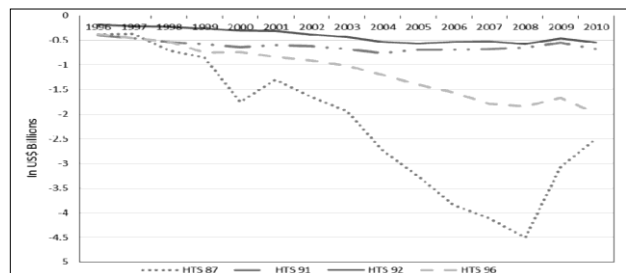
HTS 85	Electrical Machinery and Equipment
HTS 86	Railway or Tramway Locomotors
HTS 87	Vehicles other than Railway
HTS 91	Clocks and Watches
HTS 92	Musical Instruments
HTS 96	Miscellaneous Manufactured Articles
HTS 97	Works of Art, Collectors' Pieces



<Figure 12> USA's Trade Deficit with China in Medium-High Technology Products



<Figure 13> USA's Trade Deficit with China in Electrical Machinery



<Figure 14> USA's Trade Deficit with China in HTS 87/91/92/96

6.5. China-US Trade in Medium-High Technology Products

The list given in <Table 10> shows the industries labeled under medium-high technology products with their corresponding HTS codes (as has been given by USITC):

<Figure 12> shows the worsening of US's trade deficit with China in medium-high technology industries. China has continually gained technology with each passing year resulting into higher exports and increased account surplus. The largest portion of trade deficit is attributed to HTS 85 (electrical machinery and components). China generates most of its trade surplus in medium-high technology industry segment. The trade surplus in the remaining segment

categories is shown in <Figure 14> below. It can be noticed that China runs a surplus against US in all categories of medium-high technology segment trade industries.

7. China's Trade with the European Union, Japan and Rest of Asia

In this section we analyze the change in trade structure of China with its major trade partners (EU, Japan and Rest of Asia) over a decade from 1999-2009. The export-import ratio is a good indicator of a country's trade account surplus in an industry for that it shows the specialization of a country in the respective industry vis-à-vis the other.

The export-import ratio of low technology or resource based products such as agricultural commodities and fuels and mining products have shown a steady decline over the decade. This supports our initial analysis that China's exports in low technology industry is decreasing at a faster pace. China's agricultural and mining exports to Japan have declined precipitously in the last decade with China becoming a net importer from a net exporter in fuel and mining products during this period. For the manufacturing sector, China's export-import ratios with Japan and rest of Asia remained almost constant while its trade with the EU has increased significantly with export-import ratio touching close to 2.5 in 2008 before falling to 2 in 2009. In the chemicals category, China's export doesn't seem to have increased much vis-à-vis rest of Asia/Japan, whereas with

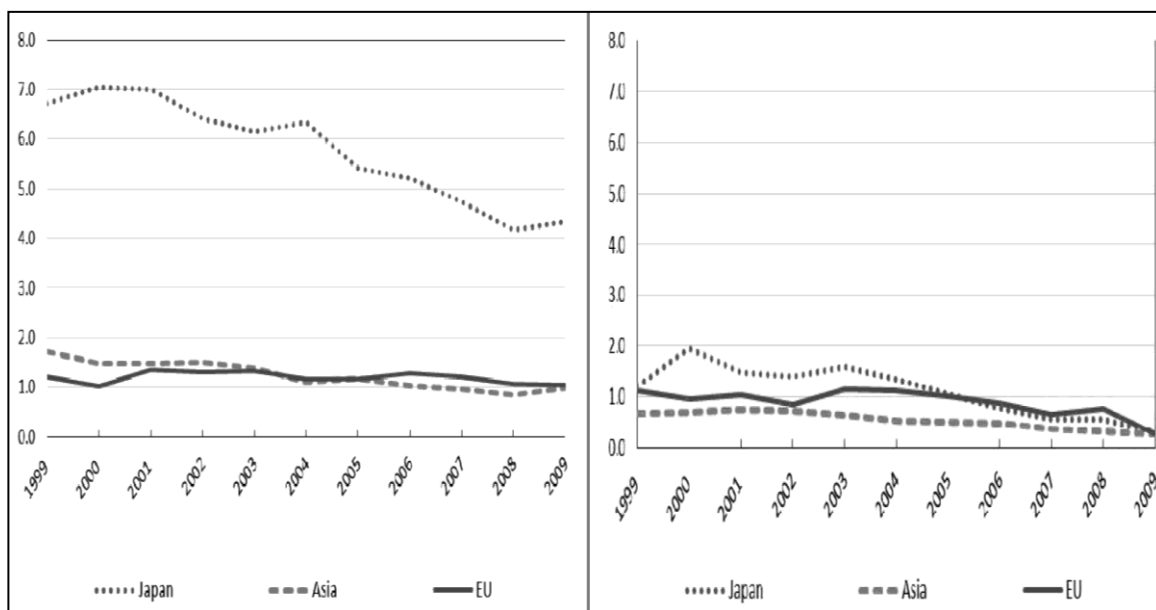
respect to EU, its export-import ratio has fallen from 0.8 to 0.6. Also, China's pharmaceutical exports to Japan and EU has decreased from its 1999 levels.

In the semi-manufacturing segment and machinery/transport equipment segment, China's exports to EU has increased at faster pace. That supports our earlier analysis that China's exports in manufacturing and high technology sectors have increased since China's entry into WTO in 2001.

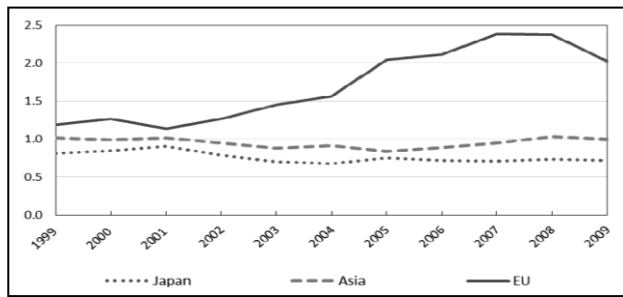
China's export-import ratio in high technology industries of office/telecom equipment and integrated circuits improved substantially with EU since 1999. The export-import ratios in office & telecom equipment touched a high of 10 in 2008 from its 1999 levels of close to one. The export-import ratios with Japan and rest of Asia in these categories remained almost at the same levels.

In the medium-high technology industries of electrical machinery and power generating equipment, China's export-import ratio with EU has increased but not as sharply as other trade categories. The trade with Japan also remained subdued in these industries.

In the textiles sector, China continued to export more to EU, Japan and Asia with its low cost manufacturing. These trends in trade makes it clear that China's trade structure with respect to EU moved from low-technology exports to high technology exports. China's export-import ratios in many high technology product categories improved from its 2001 levels showing China's increasing specialization in these industries.



<Figure 15> Export/Import Ratio of China with EU, Japan and Rest of Asia in Agricultural and Fuel & Mining Products

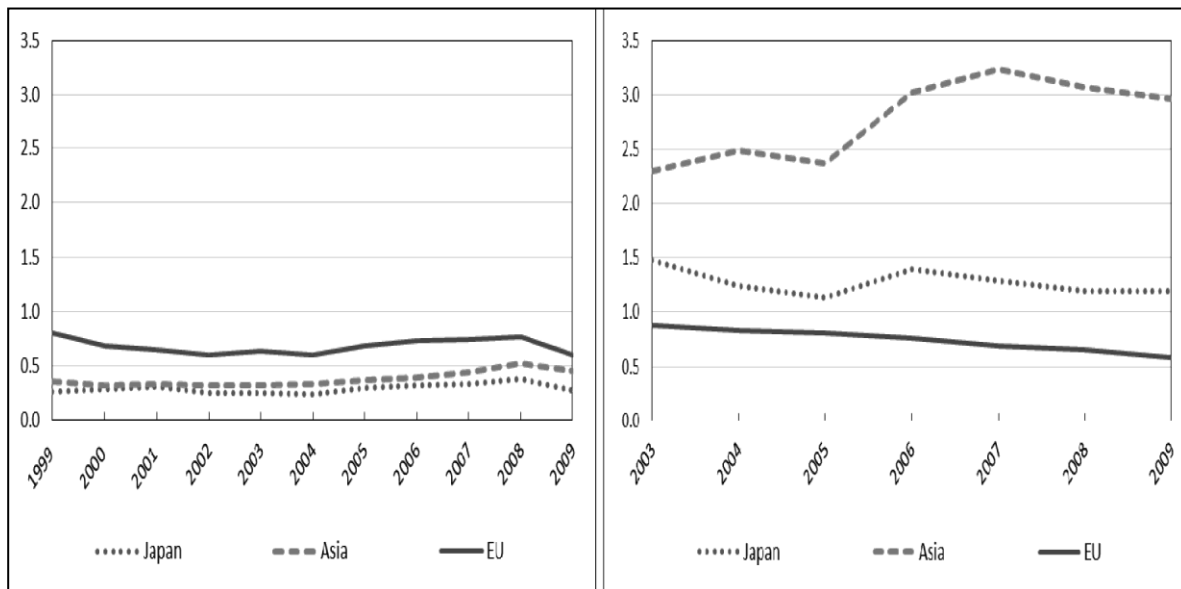


<Figure 16> Export/Import Ratios of China in Manufacturing with EU, Japan and Rest of Asia

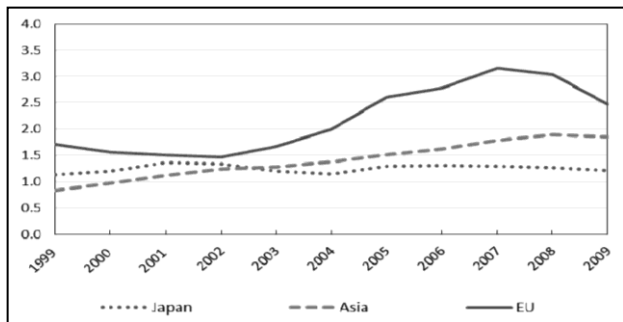
8. Interpretation of Empirical Findings: China’s Structural-cum-Trade Reforms and Emergence of Twin Surpluses

Since the implementation of economic reforms and open-door policies in 1978, China’s export trade structure had gradually changed from agricultural products to trade in manufactured goods with rapid economic growth in the country. The share of agricultural export revenue in total export revenue declined from 28 per cent in 1978 to 5 per cent in 2005. The corporate law formulated in 1979, during the reform period flowed FDI in abundance, making china a

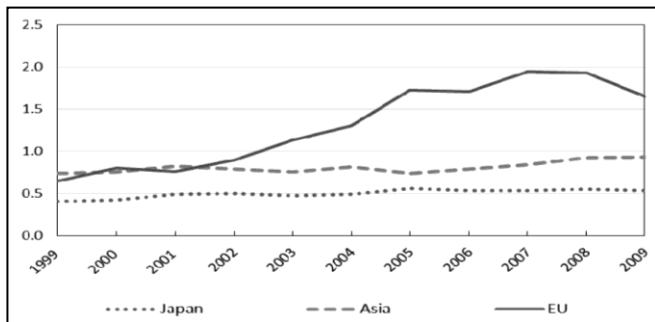
‘global exporter’. FDI inflows and outflows coupled with abundant & low cost labor attracted the foreign affiliates whose share of export investments increased from 5% to 10% from 1951 to late 80’s and 20% in 1992. Governments’ FDI policies of promotional incentive, fiscal federalism and value added tax majorly responsible in creating an investment friendly environment in China. This has attracted more Foreign Invested Enterprises (FIEs) that in turn resulted in the increased exports from 29% in 1994 to 40 % in 1996 to 50% in 2001 with the accession of WTO and shooting up to 60% in the next five years. FDI inflows increased per annum to \$50 to \$60 billion. With the passing of FDI related laws starting with the first corporate law of the reform period, Chinese-Foreign Equity Joint Ventures (1979), Wholly Foreign Owned Enterprises (1986), Technology Contract Law (1987), Mergers and Acquisition (M&A) Law 2003 and Free trade Zone - “Open Door” policy, positioned China as a global export power and sustained higher FDI inflows, higher exports and imports and advanced technology (Yueh, 2011). Yongding (2011) contends that the prime reasons for China’s twin surplus as the emerging gap between saving and investment, are low dividend payments in State Owned Enterprises (SOE’s), increased profitability with industrial growth and restructuring, pursuance of export promotion policies and export oriented FDI impacting the trade account positively.



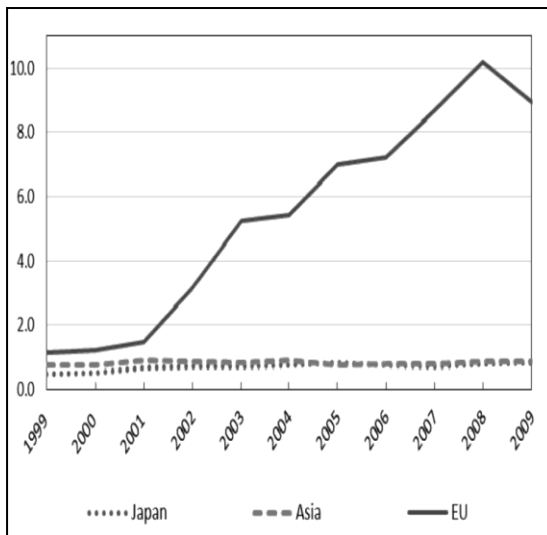
<Figure 17> Export/Import Ratios of China in Chemicals & Pharmaceuticals with EU, Japan and Rest of Asia



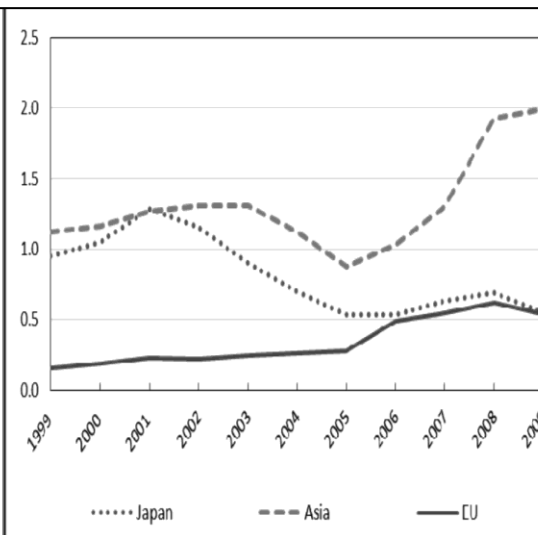
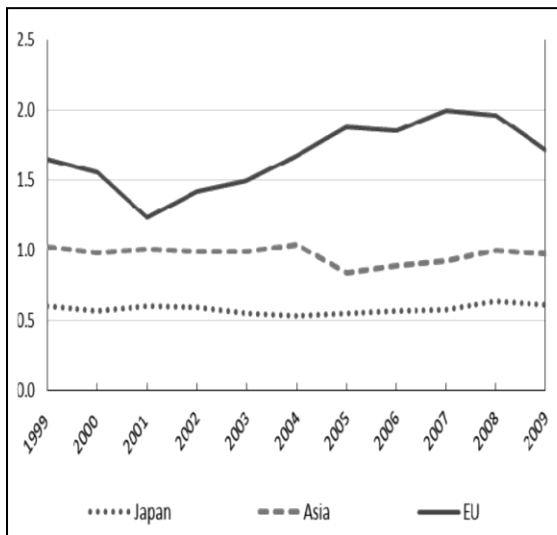
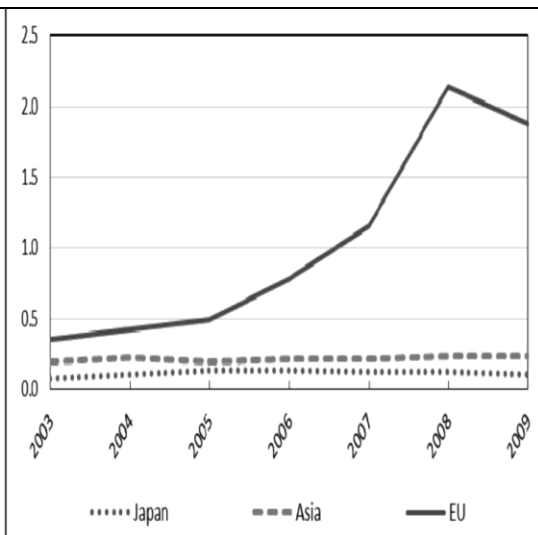
<Figure 18> Export/Import Ratios of China in Semi-Manufacturing with EU, Japan and Rest of Asia



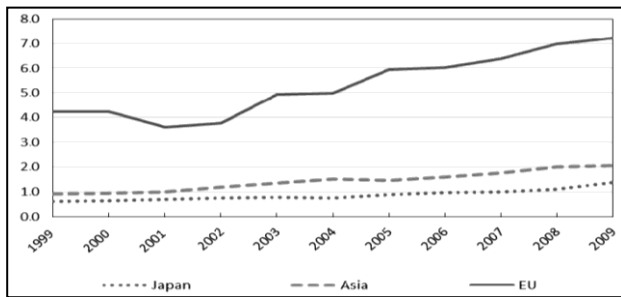
<Figure 19> Export-Import Ratios of China in "Machinery & Transport Equipment" with EU, Japan and Rest of Asia



<Figure 20> Export-Import Ratios of China in Office & Telecom Equipment and Integrated Circuits with EU, Japan and Rest of Asia



<Figure 21> Export-Import Ratios of China in Electrical Machinery and Power Generating Equipment with EU, Japan and Rest of Asia



<Figure 22> Export/Import Ratios of China in Textiles with EU, Japan and Rest of Asia

These policies created a comparative advantage between countries with otherwise similar endowments of labor and skills. China's variable costs in manufacturing are one of the least in the world because of its cheap labor cost. The low variable cost made it attractive for multi-national companies to set up manufacturing in China and with China's entry into WTO, trade barriers fell and created a win-win situation for MNC's to set up their manufacturing base in China. China's FDI policies made MNC's transfer high level technology, paving the way for China to gain expertise in high technology industries. China's high bargaining power because of its low wage structure helped it get access to high-end technology which may not be possible for other developing countries. This helped in shifting China's trade structure from low-technology, low-skill, and largely labor-intensive products to high-technology and high-skill products. China's global manufacturing surplus rocketed from \$30.9 billion before admission to the WTO to a remarkable \$539 billion in 2008 constituting 12.7% of GDP. Our analysis in this study refutes the commonly held notion that China would not be strong in exporting advanced technology products, since it is a large developing country with a huge pool of low-skilled labor. But since 1995 and specifically since China's entry into WTO in 2001, China's advanced technology exports have actually been increasing rapidly.

China exports surprisingly large levels of high technology products to US and this has been a major factor behind US accumulating large account deficit against China. Out of the 99 tradable industry products, US has a trade deficit against China in most of the high technology industries. The number of industries in which US has held a trade surplus with China decreased from 27 in 2001 to 21 in 2008. With China rapidly gaining specialization in high end technology, it is difficult to visualize any dramatic reversal of US trade deficit with China in the coming years. Currently, US has held onto its account surplus against China in industries of nuclear reactors, space-crafts, aircrafts, arms & ammunitions, etc., most of which are high technology products with a majority stake of the US Government.

The Yuan devaluation in 1995 coupled with favorable FDI

policies, made MNC's set up manufacturing units in China to leverage low cost labor. The devaluation not just made the existing exports cheaper but also prompted multinationals to manufacture and export from China thus resulting in large trade surplus for China. However, the associated shift in China's trade structure has happened not just because of Yuan devaluation and trade friendly WTO rules benefiting China, but also China's FDI policy conjointly ensured that high-end technology is brought and shared with the local manufacturers. As a result of which China has increasingly become self-sufficient in high technology products. The economic and trade conditions have changed dramatically since China got its admission to the World Trade Organization in the year 2001. After WTO entry, China's real average GDP growth measured 12% during 2001 to 2008, while it was 8.9% for the seven years prior to joining WTO in 2001. The ratio of China's manufactured exports to imports rose from 1.15 to 1.66 during 2001-2008 since China's admission into WTO.

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- <http://www.federalreserve.gov/releases/H10/weights/default.htm> - Currency trade weights
- <http://www.federalreserve.gov/releases/H10/weights/default.htm> - Currency trade weights

<Appendix I> Technical codes of WTO Classified Trade categories

Technical Code	Trade Category	Technology Classification
1	Agricultural Products	Low Technology Products
1	Food	Low Technology Products
1	Fuels and Mining Products	Low Technology Products
1	Fuels	Low Technology Products
2	Iron and Steel	Medium-Low Technology Products
2	Textiles	Medium-Low Technology Products
2	Clothing	Medium-Low Technology Products
2	Manufactures	Medium-High Technology Products
2	Chemicals	Medium-High Technology Products
2	Machinery and Transport Equipment	Medium-High Technology Products
3	Electronic Data Processing and Office Equipment	Medium-High Technology Products
3	Automotive Products	Medium-High Technology Products
4	Pharmaceuticals	High Technology Products

4	Office and Telecom Equipment	High Technology Products
4	Telecommunications Equipment	High Technology Products
4	Integrated Circuits and Electronic Components	High Technology Products

<Appendix II> WTO and USITC Database

1. US Import Data from China on 99 Tradable Commodities Classified under HTS2

This data was captured as the “customs value of imports” from China measured in US dollars for a period of 1996-2009 and was downloaded from USITC Interactive Tariff and Trade DataWeb.

2. US Exports Data to China on the 99 Tradable Commodities Classified under HTS2

This data was captured as the “FAS value of exports” to China measured in US dollars for a period of 1996-2009 and was downloaded from USITC Interactive Tariff and Trade DataWeb.

3. Trade Balance in all 99 Tradable Commodities

This indicator for the period of 1996-2009 was calculated as “Custom value of imports” subtracted from “Total FAS

value of exports” and was downloaded from USITC Interactive Tariff and Trade DataWeb.

4. Export & Import of China W.R.T. World Segregated Based on Various Industries

This data, classified into 16 major industry categories, was downloaded from the Statistics database of World Trade Organization and was measured in tradable USD value of products for a period of 1995-2010.

5. Foreign Exchange Rates for Yuan/USD and Euro/USD

This data was downloaded from the database of US Federal Reserve Board for the period of 2001-2010.

Also, the following economic indicators were captured from “World Bank” and “IMF”

6. Trade Balance as a Percent of GDP from 1996 to 2009.

7. Imports of Goods and Services as a Percentage of GDP for China and US during 1996-2009.

8. FDI as a Percentage of GDP in China from 1996-2009.

9. GDP Growth Rate of China, US in the Period 1996-2009.

HTS2 classified data (as mentioned earlier) is available only for US-China trade. The HTS data has been used only to analyze the cause and structure of US’s growing Trade deficit with China.