Structural Change in Production and Trade: A Panel Data Analysis

Yusuf Kurtoğlu[1] and Ali İbrahim Gür[2]

Abstract

Trade and foreign direct investments (FDI) in theory, have a positive impact on spillover of technology, demand for human capital and skilled worker wages, profits and total factor productivity. Rising competition conditions in world level cause and/or empower to the change in either production structure or factor endowments. Beside fast improving in information technologies, FDI and trade relations conveying the major role on this process. Free trade conditions and better investment climates contribute to improvements in skilled labor supply and its impact on economic fundamentals by affecting the product variety and quality through structural changes in factor endowments. Especially the rise in skilled labor capacities of developing world contributing more to change the landscape of the factor endowments. Within this context, production activities resulting with new production models in which the production stages segmentation through more than one country. As a result, comparative advantages of advanced economies in high tech sectors should be easing in time against emerging countries. In this study, we research these developments via panel data regressions and cross table analysis in which FDI and both total and high-tech goods' trade developments examining in countries/regions China, US, Japan and EU in 2001-2009 period.

Keywords: structural change, factor endowments, production segmentation, skilled labor

1. Introduction

Ricardian comparative advantage and Heckscher-Ohlin's different production factor endowments between countries have been known as the major causes of foreign trade. Each country produces and exports the goods that have the production factor abundantly, either capital or labor. With this factor structure, and under the free trade conditions while the abundant factor's real income increase, the scarce factors' income decrease.

In Stolper-Samuelson; trade contributes to the shift of the production factor, i.e. capital that has higher return, from abundant country to scarce developing countries. Labor factor also moves from lower wage countries to the countries with higher wage payments. In factor-price equalization model; location of production is determined solely by trade cost and factor endowments. Labor abundant countries initially have low wages, but removing of trade barriers brings the product price equalization, and then wage equalization. Thereby, economic integration allows improvements in both of the production and the incomes to the labor abundant economies. On the other hand, the capital endowed countries due to decreasing wages, partially remove from labor abundant sectors to capital abundant sectors, and capital factor earnings raise more. Therefore, free trade agreements works on behalf of the endowed factor. Compatible to the Stolper-Samuelson prediction, it could be conclude that as the multinational production increased and the inward FDI rises, imports of advanced goods supposed to be decreasing. On the other hand, skilled wages in advanced technology goods sectors increase because possibilities of leading producers of paying higher wages, "within effect". Since skill intensive goods trade increase parallel to the globalization, price of skill

[1] *Undersecretariat of Turkish Treasury/Ph.D in Economics, Ankara, TÜRKİYE,*
Email: yusuf.kurtoglu@hazine.gov.tr
[2] *Undersecretariat of Turkish Treasury, Treasury Expert, Ankara, TÜRKİYE, Email: ibrahim.gur@hazine.gov.tr*

intensive goods decreases, mainly due to the reduction in trade costs. (Burstein and Vogel, 2010)

Trade and FDI, in innovation theories have a positive impact on spillover of technology, demand for human capital, and rise in skilled workers wages, profits and total factor productivity. Rising competition conditions in world level either causing and/or empowering the change in not only production structure but also factor endowments. Beside fast improving in information technologies, FDI and trade relations conveying the major role on this process. Free trade conditions and better investment climates contributing to the improvements in skilled labor supply and its impact on economic fundamentals by affecting the product variety and quality through structural changes in factor endowments. Especially the rise in skilled labor capacities of developing world contributing more to change the landscape of the factor endowments. For example, entrants in PhD programs in China increased by six-fold in 1995-2003 period.(Freeman, 2005:4) Within this context production activities resulting with new production models in which the production stages segmentation through more than one country. According to Widodo (2009: 524), in the ASEAN+3 region this model become an interesting phenomenon that based on the vertically integrated production which each country specializing in a particular stage of production process. Freeman (2005:22) stressed that advanced economies loosing the comparative advantage in high tech sectors due to lower R&D and manufacturing costs in developing countries. As a result of these developments; it could be possible to argue that fundamental changes occurs in world production and trade structure.

In the rest of the study, we analyze these developments via cross-tables and panel regressions in which FDI and both total and high-tech goods' trade developments in CN, US, J and EU between 2001-2009 period. In section 2 literature searched, the data and methodology given in section 3, and empirical results and concluding remarks provided in section 4 and 5.

2. Literature Review

Timing of the switching economic growth policy from Solow type factor accumulation dependent form to innovative concept of endogenous (AK) model discussing in Harada (2010) which is trigger the major structural change in production and trade. In the mentioned model, the initial capital-labor ratio at the time of switch to the AK stage plays a critical role in economic growth (Harada, 2010, 524). Because, if the economy do not provide the necessary skills and has lower level of capital accumulation it does not provide sufficient ability to innovations and growth.

While acquisition activities considered as a major way of FDIs productivity conditions in firm base, the market size and lower technology adaptation costs in economy wide forms as the structural economic requirements of FDIs. Due to the complementarities between initial characteristics of the firm and innovation initial productivity have positive effect on acquisition which is act as an incentive for foreign multinationals' acquisition decisions. On the other hand, in Guadalupe et al.(2010:15-16, 20, 25), larger global markets and/or lower technology implementation cost that provided by the multinational firms seen as the other major factors affecting the acquisitions. However, an increase in the FDI should be cause to decline in export trend of the investor country. Widodo (2009, 522) explains the situation for Japanese export markets that such conditions, complementary of home country (Japan) and its export to her partners decreases. In Busse, et al. (2010); rather the regulatory changes and incentives, the size of economy, the endowment of local factors of production and geographical and cultural position, bilateral investment treaties find as one of the promoting major determining factor of FDI.

Free trade conditions, by allowing the rise in competition conditions, supports the innovations which in turn requires the increase in profits and real wages that originates from

production innovation. Then, according to Redding (2010:28), this process allows the increases in aggregate productivity.

Trade and FDI liberalization allowed both of the change in the market-share reallocation of firms and increases in aggregate productivity instead of average productivity improvement in India following the 1991 reforms. A 10 percent reduction in final, and input good tariffs and FDI liberalization increases the overall productivity by 0.55 percent, 5.6 percent and 2.4 percent respectively in 1986-2004 period. In this new trade approach, less productive firms leaving their market shares to more productive one. Reallocation of productivity in India rose sharply beginning of the reforms between 1991 and 1994.(Harrison et al., 2011:4, 14, 17, 23)

China and India's trade growth involves not only labor intensive manufacturing products as its mentioned in traditional trade models but also represents two way/global production sharing, where part of the production stage is undertaken in one country, and subsequent stages are undertaken in another. This kind of complementary results revealing largely fundamental, and structural conversion in trade and production stages in world level that so called multinational production.

Bloom et al.'s research (2011) findings over 2000-2007 period parallel to the what is suggested in basic trade theory that while trade stimulate technological progress through innovation activities, patenting, IT intensity, and raise in skilled labor demand due to import competition originated from China, low-tech firm activities and demand for unskilled workers shrink. This happened because of the cheaper imports on low-tech products that caused to decline in competitive power of the incumbent firms in these sectors. Thereby, trade induced technical change accounted around 15 percent in Europe in this period. In Hsieh and Ossa' (2011) study, cumulative spillover effect of Chinese productivity growth calculated as 0.48 percent increase in the average real income of the rest of the world.

Some researches mentions about positive effects of FDI on Chinese domestic technology advancement. But, some empirical results has found that "the effect of FDI spillover is not significant in Chinese high-technology industry".(Zhao, Zhang, 2010:85, 96) In Chamon et al.'s study (2010), exports and investments are seen as the major fundamental determining factors in Chinese growth. In the same study, half of the saving increases in 1990s which allows incremental effect on investment purchases, explained with the rising uncertainty in incomes of young employees and decrease in pension replacement ratio about from 75-80 percent to 60 percent in 1997 reform regulations. In Yang et al.' study (2011:4, 37) the analyzed saving figures of China shows a continuous increase above ten points following 2000 and reaching in 2008 to 49,2 percent of GDP.

Structural change in Chinese industry began after 2001 when the country joined the World Trade Organization (WTO). Prior to WTO membership country's manufacturing industries were promoted with high tariffs, investment incentives, export subsidies and restrictions on foreign firms. After the membership the country eliminated these protections and export subsidies. With the undervalued currency the exchange rate policy became the only supporting policy to manufacturing production and export (Rodrik, 2009:6). The author find empirically that a 10 percent appreciation of the Chinese currency should reduce the growth rate by 0.86 percentage points. Tax rebates for exports after China's WTO accession in 2001 raised about five fold between 2002-2008 to 586.6 billion Yuan.(Yang et al., 2011:11) Its accession to WTO brought also a new surge of FDI inflows. While most multinational firms' FDI from US and Japan appears as the vertical investments seeking cost advantage, EU firms interested with Chinese market with horizontal, market enlargement aspects. (Fung et al. 2009:479, 484)

As the Chinese variety of export goods change structurally on behalf of more sophisticated technological goods, both the demand and wage of skilled labor increased as

well. Parallel to these developments, while the average years of schooling increased from 10.8 to 12.8, annual average wages raised from 6.500 Yuan to 18.253 Yuan respectively in 1995 and in 2007. (Whalley, Xing, 2010:5, 9-10) Besides, despite comparatively small share compare to the inward direct investment which is one of the world's largest recipients (Wu et al.2010:72), Chinese outward investment increased also almost threefold from 3.4 % during the 1994-1999 to 9.6 % as of outflows from developing countries in 2005. (Cheung, Suny, 2009:313)

3. Data and Methodology

The data has collected from Unctad, OECD, and China government statistics web sites which yearly base for the 2001-2009 period. The same data sources studied either in the cross tables or in the panel regressions analysis.

The raw data for the FDI researches first, processed into the tables, and the changes, GDP shares, and world shares analyzed to other tables. Then following this, annual average changes proceed in a different table. After the general evaluation of the tables, specific conditions, and developments also given to the each country/region in empirical results section (4) below.

Cross table analysis evaluated by prepared 26 separate tables given in related section (4) of this study, and explanations focused mostly to the annual average values. In trade tables; first, export and import numbers given both in total and high-tech goods values for each country's own and to the other country in the examined group. Then, these values evaluated in separate tables to the bases on such indicators as; changes by years, shares of group countries, and GDP shares.

After application of the Hausman test (Gür, 2009) we decide to use fixed effect models to run the panel data regressions. The countries taken into the examinations are Japan, US, EU 16, China, Germany, France and UK and EU 13. Studies advanced in two separate cases as of the one China included and the other China excluded. The dependent variables examined in regression models are FDI, total export and import, and the advance goods exports and imports. The explanatory variables used are; GDP values, FDI inward stock values, and FDI -1, growth rates, openness ((total export + total import)/GDP)) ratio, total export values, total import values, advance goods export values, advance goods import values, population, and the GDP-per capita values.

4. Empirical Results

4.1. FDI developments and the impacts

While the total of inward FDI of US and EU-27 accumulates about two thirds of world total, outward figures reach above this ratio to almost three fourth of world values in annual average term in 2001-2009 period. (FDI Table 5)

FDI TABLES

Table:1. FDI stocks; inflows, outflows, changes (percent) **Japan**

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2001-2009
Inw/World	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
Outw/World	0,04	0,04	0,03	0,03	0,03	0,03	0,03	0,04	0,04	0,03
Inward/GDP	0,02	0,02	0,03	0,03	0,03	0,03	0,03	0,05	0,05	0,03
Outw/GDP	0,09	0,09	0,10	0,10	0,10	0,11	0,13	0,16	0,18	0,12
Inw_change	- 0,00	0,01	0,13	0,07	0,04	0,06	0,19	0,35	- 0,02	0,09
Outw_change	0,07	0,01	0,09	0,09	0,04	0,14	0,17	0,20	0,08	0,10

Table:2. FDI stocks; inflows, outflows, changes (percent): **US**

Years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2001-2009
Inward/World	34,3	26,9	26,2	24,6	24,5	23,1	20,0	16,5	17,6	23,72
Outw/World	30,1	26,0	27,7	28,9	29,3	28,5	27,3	19,2	22,7	26,63
Inward/GDP	0,25	0,19	0,22	0,23	0,22	0,25	0,26	0,18	0,22	0,22
Outw/GDP	0,23	0,19	0,25	0,28	0,29	0,34	0,38	0,22	0,31	0,27
Inw/chang	- 0,09	- 0,27	0,18	0,10	0,04	0,14	0,08	- 0,41	0,18	- 0,00
Outw/chang	- 0,16	- 0,14	0,26	0,19	0,08	0,19	0,15	- 0,70	0,28	0,01

Table:3. FDI stocks; inflows, outflows, changes (percent): **CN**

Years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2001-2009
Inward/World	0,03	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,03	0,02
Outw/World	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,01	0,01
Inward/GDP	0,15	0,15	0,14	0,13	0,12	0,11	0,10	0,09	0,10	0,12
Outw/GDP	0,03	0,03	0,02	0,02	0,02	0,03	0,03	0,03	0,05	0,03
Inw/change	0,05	0,06	0,05	0,07	0,10	0,07	0,11	0,13	0,20	0,09
Outw/chang	0,20	0,07	- 0,12	0,26	0,22	0,22	0,23	0,35	0,36	0,20

Table:4. FDI stocks; inflows, outflows, changes (percent): **EU-16**

Years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2001-2009
Inward/World	0,23	0,28	0,30	0,31	0,28	0,28	0,29	0,30	0,29	0,29
Outw/World	0,31	0,32	0,34	0,34	0,34	0,34	0,33	0,36	0,34	0,34
Inward/GDP	0,20	0,25	0,33	0,39	0,35	0,39	0,48	0,40	0,46	0,36
Outw/GDP	0,29	0,30	0,39	0,44	0,44	0,52	0,58	0,51	0,59	0,45
Inw/chang	0,04	0,19	0,26	0,18	- 0,06	0,19	0,23	- 0,14	0,11	0,11
Outw/chang	0,01	0,04	0,25	0,15	0,06	0,21	0,16	- 0,10	0,11	0,10

FDI Table 5. 2001-2009 Annual averages;
World, GDP, Changes / Shares (percent)

FDI	J	US	CN	EU-16	EU-27
Inward/World	0,01	23,72	0,02	0,29	0,41
Outw/World	0,03	26,63	0,01	0,34	0,47
Inward/GDP	0,03	0,22	0,12	0,36	0,38
Outw/GDP	0,12	0,27	0,03	0,45	0,46
Inw/chang	0,09	- 0,00	0,09	0,11	0,11
Outw/chang	0,10	0,01	0,20	0,10	0,09

Sources;UNCTAD, UNCTADstat

Euro area GDP Source: Econ: Key tables from OECD 2010

Both inflow and outflow shares of Japan in world FDI stocks with 1 and 3 percent respectively as annual average, staying small compare to US and EU, during the same period. While inward to GDP share of the country progress stagnant at 3 percent, outflows rise 12 percent. Annual average rises of inward and outward FDIs are 9 and 10 percent respectively. The country has net outflows compare to inflows. Thereby, with respect to these indicators; annual average change, GDP, and world share outflows are higher than inflow indicators.

Due to larger initial stocks at the beginning of the period, FDI stocks of the **US** has the second highest numbers after EU to the cases of both world and GDP shares among our

sample research group of countries. Despite relatively higher initial stocks to the inwards of the country during the period, annual average change stood very conservative, actually it is stagnant. Stable inward FDI movements should be indicated as the US as a developed large market, seems gradually loosing its attractiveness in last decade. This result also imply a signal of decreasing competitiveness power of the country at international level.

China's FDI feature quite different from the others examined herein this study. When we considered the annual average figures of the 2001-2009 period; first, the share in world FDI at negligible levels; while the inward share 2 percent, outward share is just 1 percent. Changes in the period are remarkable high that the figures for inward and outward are realized as 9 and 20 percent respectively. And lastly, the figures of GDP shares positive; while the share of inward 12 percent which is four times higher from Japan's share, the rate of outward just the reverse of Japan' that is only 3 percent and four times smaller than the rival country's share. Higher inward FDI rate to GDP shows that the country have an increasing rate of comparative advantages at international arena.

EU have the highest FDI-inward world and GDP shares among the group of countries subject to this research. Annual average changes of the region both of inwards and outwards higher than US, and with the 11 percent for inwards, EU almost has the same shares as the Japan and China. And with 10 percent of the outward FDI changing share even EU-16, have the same share as the Japan' but reaches only half of the Chinese 20 percent share. (FDI Table 5)

In FDI regression table A.2.1.; all of the three variables, openness, growth, GDP significantly affecting the dependent variable FDI, but the only one GDP, has negative t-value. The "trend" find as the most explanatory figure in this equation. Calculated openness variable in the table, effects FDI developments positively. Thereby, it should be considered that due to the bilateral interaction, openness supports the international product segmentation through FDI.

A.2. Panel data FDI regression: J, US, EU 16, G, F, UK, EU 13 included

Table 1.
Dependent Variable: LOG(FDI/GDP)
Method: Panel EGLS (Cross-section weights)
Total panel (balanced) observations: 63
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	83.47265	16.45720	5.072107	0.0000
LOG(OPEN)	0.600349	0.238423	2.518004	0.0149
@TREND	0.235288	0.037570	6.262740	0.0000
GROWTH	0.038692	0.015055	2.570001	0.0131
LOG(GDP)	-4.160774	0.746318	-5.575067	0.0000

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.983292	Mean dependent var	-10.27896
Adjusted R-squared	0.980079	S.D. dependent var	3.738633
S.E. of regression	0.142606	Sum squared resid	1.057492
F-statistic	306.0223	Durbin-Watson stat	1.772483
Prob(F-statistic)	0.000000		

In the FDI regression table B.2.1; the variable FDI(-1) previous term's FDI values, find the most supporting variable.

B.2. Panel data FDI regression: J, US, CN, EU 16, G, F, UK, EU 13 included

Table 1.

Dependent Variable: LOG(FDI)
Method: Panel EGLS (Cross-section random effects)
Total panel (balanced) observations: 64
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.371603	0.717049	0.518239	0.6063
LOG(GDP)	-0.284039	0.193690	-1.466459	0.1479
OPEN	-0.624079	0.421991	-1.478891	0.1446
LOG(FDI(-1))	0.904819	0.046076	19.63754	0.0000
LOG(EX)	-0.014185	0.101317	-0.140006	0.8891
LOG(IM)	0.382936	0.210097	1.822666	0.0735

	S.D.	Rho
Cross-section random	0.000000	0.0000
Idiosyncratic random	0.133981	1.0000

Weighted Statistics

R-squared	0.983083	Mean dependent var	13.56318
Adjusted R-squared	0.981625	S.D. dependent var	1.148717
S.E. of regression	0.155715	Sum squared resid	1.406340
F-statistic	674.1003	Durbin-Watson stat	2.231618
Prob(F-statistic)	0.000000		

4.2 Trade Developments

In this section the analyzed data taken as “annual average values” in 2001-2009 period if specified otherwise in the related paragraph.

4.2.1. Trade openness and GDP figures

Japan’ GDP shares of total export and total import are 15 percent and 13 percent respectively, the same rates for high-tech sectors 4 percent for the former, and 2 percent for the latter case. The shares of the US are 7 percent for total export, and 13 percent for total import, and for the high-tech goods sector both export and import the country have the same GDP share 2 percent. EU has one of the highest openness shares together with China. While the calculated GDP shares of EU is 27 percent both of the total export and total import, the shares to the advanced goods 9 percent for the export, and 5 percent to the import.

The overall tendency of advanced goods GDP shares during the 2001-2009 period for Japan, US and EU featuring almost a flat trend. But the results for China different from these three developed region. The difference comes from first, having a relatively higher GDP shares of total trade figures. Total export and total import GDP shares as a general tendency shows remarkable increases and as an average rate they reaches 29 percent, and 25 percent respectively. And second, except last two years, the country has an increasing trend of advanced goods export and import rates along the period. (GDP share tables: A and B.1a, 1b, 1c, 1d)

GDP SHARE TABLES:

A. TOTAL TRADE Tables; 1a. Japan, 1b. US, 1c. CN, 1d. EU

Table 1a: **Japan**/US, CN, EU :Total trade GDP shares

Years	**X total**	X to US	X to CN	X to EU	**M total**	M from US	M from CN	M from EU	**X to 3**	**M from 3**
2001	0,12	0,04	0,01	0,02	0,10	0,02	0,02	0,01	0,07	0,05
2002	0,12	0,04	0,01	0,02	0,10	0,02	0,02	0,01	0,07	0,05
2003	0,13	0,03	0,02	0,02	0,11	0,02	0,02	0,01	0,07	0,05
2004	0,15	0,03	0,02	0,03	0,12	0,02	0,03	0,01	0,08	0,06
2005	0,15	0,04	0,02	0,03	0,13	0,02	0,03	0,01	0,08	0,06
2006	0,16	0,04	0,02	0,02	0,14	0,02	0,03	0,01	0,08	0,06
2007	0,17	0,03	0,03	0,03	0,14	0,02	0,03	0,01	0,09	0,06
2008	0,18	0,03	0,03	0,03	0,18	0,02	0,03	0,01	0,09	0,07
2009	0,14	0,02	0,03	0,02	0,14	0,02	0,03	0,01	0,07	0,06
anu.ave.	0,15	0,03	0,02	0,02	0,13	0,02	0,03	0,01	0,08	0,06

Table 1b: **US**/Japan, CN, EU :Total trade GDP shares

Years	**X total**	X to J	X to CN	X to EU	**M total**	M from J	M from CN	M from EU	**X to 3**	**M from 3**
2001	0,07	0,01	0,00	0,02	0,12	0,01	0,01	0,02	0,03	0,04
2002	0,07	0,00	0,00	0,02	0,11	0,01	0,01	0,02	0,02	0,04
2003	0,07	0,00	0,00	0,02	0,12	0,01	0,01	0,02	0,02	0,04
2004	0,07	0,00	0,00	0,02	0,13	0,01	0,01	0,02	0,02	0,05
2005	0,07	0,00	0,00	0,02	0,14	0,01	0,01	0,02	0,02	0,05
2006	0,08	0,00	0,00	0,02	0,14	0,01	0,02	0,02	0,03	0,05
2007	0,08	0,00	0,00	0,02	0,14	0,01	0,02	0,02	0,03	0,05
2008	0,09	0,00	0,00	0,02	0,15	0,01	0,02	0,02	0,03	0,05
2009	0,08	0,00	0,00	0,02	0,11	0,01	0,02	0,02	0,03	0,04
anu.ave	0,07	0,00	0,00	0,02	0,13	0,01	0,01	0,02	0,03	0,05

Table 1c: **CN**/US, Japan, EU :Total trade GDP shares

Years	**X total**	X to US	X to J	X to EU	**M total**	M from US	M from J	M from EU	**X to 3**	**M from 3**
2001	0,20	0,04	0,03	0,05	0,18	0,01	0,03	0,02	0,13	0,07
2002	0,22	0,05	0,03	0,06	0,20	0,02	0,04	0,02	0,14	0,07
2003	0,27	0,06	0,04	0,07	0,25	0,02	0,04	0,03	0,16	0,09
2004	0,31	0,06	0,04	0,08	0,29	0,02	0,05	0,03	0,18	0,10
2005	0,33	0,07	0,04	0,09	0,29	0,02	0,04	0,03	0,19	0,09
2006	0,35	0,07	0,03	0,09	0,29	0,02	0,04	0,03	0,19	0,09
2007	0,38	0,07	0,03	0,09	0,29	0,02	0,04	0,03	0,20	0,09
2008	0,33	0,06	0,03	0,08	0,26	0,02	0,03	0,03	0,16	0,08
2009	0,26	0,05	0,02	0,06	0,21	0,01	0,03	0,02	0,13	0,07
anu.ave.	0,29	0,06	0,03	0,07	0,25	0,02	0,04	0,03	0,17	0,08

Table 1d: **EU**/US, CN, Japan : Total trade GDP shares

Years	**X total**	X to US	X to CN	X to J	**M total**	M from US	M from CN	M from J	**X to 3**	**M from 3**
2001	0,20	0,02	0,00	0,00	0,20	0,02	0,01	0,01	0,02	0,03
2002	0,20	0,02	0,00	0,00	0,20	0,01	0,01	0,01	0,03	0,03
2003	0,24	0,02	0,00	0,00	0,23	0,02	0,01	0,01	0,03	0,03
2004	0,27	0,02	0,00	0,00	0,26	0,02	0,01	0,01	0,03	0,04
2005	0,27	0,02	0,00	0,00	0,28	0,02	0,01	0,01	0,03	0,04
2006	0,29	0,02	0,01	0,00	0,30	0,02	0,02	0,01	0,03	0,04
2007	0,32	0,02	0,01	0,00	0,32	0,02	0,02	0,01	0,03	0,05
2008	0,34	0,02	0,01	0,00	0,35	0,02	0,02	0,01	0,03	0,05
2009	0,28	0,02	0,01	0,00	0,28	0,02	0,02	0,01	0,03	0,04
anu.ave.	0,27	0,02	0,00	0,00	0,27	0,02	0,01	0,01	0,03	0,04

Data: OECD Economic Outlook, Volume 2010 Issue 2, No.88, trademap.org., IMF fin.stats.March 2009

GDP SHARE TABLES
B. ADVANCE GOODS TRADE Tables; 1a. Japan, 1b. US, 1c. CN, 1d. EU

Table 1a: **Japan**/US, CN, EU : Advanced goods (*) trade GDP shares

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2002-2009
X advance	0,04	0,03	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04
X_US/GDP	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
X_CN/GDP	0,00	0,00	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
X_EU/GDP	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
M advance	0,02	0,02	0,02	0,02	0,02	0,03	0,03	0,03	0,03	0,02
M from US	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,00	0,01
M from CN	0,00	0,00	0,00	0,01	0,01	0,01	0,01	0,01	0,01	0,01
M from EU	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
X to 3/GDP	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
M from 3/GDP	0,01	0,01	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,01

(*) ISIC(30,85, 88, 90, 91); aircraft, and spacecraft, pharm., medicinal chemic. and botanical prod., office, acco.and comp.mach., radio, television and communication equipment and apparatus, medical, precision and optical instruments, watches and clocks.

Table 1b: **US**/J, CN, EU : Advanced goods trade GDP shares

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2001-2009
X advance	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
X_J/GDP	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
X_CN/GDP	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
X_EU/GDP	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
M advance	0,02	0,02	0,02	0,02	0,03	0,03	0,03	0,03	0,02	0,02
M from J	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
M from CN	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
M from EU	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
X to 3/GDP	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
M from 3/GDP	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01

Table 1c: **CN**/US, J, EU : Advanced goods trade GDP shares

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2001-2009
X advance	0,05	0,05	0,06	0,08	0,09	0,10	0,11	0,09	0,07	0,08
X_US/GDP	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,02	0,01	0,01
X_J/GDP	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
X_EU/GDP	0,01	0,01	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
M advance	0,05	0,06	0,08	0,10	0,10	0,11	0,11	0,08	0,07	0,08
M from US	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,00	0,00	0,01
M from J	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
M from EU	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
X to 3/GDP	0,03	0,03	0,04	0,05	0,05	0,05	0,05	0,04	0,04	0,04
M from 3/GDP	0,02	0,02	0,02	0,03	0,02	0,03	0,03	0,02	0,02	0,02

Table 1d: **EU**/US, CN, J : Advanced goods trade GDP shares

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2001-2009
X advance	0,07	0,07	0,08	0,09	0,09	0,10	0,11	0,11	0,09	0,09
X_US/GDP	0,00	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
X_CN/GDP	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
X_J/GDP	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
M advance	0,04	0,04	0,04	0,05	0,05	0,05	0,06	0,06	0,06	0,05
M from US	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
M from CN	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,01	0,01	0,00
M from J	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
X to 3/GDP	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
M from 3/GDP	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,02	0,01	0,01

Data: OECD Economic Outlook, Volume 2010 Issue 2, No.88

4.2.2. Structural Change in Trade Relations

Japan's total export and import as an annual average during the 2002-2009 period raised 6 and 7 percent respectively. While the changes in trade with the US, and EU were stayed below the average figures of the country, the trade with China realized much more

above the average rates; 18 percent rise both in total and advanced goods export, and 10 percent rise for the total import and 13 percent rise to the advanced goods import.

The changes in the US and EU trades with China similar to the Japan-China trade figures that have higher increasing rates compare to the trade with rest of the world. The rise in annual average US-China total trade shares higher than the US's general export and import increasing rates. Annual average rise in total export and total import during the 2002-2009 period realized as 5 percent for the US, and as 9 percent for the EU. But, the rise in the US total export to China realized as 18 percent, and increase in total import from China has found 20 percent. The rise in advanced goods export and import of the country to China realized as 14 percent and 22 percent respectively.

The increasing rates of EU total trade with China are found as 20 percent, and 21 percent for the export and for the import. The respective rates for the case of high-tech sector goods trade are 17 percent and 22 percent.

TOTAL TRADE VOLUME CHANGE TABLES
A. Total trade Tables; 2a. Japan, 2b. US, 2c. CN, 2d. EU

Table 2a: **Japan**/US,CN,EU: Total trade volume (change)

Years	**X total**	X to US	X to CN	X to EU	**M total**	M from US	M from CN	M from EU	**X to 3**	**M from 3**
2001										
2002	0,03	- 0,02	0,28	- 0,04	- 0,03	- 0,08	0,07	0,00	0,02	- 0,01
2003	0,13	- 0,02	0,44	0,19	0,14	0,02	0,22	0,13	0,12	0,13
2004	0,20	0,09	0,29	0,17	0,19	0,06	0,25	0,16	0,16	0,17
2005	0,05	0,06	0,08	0,00	0,13	0,03	0,15	0,01	0,04	0,08
2006	0,09	0,08	0,16	0,03	0,12	0,06	0,09	0,03	0,09	0,07
2007	0,10	- 0,01	0,18	0,10	0,07	0,04	0,08	0,07	0,07	0,07
2008	0,09	- 0,05	0,14	0,04	0,23	0,09	0,12	0,04	0,04	0,09
2009	-0,26	- 0,31	- 0,12	- 0,28	- 0,28	- 0,23	- 0,14	- 0,20	- 0,24	- 0,18
anu.ave.	0,06	- 0,02	0,18	0,03	0,07	- 0,00	0,10	0,03	0,04	0,05

Table 2b: **US**/Japan,CN,EU: Total trade volume (change)

Years	**X total**	X to J	X to CN	X to EU	**M total**	M from J	M from CN	M from EU	**X to 3**	**M from 3**
2001										
2002	- 0,05	- 0,11	0,15	- 0,06	0,02	- 0,04	0,29	0,07	-0,06	0,06
2003	0,04	0,01	0,29	0,06	0,09	- 0,03	0,32	0,11	0,07	0,10
2004	0,13	0,04	0,22	0,14	0,17	0,10	0,35	0,13	0,13	0,17
2005	0,11	0,02	0,20	0,03	0,14	0,06	0,30	0,07	0,05	0,12
2006	0,15	0,08	0,32	0,14	0,11	0,07	0,25	0,09	0,15	0,13
2007	0,12	0,05	0,18	0,10	0,05	- 0,02	0,14	0,06	0,11	0,07
2008	0,12	0,06	0,10	0,10	0,07	- 0,04	0,08	0,02	0,10	0,03
2009	- 0,19	- 0,23	- 0,03	- 0,19	- 0,26	- 0,31	- 0,12	- 0,23	-0,17	- 0,21
anu.ave	0,05	- 0,01	0,18	0,04	0,05	- 0,03	0,20	0,04	0,05	0,06

Table 2c: **CN**/US,Japan,EU: Total trade volume (change)

Years	**X total**	X to US	X to J	X to EU	**M total**	M from US	M from J	M from EU	**X to 3**	**M from 3**
2001										
2002	0,22	0,29	0,08	0,14	0,21	0,15	0,25	0,21	0,17	0,22
2003	0,35	0,32	0,23	0,39	0,40	0,29	0,39	0,41	0,33	0,37
2004	0,35	0,35	0,24	0,39	0,36	0,22	0,27	0,29	0,34	0,27
2005	0,28	0,30	0,14	0,26	0,18	0,20	0,06	0,06	0,25	0,09
2006	0,27	0,25	0,09	0,22	0,20	0,32	0,15	0,26	0,21	0,22
2007	0,26	0,14	0,11	0,27	0,21	0,18	0,16	0,22	0,20	0,18
2008	0,17	0,08	0,14	0,13	0,18	0,10	0,12	0,17	0,11	0,13
2009	- 0,16	- 0,12	- 0,16	- 0,12	- 0,11	- 0,03	- 0,13	- 0,02	-0,13	- 0,07
anu.ave.	0,22	0,20	0,11	0,21	0,20	0,18	0,16	0,20	0,18	0,18

Table 2d: **EU**/US,CN,Japan: Total trade volume (change)

Years	**X total**	X to US	X to CN	X to J	**M total**	M from US	M from CN	M from J	**X to 3**	**M from 3**
2001										
2002	0,07	0,07	0,21	0,00	0,04	- 0,06	0,14	- 0,04	0,07	- 0,01
2003	0,19	0,11	0,41	0,13	0,20	0,06	0,39	0,19	0,14	0,17
2004	0,20	0,13	0,29	0,16	0,22	0,14	0,39	0,17	0,16	0,22
2005	0,07	0,07	0,06	0,01	0,09	0,03	0,26	0,00	0,06	0,10
2006	0,13	0,09	0,26	0,03	0,15	0,14	0,22	0,03	0,11	0,15
2007	0,15	0,06	0,22	0,07	0,14	0,10	0,27	0,10	0,09	0,17
2008	0,10	0,02	0,17	0,04	0,11	0,10	0,13	0,04	0,05	0,10
2009	- 0,22	- 0,23	- 0,02	- 0,20	- 0,23	- 0,19	- 0,12	- 0,28	-0,18	- 0,17
anu.ave.	0,09	0,04	0,20	0,03	0,09	0,04	0,21	0,03	0,06	0,09

Data: OECD Economic Outlook, Volume 2010 Issue 2, No.88, trademap.org., IMF fin.stats.March 2009.

ADVANCE GOODS TRADE VOLUME TABLES

B. Advanced goods trade Tables; 2a. Japan, 2b. US, 2c. CN, 2d. EU

Table 2a: **Japan**/US,CN,EU: Advanced goods(*) trade volume (change)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2002-2009
X advan.		- 0,05	0,17	0,20	- 0,01	0,04	0,03	0,03	-0,20	0,03
X to US		- 0,18	0,01	0,12	- 0,01	0,00	- 0,02	- 0,02	-0,24	- 0,04
X to CN		0,31	0,55	0,24	0,07	0,17	0,16	0,08	-0,13	0,18
X to EU		- 0,12	0,20	0,19	- 0,03	- 0,03	- 0,03	0,10	-0,24	0,00
M advan.		- 0,01	0,14	0,18	0,08	0,11	0,05	0,05	-0,12	0,06
M from US		- 0,08	0,03	0,07	0,07	0,10	0,02	- 0,02	-0,15	0,01
M from CN		0,10	0,26	0,31	0,16	0,09	0,14	0,14	-0,12	0,13
M from EU		0,03	0,08	0,20	0,04	0,07	0,00	0,04	-0,06	0,05
X_3		- 0,09	0,18	0,18	0,00	0,04	0,04	0,05	-0,20	0,03
M_3		0,00	0,12	0,18	0,10	0,09	0,06	0,06	-0,12	0,06

(*) ISIC(30,85, 88, 90, 91); aircraft, and spacecraft, pharm., medicinal chemic. and botanical prod., office, acco.and comp.mach., radio, television and communication equipment and apparatus, medical, precision and optical instruments, watches and clocks.

Table 2b: **US**/J,CN,EU: Advanced goods trade volume (change)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2002-2009
X advan.		- 0,07	0,02	0,12	0,08	0,17	0,07	0,03	- 0,05	0,05
X to J		- 0,08	0,04	0,06	0,03	0,08	0,01	- 0,01	- 0,13	- 0,00
X to CN		0,21	0,02	0,14	0,35	0,41	0,11	- 0,04	- 0,07	0,14
X to EU		- 0,07	0,04	0,18	0,00	0,13	0,11	0,09	- 0,10	0,05
M advan.		0,00	0,07	0,15	0,10	0,11	0,10	0,03	- 0,12	0,05
M from J		- 0,13	- 0,01	0,13	0,01	- 0,02	- 0,00	- 0,03	- 0,22	- 0,03
M from CN		0,27	0,25	0,45	0,38	0,28	0,18	0,06	- 0,12	0,22
M from EU		0,10	0,08	0,15	0,06	0,07	0,08	0,04	- 0,10	0,06
X_3		- 0,05	0,04	0,16	0,04	0,15	0,10	0,06	- 0,10	0,05
M_3		0,04	0,08	0,20	0,12	0,11	0,10	0,03	- 0,12	0,07

Table 2c: **CN**/US,J,EU: Advanced goods trade volume (change)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	200-2009
X advan.		0,25	0,36	0,45	0,35	0,31	0,30	0,14	- 0,12	0,26
X to US		0,27	0,25	0,45	0,38	0,28	0,18	0,06	- 0,12	0,22
X to J		0,10	0,26	0,31	0,16	0,09	0,14	0,14	- 0,12	0,13
X to EU		0,16	0,42	0,45	0,22	0,28	0,19	0,07	- 0,05	0,22
M advan.		0,29	0,46	0,40	0,23	0,25	0,17	0,06	- 0,09	0,22
M from US		0,21	0,02	0,14	0,35	0,41	0,11	- 0,04	- 0,07	0,14
M from J		0,31	0,55	0,24	0,07	0,17	0,16	0,08	- 0,13	0,18
M from EU		0,21	0,02	0,14	0,35	0,41	0,11	- 0,04	- 0,07	0,14
X_3		0,18	0,32	0,42	0,26	0,24	0,18	0,08	- 0,09	0,20
M_3		0,18	0,34	0,26	0,12	0,27	0,15	0,07	- 0,09	0,16

Table 2d: **EU**/US,CN,J: Advanced goods trade volume(change)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	200-2009
X advan.		0,07	0,19	0,18	0,07	0,10	0,15	0,05	- 0,23	0,07
X to US		0,10	0,08	0,15	0,06	0,07	0,08	0,04	- 0,10	0,06
X to CN		0,02	0,35	0,38	0,06	0,29	0,17	0,16	- 0,07	0,17
X to J		0,03	0,08	0,20	0,04	0,07	0,00	0,04	- 0,06	0,05
M advan.		0,04	0,16	0,22	0,08	0,13	0,10	0,08	- 0,09	0,09
M from US		- 0,07	0,04	0,18	0,00	0,13	0,11	0,09	- 0,10	0,05
M from CN		0,16	0,42	0,45	0,22	0,28	0,19	0,07	- 0,05	0,22
M from J		0,03	0,08	0,20	0,04	0,07	0,00	0,04	- 0,06	0,05
X_3		0,08	0,11	0,18	0,06	0,10	0,09	0,06	- 0,09	0,07
M_3		- 0,05	0,14	0,24	0,05	0,14	0,12	0,08	- 0,10	0,08

Data: OECD Economic Outlook, Volume 2010 Issue 2, No.88

China has the highest increasing rates with 22 percent for total export, and 20 percent for total import among the searched group of countries. Increasing rate of total trade with US and EU higher compare to trade with Japan. High-tech goods exports and imports increasing rates are higher than the total trade figures which are realized as by ranking 26 percent and 22 percent. The higher rate of increase in advanced goods exports compare to increases in total trade and high-tech imports denotes the more China has been a net value added gaining country due to the structural change in world production and trade activities. (Trade volume tables A. and B. 2a.Japan, 2b.US, 2c.CN, 2d. EU)

The share of three countries i.e. US, CN, EU, in Japan's total exports and imports, 53 percent and 44 percent respectively in annual average base. Highest share for total exports belongs to the US with 23 percent, but for imports China has the highest share with 20 percent among "the group". The share of "the group" in advanced technology goods trade with Japan are 55 percent for export, and 60 percent for imports. Among the group, the highest figures for the country' export belong to the US with 20 percent, and for imports China has the highest share with 24 percent in Japan's import. China's share raised from 17 percent in 2001 first year of the period to 29 percent in 2009 last year of the observed term.

The US total trade shares with three member group of countries i.e.; J, CN, EU is 35 percent in the cases both of export and import. Highest trade shares of the country in the group belongs to EU with the 24 percent and 18 percent for total export and total import respectively. In high-tech goods sectors the number one trade partner also EU in the group, and the shares of EU are 34 and 24 percent for export and import by ranking. China is at the second rank to the country' advance goods imports with the 12 percent share. While the China's share in the country's advanced goods import was 5 percent in 2001 it's increased to 17 percent at the end of the studied term of in 2009. The continuity of this trade indicates the fundamental change in the area of manufacturing goods in world level, and the process is moving parallel to the argument we introduced in this study. The mentioned changing shape of the advanced goods trade reflects the gradual change in the production possibilities of developing countries, as its seen as the Chinese sample, from labor intensive goods towards the goods producing with more sophisticated technologies.

Neither of the group-3 nor any individual country in the group has a remarkably higher share in EU' total trade that the calculated rates belongs to group-3 for exports and imports by ranking are 11 percent and 14 percent. But the remarkable figure placed in advanced goods imports originated from the group-3 that has realized as just above a quarter, 26 percent share. Despite the US with 14 percent share has the highest import partner of EU among the group-3, it has a declining rate which down from 18 percent in 2001 to 13 percent in 2009. And China as the second ranked country with 7 percent, its rate showing a serious improvement in EU's high-tech goods import with the share increasing from 4 percent in 2001 to 10 percent in 2009.

China exports 57 percent of it's total export to these 3 region and imports from the group by 33 percent of it's total imports. While the share of Chinese advanced goods export to the group is the same as total export, 57 percent, the country' advanced goods imports share from the group realized as 27 percent. (Trade share tables A. and B. 3a.Japan, 3b.US, 3c.CN, 3d.EU)

TOTAL TRADE SHARE TABLES
A. Total trade Tables; 3a. Japan, 3b. US, 3c. CN, 3d. EU

Table 3a: **Japan**/US,CN,EU: Total trade shares

Years	**Xto3/totX**	X_US/totX	X_CN/totX	X_EU/totX	**Mfrom3/totM**	M_US/totM	M_CN/totM	M_EU/totM
2001	0,56	0,30	0,08	0,18	0,46	0,18	0,17	0,11
2002	0,55	0,29	0,10	0,17	0,47	0,17	0,18	0,12
2003	0,55	0,25	0,12	0,18	0,47	0,16	0,20	0,12
2004	0,53	0,23	0,13	0,17	0,46	0,14	0,21	0,11
2005	0,53	0,23	0,13	0,16	0,44	0,13	0,21	0,10
2006	0,53	0,23	0,14	0,16	0,42	0,12	0,20	0,09
2007	0,51	0,20	0,15	0,16	0,41	0,12	0,21	0,09
2008	0,49	0,18	0,16	0,15	0,37	0,10	0,19	0,08
2009	0,50	0,16	0,19	0,14	0,42	0,11	0,22	0,09
anu.ave.	0,53	0,23	0,13	0,16	0,44	0,14	0,20	0,10

Table 3b: **US**/Japan,CN,EU: Total trade shares

Years	**Xto3/totX**	X to J/tot X	X_CN/X	X_EU/X	**Mfrom3/totM**	M from J/M	M from CN/M	M from EU/M
2001	0,35	0,08	0,03	0,25	0,33	0,11	0,05	0,18
2002	0,35	0,07	0,03	0,25	0,35	0,10	0,06	0,19
2003	0,36	0,07	0,04	0,25	0,35	0,09	0,07	0,19
2004	0,36	0,07	0,04	0,25	0,35	0,09	0,08	0,19
2005	0,34	0,06	0,05	0,23	0,35	0,08	0,09	0,17
2006	0,34	0,06	0,05	0,23	0,36	0,08	0,11	0,17
2007	0,34	0,05	0,06	0,23	0,36	0,07	0,12	0,17
2008	0,33	0,05	0,05	0,22	0,35	0,07	0,12	0,16
2009	0,34	0,05	0,07	0,22	0,37	0,06	0,14	0,17
anu.ave	0,35	0,06	0,05	0,24	0,35	0,08	0,09	0,18

Table 3c: **CN**/US,Japan,EU: Total trade shares

Years	**Xto3/totX**	X to US/X	X to J/X	X to EU/X	**Mfrom3/totM**	M from US/M	M from J/M	M from EU/M
2001	0,64	0,20	0,17	0,27	0,36	0,08	0,18	0,11
2002	0,61	0,22	0,15	0,25	0,36	0,07	0,18	0,11
2003	0,60	0,21	0,14	0,26	0,36	0,07	0,18	0,11
2004	0,60	0,21	0,12	0,26	0,33	0,06	0,17	0,10
2005	0,58	0,21	0,11	0,26	0,31	0,06	0,15	0,09
2006	0,55	0,21	0,09	0,25	0,31	0,07	0,15	0,10
2007	0,52	0,19	0,08	0,25	0,31	0,07	0,14	0,10
2008	0,50	0,18	0,08	0,24	0,29	0,06	0,13	0,10
2009	0,52	0,18	0,08	0,25	0,31	0,07	0,13	0,11
anu.ave.	0,57	0,20	0,11	0,25	0,33	0,07	0,16	0,10

Table 3d: **EU**/US,CN,Japan: Total trade shares

Years	**Xto3/totX**	X to US/X	X to CN/X	X to J/X	**Mfrom3/totM**	M from US/M	M from CN/M	M from J/M
2001	0,12	0,10	0,01	0,02	0,15	0,08	0,03	0,03
2002	0,13	0,10	0,01	0,02	0,14	0,07	0,04	0,03
2003	0,12	0,09	0,02	0,02	0,14	0,07	0,04	0,03
2004	0,12	0,08	0,02	0,02	0,14	0,06	0,05	0,03
2005	0,11	0,08	0,02	0,01	0,14	0,06	0,05	0,03
2006	0,11	0,08	0,02	0,01	0,14	0,06	0,06	0,02
2007	0,11	0,07	0,02	0,01	0,14	0,06	0,06	0,02
2008	0,10	0,07	0,02	0,01	0,14	0,06	0,06	0,02
2009	0,11	0,07	0,03	0,01	0,15	0,06	0,07	0,02
anu.ave.	0,11	0,08	0,02	0,01	0,14	0,06	0,05	0,03

Data: OECD Economic Outlook, Volume 2010 Issue 2, No.88, trademap.org., IMF fin.stats.March 2009.

ADVANCE GOODS TRADE SHARE TABLES
B. Advanced goods trade Tables; 3a. Japan, 3b. US, 3c. CN, 3d. EU

Table 3a: **Japan**/US,CN,EU: Advanced goods(*) trade shares

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2002-2009
X to 3/X	0,56	0,54	0,54	0,53	0,54	0,54	0,55	0,56	0,56	0,55
X_US/X	0,27	0,23	0,20	0,19	0,19	0,18	0,17	0,17	0,16	0,20
X_CN/X	0,08	0,11	0,14	0,14	0,16	0,18	0,20	0,21	0,23	0,16
X_EU/X	0,21	0,20	0,20	0,20	0,19	0,18	0,17	0,18	0,18	0,19
M from 3/M	0,60	0,60	0,59	0,60	0,60	0,60	0,60	0,61	0,61	0,60
M from US	0,29	0,27	0,24	0,22	0,22	0,21	0,21	0,19	0,19	0,23
M from CN	0,17	0,19	0,21	0,24	0,25	0,25	0,27	0,29	0,29	0,24
M from EU	0,14	0,15	0,14	0,14	0,14	0,13	0,13	0,12	0,13	0,14

(*) ISIC(30,85, 88, 90, 91); aircraft, and spacecraft, pharm., medicinal chemic. and botanical prod., office, acco.and comp.mach., radio, television and communication equipment and apparatus, medical, precision and optical instruments, watches and clocks.

Table 3b: **US**/J,CN,EU: Advanced goods trade shares

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2001-2009
X to 3/X	0,45	0,45	0,46	0,48	0,46	0,45	0,47	0,48	0,45	0,46
X_J/X	0,08	0,08	0,08	0,08	0,07	0,07	0,06	0,06	0,06	0,07
X_CN/X	0,03	0,04	0,04	0,04	0,05	0,06	0,07	0,06	0,06	0,05
X_EU/X	0,33	0,33	0,34	0,36	0,33	0,32	0,33	0,35	0,33	0,34
M from 3/M	0,43	0,45	0,46	0,48	0,48	0,48	0,48	0,48	0,48	0,47
M from J	0,15	0,13	0,12	0,12	0,11	0,09	0,09	0,08	0,07	0,11
M from CN	0,05	0,07	0,08	0,10	0,13	0,15	0,16	0,17	0,17	0,12
M from EU	0,23	0,25	0,26	0,26	0,25	0,24	0,23	0,24	0,24	0,24

Table 3c: **CN**/US,J,EU: Advanced goods trade shares

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2001-2009
X to 3/X	0,69	0,65	0,63	0,62	0,58	0,54	0,49	0,47	0,48	0,57
X_US/X	0,21	0,22	0,20	0,20	0,20	0,20	0,18	0,17	0,17	0,19
X_J/X	0,19	0,17	0,15	0,14	0,12	0,10	0,09	0,09	0,09	0,13
X_EU/X	0,29	0,27	0,28	0,28	0,25	0,25	0,23	0,21	0,23	0,25
M from 3/M	0,35	0,32	0,29	0,26	0,24	0,24	0,24	0,24	0,24	0,27
M from US	0,10	0,09	0,07	0,05	0,06	0,07	0,06	0,06	0,06	0,07
M from J	0,13	0,13	0,14	0,12	0,11	0,10	0,10	0,10	0,10	0,12
M from EU	0,12	0,09	0,08	0,08	0,07	0,07	0,07	0,08	0,08	0,08

Table 3d: **EU**/US,CN,J: Advanced goods trade shares

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2001-2009
X to 3/X	0,09	0,09	0,09	0,09	0,09	0,09	0,08	0,08	0,10	0,09
X_US/X	0,07	0,07	0,06	0,06	0,06	0,06	0,06	0,06	0,07	0,06
X_CN/X	0,01	0,01	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,01
X_J/X	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
M from 3/M	0,28	0,26	0,25	0,26	0,25	0,26	0,26	0,26	0,26	0,26
M from US	0,18	0,16	0,14	0,14	0,13	0,13	0,13	0,13	0,13	0,14
M from CN	0,04	0,05	0,06	0,07	0,08	0,09	0,09	0,09	0,10	0,07
M from J	0,06	0,05	0,05	0,05	0,05	0,04	0,04	0,04	0,03	0,05

Data: OECD Economic Outlook, Volume 2010 Issue 2, No.88

4.3. Panel Regression Findings

4.3.1. China excluded

In table (A.1) 1, the total export regression, FDI, GDP, and growth rate taken as the explanatory variables. All of the three variables probability levels find smaller than 0.05 and t-values find higher than 2. With 10.25 t-value GDP seen as the most explanatory variable. In table (A.1) 2, when we extend the model by adding one more variable openness, t-value of the growth variable turns to negative -1.44, and probability level get over the 0.05 level to 0.15. Openness become the most explanatory variable in this second model with the probability level smaller than the least level, and with the t-value 28.93. While growth rate meaningless to explain the dependent variable, GDP probability and t-values figures find significant to explain the export increases.

When the exports of advanced goods taken as the dependent variable, FDI, GDP, openness taken as the independent variables, in table (A.1) 3; the most explanatory variable calculated is the openness with 6.19 t-value and 0.00 probability. In table(A.1) 4, the case of import taken as the dependent variable**;** the most explanatory two variables, as it's expected, find as openness and GDP among the four variables, FDI, GDP, growth, openness. The similar explanatory results find with the same variables as it's in the case of import in the case of dependent variable imports of advance goods in table (A.1) 5.

- Table (A.1) 1, FDI variable is find the least significantly explaining variable to the total export improvements of advanced countries, and the probability of FDI worsening in table (A.1) 2 when we included the openness variable into the equation. Openness in tables (A.1) 2 and (A.1) 3 forms as the most explanatory variable on export values. That means, openness rather than FDI supports and interacts more with our treatments.
- Table (A.1) 4 and table (A.1) 5, openness and size of GDP for the case of total and high-tech products imports seen as the most interacting variables with our studied arguments.

A.1. Panel data trade regressions: J, US, EU 16, G, F, UK, EU 13 included

Table 1.
Dependent Variable: LOG(EX)
Method: Panel EGLS (Cross-section weights)
Total panel (balanced) observations: 63
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-22.25188	3.251087	-6.844444	0.0000
LOG(FDI)	0.241835	0.052227	4.630447	0.0000
LOG(GDP)	1.781161	0.173658	10.25669	0.0000
GROWTH	0.022094	0.004640	4.761987	0.0000

Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.994245	Mean dependent var	23.65177
Adjusted R-squared	0.993267	S.D. dependent var	8.070761
S.E. of regression	0.080687	Sum squared resid	0.345052
F-statistic	1017.319	Durbin-Watson stat	1.526723
Prob(F-statistic)	0.000000		

Table 2.
Dependent Variable: LOG(EX)
Method: Panel EGLS (Cross-section weights)
Total panel (balanced) observations: 63
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.078544	1.337375	2.301930	0.0254
LOG(FDI)	0.008777	0.016702	0.525510	0.6015
LOG(GDP)	0.827846	0.062626	13.21899	0.0000
GROWTH	-0.001977	0.001366	-1.447606	0.1537
LOG(OPEN)	1.041755	0.036001	28.93666	0.0000

Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.999655	Mean dependent var	40.78647
Adjusted R-squared	0.999588	S.D. dependent var	24.39562
S.E. of regression	0.034826	Sum squared resid	0.063070
F-statistic	15045.96	Durbin-Watson stat	0.808471
Prob(F-statistic)	0.000000		

Table 3.
Dependent Variable: LOG(EX_ADV)
Method: Panel Least Squares
Cross-sections included: 7
Total panel (balanced) observations: 63

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.564028	8.429414	0.541441	0.5905
LOG(FDI)	-0.275422	0.114821	-2.398718	0.0200
LOG(GDP)	0.870818	0.406101	2.144337	0.0366
LOG(OPEN)	1.512321	0.244089	6.195767	0.0000

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.990735	Mean dependent var	18.83188
Adjusted R-squared	0.989162	S.D. dependent var	1.526904

S.E. of regression	0.158960	Akaike info criterion	-0.695713
Sum squared resid	1.339216	Schwarz criterion	-0.355533
Log likelihood	31.91497	Hannan-Quinn criter.	-0.561919
F-statistic	629.7319	Durbin-Watson stat	1.219024
Prob(F-statistic)	0.000000		

Table 4.
Dependent Variable: LOG(IM)
Method: Panel EGLS (Cross-section weights)
Total panel (balanced) observations: 63
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.778923	0.898695	-4.204902	0.0001
LOG(FDI)	0.012942	0.010215	1.266956	0.2108
LOG(GDP)	1.130977	0.043298	26.12070	0.0000
GROWTH	0.002368	0.001094	2.165331	0.0350
LOG(OPEN)	0.969084	0.022569	42.93884	0.0000

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.999872	Mean dependent var	30.57798
Adjusted R-squared	0.999847	S.D. dependent var	16.74048
S.E. of regression	0.018549	Sum squared resid	0.017892
F-statistic	40494.09	Durbin-Watson stat	1.246120
Prob(F-statistic)	0.000000		

Table 5.
Dependent Variable: LOG(IM_ADV)
Method: Panel EGLS (Cross-section weights)
Cross-sections included: 7
Total panel (balanced) observations: 63
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.324597	3.442711	-0.965691	0.3387
LOG(FDI)	0.035012	0.047771	0.732909	0.4669
LOG(GDP)	0.991848	0.152265	6.513951	0.0000
LOG(OPEN)	0.831705	0.128593	6.467729	0.0000
GROWTH	-0.005224	0.005318	-0.982401	0.3305

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.997749	Mean dependent var	26.73563
Adjusted R-squared	0.997317	S.D. dependent var	11.89577
S.E. of regression	0.095025	Sum squared resid	0.469542
F-statistic	2305.378	Durbin-Watson stat	1.024128
Prob(F-statistic)	0.000000		

4.3.2. China Included

Openness and GDP figures, as it's predicted and showed in China excluded export regression, formed again, as the major explanatory variables to the total export regression in table (B.1) 1. In table (B.1) 2, in advanced goods exports regression; the most explaining variables seen as the imports of advanced products imports, the second is GDP, and openness get behind them to third rank. While the most explanatory variable in total import regression in table (B.1) 3, is GDP, openness and high-tech goods export variables ranked as first and second high explanatory variables in advanced good import regression in table (B.1) 4.

The positive impact of advanced goods imports on exports of high-tech products which is find as the most explanatory variable in table (B.1) 2 that higher than GDP size and openness variables. This result strongly supports our arguments of international product segmentation in manufacturing sectors, factor endowment change and related result of increasing comparative advantage of an emerging country China, in high-tech products. When we put together the regression findings in table (B.1) 2, with the advanced goods trade cross-tables, that we already find relatively higher rate of China's advanced goods export (Table B.3c), and increasing trends of advanced goods imports of Japan, US and EU from China (Tables B. 3a., 3b, 3d.) the combined analysis gives us strong explanatory proofs in our conception of "structural change in production and trade". The similar results achieved for the advanced goods import regression in table (B.1) 4 that two highest explanatory variables found as the exports of high-tech products and FDI that supporting also our above arguments.

B.1. Panel data trade regressions: J, US, CN, EU 16, G, F, UK, EU 13 included

Table 1.
Dependent Variable: LOG(EX)
Method: Panel EGLS (Cross-section weights)
Cross-sections included: 8
Total panel (balanced) observations: 72
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.043715	0.339728	-3.072211	0.0032
LOG(FDI)	0.002076	0.006304	0.329320	0.7431
LOG(GDP)	1.919874	0.077107	24.89872	0.0000
LOG(IM)	-0.948126	0.056905	-16.66150	0.0000
LOG(OPEN)	1.941038	0.059232	32.76995	0.0000
LOG(GDPPC)	0.033126	0.068098	0.486449	0.6285

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.999881	Mean dependent var	44.07443
Adjusted R-squared	0.999857	S.D. dependent var	27.38189
S.E. of regression	0.020782	Sum squared resid	0.025483
F-statistic	41323.38	Durbin-Watson stat	0.349562
Prob(F-statistic)	0.000000		

Table 2.
Dependent Variable: LOG(EX_ADV)
Method: Panel EGLS (Cross-section weights)
Cross-sections included: 8
Total panel (balanced) observations: 72
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.879047	1.364366	-4.308997	0.0001
LOG(GDP)	0.633875	0.098310	6.447740	0.0000
LOG(OPEN)	0.228010	0.088309	2.581951	0.0123
LOG(FDI)	-0.216075	0.036969	-5.844797	0.0000
LOG(IM_ADV)	0.743869	0.076102	9.774591	0.0000

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.999079	Mean dependent var	32.62516
Adjusted R-squared	0.998910	S.D. dependent var	20.29748
S.E. of regression	0.108007	Sum squared resid	0.699924
F-statistic	5916.073	Durbin-Watson stat	1.538416
Prob(F-statistic)	0.000000		

Table 3
Dependent Variable: LOG(IM)
Method: Panel EGLS (Cross-section weights)
Cross-sections included: 8
Total panel (balanced) observations: 72
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.505352	0.408357	1.237523	0.2207
LOG(FDI)	0.041404	0.011152	3.712643	0.0005
LOG(GDP)	0.922792	0.019554	47.19224	0.0000
LOG(OPEN)	1.029651	0.022452	45.85954	0.0000
GROWTH	-0.000395	0.001233	-0.320569	0.7497

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.999743	Mean dependent var	25.71552
Adjusted R-squared	0.999696	S.D. dependent var	11.23107
S.E. of regression	0.020780	Sum squared resid	0.025908
F-statistic	21247.71	Durbin-Watson stat	1.109661
Prob(F-statistic)	0.000000		

Table 4.
Dependent Variable: LOG(IM_ADV)
Method: Panel EGLS (Cross-section weights)
Cross-sections included: 8
Total panel (balanced) observations: 72
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.403121	1.188838	0.339088	0.7357
LOG(GDP)	0.457064	0.101904	4.485238	0.0000
LOG(EX_ADV)	0.396330	0.068098	5.819979	0.0000
LOG(OPEN)	0.637452	0.096641	6.596093	0.0000
LOG(FDI)	0.081935	0.040219	2.037242	0.0461
GROWTH	-0.007808	0.004167	-1.873695	0.0659

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.998346	Mean dependent var	24.79142
Adjusted R-squared	0.998009	S.D. dependent var	9.653460
S.E. of regression	0.079733	Sum squared resid	0.375081
F-statistic	2967.339	Durbin-Watson stat	1.475200
Prob(F-statistic)	0.000000		

5. Concluding Remarks

We have reviewed the recent literature deals with the changing shape of international trade, FDI, and production stages, and then, recent development in Chinese economy examined. The data we collected and processed first the statistical figures into cross-tables and regression models. Then, through the analysis we showed how the production and trade patterns changing structurally. The computational results indicating that how advanced goods import trends of developed countries from China and export trends of high-tech products originated from China is changing. The developments in FDIs and especially high technology goods trade evidently explains the structural changes in Chinese manufacturing production.

As indicated at empirical results sections, for the examined developed countries; “the annual average increasing rates of total and high-tech goods exports to China and imports from China” higher than “their total and high-tech goods export and import rising rates” in the cases of trade with each other and trade with the world. These are the supporting proves to the changing structure of China’s manufacturing production sectors which reflects at the same time changing profile of the factor endowments on behalf of the skilled labor intensity in total production factor equations. Thereby, such improvements strongly supports our arguments put forward in this study that landscape of the production and trade structures are changing through segmentation of production stages at the international arena.

As the result, the advanced goods manufacturing regions tending to move from developed world through developing countries, as seen Chinese sample. Thereby, it should be concluded that the comparative advantage of advanced countries in high-tech, and higher value added products gradually easing against the emerging countries such as China. Further, this kind of structural changes requires new approaches to the predictions of the classical trade and production theories that international trade and production activities were explaining with the factor endowments and comparative advantages.

In order to improve the participation at the global production chains, developing economies supposed to make more structural reforms to their economic fundamentals such as education, science and technology and research and development investments.

References

- Bloom, N., Draca, M., Reenen, J.V. (2011), "Trade induced technical change? The impact of Chinese imports on innovation, IT and productivity", NBER Working Paper 16717, January.
- Burstein, A. & Vogel, J. (2010), "Globalization, technology, and the skill premium: A quantitative analysis", NBER Working Paper 16459, October.
- Busse, M., Königer, J. & Nunnenkamp, P. (2010), "FDI promotion through bilateral investment treaties: more than a bit?" Review of World Economics, Vol.146, N.1, April.
- Chamon, M., Liu, K. & Prasad, E.S. (2010), "Income uncertainity and household savings in China", NBER Working Paper 16565, December.
- Cheung, Y.W. & Suny, X.Q. (2009), "Empirics of China's Outward direct investment", Pacific Economic Review, 14:3, pp.312-341.
- Dimaranan, B., Ianchovichina E. & Martin, W. (2009), "How will growth in China and India affect the World economy?", Review of World Economics, V.145, No.3, October.
- Freeman, R.B. (2005), "Does globalization of the scientific/engineering workforce threaten U.S. economic leadership", NBER Working Paper 11457, June.
- Guadalupe, M., Kuzmina, O. & Thomas, C. (2010), " Innovation and foreign ownership", NBER Working Paper 16573, December.
- Gür, A. İ., (2009), "The effect of global financial turmoils on emerging countries' risk premiums", Expertise, Thesis at Undersecretariat of Turkish Treasury, Ankara, Türkiye, March.
- Harada, T. (2010), "Path-dependent economic growth with technological trajectory", Economics of Innovation and New Technology, Vol.19, No.6, 521-538, September.
- Harrison, A.E., Martin, L.A. & Nataraj, S. (2011), "Learning versus stealing: How important are market-share reallocations to India's productivity growth?", NBER Working Paper 16733, January.
- Hsieh, C.T. & Ossa, R. (2011), "A global view of productivity growth in China", NBER Working Paper 16778, February.
- Redding, S.J. (2010), "Theories of heterogeneous firms and trade", NBER Working Paper 16562, December.
- Rodrik, D.(2009), "Making room for China in the world economy", Harvard Kennedy School, Cambridge, MA. December.
- So, K.T. (2009), "Relative endowments and the volume of trade", Journal of Economic Integration" 24(4), 744-764, December.
- Whalley, J. & Xing, C. (2010), "The regional distribution of skill premia in urban China", NBER Working Paper 16575, December.
- Widodo, T. (2009), "Dynamic comparative advantages in the ASEAN+3", Journal of Economic Integration" 24(3), 505-529, September.
- Wu, F., Pan, R. & Wang, D. (2010), "Renminbi's potential to become a global currency", China & World Economy, 63-81, Vol.18, No. 1.
- Yang, D.T., Zhang, J. & Zhou, S. (2011), "Why are saving rates so high in China?", NBER Working Paper 16771, February.
- Zhao, G. & Zhang, Z. (2010), "Uncovering the relationship between FDI, human capital and technological progress in Chinese high-technology industries",China & World Economy, 82-98, Vol.18, No.1.