

**Chinese Bilateral Intra-Industry Trade  
with Her Major Trading Partners:  
A Case Study of Japan, Korea, United States,  
European Union, Hong Kong and Taiwan**

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**Abstract**

The purpose of this paper is to examine the features and determinants of Chinese intra-industry trade during the 1992-2010 transition periods for China's primary trade partners. We disentangle total intra-industry trade into vertical intra-industry trade and horizontal intra-industry trade, using data at the harmonization system level. The results of our sets of estimations suggest that China's HIIT is more likely to emerge with countries that are similar than with those that are different. Conversely, China's VIIT happens more with different rather than with similar countries. And in the intra-industry trade, the vertical intra-industry trade takes the central stage since existing wide gap of technology and management of corporations between the interior of China and major trading partners.

**Key Word:** China, Major Trading Partners, Trade

**Introduction**

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## Background

In the year 1987, China started to introduce liberal economic policies in the area of foreign trade and investment. During the period from 1978 to 2000, the overall reform and opening-up policy reflected a gradual, step-by-step movement toward a more market-oriented system. Although the era of isolation was ended as a result, China's Trade barriers, including a plethora of tariff and non-tariff measures, were still maintained at levels similar to those in highly protectionist developing countries. After 2000, though, the relaxation of the foreign trade and investment policies accelerated. For example, year after year simple mean tariffs have been cut down with large slices, which dropped average import tariffs dramatically. In line with this process of accelerated liberalization, Chinese trade has expanded impressively, simultaneously producing a significant upgrade of China's trade pattern. The ratio of exports to GDP increased from 23 percent in 2001 to 27 percent in 2011, and the share of manufactured goods in exports and ratio of intra-industry trade to inter-industry also increase simultaneously, which indicates the dramatic change in China's trade structure from 2001 to 2010.

## Objectives

The main objectives of this study are as follows:

1. To measure the magnitude of Chinese bilateral intra-industry trade;
2. To explore the Chinese trade performance and the reason why the intra-industry trade happens and increases rapidly, in China;
3. To examine an empirical evidence on determinants of Chinese bilateral intra-industry trade with major trade partners;

4. To forecast the trend of Chinese bilateral intra-industry trade with major trade partners, and find policy implications.

### **Scope of the Study**

The study is based on database of China's trade with her major trade partners namely, Japan, South Korea, United State, the European Union, China, Taiwan and Hong Kong. The annual data is from 1992 to 2010.

Data comes from the OECD database, the World Bank database, the China Statistics Yearbook, the China Foreign Economic Statistical Yearbook, the China Trade and External Economic Statistical Yearbook and the China Foreign Merchant Investment Report.

### **China's Trade with Major Trade Partners**

#### **China's Trade Performance in the World**

With its huge population size, high development pace and unique reform program, China is a major economic force in the current transition period. The value of China's bilateral trade with principal trade partners, such as US, EU and Japan, has risen dramatically over the last ten years, from 2001 to 2011. Before 2007, China's trade of manufactured commodities mainly concentrated with developed countries, such as the United States, the European Union and Japan. Over time, as China's manufacturing sector grew and the production technology development, China's international trade in export destinations and import supply sources diversified to more countries, especially in the East Asian and Southeast Asian countries and regions gradually.

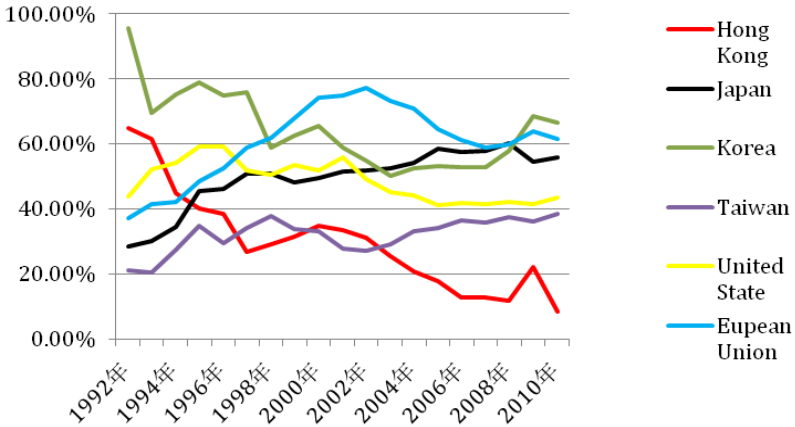
### **China's Trade Composition with Major Trade Partners**

With technology development and R&D investment, the structure of China's trade with the trading partners also has changed gradually. And the economic integration with global economy has not only greatly expanded the utilization of its abundant human resources and augmented its manufacturing capacity into high value-added products, including fundamental change in its trade structure. In many ways, the liberalization of the Chinese economy has generated the success of China's trade. The Chinese experience may provide vital information for the development of a coherent explanation and theory of intra-industry trade. Therefore, the present research aims to analyze what specific factors influence bilateral intra-industry trade over the transition period by exploring a rich panel data set between China and her major trade partners from 1992 to 2010.

### **China's Intra-Industry Trade with Major Trading Partners**

In intra-industry trade of China, it means that the simultaneous import and export of goods in China, like differentiated products, are traded within one and the same industry by both trade partners. And in the purpose of this paper, we focus on intra-industry trade of China trading with primary trader partners. Since the open policy occurred, China's economy has started to develop in international trade. Actually, the openness of the China's trade took place from 1984, and the intra-industry trade also began to happen from 1990s, as illustrated in the following figure 1.1. We can find that all of the major trading partners almost increased the intra-industry trade with China which also had a fluctuation when the economic crisis broken in the world. However, for the Japan and Taiwan, the share of the intra-industry trade almost increased. Conversely, the trade of Hong Kong always

decreases the intra-industry trade with inland of China with the factor endowment of both regions.



**Figure 1** Chinese Intra-Industry Trade Index with Major Trade Partners

**Note:** Calculated by the author based on the data from China Foreign Economic Statistical Yearbook, China Trade and External Economic Statistical Yearbook

China is a noticeable economic force in the current transition age. The multi-faceted liberalization of the Chinese economy has generated the success of China’s trade and witnessed impressive growth rates. The Chinese experience may provide vital information for the development of a coherent explanation and theory of intra-industry trade. The present study, therefore, aims to detect what country specific factors influence bilateral intra-industry trade over the transition period by exploring a case study of the most important trade partners (countries and regions).

## Conceptual Framework

### Definitions and Theory of Intra-Industry Trade

Intra-industry trade means that the simultaneous import and export of goods, like differentiated products, are traded within one and the same industry by both trade partners. After the second war, there were some significant theories to be proposed by economists, such as the new factor-endowment theory and the new technology theory, which laid the foundation of intra-industry theory. And these theories introduced human capital, R&D, scale economy, technology innovation, product life cycle and reciprocal demand, and so forth, to expound the significance the intra-industry trade in modern international trade.

### Measurement of Intra-Industry Trade Index

The extent of intra-industry trade could be used the Adjusted Grubel-Lloyd Index (1975), which corrects for the bias caused by the imbalance of bilateral commodity trade. This index is defined as

$$IIT = \frac{\sum(X_i + M_i) - \sum|X_i - M_i|}{\sum(X_i + M_i) - |\sum X_i - \sum M_i|} \times 100$$

Where  $X_i$  and  $M_i$  stand for the values of export and import of product group  $i$ , respectively. The intra-industry trade index range from 0 (complete inter-industry trade) to 100 (complete intra-industry trade).

### Identification of VIIT and HIIT Index

In our analysis, we chose to distinguish between vertical intra-industry trade and horizontal intra-industry trade. And we could identify HIIT mainly by applying the extent of relative export to import per values of 1 divided by 1.25 to 1.25. Although a lot of the latest analysis, for instance, AbdRahaman (1991), Greenaway (1994) and Fontagne (1997), mainly use a 15% threshold to discriminate between horizontally and vertically differentiated products, we apply a 25% threshold for this analysis.

**Table 1** Classification of Trade Types

Type	Degree of Trade Overlap	Disparity of Unit Value
One-Way Trade (OWT)	$\frac{\text{Min}(M_{kk'j}, M_{k'kj})}{\text{Max}(M_{kk'j}, M_{k'kj})} \leq 0.1$	Not Applicable
Horizontal Intra-Industry Trade (HIIT)	$\frac{\text{Min}(M_{kk'j}, M_{k'kj})}{\text{Max}(M_{kk'j}, M_{k'kj})} > 0.$	$\frac{1}{1.25} \leq \frac{UV_{kk'j}}{UV_{k'kj}} \leq 1.25$
Vertical Intra-Industry Trade	$\frac{\text{Min}(M_{kk'j}, M_{k'kj})}{\text{Max}(M_{kk'j}, M_{k'kj})} > 0.$	$\frac{UV_{kk'j}}{UV_{k'kj}} < \frac{1}{1.25}$ or $1.25 < \frac{UV_k}{UV_{k'}}$

### Literature Review

#### Theoretical Research of Intra-industry Trade

In the years following the Second World War, researchers have found much evidence of rapidly increasing intra-industry trade. Balassa

(1966) first coined the term “intra-industry trade” to signal the simultaneous import and export of goods within one and the same industry by both trade partners. Abd Rahman (1991) and Greenaway (1995) emphasized that the distinction of the two types of intra-industry trade is very important. Grubel and Lloyd (1975); Dixit and Stiglitz (1977); Krugman (1979, 1980, 1981) and Lancaster (1979, 1980), completed the early work and constructed the models on intra-industry trade concentrated on horizontal differentiation by applying the traditional monopolistic competition approach. Helpman and Krugman (1985) synthesized insights into a unifying theoretical model, which became known as the so-called Chamberlin-Heckscher-Ohlin (CHOS) model. Helpman and Krugman (1985) synthesized insights into a unifying theoretical model, which became known as the so-called Chamberlin-Heckscher-Ohlin (CHOS) model. Linder’s theory (Linder 1961) can also contribute to the explanation of HIIT. The models of Falvey (1981), Shaked and Sutton (1984), Falvey and Kierzkowski (1987) and Flam and Helpman (1987) show how trade in vertically differentiated products takes place between countries with different per capita incomes and factor endowments, following the CHOS theory.

### **Empirical Research of Intra-industry Trade**

Don P. Clark and Denise L. Stanley (1999) identified countries and industry-level determinants of intra-industry trade between the US and developing countries. And the study found the intra-industry trade that declines with greater differences in relative factor endowments has a significant relationship with economic size and trade orientation of developing countries, besides geographic distance.



$$\begin{aligned} IIT_{ij} = & a_{ij} + \text{Ln DIFF}_{ij} + \text{Ln GDP}_{ij} + \text{Ln DIST}_{ij} + \text{TO}_{ij} + \text{TIMB}_{ij} + \text{MES}_{ij} + \text{CR4}_{ij} \\ & + \text{ESTAB}_{ij} + \text{DSPH}_{ij} + \text{AS}_{ij} + \text{KL}_{ij} + \text{OAP}_{ij} + \text{Ln VS}_{ij} \end{aligned}$$

Where DIFF denotes differences in factors endowments, instead of per capita GDP, and GDP represents gross domestic production of developing countries, DIST distant between U.S. and a trading partner, TO developing countries' trade orientation, TIMB trade imbalance, MES minimum efficient scale, DSPH sectorial dispersion index, AS advertising to sale, KL capital to labor, OAP industrial participation under offshore assembly provision, VS industry shipments.

## Research Methods

### Construction of Intra-Industry Trade Models

On finding the determinants of China's intra-industry trade, we will estimate the following models. Total intra-industry trade model:

$$\begin{aligned} TIIT_{it} = & \beta_0 + \beta_1 \text{LOG}(\text{FDI}_{it-1}) + \beta_2 \text{LOG}(\text{DGDP}_{it}) + \beta_3 \text{DPIN}_{it} + \beta_4 \text{DIMB}_{it} \\ & + \beta_5 \text{MR2}_{it} + \beta_6 \text{EXCH}_{it} + \beta_7 \text{OPEN}_{it} + \beta_8 \text{DIST}_{it} + \varepsilon_{it} \end{aligned}$$

Vertical intra-industry trade model:

$$\begin{aligned} VIIT_{it} = & \beta_0 + \beta_1 \text{LOG}(\text{FDI}_{it-1}) + \beta_2 \text{LOG}(\text{MNE}_{it}) + \beta_3 \text{LOG}(\text{DGDP}_{it}) + \beta_4 \text{DIMB}_{it} \\ & + \beta_5 \text{DPIN}_{it} + \beta_6 \text{MR2}_{it} + \beta_7 \text{EXCH}_{it} + \beta_8 \text{OPEN}_{it} + \beta_9 \text{DIST}_{it} + \varepsilon_{it} \end{aligned}$$

Horizontal intra-industry trade:

$$\text{HIIT}_{it} = \beta_0 + \beta_1 \text{LOG}(\text{FDI}_{it-1}) + \beta_2 \text{LOG}(\text{MNE}_{it}) + \beta_3 \text{LOG}(\text{DGDP}_{it}) + \beta_4 \text{DIMB}_{it} \\ + \beta_5 \text{DPIN}_{it} + \beta_6 \text{MR1}_{it} + \beta_7 \text{EXCH}_{it} + \beta_8 \text{OPEN}_{it} + \beta_9 \text{DIST}_{it} + \varepsilon_{it}$$

Where TIIT = Total Intra-Industry Trade

VIIT = Vertical Intra-Industry Trade

HIIT = Horizontal Intra-Industry Trade

FDI = Foreign Direct Investment from Major Trader in China

DGDP = Difference of GDP between China and Major Trader

$$= 1 + \frac{[w \ln(w) + (1-w) \ln(1-w)]}{\ln 2}$$

$$w = \text{GDP}_a / (\text{GDP}_a + \text{GDP}_b)$$

DPIN = Difference of Per Capital Income between China and Major Trader

DIMB = Balance of Payment between China and Major Trader

MR1 = Share of Trading Value of Primary Products in Total Trade

MR2 = Share of Trading Value of Manufactured Products in Total Trade

EXCH = Exchange Rate between China and Major Trading Partner

$$\text{OPEN} = \text{Open Degree of Trade} = (\text{X}_{it} + \text{M}_{it}) / \text{GDP}_{it}$$

DIST = Geographic Distance between China and Major Trader.

### **Description of Determinants of Intra-Industry Trade Models**

HIIT is more prominent among countries that are more similar in terms of consumer patterns and factor endowments. And it is also prominent among countries that large in terms of their economic size.

VIIT is more prominent among countries that are different in terms of

factor endowments and consumers patterns. In addition, VIIT is also more prominent if efficiency-seeking FDI inflow is large, but HIIT is not. And both VIIT and HIIT are more prominent if the share of manufacturing goods in total trade is large and trade barriers are low. Furthermore, intra-industry trade is more prominent compared with inter-industry trade if geographical distance is short, which is especially the case of HIIT.

### Research Results

**Table 2** The result of intra-industry trade models

Independent Variable	TIIT		VIIT		HIIT	
	Coefficient	T-Statistic	Coefficient	T-Statistic	Coefficient	T-Statistic
C	0.9654 69	11.439 04	0.1688 25	1.0759 49	-0.454 36	-3.971 764
LOG(FDI ?(-1))	-0.292 220	-4.907 359	-0.070 615	-5.827 274		
LOG(MN E)					0.1256 3	26.374 47
DGDP	-0.243 374	-7.178 094	0.2917 73	-4.140 582	-0.080 65	2.8766 14
DPIN	-0.552 629	-5.850 487	0.8061 53	-8.035 577	-0.194 83	-2.433 316
DIMB	-0.828 892	-23.42 909	-0.324 935	-8.432 685	-0.057 48	-3.636 429
MR1					0.3744 37	-6.998 203

**Table 2** (Continue)

Indepen dent Variable	TIIT		VIIT		HIIT	
	Coeffic ient	T-Stati stic	Coeffic ient	T-Stati tic	Coeffic ient	T-Stati tic
MR2	1.2216 77	2.400 350	0.2145 68	-3.166 881		
EXCH	0.0207 22	4.037 925	0.0004 87	4.3219 97	0.0000 48	18.568 49
OPEN?	0. 032473	3.110 605	0.1228 10	4.5825 29	0.0173 38	-33.36 429
DIST					-0.024 981	0.0004 12
R-squared	0.889907		0.896083		0.937401	
F-statistic	383.3992		151.73862		189.84746	

**Notes:** we choose the significance at the 5% level. All variables except for FDI and MNE are not in logarithms. Besides, the variable FDI is used at time t-1.

According to the analysis of TIIT, VIIT and HIIT by G-L measurement, we find that the primary determinants: GDP, FDI and IMB have a significant effect on the intra-industry trade index by the panel data regression. In particularly, economic scale has a positive relationship with intra-industry trade in horizontal intra-industry trade. With transition of Chinese international trade, industrial structure, geographical distance, political and cultural factor has taken a prominent position in Chinese intra-industry trade.

Economic scale is the important determinant on IIV. On the demand size, Chinese government should drive to improve people per capita income and encourage them to do consumption in differentiated

commodities, which could help to wide market scale and potential. On the supply size, it must be implemented that industrial structure upgrading, rational merger and establishment of modern enterprise system to lead much more enterprises to focus on economic scale affect more. Meanwhile changing the super national tax treatment raises quality of foreign direct investment and the Chinese government should lead it into process of production to increase the additional production values and export ability, which adjusts the unfavorable position of China in international division. Thus, it could help it to develop the level of intra-industry trade. Besides, we find that the balance of international payment has a negative impact on Chinese intra-industry trade. Therefore, they must strength themselves in export abilities to make differences and rationalization for international market. Meanwhile, it should be decreased in different tariffs and non-trade barriers to eliminate the unbalance of international payments in China.

### **Conclusion**

Our examinations of the intra-industry trade models, suggests that the effect of FDI is relatively small. It implies that firms choose to become multination and exploit the factor price gap between the domestic and foreign countries. As a result, MNE's home country specializes more in the production of capital-intensive high-quality products, while the host country specializes more in the production of labor-intensive and low quality products. Similarly, the lower the trade costs, the more vertical IIT will occur between the home and the host countries. Hence, the analysis reflects that lower costs of foreign direct investment and trade enable enterprises to benefit from the

international vertical division of labor, resulting in an increase in vertical IIT. Lastly, the Chinese Government should take advantages of geographic distance, similar political and cultural factor with Japan, Korean, Taiwan and Hong Kong to promote the intra-industry trade. And with research the market each other, it will has a positive impact to exploit market and deepen the communication and cooperation of policies and cultures.

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