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Country-Specific Factors and the Pattern of Intra-Industry Trade in China's Manufacturing

Zhaoyong ZHANG

KOREA INSTITUTE FOR
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Executive Summary

Over the past few decades there have been extensive empirical and theoretical studies of the determination of intra-industry trade (IIT), but mostly for the industrialized countries. This paper aims to assess the trends and pattern of intra-industry trade and structural adjustment in China's manufacturing associated with its trade liberalization using data spanning from 1989 to 2001. In particular, we distinguish intra-industry trade as either horizontally or vertically differentiated, and examine how the various country-specific factors affect the intensity of China's horizontally and vertically differentiated intra-industry trade with its major trading partners, and how trade liberalization changes the pattern of China's IIT and integration with the East Asian region. These issues have important policy implications for product differentiation strategy and labour adjustment.

JEL Classification: F12; F14
Keywords: Intra-industry trade; Chinese economy; Manufacturing

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Country-Specific Factors and the Pattern of Intra-Industry Trade in China's Manufacturing

Zhaoyong ZHANG

I. Introduction

China's path-breaking initiatives begun over two decades ago have transformed itself from a poor, closed nation to an important trading nation and manufacturing center in the world (see Lardy 1998; Naughton 1996). Its impressive accomplishments over this period are capped by near double-digit growth, and the uplifting of hundreds of millions of people out of absolute poverty.[1] Accompanying and fostering China's transformation and growth has been largely its rapid expansion in foreign trade and a surge in foreign direct investment (FDI). China emerged from practically null to the second largest recipient of FDI worldwide in 1993 and further advanced to the world's largest FDI recipient in 2002, attracted nearly US$53 billion. China's abundance of cheap labor has made it internationally competitive in many low cost, labor-intensive, manufactures. As a result, manufactured products comprise an increasingly larger share of China's trade. The share of Chinese manufactured exports to total exports rose from 50% in 1980 to 90% in

[1] China's real GDP rose at an average annual rate of 9.4% in 1979-2001. According to the World Bank report, China has made the largest single contribution to global poverty reduction of any country in the last 20 years.

2000, while manufactured imports as a share of total imports rose from 65% to 84% (see Tables 1A and 2A). A large share of China's manufactured imports are comprised of intermediates (e.g., chemicals, electronic components, and textile machinery) used in manufacturing products in China. Economic reforms have transferred China into a major trading power. Its exports rose from $14 billion in 1979 to $266 billion in 2001, while imports over this period grew from $16 billion to $244 billion. China's ranking as a trading power in the world rose from 27th in 1979 to 6th in 2001.

How does China's rapid economic development affect its international trade of both homogenous products and differentiated products? In recent years there is a large empirical literature that investigates the determination of intra-industry trade (IIT), that is trade based on product differentiation and economies of scale. Studies find strong support for country effects, indicating that similarity in industrial structure, demand patterns and size of countries are important country level influences, and at industry level, the characteristics of product differentiation and scale economies appear to be deterministically related to IIT. However, most of these theoretical and empirical studies have been undertaken for the developed countries, and it is also less conclusive how transport costs, trade barriers and FDI affect the intra-industry trade pattern. With the progress of trade liberalization and cross-hauling of foreign direct investment, to what extent is the growth in IIT driven by inward FDI, and to what extent can the growth of IIT be explained by income distribution?

The purpose of this paper is to assess the trends and pattern of China's intra-industry trade and structural adjustment in the manufacturing associated with its trade liberalization, and to investigate empirically the determination of China's IIT using data spanning from

1990 to 2000. In particular, we distinguish intra-industry trade as either horizontally or vertically differentiated, and examine how the various country-specific factors affect the intensity of China's horizontally and vertically differentiated intra-industry trade with its major trading partners, and how trade liberalization changes the pattern of China's IIT and integration with the East Asian region. These issues have important policy implications for product differentiation strategy and labour adjustment.

The paper is organized as follows. Section II briefly summarizes the basic theoretical arguments of different type of IIT and the empirical implications to be tested. Section III discusses data used in this study. In Section IV we decompose China's intra-industry trade into either horizontally or vertically differentiated, and construct bilateral shares of horizontally and vertically differentiated intra-industry trade with the rest of East Asian economies. Then, we examine the relationship between horizontally and vertically differentiated intra-industry trade and FDI as well as the variation in the distribution of income across the East Asian countries. This decomposition of intra-industry trade is important in its implications for adjustment costs stemming from trade liberalization, and for product differentiation strategy. Section V concludes.

II. The Theoretical Framework

Intra-industry trade between industrialised countries with similar factor endowments has long been recognised (Grubel and Lloyd 1975). The most widely used explanations for IIT at industry level draw on economies of scale and horizontal product differentiation as well as country characteristics with a model of monopolistic competition (Helpman and Krugman 1985; Greenaway and Torstensson 2000). Helpman and Krugman (1985) provide a theoretical framework to describe the negative relationship between the share of intra-industry trade and per capita GDP difference across countries. They show that, as countries become more similar in size and factor composition, the volume of trade as a proportion of group GDP should increase. The model is specified as follow:

$$IIT_{ijt} = \alpha_0 + \alpha_1 \ln\left|\frac{GDP_{it}}{N_{it}} - \frac{GDP_{jt}}{N_{jt}}\right| + \alpha_2 \min\left(\ln GDP_{it}, \ln GDP_{jt}\right) + \alpha_3 \max(\ln GDP_{it}, \ln GDP_{jt}) + \varepsilon_{ijt} \quad (1)$$

where N is the population. *MINGDP* and *MAXGDP* are included to control for relative size effects. IIT_{ijt} is the Grubel-Lloyd index for bilateral trade of countries i and j in year t, and defined as:

$$IIT_{ijt} = \frac{2\sum_k \min(X_{ijk}, X_{jik})}{\sum_k (X_{ijk}, X_{jik})} \quad (2)$$

and the share of intra-industry trade between countries *i* and *j* in industry *k*:

$$IIT_{ijk} = \frac{2\min(X_{ijk}, X_{jik})}{(X_{ijk}, X_{jik})} \quad (3)$$

Although with different assumptions, most models state that firms have increasing returns to scale and operate in monopolistically competitive industries, while consumers have utility functions that reward product diversity. Intra-industry trade arises because each variety of a differentiated good is produced in only one country but is consumed in all countries. However, empirical studies (such as Hummels and Levinshn 1995) also found a positive relationship in regressions when control for country-specific fixed effect. The explanation for the change in the sign is the controlling for differences in distance and land endowments in regressions. However, this change in the sign may also be due to the vertically differentiated varieties of an indivisible good but there are no such differences in the Helpman and Krugman model (see Durkin and Krygier 2000). Intra-industry trade in vertically differentiated products arises because consumers who have different incomes demand different quality products, and also because in a given country the range of produced qualities does not correspond precisely to the demanded range of qualities (Flam and Helpman 1987). The number of varieties exported by the low productivity country depends on the relative wage, differences in technology and the income distribution overlap.

Another important but less addressed issue is the role of foreign direct investment in driving intra-industry trade. FDI has been traditionally viewed as part of "the macroeconomic theory of capital flows," but

late studies refined the evidence by showing that direct investment is closely related to knowledge-based and other intangible assets and not to physical capital intensity (Markusen and Maskus 2002). Intra-industry trade is often associated with FDI (Greenaway and Millner 1987). Firms therefore face a choice of penetrating foreign markets by either exports or relocation of their operations overseas or even serving the home market by exports from their foreign affiliates. The foreign activities of multinational enterprises are closely related to intra-industry trade, in particular, of intermediate products. Firms are likely to engage in FDI whenever they perceive that the net benefits of their joint ownership of domestic and foreign activities and the transactions arising from them are likely to exceed those offered by external trading relationships. The internalisation theory would predict that, given a particular distribution of factor endowments, the activity of multinational enterprise will be positively related to the costs of organizing cross-border markets in intermediate products (Dunning 1993).

In this study, following Greenaway et al. (1994), we classify intra-industry trade as either horizontally differentiated or vertically differentiated, and construct the bilateral share of horizontal and vertical intra-industry trade at SITC 5-digit level between China and the rest of East Asia. We then extend the Grossman and Helpman model to examine how IIT should be related to country specifics, foreign direct investment and firm specifics in the case of the Chinese economy. In particular, we test whether the hypothesized relationship between the proposed country-specific factors and intra-industry trade hold during China's reform era. It is postulated that the intensity of IIT will be positively correlated with the market size of both countries *(AGDP)*, the openness *(TO)* and foreign direct investment *(FDI)*, while negatively correlated with transport costs *(DIST)* and the differences in economic

size *(DGDP)* and in per capita income *(DPIN)* between the two partner economies. In particular, IIT, HIIT and VIIT are all expected to be positively related to the market size of both countries *(AGDP)* and the openness *(TO)*. The more countries differ in relative factor endowments *(DGDP)*, the less likelihood there is for IIT and HIIT, but the greater the expected share of VIIT. Similar relationship is hypothesized between the differences in per capita income *(DPIN)* and IIT and HIIT as well as VIIT. DIST is expected to be negatively related to IIT, HIIT and VIIT, while the relationship between FDI and VIIT is undermined. Both horizontal and vertical intra-industry trade will be tested, respectively. The model is specified as follows:

$$IIT_{ijkt} = (AGDP_{ijt} \text{ or } POP_{ijt}, GDPD_{ijt}, DPIN_{ijt}, Dis_{ij}, FDI_{ijt}, TO_{ijt}) \quad (4)$$

The left-hand of the model refers to the bilateral share of intra-industry trade, horizontal and vertical intra-industry trade. For country variables, we use the average GDP *(AGDP)* (in millions of U.S. dollars) or population *(POP)* of China and its trading partners to proxy the market size, and $GDPD_{ijt}$ for the relative difference in size between the two countries. Following Balassa and Bauwens (1988), $GDPD_{ijt}$ is derived according to the following formula, to reflect the standardized difference in size:

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

where w represents the ratio of a country's GDP to the sum of its GDP and the trade partner's GDP, i.e.,

$$w = \frac{GDP_i}{GDP_i + GDP_j}$$

Other country variable includes the difference in per capita income or the economic distance between two countries $(DPIN_{ijt})$ and the transportation costs $(Dist_{ij})$. $DPIN_{ijt}$ is measured by the difference between the reporting country's per capita GDP and that of its trading partner, reflecting both demand and supply side forces. The transportation cost is proxied by the geographical distance in nautical miles between the reporting country and each of its trading partners.

We also include foreign direct investment and trade orientation variables in the model specification. It is postulated that the intensity of IIT will be greater the more open is the economy. Following Balassa (1986) and Balassa and Bauwens (1988), we define a proxy for trade orientation (TO_{ijt}) as the residuals from a regression of per capita trade on per capita income and population. FDI is expected to promote intra-industry trade. A firm has an incentive to set up a foreign affiliate if the trading costs associated with exporting the good is higher. Globalization provides more room for firms to conduct global operations, which may result in greater intra-firm trade, while, on the other hand, globalization reduces the service costs of linking remote locations together, which makes arm's-length trade easier and cheaper (Fukasaku and Kimura 2002). We use China's FDI inflows from the rest of East Asia to determine the importance of multinational enterprises in explaining intra-industry trade.

III. Data

The share of total intra-industry trade is calculated by using 5-digit SITC bilateral export and import data for industry in the SITC categories 5 to 8 for China and the rest of East Asia for the years from 1990 to 2000.[2] To calculate the share of vertically differentiated and horizontally differentiated trade, we follow Greenaway et al. (1994) in using the unit values of exports relative to imports for distinguishing between horizontal and vertical intra-industry trade. They chose a range of ±15% in their study and argue that, if trade within an industry category is more horizontally differentiated, the ratio of export to import unit values should be within the range of 0.85 to 1.15. Beyond this range, trade in that industry is classified as vertically differentiated. Given the geographical size of China, we also use a broader range of ±25% to determine horizontally differentiated and vertically differentiated intra-industry trade. Data used for calculating the indices were from OECD: International Trade by Commodity CD-ROM Rev3.[3]

The country income level variables (GDP and per capita GDP), and population were obtained from IMF: International Financial Statistics (various issues), and Asian Development Bank Key Economic Indicators (various issues). Data on China's inward FDI from the rest of East Asia was collected from Almanac of China's Foreign Economic Relation and Trade. Geographical distances were obtained from Fitzpatrick and Modlin (1986).

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2) We have also tried to include other major trading partners. But due to data availability, we could include the United States only in assessing the intensity of China's intra-industry trade.

3) We are very grateful to Dr. Masaru Umemoto of ICSEAD for providing these data.

IV. The Results

1. The Distribution of IIT

We first calculate the share of total intra-industry trade for the ten East Asian economies at the 5-digit SITC level for industry categories 5 to 8 from 1990 to 2000. As the volume of intra-industry trade in industry k between China and the rest of East Asia during year t is $2\min(X_{jit}, M_{jit})$, the share of intra-industry trade is defined as:

$$IIT_{jit} = \frac{2\sum_{k} \min(X_{jikt}, M_{jikt})}{\sum_{k} (X_{jikt}, M_{jikt})}$$

Following Greenaway et al.(1994), we classify intra-industry trade as either horizontally differentiated or vertically differentiated using a threshold of 15% for unit value differences and also a threshold of 25% as a check of the robustness. The unit value is an approximation of the price of the product in the given industry, and price differences between exports and imports are assumed to reflect quality differences. If differences in the unit values of exports relative to imports are sufficiently larger, the products are vertically differentiated; otherwise horizontally differentiated. The results of the means shares of intra-industry trade as well as horizontal and vertical intra-industry trade between China and the rest of East Asia are tabulated in Table 1.

<Table 1> Means Shares of Intra-industry Trade between China and the Other EA and the USA

	IIT	HIIT ±15%	VIIT ±15%	HIIT ±25%	VIIT ±25%	VIIT in IIT ±15%	VIIT in IIT ±25%
Hong Kong	0.342	0.085	0.256	0.133	0.209	0.750	0.612
Indonesia	0.164	0.018	0.146	0.032	0.131	0.891	0.802
Japan	0.192	0.023	0.169	0.035	0.157	0.881	0.818
Korea	0.202	0.029	0.174	0.053	0.149	0.858	0.739
Malaysia	0.203	0.030	0.173	0.050	0.153	0.854	0.754
Philippines	0.181	0.023	0.158	0.038	0.143	0.872	0.790
Singapore	0.234	0.033	0.201	0.058	0.176	0.858	0.753
Thailand	0.217	0.020	0.196	0.034	0.182	0.906	0.841
Taiwan	0.147	0.026	0.121	0.043	0.104	0.825	0.710
USA	0.146	0.011	0.135	0.019	0.128	0.924	0.872

Note: HIIT stands for horizontal IIT, and VIIT stands for vertical IIT.

As seen from Table 1, the bilateral trade at the 5-digit level between China and the rest of East Asia contains on average about 21% intra-industry trade, with Taiwan being the least (only 14.7%) and Hong Kong the largest (at 34.2%). The share of China's IIT with the United States is also very low, less than 15%. It is also interesting to note that, of China's total intra-industry trade with the rest of East Asia and the United States, vertical intra-industry trade dominates, making up above 82% (with the exception of Hong Kong) in the case of a 15% threshold used for the unit value differences, and over 71% (with the exception of Hong Kong) when using the 25% threshold. These results suggest that China trades mostly vertically differentiated products with the rest of East Asia and the United States, and has relatively higher shares of horizontal intra-industry trade with Hong Kong and Taiwan.

We now examine the distribution of intra-industry trade at both industry and country levels. Figure 1 presents the means shares of intra-industry trade and the variation coefficient within each industry for the threshold of 15% unit value differences. The variation coefficient is defined as the ratio between the standard deviation and the mean within each industry. Figure 1A in the appendix reports the means and variation coefficient of intra-industry trade by industry at 25% threshold. We can see from Figure 1 that there is little variation within and across industries, with a variation coefficient ranging between 0.02 and 0.06 only. Manufacture of machinery and transport equipment is the industry with the largest shares of intra-industry trade and vertical intra-industry trade, each accounting for about 31% and 25%, respectively. The share of horizontal intra-industry trade is small for all industry categories. The chemicals and related products industry has relatively the highest share of horizontal intra-industry trade, accounting for 22% of the total intra-industry trade only. Miscellaneous manufactured articles have the lowest mean share of horizontal intra-industry trade, accounting for only slightly over 10% of the total intra-industry trade. With the broad range of unit value differences, the mean share of horizontal intra-industry trade for most industries is only about two percentage points, accounting for 34% to the highest and about 20% to the lowest of the total intra-industry trade, respectively.

Figure 2 presents the means shares of intra-industry trade and the variation coefficient at the country level with a threshold of 15% unit value differences. Figure 2A reports the means and variation coefficient of intra-industry trade by country at a 25% threshold. We can see that in general there is a very small variation across countries, with a variation coefficient less than 6% for all countries except the Philippines.

Figure 1. Mean and variation coefficient by industry

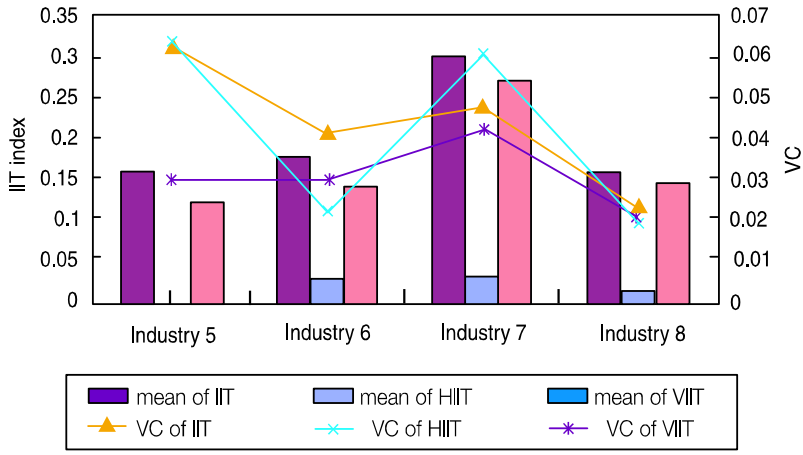
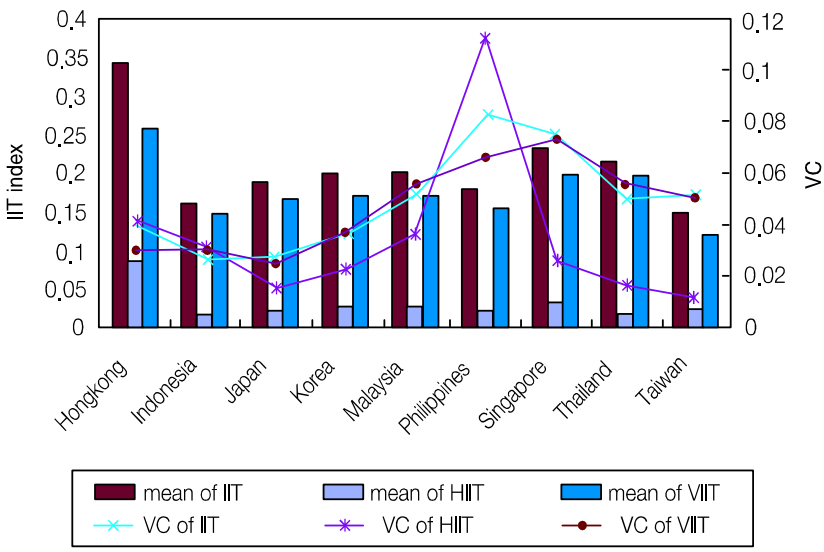


Figure 2. Mean and variation coefficient by country



China's bilateral trade with the rest of East Asia is predominantly one-way trade and vertically differentiated. Hong Kong has the largest share of intra-industry trade with China, accounting for over 34% of their total trade, and the share of horizontal intra-industry trade between Hong Kong and China is also the largest, making up 25% with a narrow threshold and about 39% in the broad range, respectively, of the total intra-industry trade. This is followed by Taiwan, Singapore, Malaysia and Korea.

All the rest show a share of around 10% of horizontal intra-industry trade in the total intra-industry trade.

2. The Estimation Results

As the dependent variable lies somewhere within the range [0,1], depending on the importance of intra-industry trade, we apply a logistic transformation to the IIT index since the predicted values are not limited to that interval. We take natural logarithms in regression for the specified independent variables. Moreover, as OLS estimation disregards heteroskedasticity since measurement errors may arise in the independent variables due to the extensive use of proxies, OLS estimates in this case will be unbiased and consistent, but not efficient. Whatever conclusions drawn from the estimates may be misleading. We run the White test and apply a White correction for heteroskedasticity or GLS in our estimation when appropriate. Furthermore, it is possible that the significance of the estimates could be inflated if most of the variation in the panel is between countries rather than within countries. In this case, we conduct the fixed effect regression, assuming $\varepsilon_{ijt} = \mu_{ij} + \nu_{ijt}$, where μ_{ij} reflects the fixed effects and ν_{ijt} is the truly idiosyncratic components of the errors. Finally, the estimate of the *DIST* variable was al-

ways statistically very insignificant in all our regressions, indicating the geographical distance is no longer an important factor to deter intra-industry trade between China and its EA trading partners. We exclude *DIST* in our final estimations. We have also used population as a proxy for the market size in our estimations, but it did not yield better results. The final estimation results are reported in Table 2.

Table 2. Estimation Results (1990 - 2000)

	(1) IIT	(2) HIIT (±15%)	(3) VIIT (±15%)	(4) HIIT (±25%)	(5) VIIT (±25%)
$AGDP_{ijt}$	0.2405 (4.895)	0.0818 (1.826)	0.1647 (3.032)	0.1067 (2.419)	0.1636 (3.123)
$GDPD_{ijt}$	-0.0601 (-3.125)	-0.0652 (-3.076)	-0.0855 (-3.258)	-0.0520 (-1.630)	-0.1044 (-3.516)
$DPIN_{ijt}$	-0.0708 (-1.458)	0.0696 (1.758)	0.1568 (3.911)	-0.1214 (-4.629)	0.1155 (3.362)
FDI_{ijt},	0.0017 (0.159)	0.1095 (5.236)	0.0089 (0.509)	0.1705 (8.233)	-0.0297 (-1.641)
TO_{ijt}	0.0380 (2.716)	0.0233 (3.681)	0.0481 (4.101)	0.0651 (10.520)	0.0265 (2.033)
Fixed-effects regression	Yes	No	Yes	No	Yes
Adjusted R^2	0.9738	0.9651	0.9735	0.9362	0.9784

Note: t-statistics are in parentheses. Each regression contains 324 observations.

In general, the results are supportive of the IIT hypotheses and levels of significance are high. As see in Column (1) of Table 2, our estimation generates significant estimates with the right sign for the variables of $AGDP_{ijt}$, $GDPD_{ijt}$ and TO_{ijt} with fixed-effect regression, despite of the insignificant estimates of $DPIN_{ijt}$ and FDI_{ijt}. It is also noted that the fixed effects improve the explanation power, explaining over 97% of the variation in the intra-industry trade shares. The most important determinant of intra-industry trade in China's manufacturing is found to be

the market size, implying the importance of economies of scale, while the relative difference in economic size and the economic openness or trade orientation also affect the share of intra-industry trade significantly with the expected sign. IIT increases significantly as the average size of both countries increases. Wealthier countries tend to offer more variety to consumers in response to growing demand for differentiated products. The difference in country size between the trading partners is seen to have the expected negative influence on IIT as the potential for gains in trade of different varieties is reduced. Although the difference in per capita income has the expected sign, it is not statistically significant. The implication of the result is that increased economic distance between trading partners creates more opportunities for specialisation along comparative advantage lines and also reflects less overlap in demand patterns. It suggests that the smaller the difference in per capita income between two countries, the higher the proportion of IIT in manufactured goods.

It is interesting to note that foreign direct investment does not affect China's IIT intensity in a significant way. This is to a large extent related to the type of FDI that China has attracted. Between 1979 and 2000, China has received over US$350 billion in FDI with 363,768 FDI projects being approved. The East Asian economies, in particular, Hong Kong, Taiwan, Japan, Singapore and South Korea, are the major sources, accounting for about 80% of China's total FDI. A large portion of FDI is destined for manufacturing, which took up more than 70% of the total realized FDI (Zhang 2002). However, a significant portion of FDI in China was actually injected into resource-extracting and processing industries, and real-estate development and service-related industries, aiming at China's cheap resources and giant domestic market. This type of FDI will affect inter-industry trade and intra-industry trade as well as

horizontal and vertical intra-industry trade differently.

Columns (2)-(3) and Columns (4)-(5) report the results for estimation of both horizontal and vertical intra-industry trade as the dependent variable with a 15% threshold and 25% threshold, respectively. Almost each variable has yielded the expected sign, while estimation with the broad range of 25% has generated more significant estimates than with the narrow range. This implies that, given the size of the country, a broader scope would better capture the variation in the unit values due to especially the associated transportation costs and so on.

The market size variable, $AGDP_{ijt}$, has yielded the expected positive sign with statistical significance in all regressions, suggesting that the intensity of both horizontal and vertical IIT increases when both China and its trading partner's GDP rises. The results also confirm that when countries become more dissimilar in GDP and in per capita income, horizontal IIT will decrease. As vertical IIT is concerned, the coefficient of the variable, $DPIN_{ijt}$, yielded the expected positive sign, but not for the variable $GDPD_{ijt.}$ It is argued that, the more countries differ in relative country size and relative factor endowments, the less likelihood there is for IIT and horizontal IIT, but the greater the expected share of vertical IIT. And differences in per capita incomes can serve to capture the extent of the relative levels of economic development of two countries, serving as a proxy, in particular, for differences in factor endowments. That is, the greater the difference in per capita incomes, therefore, the greater the opportunity for vertical disintegration of the production process within an industry group across economies. One tentative explanation for a negative relationship between the relative difference in country size and vertical IIT is that too much difference between countries in factor endowment might lead to relatively more inter-industry trade, which in turn suppresses IIT and also vertical IIT.

The coefficient of openness and trade orientation, TO_{ijt}, has the expected sign and is also statistically significant at the 5% level. The estimates for FDI show the right sign and are also significant at least at a 10% level only in the regressions with a 25% threshold. This finding confirms our casual observation that a large portion of FDI that China has attracted is mainly motivated by China's cheap labor and other resources as well as its giant market. MNEs set up their operations in China to penetrate the local market and use cheap local resources to produce for exports. Given the domestic demand and tastes, the products exported back to the home countries are mainly horizontally differentiated, seeking variety in nature. For those types of FDI targeting the local market, in particular, "responding to local sales expansion, exploring new markets, supplying parts to business partners (assemblers), and developing new products for local markets" (Japan Bank for International Cooperation 2002), it is likely to reduce vertically differentiated intra-industry trade. This issue is important in its implications for the agglomeration effects of FDI on intra-industry trade.

V. Conclusions

In this study, we have distinguished intra-industry trade as either horizontally or vertically differentiated using bilateral export and import data between China and its East Asia trading partner at the 5-digit SITC level for categories 5 to 8 for the years from 1990 to 2000. First, the bilateral trade at the 5-digit level between China and the rest of East Asia contains on average about 21% intra-industry trade, with Taiwan being the least (only 14.7%) and Hong Kong the largest (at 34.2%). Second, over 80% of China's total intra-industry trade with the rest of East Asia is vertically differentiated trade (with the exception of Hong Kong). Even with a broad threshold of 25% for the unit value differences, vertical intra-industry trade still makes up over 70% (except Hong Kong). China trades mostly vertically differentiated products with the rest of East Asia and the United States, and has relatively higher shares of horizontal intra-industry trade with Hong Kong and Taiwan. Third, little variation was found in the shares of intra-industry trade across industries and countries.

This pattern of intra-industry trade is clearly a result of the differences in economic level and size between China and the rest of East Asia. This is confirmed by our estimation results. With the fixed effects regressions, we found a positive relationship between the market size and the share of IIT and vertical intra-industry trade. The variation across countries seems not affect this relationship with horizontal IIT. Similar results are found for the openness. In general, the results provide support to our conjecture that, the more countries differ in relative country size and relative factor endowments, the less likelihood there is for IIT and horizontal IIT. If the difference between countries in relative factor endowment is too substantial, it might lead to more inter-in-

dustry trade, which in turn suppresses IIT and vertical IIT. Finally, the findings confirm FDI affects the different pattern of IIT differently. Given the domestic demand and tastes, MNEs would export mainly horizontally differentiated products back to their home countries, seeking variety in nature. For those types of FDI targeting the local market, it is likely to reduce vertically differentiated intra-industry trade. This issue is important in its implications for the agglomeration effects of FDI on intra-industry trade.

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Appendix: Tables and Figures

Table A-1. Compositions of China's Foreign Trade with the World

	1992	1995	1997	1998	1999	2000
Panel A: Compositions of China's Export to the World						
0 Food and live animals	0.098	0.067	0.061	0.058	0.054	0.049
1 Beverages and tobacco	0.008	0.009	0.006	0.005	0.004	0.003
2 Crude materials, inedible, except fuels	0.037	0.029	0.023	0.019	0.020	0.018
3 Mineral fuels, lubricants and related materials	0.055	0.036	0.038	0.028	0.024	0.032
4 Animal and vegetable oils, fats and waxes	0.002	0.003	0.004	0.002	0.001	0.000
5 Chemicals and related products, n.e.s.	0.051	0.061	0.056	0.056	0.053	0.049
6 Manufactured goods	0.190	0.217	0.188	0.177	0.171	0.171
7 Machinery and transport equipment	0.155	0.211	0.239	0.273	0.302	0.331
8 Miscellaneous manufactured articles	0.400	0.364	0.384	0.382	0.371	0.345
9 Commodities and transactions, n.e.s.	0.004	0.002	0.002	0.000	0.001	0.002
Panel B: Compositions of China's import from world						
0 Food and live animals	0.039	0.046	0.030	0.027	0.022	0.021
1 Beverages and tobacco	0.003	0.003	0.002	0.001	0.001	0.002
2 Crude materials, inedible, except fuels	0.072	0.077	0.084	0.076	0.077	0.089
3 Mineral fuels, lubricants and related materials	0.044	0.039	0.072	0.048	0.054	0.092
4 Animal and vegetable oils, fats and waxes	0.006	0.020	0.012	0.011	0.008	0.004
5 Chemicals and related products, n.e.s.	0.139	0.131	0.136	0.144	0.145	0.134
6 Manufactured goods	0.239	0.218	0.226	0.222	0.207	0.186
7 Machinery and transport equipment	0.382	0.399	0.371	0.405	0.419	0.408
8 Miscellaneous manufactured articles	0.069	0.061	0.060	0.060	0.058	0.056
9 Commodities and transactions, n.e.s.	0.007	0.006	0.007	0.005	0.008	0.008

Table A-2. Changes of China's Foreign Trade with the World

	1993	1995	1997	1998	1999	2000
Panel A: Growth of China's export to the world						
0 Food and live animals	0.011	0.006	0.082	0.042	0.015	0.174
1 Beverages and tobacco	0.252	0.367	0.218	0.070	0.209	0.034
2 Crude materials, inedible, except fuels	0.028	0.062	0.038	0.160	0.113	0.139
3 Mineral fuels, lubricants and related materials	0.124	0.310	0.178	0.259	0.100	0.686
4 Animal and vegetable oils, fats and waxes	0.478	0.083	0.722	0.526	0.571	0.117
5 Chemicals and related products, n.e.s.	0.063	0.458	0.152	0.009	0.005	0.166
6 Manufactured goods	0.016	0.389	0.208	0.057	0.024	0.279
7 Machinery and transport equipment	0.156	0.434	0.238	0.149	0.172	0.404
8 Miscellaneous manufactured articles	0.132	0.092	0.246	0.001	0.031	0.189
9 Commodities and transactions, n.e.s.	0.198	0.060	0.934	0.984	30.219	1.536
Panel B: Growth of China's import from the world						
0 Food and live animals	0.299	0.954	0.241	0.120	0.044	0.315
1 Beverages and tobacco	0.028	4.792	0.356	0.440	0.160	0.752
2 Crude materials, inedible, except fuels	0.058	0.366	0.122	0.107	0.188	0.571
3 Mineral fuels, lubricants and related materials	0.630	0.271	0.498	0.343	0.315	1.316
4 Animal and vegetable oils, fats and waxes	0.042	0.440	0.007	0.114	0.083	0.286
5 Chemicals and related products, n.e.s.	0.130	0.426	0.066	0.045	0.192	0.257
6 Manufactured goods	0.480	0.024	0.026	0.036	0.104	0.218
7 Machinery and transport equipment	0.448	0.023	0.036	0.077	0.222	0.324
8 Miscellaneous manufactured articles	0.127	0.207	0.018	0.009	0.145	0.310
9 Commodities and transactions, n.e.s.	0.206	0.159	0.238	0.194	0.825	0.253

Figure A-1. Mean and variation coefficient by industry

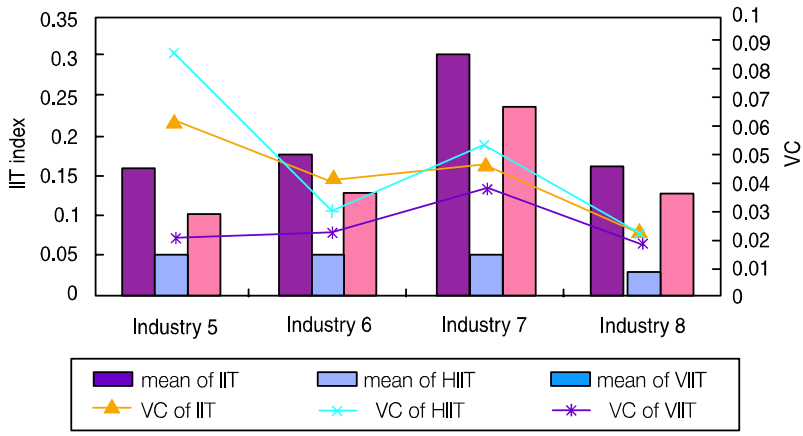
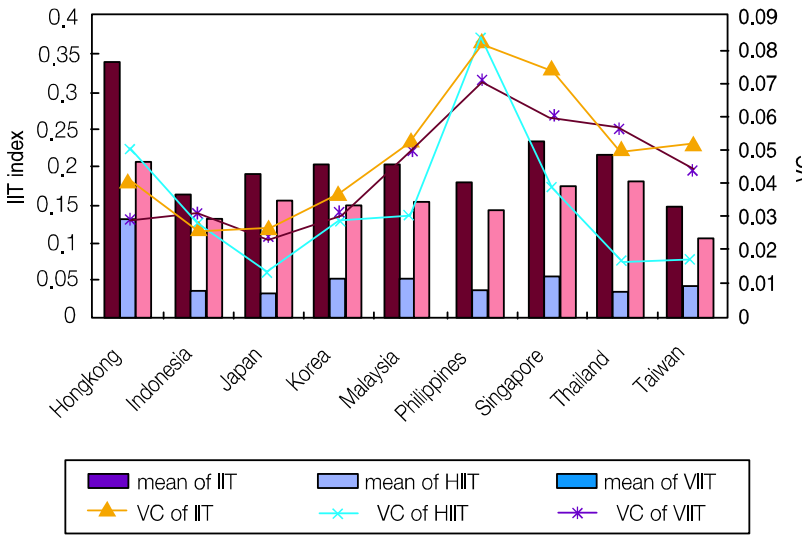


Figure A-2. Mean and variation coefficient by country



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Country-Specific Factors and the Pattern of Intra-Industry Trade in China's Manufacturing

Zhaoyong ZHANG

This paper aims to assess the trends and pattern of intra-industry trade and structural adjustment in China's manufacturing associated with its trade liberalization using data spanning from 1989 to 2001. In particular, we distinguish intra-industry trade as either horizontally or vertically differentiated, and examine how the various country-specific factors affect the intensity of China's, and how trade liberalization changes the pattern of China's IIT and integration with the East Asian region. These issues have important policy implications for product differentiation strategy and labour adjustment

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