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VERTICAL INTRA-INDUSTRY TRADE
BETWEEN CHINA
AND OECD COUNTRIES

by

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RÉSUMÉ

Ce document traite des échanges au sein d'une même branche industrielle dans une économie en transition : les réformes d'ouverture sur le marché en Chine ont-elles stimulé les échanges de produits équivalents ou bien ont-elles permis d'importer des biens non produits dans le pays ? Les résultats montrent que le commerce intra-branche entre la Chine et les pays de l'OCDE est passé de 12 pour cent des échanges totaux de produits manufacturés en 1980 à plus de 20 pour cent en 1992, le Japon et le Royaume Uni en assurant la plus grande part.

Du fait des grandes différences en termes de dotation en facteurs entre la Chine et les pays de l'OCDE, on peut faire l'hypothèse d'une structure verticale du commerce intra-branche, c'est-à-dire d'importations et exportations simultanées d'un même produit mais de qualité différente. De fait, l'observation empirique montre que la Chine exporte principalement des produits de basse qualité en échange de produits de plus grande qualité en provenance des pays de l'OCDE.

Le document examine également les déterminants des échanges intra-industrie dans le commerce entre la Chine et les pays de l'OCDE. Il apparaît que le commerce intra-branche est plus important pour les biens dont la qualité est très différente. Une analyse de régression montre enfin que les taxes douanières représentent un obstacle important à la croissance des échanges intra-industrie entre la Chine et les pays de l'OCDE.

SUMMARY

This paper examines the issue of intra-industry trade in a transition economy. We address the question of whether the market-opening reforms in China have resulted in an increasing exchange of similar products, or whether foreign trade is still playing the role of filling the gap of products not produced within the country. We find that the proportion of intra-industry trade in China-OECD trade has increased from 12 per cent of total manufacturing trade in 1980 to over 20 per cent in 1992. The highest shares of intra-industry trade with China are reported for Japan and the United Kingdom

Due to the large differences between China and the OECD countries in terms of factor endowments, we expect intra-industry trade to be of the vertical nature, i.e., two-way trade in varieties of a product characterised by different qualities. Empirical evidence indeed shows that the majority of the intra-industry trade between China and the OECD is of the vertical nature; China exports lower quality varieties in exchange for higher quality varieties from OECD countries.

The paper also analyses determinants of intra-industry trade in trade between China and OECD countries. The share of intra-industry trade is found to be larger in products with large differences in quality. Furthermore, the regression results indicate that tariffs constitute important barriers to the growth of intra-industry trade in China-OECD trade.

PREFACE

The “reform and opening-up” of China in the late 1970s has provided OECD countries with an important opportunity for trade and investment. However, this process has also given rise to concerns about relocation of production and jobs which affects the latter’s import-competing industries. Such concerns are particularly strong in Europe, where the average rate of unemployment remains at over 11 per cent. Why are these concerns limited to trade with emerging economies such as China, when trade with other high-wage countries makes up the major share of OECD trade? Part of the explanation is that the bulk of trade in manufactured goods among OECD countries takes the form of intra-industry trade, that is, mutual exchanges of goods within the same product category. In contrast, trade between OECD and developing countries is largely of the inter-industry type. Inter-industry specialisation tends to accentuate pressures for adjustment to imports, due to the large differences in relative factor endowment between the two groups of countries,

There are few studies on intra-industry trade (IIT) with respect to economies in transition. The present paper is intended to fill this gap by examining in detail recent developments in intra-industry trade between China and OECD countries. Lisbeth Hellvin shows that the proportion of intra-industry trade between the two increased moderately during the 1980s and that, as expected from the theory of intra-industry trade, IIT between China and OECD countries is primarily vertical in nature, whereas it is horizontal among OECD countries. Her analysis also indicates that tariff barriers in China tend to reduce the IIT component of its trade with OECD countries.

By shedding new light on recent developments in China’s trade with OECD countries from the viewpoint of intra-industry trade, this paper constitutes an important contribution to the Centre’s ongoing work on China’s open-economy reform and its implications for OECD countries.

Jean Bonvin
President
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I. INTRODUCTION

A significant proportion of trade in manufactures between market economies is a simultaneous export and import of products within the same product category, i.e., intra-industry trade. In trade with centrally planned economies, however, we would expect intra-industry trade to be rather negligible. The potential for intra-industry trade is limited in the planning process, where foreign trade is strictly regulated and goods are mainly imported to fill resource gaps.

This paper assesses the importance and structure of intra-industry trade in the case of one transition economy, China. Since the start of the reform process in the late 1970s, the trade and exchange systems have been liberalised and the Chinese economy has become more open. As a consequence, the exports of manufactured products to the OECD countries increased at an average annual rate of 28.8 per cent between 1978-1993. The peak period was in 1984-1988, when such exports increased at an average annual rate of 33 per cent (Lemoine 1995, Table 2.4). Furthermore, the proportion of manufactured goods in total exports increased from less than 50 per cent at the end of the 1970s to over 80 per cent in 1992.

The first issue raised in this paper is whether the market-opening reforms in China have given access to an exchange of *similar products*, i.e., intra-industry trade, or whether foreign trade is still playing the role of filling the gap of products not produced within the country. There are several reasons to expect the extent of intra-industry trade to increase in China's trade. In addition to market-opening reforms and trade liberalisation, which we would expect to have a positive impact, the economy has grown very rapidly for more than a decade and a half. According to earlier empirical studies, the proportion of intra-industry trade is positively related to per capita income. Growth of per capita income will increase the demand for variety and production of differentiated products.¹ GNP per capita grew on average by 7.6 per cent annually 1980-92. Estimations by Penn World Tables indicate that Gross Domestic Product per capita based on purchasing power parity reached over \$2,000 in 1990. Other calculations do, however, indicate a somewhat lower figure (see e.g. Lardy, 1994, pp. 14-18). On the other hand, there are reasons to expect moderate development of China's intra-industry trade. Even if exports have been subject to decentralisation during the reform process, China is still very protective on the import side (see e.g., Lardy, 1992, 1994; Fukasaku and Wall, 1994; and World Bank, 1994). Domestic production is extensively protected by tariffs and non-tariff barriers. This study also sets out to analyse whether these trade barriers have any negative impact on intra-industry trade between China and the OECD countries. The study takes its starting point from 1980, and analyses the development of intra-industry trade in China's overall foreign trade. Trade with the OECD market as a whole as well as with individual OECD countries is considered.

A second issue raised in this paper concerns the importance of vertical intra-industry trade. Due to the large differences between China and OECD countries in terms of factor endowments, we would expect intra-industry trade to be of the *vertical*

nature, i.e., two-way trade in varieties of a product characterised by different qualities. Does China specialise in production and export of lower quality varieties in exchange for higher quality varieties from the OECD? Most earlier empirical studies have focused on horizontal intra-industry trade, i.e., trade in varieties of a product characterised by different attributes, which is most likely to take place between countries with high and similar levels of per capita income. Due to the large differences in per capita income between China and the OECD countries, we would expect the potential for horizontal intra-industry trade to be small. Following the work by Falvey (1981), and Falvey and Kierzkowski (1987), there is a potential for vertical intra-industry trade in trade between countries at different levels of per capita income. We would expect China to produce and export labour-intensive lower quality varieties in exchange for capital-intensive higher quality varieties from the OECD countries. The hypothesis will be tested empirically in bilateral trade between China and the OECD countries.

The remainder of the paper is organised as follows. Section II analyses the level of intra-industry trade in China-OECD trade. Section III presents the hypotheses and reviews earlier empirical studies of vertical intra-industry trade. The method, data, and regression results are in Section IV. Section V examines quality differences in trade between China and the OECD. Finally, Section VI summarises the main findings and provides some concluding remarks.

II. THE EXTENT OF INTRA-INDUSTRY TRADE

The common way to define and measure bilateral intra-industry trade (IIT) is by the Grubel-Lloyd index (Grubel and Lloyd, 1975):

$$IIT_{jk}^i = 1 - (|X_{jk}^i - M_{jk}^i| / (X_{jk}^i + M_{jk}^i)), \quad (1)$$

where X_{jk}^i and M_{jk}^i are country j 's exports and imports, respectively, of commodity i in trade with country k . Higher index values are associated with greater IIT as a proportion of total trade. If all trade is IIT, the index is equal to one and if there is no IIT at all, the index is equal to zero. In several earlier studies of IIT, different procedures for adjustments for trade imbalances have been undertaken.² There is, however, a trend in recent empirical literature to not adjust for trade imbalances that might induce rather than adjust for a measurement bias (see Clark, 1993; Ballance et al., 1992; and Lundberg, 1992). The issue is further discussed in Vona (1991), and Kol and Mennes (1989). The present study will estimate IIT on figures of OECD-China trade unadjusted for trade imbalances. Trade data are taken from the OECD Database Impex.

Table 1. The Development of China-OECD Intra-Industry Trade in Manufactures 1980-1992

Year	IIT	Year	IIT
1980	0.125	1987	0.170
1981	0.136	1988	0.196
1982	0.141	1989	0.204
1983	0.138	1990	0.213
1984	0.131	1991	0.217
1985	0.099	1992	0.207
1986	0.119		

Note: Calculations are made from SITC 5-8, three-digit level, unadjusted for trade imbalances.

Source: Calculations from the OECD Database Impex.

Table 1 reports the recorded levels of IIT in manufacturing trade between China and the OECD countries between 1980-1992. The recorded levels refer to three-digit level of Standard International Trade Classification (SITC) 5-8, Rev. 2. A growing proportion of trade between the OECD countries and China is an exchange of similar products. Between 1980 and 1992, the share of IIT increased from 12.5 per cent to over 20 per cent. The increase has, however, not been continuous over time. IIT was quite stable until 1987, when it increased from about 12 per cent to almost 20 per cent. Thereafter, it was stable at around 20 per cent. One explanation might be found on the import side. Despite liberalisation on the export side, China is still protective on the import side, might constitute a barrier to a further expansion of IIT. The large increase in IIT in 1987 might be explained by a sharp increase in imports. The volume

of merchandise exports has increased continuously, while the volume of merchandise imports has fluctuated widely in China. The fluctuations in imports reflect the “stop-go” macroeconomic policies in China (see Fukasaku and Wall, 1994, pp. 60-62). Imports rose sharply in 1979/80, 1984/85 and 1987/88, followed by tighter control of imports in 1981, 1986 and 1989. The trade deficit was particularly large in 1985-86, and since the index is not corrected for trade imbalances, the large trade deficit is reflected in a low proportion of intra-industry trade.³

China has followed many of the other East Asian economies and expanded its exports of labour-intensive goods, classified in SITC 8, such as clothing, toys, sporting goods, and footwear. The manufacturing exports are concentrated in a few products. The ten most important exported manufacturing commodities, classified at the three-digit level of SITC Rev. 2, constituted almost 60 per cent of total manufacturing exports to the OECD in 1992, and there was almost no intra-industry trade in those sectors.⁴ There are large variations between the one-digit SITC groups; IIT is consistently higher in SITC 5-7 than in SITC 8.⁵ SITC 8 contains around 67 per cent of total manufacturing exports from China. On the import side, however, SITC 8 is a rather small group with only about 5 per cent of total manufacturing imports. The figures might indicate that import impediments in China restrict IIT in China’s main exporting sectors. The average level of tariffs in SITC 8 exceeds that in the other product groups. As we will see in section IV, trade barriers in China have a negative impact on intra-industry trade proportions.

Table 2. **Cross-industry comparisons of average levels of IIT in China-OECD trade**

SITC Section	1980	1992
SITC 5 Chemicals and Related Products	32.2	44.3
SITC 6 Manufactured Goods	13.4	27.8
SITC 7 Machinery and Transport Equipment	2.4	37.7
SITC 8 Miscellaneous Manufactured Goods	5.4	4.4

Source: Calculations from the OECD Database Impex.

There is also a wide variation in IIT shares across countries. According to the findings in earlier empirical studies of IIT we would expect IIT to increase with the level of development. This seems to be the case in China-OECD trade as well (Table 3). The highest indices are reported for Japan and the United Kingdom with about 19-20 per cent IIT with China. In contrast, there are several countries with very low indices of IIT. Greece, Iceland, Portugal and Turkey have almost only inter-industry trade in their trade with China. The volume of trade between China and these countries is, however, relatively small. They only account for a small percentage of China-OECD trade.

It is noteworthy that Japan, which has a relatively low level of IIT in trade with the OECD, has the highest level of IIT among the OECD countries in its trade with China. Its IIT share in trade with the OECD was 35 per cent in 1991, which is far below most other OECD countries (The OECD Jobs Study, 1994, Table 3.A.1) In fact, between 1970 and 1985, Japan decreased its IIT with developed market economies, but increased its IIT with developing countries, in general, and newly industrialising economies, in particular (Ballance and Forstner, 1990: Ch. 4).⁶

Table 3. Cross-Country Comparison of Average Levels of IIT in Manufactures and the Share of China-OECD Trade, 1992.

Country	Share of Total China-OECD Manuf. Trade		IIT with China
	Exports	Imports	
Japan	41.4	17.8	0.205
United Kingdom	2.2	2.5	0.188
Italy	4.7	3.9	0.131
Germany	13.1	11.4	0.129
France	4.7	5.2	0.128
Netherlands	0.9	1.3	0.123
United States	22.2	43.0	0.095
Be-Lux	1.3	0.4	0.116
Ireland	<0.1	0.2	0.107
Spain	0.9	2.5	0.103
Canada	1.7	3.2	0.090
Switzerland	1.6	1.0	0.088
Sweden	1.5	1.2	0.086
Austria	0.9	0.9	0.085
Denmark	0.4	0.8	0.057
Australia	0.7	2.7	0.053
Norway	0.3	0.6	0.053
Finland	0.9	0.4	0.049
Turkey	0.5	0.2	0.027
New Zealand	<0.1	0.4	0.027
Portugal	<0.01	0.2	0.021
Greece	0.1	0.4	0.006
Iceland	<0.01	<0.01	0.002

Note: Calculations are made from figures at the three-digit SITC level, SITC Rev.2, unadjusted for trade imbalances.

Sources: Figures are calculated from the OECD Trade data base Impex.

III. HORIZONTAL VERSUS VERTICAL INTRA-INDUSTRY TRADE

Despite the fact that a wide range of empirical studies has been undertaken since the concept of IIT was introduced in the 1960s, there is a lack of studies on China. Most empirical studies have primarily been concentrated on developed countries (North-North trade) while studies of developing countries' intra-industry trade (North-South and South-South trade) are few.⁷ The main reason is probably that intra-industry trade dominates North-North trade while it is modest in trade involving developing countries. The theoretical literature predicts that the extent of intra-industry trade would be larger the higher and more similar income levels of the trading partners. Demand for variety increases with income; when income increases so does demand for differentiated goods. On the supply side, intra-industry trade will increase with income if we assume differentiated goods, in general, to be more capital intensive than homogeneous goods and interpret a high per capita income as a high capital-labour ratio (see e.g. Helpman, 1981, and Helpman and Krugman, 1985). Moreover, the more similar per capita income, the more similar demand structure (taste overlap) and the larger the demand for varieties produced in the partner country will be. Due to the low per capita income of China, and the large difference in per capita income between China and the OECD countries, we would expect the proportion of intra-industry trade to be dominated by an exchange of products classified in *different categories*, i.e., inter-industry trade.

It is, however, possible to distinguish two kinds of intra-industry trade; horizontal and vertical. Horizontal intra-industry trade is trade in varieties of a product characterised by different attributes, while vertical intra-industry trade is trade in varieties of a product characterised by different qualities. The two sets of models are different in their predictions. Whereas horizontal intra-industry trade is more likely to take place between countries with high and similar per capita incomes, vertical intra-industry trade is more likely to take place between countries at different levels of per capita incomes.⁸

Following the Linder hypothesis (1961), that the pattern of demand is determined by level of incomes, we would expect consumers with different incomes to demand different qualities of a specific product. Since incomes are not evenly distributed within each country, there is an income overlap. IIT arises when there is a demand of qualities not produced domestically. As long as incomes are not equally distributed within countries, we might have a situation where low income groups in the North demand lower quality varieties produced in the South, while high income groups in the South demand higher quality varieties produced in the North. The models by e.g., Falvey and Kierzkowski (1987), Falvey (1981), and Flam and Helpman (1987) show how trade in vertically differentiated products takes place between countries with different per capita incomes. In the models by Falvey (1981) and Falvey and Kierzkowski (1987), quality is an increasing function of capital intensity. Capital abundant countries would then have comparative advantage in higher-quality varieties while labour abundant countries have comparative advantage in lower-quality varieties. The model by Flam and Helpman

(1987), on the other hand, has only one factor of production, labour. Instead, quality differences between varieties from the North and the South, respectively, originate from differences in technology.

The models discussed above generate the hypothesis that the North will produce and export higher-quality varieties while the South will produce and export lower-quality varieties and there will be two-way trade when there is a demand for varieties not produced in the domestic market. We would therefore expect North-North IIT to be of a horizontal nature while North-South IIT would be of a vertical nature. More specifically, the models generate the following hypothesis concerning China-OECD trade: *The larger the quality differences, the larger the extent of intra-industry trade between China and the OECD countries, i.e., the level of IIT between China and every OECD country is an increasing function of the extent of quality differences.* The hypothesis is tested in section IV.

Earlier Studies of Vertical Intra-Industry Trade

Most previous studies of IIT have been concentrated on horizontal IIT, while the empirical evidence concerning vertical IIT is rather limited. There are, however, some studies focusing explicitly on the issue of vertical IIT. Tharakan and Kerstens (1995) employ a dummy variable for vertically differentiated products, indicated by industry-spokesmen, in a study of the United Kingdom's IIT in one single industry, the toy industry. The results provide no support for the hypothesis of a positive correlation between vertical product differentiation and bilateral IIT shares between the North and the South. On the contrary, the results rather suggest that the bilateral IIT in the toy industry is determined by horizontal product differentiation and economies of scale. Empirical support for the neo-Heckscher-Ohlin IIT model is, however, provided by Torstensson (1991) in a study of Sweden's vertical IIT with countries at different levels of per capita incomes. By looking at the relationship between unit prices of exports and the capital endowment of exporting countries, it is found that the higher the capital endowments, the higher the quality of exports. Greenaway et al. (1994) have examined the determinants of vertical IIT in the trade of the United Kingdom. They found that the share of vertical IIT is positively related to market size and membership of a customs union. The result for the variable measuring differences in per capita incomes indicates that the share of vertical IIT in UK gross trade decreases as the differences in relative capital abundance increase. Ballance et al., (1992) provide two separate regressions with two alternative specifications of the variable measuring quality differences.⁹ Firstly, by measuring the differences between unit values of the developed country's exports to the developing countries and the unit values of the imports. Secondly, by a dummy variable taking the value one when the ratio between unit values in trade exceeds one. The hypothesis about a positive relationship between quality differences in trade and the extent of IIT is supported in the regression including the former specification of quality differences, while the empirical support for the latter variable is somewhat weaker.¹⁰ The regressions are undertaken for total manufacturing trade as well as for eight individual industries, specified at the three-

digit level of SITC. The coefficient for quality differences shows the expected sign and is highly significant statistically in five of eight industries.¹¹ It is noteworthy that they find an unexpected negative sign of the coefficient for quality differences in the clothing industry, which is an important export industry for many developing countries. The authors suggest that the result for the clothing industry might be due to the Multi-Fibre Agreement that would give developing countries an incentive to produce higher qualities than suggested by their relative factor endowments.

IV. DETERMINANTS OF CHINA'S INTRA-INDUSTRY TRADE

The determinants of IIT will be analysed in the bilateral trade flows between China and every OECD country with respect to country and industry variables. The sample includes 547 manufacturing goods at the four digit level of SITC Rev. 3.¹² The dependent variable concerns the share of intra-industry trade of both horizontal and vertical nature.

According to the models discussed above, it will be possible to separate between vertically and horizontally differentiated goods by looking at quality differences in trade. IIT in varieties with large differences in quality would be distinguished as vertical IIT. The problem that arises is then how to measure differences in quality. Several studies have used unit prices as a proxy for quality differences (Ballance et al., 1992; Greenaway et al., 1994; Torstensson, 1991; and Abd-el-Rahman, 1991).¹³ Following Ballance et al., (1992), we measure quality differences (QD_{Ch}^i) in product i by the ratio between the unit value of China's import from developed countries (pm^i) and the unit value of China's exports to the developed countries (px^i). In order to test the hypothesis about a positive relationship between quality differences in trade and the extent of IIT, we specify the index as the deviation from one, i.e.,

$$QD_{Ch}^i = \left| \frac{pm^i}{px^i} - 1 \right| \quad (2)$$

The larger the quality differences in trade, the larger the value of QD_{Ch}^i . Since China is classified as relatively capital-scarce compared to the OECD countries, we would expect the unit price of the Chinese imports of a specific product to exceed the unit price of its exports of the same product. Just as countries with different relative factor endowments specialise in different commodities, countries will specialise in different varieties of a specific commodity. Figures on unit values of China's exports and imports, respectively, in its trade with developed countries are from the United Nations, *Commodity Trade Statistics, Series D*.

In addition to the index of quality differences in trade specified above, the test also includes variables measuring the levels of tariffs in China at the industry level. We intend to analyse whether the level of tariffs has any impact on IIT shares in trade with the OECD countries. Falvey (1981) has shown that trade in differentiated products would be more sensitive to trade barriers than trade in homogeneous products. Although China's exports have been liberalised, imports remain controlled by relatively high tariff rates as well as non-tariff barriers. China is still one of the most protective economies in Asia.¹⁴ The unweighted average tariff rate was about 40 per cent in the beginning of 1993 (see e.g., Tseng, et al., 1994). We would expect inter-industry trade to be less sensitive to trade barriers than intra-industry trade due to the limited possibilities for replacing imports with domestically produced goods. In the case of goods that are simultaneously exported and imported, the imports would be more

easily replaced by domestically produced goods due to the existence of domestic substitutes. Intra-industry trade would then be more sensitive to trade barriers. The figures of tariffs are taken from the UNCTAD, TRAINS Database (1994).

The two country variables concern per capita income and market size. The level of per capita income is assumed to affect the share of IIT positively. As suggested by Linder (1961), demand for variety would increase with per capita income. Low per capita income countries' demand is concentrated on standardised products, whereas high per capita income countries have a larger demand of differentiated products. This variable is measured as the per capita gross domestic product in USD. Furthermore, the extent of IIT will be positively correlated with market size. A large domestic market implies large opportunities to take advantage of economies of scale in production of differentiated products and thereby large opportunities for trade in differentiated products, i.e., IIT. Market size is measured by Gross Domestic Product (GDP).¹⁵

Method

The share of IIT, defined in equation (1), is taken as the dependent variable, and the two country variables and two industry variables referred to above as explanatory variables. The hypotheses are tested by Weighted Least Squares (WLS). According to equation (1), the dependent variable lies somewhere within the range [0,1], depending on the importance of IIT. However, since the predicted values are not limited to that interval, a logit transformation of the IIT index is preferable:

$$\ln(IIT_{jCh}^i / (1 - IIT_{jCh}^i)), \quad (3)$$

where IIT_{jCh}^i denotes share of bilateral IIT of country j with China and i refers to industry characteristics. The dependent variable can take values from minus infinity to plus infinity.

The estimated equation is as follows:

$$\begin{aligned} \ln(IIT_{jCh}^i / (1 - IIT_{jCh}^i)) = \\ \alpha_0 + \alpha_1 \ln GDP_j + \alpha_2 \ln PC_j + \alpha_3 \ln QD_{Ch}^i + \alpha_4 \ln TARIFF_{Ch}^i, \quad (4) \end{aligned}$$

where GDP_j denotes the size of country j ; and PC_j the average level of per capita-incomes. There are also two industry variables: QD_{Ch}^i denotes the degree of quality differences in product group i ; $TARIFF_{Ch}^i$ the level of China's import charges in product group i .

Moreover, in a correct estimation procedure, the dependent as well as the explanatory variables should be multiplied by $\sqrt{n_{jCh}^i IIT_{jCh}^i (1 - IIT_{jCh}^i)}$, in order to avoid heteroscedasticity (see Bergstrand, 1983). We therefore estimate equation (4) by WLS, with $\sqrt{n_{jCh}^i IIT_{jCh}^i (1 - IIT_{jCh}^i)}$ as the weight term.¹⁶

Results

Regression results are reported in Table 4.^{17,18} The results confirm the theoretical expectations and all coefficients are highly significant statistically. The regression results for the country variables show that the share of IIT with China will grow with market size and the level of per capita income of the partner country. These findings are similar to those of earlier empirical studies of total IIT (see e.g., Greenaway and Milner, 1989). The positive coefficient for per capita income indicates that the proportion of IIT will be higher in trade with high income countries than OECD countries with a lower level of per capita income. As can be seen from Table 3, the OECD countries with the lowest per capita income also have the smallest proportion of IIT.

Table 4. Determinants of Chi na - OECD Intra-Industry Trade in Manufactures (1992)

Independent variables	expected sign	Weighted Least Squares
constant		-58.59 (-43.11)*
<i>Country variables</i>		
ln GDP	pos	1.59 (67.10)*
ln PC	pos	3.08 (21.59)*
<i>Industry variables</i>		
ln QD	pos	0.32 (21.50)*
ln TARIFF	neg	-0.30 (-11.68)*
obs		7,844
adj. R ²		0.54

Note: The figures in parentheses are t-values. * = significant at the 1 % level

The results for the variable measuring quality differences support our key hypothesis stating that the more differentiated products are in terms of quality, the larger the share of bilateral IIT will be. The coefficient has the expected sign and is statistically significant at the 1 per cent level. The results suggest that the IIT between China and the OECD countries would be of a vertical nature rather than taking place in horizontally differentiated products. Due to the large differences in level of per capita income between China and the OECD, we also hypothesised vertical IIT to be more important than horizontal IIT. The issue will be further analysed in section V.

The results suggest that tariffs in China are an important barrier to IIT in China-OECD trade. The coefficient for the variable measuring tariffs in China at the industry level is negative and statistically significant at 1 per cent level. It is notable that, despite the fact that China has continuing its high rate of economic growth, the proportion of IIT has not increased since 1988 (Table 1). The proportion of IIT in total trade is usually linked with level of development, and most countries have experienced a rapid increase in IIT when the level of their per capita income increase. In the trade of the newly industrialising economies, for example, IIT shares increased by 15 percentage points in trade with the rest of the world, and by over 18 percentage points in trade with developed market economies between 1970-85 (Ballance and Forstner, 1990: Table 4.2). Our results indicate that tariffs in China are an important barrier to a further expansion of IIT. Even though the exports have been decentralised, China is still very protective on the import side.

V. THE IMPORTANCE OF VERTICAL INTRA-INDUSTRY TRADE IN CHINA-OECD TRADE

In order to analyse our key hypothesis regarding quality differences in IIT between China and the OECD further, we will classify products as horizontally or vertically differentiated depending on the ratio between the unit value of exports and imports in trade between China and developed countries. In a similar study by Greenaway et al., (1994), UK intra-industry trade was shown to be dominated by vertical IIT in most bilateral trade flows.¹⁹ As we would expect due to the large differences in per capita incomes, the percentage of products in which the value of exports exceeds that of imports is considerably higher in trade with developing countries. In the UK trade with China, for example, as much as 94 per cent of total IIT is classified as vertical IIT. Furthermore, as for 72 per cent of IIT the UK exports higher quality varieties in exchange for lower quality varieties from China. A similar pattern is found for the trade conducted with other Asian developing countries, such as India, Indonesia, Sri Lanka, the Philippines, Pakistan, Thailand, and Malaysia.

In the introduction, we addressed the question of quality differences in China-OECD trade. Since China is classified as relatively capital-scarce compared to the OECD countries, we would expect China to export lower quality varieties in exchange for higher quality varieties. We define horizontally differentiated products as those with a quality index within a specific range, while those that fall outside this range are defined as vertically differentiated. Since import prices are reported including cost, insurance and freight (c.i.f.), while export prices are reported free on board (f.o.b.), we would expect the unit values of imports to exceed the unit value of exports when products are of the same quality. Therefore, we allow a larger deviation upwards in relative unit prices. We use three alternative ranges: 0.70 - 1.40 (A); 0.80 - 1.30 (B); and 0.90 - 1.20 (C).

Table 5 shows the relative importance of vertical intra-industry trade in trade between China and total OECD. We have data on unit prices of 74 per cent of total IIT. In general, it seems that IIT is in accordance with the theories discussed in section III stating that it should predominantly take place in vertically differentiated products, and that China would concentrate its production and exports on varieties of lower qualities than the imported varieties. Independently of the interval specified, the majority of the exports from the OECD are of higher quality than their imports from China. The unit prices of China's exports are lower than those of imports in 75 per cent of the trade with the OECD. Horizontal intra-industry trade, on the other hand, only makes up about 7-14 per cent of intra-industry trade.

Table 5. **Quality Differences in China-OECD Intra-Industry Trade, 1992**

	Number of Products			Percentage of Total IIT		
	A	B	C	A	B	C
Horizontally differentiated	111	87	56	14.0	11.2	6.9
Vertically differentiated of which China imports:						
high quality varieties	333	346	356	74.8	76.8	77.3
low quality varieties	103	114	135	11.2	12.0	15.8
Total	547	547	547	100.0	100.0	100.0

Note: Calculated at the four-digit level of SITC, Rev 3. Low quality varieties are products of which the unit value in China's export is lower than that of its imports, and high quality varieties are products of which the unit value in China's export is higher than that of its imports. The alternative ranges are: A = 0.70 - 1.40; B = 0.80 - 1.30; and C = 0.90 - 1.20.

VI. SUMMARY AND CONCLUSIONS

In a centrally planned economy, imports mainly fill the gap of products not produced domestically. Hence, the primary condition for IIT is not met. We would therefore expect the share of IIT in total trade to increase considerably when an economy is transformed from a planned to a market economy. In the introduction we addressed the question of whether the market-opening reforms in China have increased an exchange *of similar products*, or if foreign trade still plays the role of filling a gap of commodities not produced within the country. IIT between China and the OECD was relatively stable until the second half of the 1980s when it increased from about 12 per cent to almost 20 per cent. It is found to be most important in product groups SITC 5-7, while only about 4 per cent of trade in product group SITC 8, including the most important manufactured exports, is IIT. We also found that the majority of the IIT between China and the OECD is vertical IIT, i.e., based on differences in relative factor endowments, where China exports lower quality varieties in exchange for higher quality varieties from the OECD.

The increase in IIT shares can be related to the change in trade policy with a shift in favour of export production that took place in the mid-1980s. Even if China has been continuing its high rate of economic growth and the volume of foreign trade has increased dramatically, the proportion of IIT has been relatively stable since 1988. One explanation might be found on the import side. Even if the export side has been subject to decentralisation during the reform process, China is still very protective on the import side. Compared with other developing countries, China is still among the most protective economies in Asia. We also found that tariffs in China are important barriers to IIT in China-OECD trade.

Earlier studies of the trade pattern indicate that China's export has been increasingly developed in accordance with its comparative advantage. China has followed many of the other East Asian economies and expanded its exports of labour-intensive goods; for example, clothing, footwear, toys and sporting goods. Labour-intensive manufactures account for almost 75 per cent of exports. The results from our study indicate that there has been a tendency of specialisation *within* each product. China exports lower quality varieties in exchange for varieties of higher qualities in a large share of the volume of IIT with the OECD. That is in accordance with the predictions from the neo-Heckscher-Ohlin IIT model suggesting that labour-abundant countries specialise and export labour-intensive lower quality varieties and import capital-intensive higher quality varieties from capital-abundant countries.

In summary, IIT has become an increasing feature of China-OECD trade since the reform programme started in the end of the 1970s. The IIT between China and the OECD is mainly of vertical nature due to large differences in relative factor endowments. In order to increase the gains from inter- as well as intra-industry trade, the liberalisation process must be continued. Even if China is considered as a "large" economy, domestic competition is not sufficient for improving the efficiency of the economy.

NOTES

1. See Greenaway and Milner (1986: Ch. 7).
2. See Greenaway and Milner (1986: Ch. 5) for a discussion of measurements of intra-industry trade.
3. The trade deficit amounted to US\$14.9 billion in 1985 and US\$12.0 billion in 1986.
4. These are (SITC Rev. 2): radio broadcast receivers (762), household type equipment (775), travel goods (831), women's outerwear (843), outwear knit (845), under garments (846), headgear nontextil (848), footwear (851), toys, sporting goods (894), and other manufactured goods (899).
5. There are, however, substantial variations in the IIT indices for individual products at the three digit level of SITC.
6. Among the Asian economies China had the highest share of IIT in trade with Hong Kong, (47.7 per cent), followed by Thailand and Singapore (about 20 per cent), and Japan (14.5 per cent) in 1988 (see Fukasaku, 1992). The figures for Japan indicate that Japan has more IIT in its trade with China than in its trade with Indonesia, the Philippines, Thailand, Australia and New Zealand.
7. There are, however, some focusing explicitly on developing countries. Hellvin (1994) has analysed IIT among Asian countries at different level of per capita incomes. Lee (1987) examined IIT in the Pacific Basin. Balassa and Bauwens (1987) and Nolle (1990) estimated determinist of IIT in trade among countries at different levels of per capita incomes. Havrylyshyn and Civan (1985) compare the extent of IIT in trade among different groups of countries.
8. Two sets of models for horizontal intra-industry trade are present in the theoretical literature: the neo-Chamberlinian model and the neo-Hotelling models (see Greenaway and Milner 1986, Chapter 2). The models differ on the demand side where the former model generates an aggregated demand for different varieties since consumers are assumed to maximise their utility by consuming as many varieties as possibly (the "love of variety" approach).
On the other hand, the latter generates an aggregate demand for varieties by the assumption that each consumer has his/her ideal variety and this most preferred variety differ among the consumers (the "favourite variety" approach).
9. The study includes 20 developed and 25 developing countries.
10. The adjusted R^2 is very low, only 0.01, even though the country variables measuring average per capita income level, similarity in per capita income, average market size, and similarity in market size are included and their coefficients are highly significant statistically.
11. That is; rubber articles, telecommunications apparatus, domestic electrical equipment, electrical machinery, and plastic articles
12. See Greenaway et al., (1994) for a discussion of the different shortcomings of measuring quality by unit values.
13. That is, all products in which China conduct trade with the developed countries and in which data on units also is available in the United Nation publication, *Statistical Papers, Series D*.

14. Only Pakistan and India show higher rates of their average tariff levels (see Tseng et al., Table 2, 1994).

15. Figures are from World Bank Data base.

16. Since our sample includes several zero observations, a small number is added to

$$IIT_{jCh}^i$$

17. A logistic function, which ensures that the predicted values are limited to the interval [0,1], constitutes an alternative method:

$$IIT_{jCh}^i = (1 / (1 + \exp (- \alpha x_{jCh}^i)))$$

where x_{jCh}^i is the vector of explanatory variables:

$$\alpha x_{jCh}^i = \alpha_0 + \alpha_1 \ln GDP_j + \alpha_2 \ln PC_j + \alpha_3 \ln QD_{Ch}^i + \alpha_4 \ln TARIFF_{Ch}^i$$

The Non-linear Least Squares method has been used by Balassa (1986), Balassa and Bauwens (1987), and Tharakan (1984). The estimates have been corrected for heteroscedasticity following the method proposed by White (1980). The results, which are the same as those obtained in our regressions by WLS except for somewhat lower adjusted R², are available on request.

18. We have tested and found that there is no problem with multicollinearity.

19. They test the sensitivity to the classifications and calculate the importance of vertical IIT by using several alternative limits of relative prices i.e. 0.65-1.35, 0.75-1.25, 0.85-1.14, and 0.95-1.05. 68 per cent of total IIT is of the vertical nature when goods with a difference in price between exports and imports within the range 0.85-1.15 are classified as horizontally differentiated goods. The figure is somewhat lower, 55 per cent, when calculated with the range 0.75-1.25.

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