What Determines Sino-South Korean Intra-industry Trade? Theoretical Hypotheses and Empirical Evaluation

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Abstract: Despite prominence of intra-industry trade (IIT) in Sino-South Korean trade, key determinants of stimulating IIT remain unclear. To address this issue, this study proposes six hypotheses and performs an empirical evaluation by adopting the SITC6 products over the period of 1991-2008 through a logit econometrician model. In conclusion, this paper reports findings and provides strategic ideas for both governments and firms' reference. Firstly, key determinants of Sino-Korean IIT include FDI, R&D cost, per capita income, advertising cost and trade intensity. Secondly, extent of firm scale has no significant impact on IIT, and similar indexes have varied statistical significance for these two countries. Thirdly, advertising cost has emerged as a new factor of IIT, which, however, has not yet received due regard in the same line of inquiry in China.

Key Words: Intra-industry trade, theoretical hypotheses, logit models

1 Introduction

The volume of import and export between China and South Korea has growth from USD44430.59 million in 1991 to USD1683191.72 million in 2008, 37.9% up. In terms of Standard International Trade Classification (SITC), intra-industry trade (hereafter called IIT) represents a share of 42%[2] in the overall trade volume of the SITC6 products of 2008. According to comparative advantage (CA) theory, the dissimilarity of economic development stages between China and South Korea suggests a fairly fast growth in IIT. In accounting for the counterintuitive phenomenon, CA theory turns to be vulnerable. Thus a new theoretical framework is needed. Despite some research on such an increasingly growing IIT, findings and conclusions are not consistent. And disputes arise in many respects. As with change in technological environment and

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expansion in trade volume, conceptions of IIT are evolving in depth and some emerging factors are identified as major determinants of IIT. Against this backdrop, this study is of significance in analyzing IIT determinants in theory and in practice as well.

The conception of IIT was developed by Grubel & Lloyd (1975). In their terms, IIT refers to export and import of goods and services within an industry among countries. This phenomenon challenges its explanatory power of traditional CA theory. In explaining IIT, numerous efforts have been made in proposing theoretical hypotheses particularly focusing on identifying the key determining factors of IIT. Finger (1975) argued that the main reason for IIT was that existing industrial classification failed in having differences in factor endowment reflected further at industry levels. However, evidence shows that a further breakdown at industrial levels could not deny the presence of IIT. In this sense, his explanation is not convincing. Flavey & Kierzkowski (1987) assumed that if all goods were manufactured under the same technological conditions, difference on the demand side would make a difference as to whether an IIT exists or not. Product quality disparities derive from varied capital intensity involved in the manufacture. Products of high quality depend on capital-intensive manufacturing conditions and disparities in consumer demand for quality give rise to IIT. However, such a model has no explanatory power for factor endowment similarity-based IIT. Krugman & Paul (1991) introduced new trade theory to the same line of inquiry from perspectives of marginal increasing income and economies of scale, but their analytical framework has some limitations, too. In order to explore key determining factors for IIT, a plethora of research from different angles have been undertaken. In terms of research subject, some are country-specific and industry-specific (Fukao et al., 2003;Yoshida et al., 2009). As far as IIT indexes are concerned, some have identified FDI, technological innovation, per capita GDP, per capita income, market openness, exchange rate, among others(Lee,1987; Stone & Lee， 1995). Methodology is also improved from multilinear model (Lee, 1987), to multilinear logarithmic model (Stone & Lee, 1995) followed by logit model (Yoshida & Leitao, 2009) in continued efforts to reduce heteroscedasticity.

The late 1990s started to see IIT studies by Chinese scholars. Zhou & Ren(1999) reported an analysis of the status quo of China's IIT，regarding product diversification and economies of scale as IIT stimulants(Xu，2001). But Ma et al.(2002) found that economies of scale has little impact on IIT. As for the impact of FDI, Chen et al (2004) reported a negative association with IIT. More recent studies provide both consent (Wang， 2010) and dissent (Liu, 2009). Still others argue that FDI functions differently across industries (Cheng & Xie, 2009). For the aforementioned literature, multilinear regression model is dominantly employed.

Despite their reasonable contributions, previous research has obvious weaknesses. The first weakness relates to subjects examined. Some is based on panel data to analyze inter-country and inter-industry specific IIT but neglects their respective disparity. Therefore, some resulting heteroscedasticity lends discount to model-based findings and conclusions. To overcome such a problem, the present study chooses to conduct a certain industry-based Sino-South Korean IIT analysis so as to reduce the impact of heteroscedasticity to minimum. The second weakness concerns indexes used. Some indexes are not justifiably used. Examples include per capita GDP and the number of large and medium-sized enterprises as proxy variables to represent economies of scale. Conversely, some major indexes for product disparities are even neglected. Take advertising cost for example. Its absence in previous studies is acceptable especially for the case of the 1980s and earlier when advertising was not much used. However, advertising cost has become significantly conducive to IIT in current age of information. This study will introduce advertising cost as a major index of IIT into its theoretical model analysis. With the above considerations, this study aims to contribute to this line of inquiry by refining subject, index and model examined in existing studies. To meet this end, the present study is designed to conduct a reconfirmation test of IIT indexes by employing the data of consecutive years of Sino-Korean IIT and identify main determinants of IIT.

The rest of this paper is organized as follows. The second section concerns theoretical hypotheses, established by reasoning informed IIT indexes. The third section is an introduction to the data under study and an empirical model evaluation, including sources of data, data processing and findings. In the fourth section of Discussions and Concluding Remarks, we will present our comments on the main findings and offer some strategic proposals for governments and firms concerned.

2． Theoretical Hypotheses

This study assumes that product disparity is the main reason for trade at intra-industry level. Six factors are believed to contribute to product disparity. Three relate to manufacturing; they are FDI, technology innovation and economies of scale. The other three fall into/concern demand;

they are per capita income, advertising cost and trade intensity.

Hypothesis 1：FDI can encourage IIT.

FDI is a means of overseas economic activities with local firms by holding shares, controlling shares and other variations. In theory, FDI can promote trade in that unlike tariff barriers common to international trade, FDI has potential to dramatically reduce tariffs by investing in host countries. What's more, host countries tend to adopt preferential measures, such as taxation incentives, tariff incentives, land use subsidies, loan subsidies and R&D assistances, etc. It is understood in principle that FDI is positively proportional to IIT.

Life cycle theory postulates that new product life cycle consists of three phases: new product stage, maturing stage, and standardized stage. During the standardization phase, technologically advanced countries enable technologically underdeveloped countries to export more of standardized products to the former by enlarging FDI on the one hand and import products of high quality from the former. FDI and IIT are mutually supportive. This argument is evidenced by Fukao et al's (2003) analysis of the relationship between electronics industry-specific FDI in East Asian countries and IIT. Yoshida et al's (2009) Japan and Europe-specific study also revealed a positive correlation relationship between FDI and IIT. However, some research by Chinese academics report disagreement. Supporting evidence against the role of FDI includes, for instance, Wei (2005)'s report of a significantly negative correlation between FDI by America in China and IIT in automobile industry, and Wang (2010)'s claim of FDI's restraint on IIT in the Chinese services industry. Defending evidence for the role of FDI includes, for instance, Liu (2009)'s conclusion of Japanese FDI encouraging IIT in Chinese finished products. However, based on analyzing the actual use of FDI by Chinese and its manufacturing industry IIT, Cheng & Xie (2009) concluded a dividing line of FDI's impact on IIT across industry, either encouraging or discouraging.

FDI in the present study refers to aggregate actual investment by South Korea in China, regardless of industry. Different from the above-mentioned studies, the present study investigates the actual FDI by South Korea over the period of 1991-2008 and concludes heavy FDI concentration in manufacturing industry. Thus, the present study is justified to analyze the relationship between FDI and IIT in manufacturing industry.

Hypothesis 2：The relationship between technological innovation and IIT is uncertain.

Firms can utilize technological innovation, a market competition conduct, to upgrade products for new product development and product competitiveness as well. Technology innovation also has potential to enlarge the scope of product differentiation and avoid heads-on price competition among similar products. In this sense, technology innovation is an effective means for firms' competitiveness. For its capacity to increase the extent of product differentiation and trade volume, investment in technology innovation and industry-specific IIT are positively correlated. The impact of IIT on industry-specific ingenuity and innovation capacity is also double-edged. One the one hand, IIT facilitates technology transfer and in return its spillover effect encourages firms' capacity to create and innovate. On the other hand, IIT can also produce a negative substitution effect on industry-specific ingenuity and innovation capacity, or rather, a detrimental effect. Lee (1987) examined Pacific Basin countries by employing the ratio of R&D cost to total sales as an indicator of technology innovation and concluded a significantly positive correlation with IIT. Likewise, the case of China provides no consistent relationship between technology innovation and IIT. Xu & Deng (2007) reported that R&D is negatively correlated with labor-intensive industry-specific IIT but positively correlated with capital-intensive industry-specific IIT. Shao & Xie (2008) maintained that the impact of R&D cost on IIT was insignificant. To further explore the issue under discussion, this study takes the ratio of R&D cost to GDP over the period of 1991-2008 by China and South Korea each as an indicator of technology innovation investment, and denotes China's and South Korea's as R&Dcn and R&Dkr respectively.

Hypothesis 3：The association of the extent of firm scale with IIT is uncertain.

There are two scenarios for the relationship between the extent of firm scale and IIT. For the first scenario, firm scale can effectively reduce the cost of commodities and thus bring their price down for market competitiveness. Thus, economies of scale to some extent can raise trade volume. For the second scenario, an increase in consumer demand for diversified products would make a large-scale individual product market vulnerable to change in markets; besides, firms' limited resources coupled with manufacturing on a larger scale would result in a lower degree of product differentiation. Then a negative correlation between scale economies and IIT can be concluded. To sum up, the association between scale economies and IIT is uncertain.

Previous Chinese studies on firm's scale economies feature the use of different indicators.

Shao Ling & Xie Jianguo (2008) employed the number of large and medium-sized enterprises to represent firm's scale economies and reported a negative correlation with IIT. Zhang Bin & Sun Meng (2009) employed the absolute value of the difference in two countries' GDP as an indicator of firm's scale economies and found no significant relationship with IIT. Wei & Liu (2010) used average GDP and reached a conclusion of a positive relationship with IIT. Similarly, the use of different indictors is also found in non-Chinese literature. Hufbauer (1970) introduced industrial product value added as an indicator of firm's scale economies. Lee (1987) followed Hufbauer's (1970) and reported no significant impact on IIT for the 1970s but significant impact on IIT for the 1980s. Loertscher & Wolter (1980) employed average GDP to represent firm's scale economies of two countries, and concluded a significantly negative correlation. In contrast, Stone & Lee (1995) also adopted average GDP but reached quite a different conclusion that the relationship between scale economies and IIT is significantly positive. The present study maintains that the use of per capita GDP to evaluate the extent of firm's scale economies would result in a relatively big bias. The reason can be that as an indicator of the overall national level of economic development, per capita GDP would be doomed to fail when used to represent firm-level development. Furthermore, firm's scale should be reflected in a relative indicator other than an absolute indicator such as per capita industrial value added. In other words, this study argues for the use of the ratio of industrial value added to aggregate industrial value as an indicator of the extent of firm scale. An increase in the ratio implies a growth in firm scale. So is the other way around. Thus, the ratio of industrial value added to aggregate industrial value over the period of 1991-2008 is used in this study to reflect the change in firm's scale respective of China and South Korea. The extent of firm scale of China is denoted as Addcn and that of South Korea Addkr.

Hypothesis 4：Per capita income rise can facilitate IIT

Per capita income is a major determinant of consumer demand. An increase in personal income will lead to that in consumer demand for product diversity and quality as well. Such a change in demand will promote a growth in IIT. Therefore, per capita income and IIT present a positive correlation. Recent years have seen related Chinese studies. Per capita income level and similarity are reported to potentially stimulate overall IIT (Chen et al., 2004; Chen, 2006). Supporting evidence is also found in trade between China and advanced countries that per capita income gap encourages IIT (Yao & Qi, 2010) and in Sino-Japanese IIT that per capita dissimilarity and overall IIT are positively associated (Xu & Tang, 2009). However, there is a different story at industry level. A negative correlation is revealed between per capita income gap and IIT in a study on the Sino-American services sector (Cheng, 2008) and also a study on China's hi-tech and technology-intensive industries as well (Wei & Liu, 2010; Zhou & Lu, 2010). Li et al. (2003) employed per capita dissimilarity as an index and concluded an inverse correlation with IIT at insurance industry level.

Per capita income gap was introduced as an explanatory variable in the same line of inquiry studies mainly on OECD countries. An income gap examination of these countries with a relatively small income gap can help reveal the impact of income on IIT. This study will take actual per capita income each by Chinese and Korean residents/nationals rather than their respective gap to investigate its impact on IIT. The rationale is grounded on the belief that mutual income gap is relatively wide and IIT is more influenced by per capita income than by the gap in between and therefore, the former has more explanatory power than the latter. This study takes per capita income as an independent variable to examine its impact on IIT (also see Flam & Helpman, 1987; Falvey & Kierzkowshi, 1987) and undertakes an empirical evaluation by using as samples of the 1991-2008 data of Chinese residents' per capita income at town and city levels in US dollars and the counterpart in US dollars of average Korean household income divided by average household heads. The former is denoted as INcn and the latter as INkr.

Hypothesis 5：A growth in advertising cost can enhance IIT.

With the booming information technology in modern society, adverting has become part of life and a most important factor for determining product differentiation. Induced by advertising, consumers become attached to products to the effect that the scope of product differentiation is enlarged. In theory, advertising cost and IIT are positively correlated. The impact of advertising on IIT was empirically investigated by Caves (1981) and Lee (1987) and the significantly positive impact of product advertising on IIT was concluded in the latter. To the authors' knowledge, empirical study by Chinese academics remains lacking, however. To fill the gap, this study takes advertising cost as a variable to address this issue. As part of industrial sales expenses, China's advertising cost is measured with reference to the 1991-2008 data of industrial sales expenses in US dollars and South Korea's measured with reference to the 1991-2008 data of manufacturing industry in US dollars as samples. The Chinese indicator is denoted as Adcn and the Korean counterpart as Adkr.

Hypothesis 6：Trade intensity can stimulate IIT.

Trade intensity can facilitate product differentiation. It is understood that a product impression after consumers' purchase and use can gradually grow into a famous product image, which is especially true of durables. And product brand name will further influence purchase by individuals and their social groups. Positive product brand names can encourage trade whereas poor ones can discourage trade. Therefore, the relationship between product brand name and IIT is positive.

As an indicator, trade intensity reflects change in industry-specific specialization or market concentration. Grubel & Lioyd (1975) and Lee & Lee (1993) both adopted this indicator and concluded a positive correlation with IIT. The trade intensity formula is expressed as below:

$$TIN = \frac{X_j + M_j}{X_t + M_t}$$

Where Xj and Xt refer to South Korea's aggregate exports to China in j industry and in all industries respectively; Mj and Mt denote South Korea's aggregate imports from China in j industry and in all industries respectively. Wang Ying (2010) adopted this index of trade intensity and concluded a positive correlation with IIT. This study also adopts trade intensity to examine its correlation with IIT.

3. Empirical Analysis: Data and Theoretical Model

In terms of SITC, Sino-South Korean IIT mainly operates in industries of SITC5, SITC6, SITC7, and SITC8. In SITC5 manufactures (chemicals and chemical manufactures), exports markedly exceed imports. In SITC6 (machinery classified by materials), Korea's export to China is slightly greater than its import from China and in 2005 with a roughly balanced bilateral trade. In SITC7 (machinery and transportation equipment), Korea's export to China exceeds its import from China. When it comes to miscellaneous industrial commodities in SITC8, exports and imports in between are close to each other.

This study takes SITC6 manufactures for instance to investigate changes in Sino-South Korean IIT. The SITC6 manufactures are classified by materials and can be further broken down into nine two-digit sub-industries: 61 for leather, leather manufactures, dressed furskins, 62 for rubber manufactures, 63 for cork and wood manufactures (exclusive of furniture), 64 for paper, paperboard, articles of paper pulp, 65 for textile yarn, fabrics, made-up articles， 66 for non metallic mineral manufactures， 67 for iron and steel， 68 for ferrous metals, and 69 for manufactures of metals.

IIT index is computed following Herbert Grubel and Peter Lloyd，called G-L index for short, and expressed in the following formula/equation:

$$IIT = (1 - \frac{|X_j - M_j|}{X_j + M_j}) \times 100$$

Where X_j, M_j denotes South Korea’s exports of j product to China and import from China respectively. As for IIT index calculation, this study breaks the SITC6 industry into two-digit level ones and obtains their respective IIT indices. These IIT indices are weighted each by the ratio of two-digit industry-specific trade volume to overall IIT one and finally their composites are obtained (See Table 1).

Table 1 Sino-South Korean IIT during the period of 1991-2008

Year	IIT	61	Weight	62	Weight	63	Weight	64	Weight	65	Weight	66	Weight	67	Weight	68	Weight	69	Weight
1991	0.36	0.33	0.04	0.34	0.00	0.74	0.01	0.06	0.02	0.42	0.42	0.04	0.24	0.57	0.22	0.24	0.03	0.99	0.02
1992	0.45	0.14	0.06	0.85	0.00	0.57	0.01	0.02	0.03	0.60	0.39	0.07	0.09	0.41	0.34	0.85	0.03	0.66	0.04
1993	0.51	0.08	0.09	0.52	0.00	0.96	0.01	0.03	0.04	0.79	0.43	0.41	0.01	0.26	0.36	0.84	0.03	0.68	0.03
1994	0.65	0.21	0.12	0.58	0.00	0.96	0.02	0.03	0.04	0.89	0.46	0.32	0.01	0.57	0.23	0.55	0.05	0.49	0.05
1995	0.72	0.25	0.11	0.57	0.00	0.97	0.01	0.05	0.04	0.99	0.42	0.26	0.03	0.63	0.28	0.79	0.06	0.58	0.05
1996	0.68	0.19	0.12	0.71	0.00	1.00	0.02	0.03	0.05	0.77	0.42	0.38	0.03	0.81	0.27	0.89	0.06	0.79	0.05
1997	0.64	0.17	0.11	0.43	0.01	0.60	0.01	0.03	0.05	0.73	0.40	0.33	0.03	0.77	0.28	0.86	0.07	0.88	0.04
1998	0.57	0.16	0.11	0.40	0.00	0.94	0.01	0.02	0.08	0.68	0.40	0.74	0.02	0.60	0.23	0.99	0.10	0.48	0.05
1999	0.65	0.20	0.10	0.56	0.00	0.85	0.02	0.06	0.06	0.69	0.40	0.98	0.03	0.66	0.22	1.00	0.12	0.76	0.04
2000	0.68	0.16	0.10	0.85	0.01	0.74	0.02	0.21	0.05	0.68	0.39	0.84	0.04	0.79	0.25	0.97	0.10	0.90	0.05
2001	0.61	0.24	0.10	0.86	0.01	0.43	0.02	0.17	0.05	0.67	0.38	0.75	0.06	0.52	0.22	0.92	0.10	0.99	0.06
2002	0.62	0.31	0.08	0.64	0.01	0.21	0.02	0.23	0.05	0.71	0.34	0.50	0.09	0.52	0.22	0.85	0.13	0.98	0.07
2003	0.63	0.37	0.05	0.88	0.01	0.23	0.02	0.33	0.04	0.68	0.28	0.53	0.08	0.48	0.31	0.94	0.15	0.98	0.07
2004	0.79	0.48	0.04	0.79	0.01	0.30	0.01	0.35	0.03	0.71	0.22	0.42	0.07	0.89	0.39	0.90	0.16	0.98	0.08
2005	0.84	0.46	0.03	0.86	0.01	0.10	0.01	0.62	0.02	0.78	0.20	0.34	0.06	0.95	0.42	0.95	0.16	0.85	0.08

2006	0.77	0.60	0.02	0.74	0.01	0.04	0.01	0.88	0.02	0.88	0.18	0.31	0.06	0.74	0.38	0.97	0.21	0.70	0.09
2007	0.67	0.60	0.02	0.66	0.01	0.02	0.01	0.98	0.02	0.95	0.15	0.24	0.06	0.52	0.42	0.98	0.20	0.58	0.10
2008	0.56	0.45	0.01	0.57	0.01	0.03	0.01	0.95	0.02	0.96	0.12	0.22	0.05	0.39	0.53	0.97	0.14	0.55	0.10

As can be seen in Table 1, IIT weighted indexes from 1991 to 2008 indicated nonlinear truncations, as evidenced by 0.36 in 1991, 0.84 in 2005, and 0.56 in 2008. The case of variations is also true of IIT indexes at the 10 fragmented industries subordinated to the SITC6 class. In 1991, the IIT indexes for sub-industries of 61 (leather manufactures) and 69 (metal manufactures) each are 0.33 and 0.99 respectively. Over the period of 1991-2008, the sub-industries each reflected a varied change in their respective IIT index. The two-digit 63 IIT index was 0.74 in 1991, and bottomed at 0.03 in 2008, and in contrast, the two-digit 64 IIT index was 0.06 in 1991 and peaked at 0.95. Wide variations were also reflected in weighted coefficients; in terms of weight of IIT at the two-digit fragmented industry level relative to the overall IIT of all industries, 65 topped the ranking list, and 67 followed as the second highest, as evidenced by 42% and 22% respectively in 1991 and the remaining others had a relative low. Overall, the weight coefficients of a majority of fragmented industries were relatively stable; and those of fewer ones fluctuated. The latter case was evidenced by the two-digit industries of 65 (12% in 2008, down from 42% in 1991), 66 (5% in 2008, down from 24% in 1991), and 67 (53% in 2008, up from 22% in 1991).

Take IIT as a dependent variable and influencers of IIT coefficients as independent variables. The latter includes FDI, $R\&D_{CN}$, $R\&D_{KR}$, Add_{CN} (Add, denoted for extent of firm scale), Add_{KR}, In_{CN} (In, denoted for per capita income), In_{KR}, Ad_{CN}(Ad, denoted for advertising cost), Ad_{KR}, and TIN (TIN, denoted for trade intensity). On the assumption that probability distribution function of IIT index is within the range from 0 to 1, its nonlinear probability distribution function can be expressed as follows：

$$Ln(\frac{IIT}{1-IIT}) = \alpha_0 + \alpha_1 LnFDI + \alpha_2 LnRD_{CN} + ... + \alpha_{10} LnTIN$$

Data sources：Chinese Statistics Yearbook (1992-2009), Korean Statistics, (http://www.nso.go.kr/，and http://global.kita.net/) and SPSS（11.5 version）.

4. Results and Concluding remarks

A multi-parameter progressive regression analysis shows that the econometric model passes the significance test and variables also satisfy the requirements of a significant level, and post-progressive regression F value, t value, DW value, and R^2 all meet the requirements of the significance test. The empirical findings drawn from examining Sino-Korean trade in the SITC6 products confirms that FDI, R&D investment, per capita income level, advertising cost and trade intensity are the major factors of influencing Sino-Korean IIT. Evidence is not found in this study for the hypothesis that the extent of firm scale significantly influences IIT.

Table 2 Estimated Valuations of IIT Parameters

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-12.560	6.303		-1.993**	.081
FDI	.987	.211	2.240	4.686**	.002
RD_{CN}	.989	.388	.715	2.547**	.034
RD_{KR}	-7.557	1.975	-2.355	-3.825**	.005
IN_{KR}	.651	.555	.402	1.172**	.275
Ad_{CN}	.327	.134	.353	2.434**	.041
Ad_{KR}	-.944	.608	-.437	-1.555**	.159
TIN	-10.610	3.262	-1.084	-3.252**	.012

Dependent Variable: IIT; ** denotes 5% significant level.

D.W=1.72, F=11.25 R^2=0.91

The significantly positive relationship between FDI and IIT reveals a marked role of Korean FDI on promoting IIT to the effect that Korean FDI promotes technology transfer and increases product export in volume. This conclusion is consistent with Helpman & Krugman (1985) in that FDI and IIT are complementary in the sense that the growth in FDI can promote IIT.

The relationship between R&D cost and IIT is not the same, in respect to China and South Korea. R&D cost by China and IIT present a significantly positive correlation whereas R&D cost by South Korea and IIT a significantly negative one. This study maintains that such a difference may relate to industrial development stage-based differentials. Since China remains in the industrialization process, an increase in R&D cost can promote product differentiation and market competitiveness as well, thereby promoting IIT. In contrast, post-industrialization South Korea has started shifting R&D focus and direction from low-end to high-end products. Despite a high ratio of R&D cost to GDP, South Korea directs R&D cost more towards high-end products, which explains why R&D and IIT are found to be negatively correlated for manufacturing products.

When it comes to the relationship between residents' per capita income and IIT, a significantly positive correlation is found for South Korea but the case is the other way round for China. That explains the removal of this index from the model under study. As Chinese products are characteristic of average quality but low price, Korean consumers are fairly sensitive to change in price and a rise in their per capita income would trigger a considerable growth in their demand for Chinese products. Thus income level has a significantly positive correlation with IIT. Despite a moderate rise, per capita income of Chinese residents is steeply lopsided across regions and industries. That is why a rise in income will produce little impact on the demand side of trade. Furthermore, Korean products in China are regarded as up-market and priced relatively high, thereby targeted towards high income consumers. Therefore, change in Chinese per capita income has no significant impact on IIT.

The impact of advertising on IIT is also different for China and South Korea. A significantly positive correlation is found for China but a significantly negative one for South Korea. In China advertising permeates people's life and produces a huge impact on people's way of living and consumer habits; hence a positive correlation. As a highly advanced society of information technology, South Korea also appreciates the importance of advertising in people's life but finds a negative relationship with IIT. The main reason behind is that Korea-specific consumption culture and the effect of comparative advertising (Miracle, 2004). In Koreans' mind, China belongs to developing countries and imports from China are low both in quality and price. In this case, they may make purchase of low-priced goods without advertising promotion. On the other hand, the introduction of comparative advertising to South Korea may produce a constraining effect on the sales volume of Chinese products and consequently on IIT between China and South Korea.

When it comes to the impact of trade intensity on IIT, findings in the present study contradict with Lee&Lee (1993). They concluded that trade intensity has a positive relationship with IIT on the assumption that a growth in IIT can lead to more trade in differentiated products. The strong reason for the contradiction is that overall industries were dealt with in their study, though they have acknowledged that IIT trade weighted coefficient far exceeds the sum of average coefficients. Anyway, IIT coefficients are composites, influenced by weight and trade volume as well. When industries are further fragmented, a different result is understandable. The present study claims that change in IIT coefficients is impacted by sub-industry specific characteristics and change in trade intensity reflects products-related extent of specialization. A rise in products-related extend of specialization can result in a positive correlation between trade intensity of products of same type and IIT. Provided that extent of specialization is low, a rise in the extent of differentiation of products can result in an inverse association. Sino-Korean SITC6 class products are machinery categorized by reference to materials and the respective IIT is characterized by small scale, diverse demand and relatively low extent of specialization; therefore, a significantly negative correlation is revealed between trade intensity and IIT coefficients.

Extent of firm scale and IIT reveal no significant relationship for China and South Korea. This study claims that some overcapacity is true of firms in both countries and thus production on a larger scale would not effectively reduce cost for a larger market share. Therefore, production scale is not a significant factor of influencing IIT.

The above findings and discussions also yield strategic implications for governments and firms. The Chinese government should continue to 1) vigorously utilize capital by foreign investors and improve their investment quality and quantity; 2) pump capital into R&D for more product competitiveness in international markets; 3) adjust income distribution regime to enhance consumer purchase capacity. And in product marketing, the Chinese firms should make full use of advertising media for commodity branding and influence. The Korean government and firms should exploit China's investment incentives and industrial upgrading in efforts to 1) invest more in China and promote bilateral trade; 2) allocate R&D cost to new and traditional industries with a promising market prospect after technological innovation and uplift as well as hi-tech ones; 3) in more efficient use of commodity advertising cost, maintain moderate competitive adverts and intensify informative ones so as to avoid overdoing advertising competition.

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