Comparative Advantage in Japan, Korea and Taiwan between 1980 and 1996: Testing for Convergence and Implications for Closer Economic Relations

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Abstract

The possibility that Korea and Japan will enter into a free trade agreement (FTA) early in the 21st Century represents a profound change in the trade policy of these two major East Asian economies. This paper seeks to explore the basis for such an agreement by comparing export patterns of the two partner countries (Japan and Korea) with that of a non-member that is geographically close and is also a major exporter of machinery (Taiwan). Indices of revealed comparative advantage (RCA) are calculated for 217 3-digit SITC categories for two sub-periods (1980-1987 and 1988-1996). Median RCA values for each sub-period are used to get Spearman rank correlation coefficients, which are then tested for significance between each pairing of partners (Japan-Korea, Korea-Taiwan and Japan-Taiwan). Finally we test for convergence of export patterns using Daniel's test. We find that each partner has a statistically significant correlation of RCA indices and that export patterns of Korea and Taiwan are converging with that of Japan. In the case of Taiwan and Korea there is a significant correlation in RCA indices, however, there is no significant convergence between their export patterns over time. Finally, we identify sectors where trade diversion is likely to occur and provide an upper-bound estimate of the potential amount of trade that might be diverted from Taiwan by a Japan-Korea FTA.

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I. Introduction.

The motivation for this study is to provide empirical analyses of emerging patterns of international trade of three major East Asian economies in order to assess the implications of the possible free trade agreement between Japan and the Republic of (South) Korea (Korea, hereafter).[1] Japan and Korea began to explore the possibility of establishing closer economic relations following the summit between President Kim Dae Jung and Prime Minister Keizo Obuchi in October 1998. President Kim expressed his wish to put past difficulties between the two countries behind in order to build a basis for a new relationship in the 21st century. This decision led to the establishment of *The 21st Century Japan-Korea Economic Relations Study Team* (IDE/JETRO 2000) and the beginning of serious discussions between intellectual, business and official circles in the two countries of the framework for a Japan-Korea Free Trade Agreement (FTA).

The decision to initiate negotiations between Japan and Korea follows similar moves between Korea and Chile, Korea and New Zealand, Japan and Singapore, and Japan and Mexico.[2] The reasons for the break with the past practice of "pure multilateralism" by both Japan and Korea are explored elsewhere. Herein our purpose is to establish empirically the basis for a closer economic relationship in the dimension of international trade, focusing primarily on merchandise trade. We wish to develop an understanding of the current status of "revealed comparative advantage" indices (RCAs) among industries in Korea and Japan, in order to understand whether the two countries have complementary or competitive export structures. We also

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[1] This paper is one of a series of empirical studies of ICSEAD of the trade relationship of Japan, Korea and Taiwan. See also Sohn (2000), James and Movshuk (2000) and James (2000).

[2] In point of fact, as of December 2000 as many as 15 new FTAs involving Asian and Pacific countries have been proposed, with several already in the negotiating stage.

attempt to examine the potential for trade diversion with third parties, particularly with reference to Taiwan.

Inclusion of Taiwan is dictated by the importance of Taiwan, in its own right, as a major trading power on a global and regional basis and the similarity of its pattern of trade with that of Korea. Taiwan is also becoming established as a major supplier of information technology (IT) hardware, including personal computers (PCs), mobile telephones, semiconductors, and fibre-optic cable. The inclusion of Taiwan helps us draw attention to the ultimate importance of the mechanisms by which a FTA implements tariff discrimination and national treatment provisions with regard to members and non-members.

Our study of patterns of comparative advantage in Japan, Korea and Taiwan is most closely related to Lee (1986), who also analyzed indices of revealed comparative advantage (RCAs) in Japan, Korea, and Taiwan. However, Lee's study covers 1964-1977, so it has become dated. In contrast, we analyze the dynamics of comparative advantage over a more recent period of 1980-1996. Second, we not only report Spearman rank correlation coefficients between national RCA indices, but also test the statistical significance of these correlation coefficients. Third, our study also applied statistical tests for the presence of trend in the convergence/divergence of national export patterns. Finally, while Lee's paper dealt only with exports to OECD countries, our analysis is based on exports to the world. Lee reports that export specialization patterns between Korea and Taiwan are similar but between Korea and Japan and Taiwan and Japan are quite dissimilar. We have obtained somewhat different results. In particular we find that export specialization patterns of Korea-Japan and Taiwan-Japan are similar and are converging.

The plan of the paper is as follows. In section II we discuss our data and methodology in selecting a theoretically sound measure of RCA. Section III reports our major findings about the convergence of comparative advantages in Japan, Korea, and Taiwan. In section IV we discuss implications of our findings for closer economic cooperation between Japan, Korea, and Taiwan, identifying sectors with the highest potential for trade divergence from Taiwan by a Japan-Korean free trade agreement. Section V concludes.

II. Data and Methodology.

We have calculated RCA (revealed comparative advantage) indices for Japan, Korea and Taiwan at the 3-digit SITC level of aggregation over two separate sub-periods (1980-1987 and 1988-1996). Though a large number of alternative RCA indices have been proposed in the literature, many of these indices are not consistent, producing very different rankings of RCA with the same sample of data (Ballance, Forstner and Murray, 1987). Therefore, it is important to use RCA indices that have a sound theoretical background. Vollrath (1991) investigated the theoretical underpinning of ten *RCA* indices, and recommended the following two indices:

$$RCA1_i^c = \left(X_i^c / X_t^c\right) / \left(X_i^w / X_t^w\right) \tag{1}$$

$$RCA2_i^c = \left(X_i^c / X_t^c\right) / \left\{\left(X_i^w - X_i^c\right) / \left(X_t^w - X_t^c\right)\right\} \tag{2}$$

where X denotes exports, and subscripts *i* and *t* refer to a specific i^{th} commodity and the sum of all commodities (that is, $E_t = \sum_i X_i$). Superscripts *c* and *w* denote a particular country *c* and the world.

The *RCA1* index is essentially adopted from Balassa (1965)[3]. Using Kunimoto's (1977) theoretical approach, Vollrath interprets the *RCA1* index by introducing the concept of expected export of commodity *i* from country *c*, $E(X_i^c)$. Note that expected exports are calculated under the assumption that there is no geographical specialization in international trade due to comparative advantage:

$$E\left(X_i^c\right) = X_t^c \times \left(X_i^w / X_t^w \right) \tag{3}$$

so that $E(X_i^c)$ is determined by the total exports of country *c* and the share of commodity *i* in the world trade. Using (3), we can redefine (1) as

$$RCA1_i^c = X_i^c / E(X_i^c) \tag{4}$$

Therefore, *RCA1* indices equal to one imply that actual exports coincide with the expected ones, calculated under the assumption of neutrality of comparative advantage. On the other hand, deviations above (below) unity indicate the presence of comparative advantage (disadvantage) in actual exports X_i^c.

Like *RCA1*, *RCA2* can also be interpreted within Kunimoto's theoretical framework. The only difference between these indices is that *RCA2* avoids double counting, excluding X_i^c and X_t^c from the corresponding totals in the denominator of *RCA1*.

To show the correspondence between *RCA1* and *RCA2*, we use the shares of country *c* in world exports of commodity *i* and in total world exports, defined by $\rho_i^c = E_i^c / E_i^w$ and $\rho_t^c = E_t^c / E_t^w$. Then from (2) we get

$$RCA2_i^c = \left(X_i^c / X_t^c\right) \Big/ \left\{X_i^w (1-\rho_i^c) / X_t^w (1-\rho_t^c)\right\}$$

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[3] Vollrath (1991, p. 269) pointed at an earlier usage of formula (1) by Kanamori (1960), who used the

from which it follows that

$$RCA2_i^c = RCA1_i^c \times \frac{1-\rho_t^c}{1-\rho_i^c} \tag{5}$$

Therefore, *RCA1* and *RCA2* coincide only if $\rho_i^c = \rho_t^c$. Secondly, *RCA1* and *RCA2* can be close even if $\rho_i^c \neq \rho_t^c$, but both ρ_i^c and ρ_t^c are close to zero. In this study we applied both *RCA1* and *RCA2* indices, and obtained very similar results[4].

RCA1 and *RCA2* can be biased by voluntarily export restraints (as in the case of US-Japan agreement on car exports to the United States, or the Multi-Fibre Arrangement on textiles and clothing). Similarly, RCA indices can be distorted by various export incentives, such as European agricultural export subsidies. Unfortunately, in practice it is very difficult to evaluate the extent to which trade distortions can bias RCA indices.

Our approach is to test the statistical significance of correlations between national RCAs as an alternative indicator of the extent to which export structures are similar between these three economies. The sample was subdivided into the two sub-periods so that median values of RCAs in each period could be calculated. Median values are more robust indicators of general tendencies than the mean. We then differentiated product categories ranked by RCA values. A ranking of RCA indices (Tables 1a-b to 3a-b) from the largest values to values of around unity provide information on the structure of exports in each country during the two periods. Our principal interest is in an evaluation of how similar export comparative advantage is among these three economies and in an assessment of the dynamic changes in export

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formula to study export specialization patterns. Unlike Balassa (1965), Kanamori did not associate the formula with comparative advantage.

[4] Since our study is based on the ordinal ranking of RCA indices, it seems that the difference between RCA1 and *RCA2* turned out to be insufficient to reshuffle the ranking of these RCA indices. Both sets of results with RCA1 and *RCA2* indices are available upon request from the authors.

patterns. In particular, we attempt to measure whether export structures are becoming more similar over time among the three.

In order to achieve the above objectives we first calculated Spearman rank correlation coefficients for 217 3-digit SITC categories between Korea-Japan, Japan-Taiwan and Korea-Taiwan (reported in tables 4a, 5a and 6a, respectively). We then show the p-values of these correlation coefficients (tables 4b, 5b and 6b, respectively). Finally, we evaluated the tendency of export structures to converge using a non-parametric test for trend, which was introduced by Daniels (1950).

Daniel's test is a counterpart to the more conventional parametric testing for trend by OLS regression. In OLS, a time series y_t is regressed on the linear trend t and the intercept, and the presence of trend is verified by a significant t-statistic for the trend variable t. However, the validity of this parametric approach depends on several assumptions of the OLS regression that may not hold in practice (such as the normality assumption for the disturbance term). In addition, the parametric test may have low power if the time trend in y_t is not exactly linear.

Daniel's test replaces the original y_t with corresponding ranks $R(y_t)$, and calculates Pearson's correlation coefficient between $R(y_t)$ and a time trend (in other words, Daniel's test is the Spearman rank correlation between y_t and t).

The use of ranks makes the test robust against outlying observations as long as outliers do not substantially affect the ordering of observations. Besides, there is no need to assume normality in the analyzed data[5]. Finally, the test does not assume any particular trend pattern (such as a linear trend). When y_t is normally distributed, the asymptotic relative efficiency of Daniel's test is only slightly less (98%) than the

power of the parametric test with an OLS regression (Conover, 1980, p. 258). On the other hand, if the distribution of y_t is not normal, Daniel's test may become much more powerful than its parametric counterpart.

We calculated exact critical values for the rank correlation coefficient in Daniel's test with the algorithm of Best and Roberts (1975)[6], using TSP software package (version 4.5)[7].

III. Results.

The Structure of Comparative Advantage: Japan, Korea and Taiwan

The median RCA values for the top 10% of 3-digit product categories in each of the two sub-periods (tables 1a, 2a and 3a, respectively) provide some information on the changing structure of comparative advantage in Japan, Korea and Taiwan. In the first sub-period, SITC 776 (which includes semi-conductors) is among the top-ranked RCA values only in the case of Japan. SITC 764 (telecommunications) is ranked among the top 10% of export categories in both Japan and Taiwan. Household electronic products (SITC 762 and 761), photographic equipment (SITC 881), optical instruments (SITC 871), and various types of machinery and transport equipment figure prominently in Japan's leading export categories ranked by RCA values in 1980-87. In Korea, although machinery and transport equipment are important, 7 of the top 10 items are labor-intensive manufactures (including textiles, apparel and footwear). Similarly, in Taiwan in the first sub-period labor-intensive manufactured products are predominant in comparative advantage. The only resource-based items

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[5] The only required assumption is that analyzed data follow the same data-generating process, which may be different from the normal distribution (Conover, 1980, p. 258).
[6] The original version of their algorithm is available at http://lib.stat.cmu.edu/apstat/89.
[7] Our TSP procedure to calculate exact p-values of the rank correlation test is available upon request.

in the top rankings are fish (SITC 034) in Taiwan and Korea and wood products (SITC 635) and leather manufactures (SITC 612) in Taiwan.

In the second sub-period, Japan has an RCA structure heavily weighted towards information and communication technology (ICT) products, transport equipment and various types of machinery. Components for office machinery (SITC 759) and telecommunications equipment (SITC 764) RCAs rank among the top categories in Japan in this period. Computers (SITC 752) and office machines (SITC 751) fell just below the cut-off for the top 10% of RCA-ranked products in Japan (table 1b). Consumer electronics products become much less important compared with the first sub-period in Japan.

In Korea, semi-conductors (SITC 776) become important in the second sub-period. However, a large number of labor-intensive items remain important in the latter period along with some metal products, consumer electronic items and ships. Korea lags in specialization in computer hardware, although in the second sub-period this sector finally attains an RCA of 1.27 (table 2b). In contrast, telecommunications equipment's RCA reaches a high value of 2.09 in the second sub-period.

In Taiwan in the second sub-period IT products such as computers (SITC 752) and office machines (SITC 751) achieve high ranks (along with motor bikes). Semi-conductors' (SITC 776) RCA is 2.00 (table 3b) in the second sub-period. Despite the growing importance of IT products, still a large number of items that are labor-intensive or that use standard technology remain important. Thus, an important distinction between Korea and Taiwan on one hand and Japan on the other can be

drawn based on the lingering importance of labor-intensive manufactures in the export structure of the former economies.[8]

Statistical Tests of Export Similarity and Convergence

We have calculated Spearman rank correlation coefficients for each pair of countries (tables 4a, 5a, and 6a) and have reported on the p-values for these correlations (tables 4b, 5b and 6b) over the entire sample period (1980-1996). Essentially we find that all these correlations are statistically significant. In our analysis we found that inclusion of non-manufacturing trade (i.e., SITC categories 0-4) is important in obtaining this result. If we exclude primary sectors and focus just on manufactures, there are a few insignificant correlation coefficients, particularly for Japan and Korea as a pair. Since we are concerned with a free trade agreement that corresponds to the requirements of GATT Article XXIV (covering substantially all trade), we decided the most comprehensive coverage of merchandise trade was justified.[9] Our results indicate that pair-wise, the correlation between Korea and Japan has tended to be slightly higher than that of Japan and Taiwan (as shown by the bolded diagonal figures in tables 4a and 5a). Moreover, the correlations appear to be rising over the entire sample period for both pairs, as is indicated by the positive and statistically significant result for the test for presence of trend (see note in table 4a). Interestingly, pair-wise Korea and Taiwan have even greater correlation coefficients than the other two pairs (see Table 6a, bolded diagonal figures), however, there is no statistically significant trend over time.

What can we conclude from the observed convergence of export specialization between Korea and Japan and Taiwan and Japan? First, it is important to recognize

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[8] In part, the existence of large export quotas under the Multi-Fibre Arrangement (MFA) for textile and apparel items may help explain this pattern. See Baldwin, Chen and Nelson (1995).

that in spite of the trend, the export specialization of Korea and Taiwan still reflects a more labor-intensive and less technologically advanced factor endowment than that of Japan. Thus, Korea, for example, in 1996 has an export specialization that is more highly correlated (and is statistically significant) with Japan in the early 1980s than in 1996. As shown in notes to table 4a, the time trend test statistic is also shown to be greater in the first row of table 4a than in the diagonal (0.988 and 0.827, correspondingly). A similar result obtains for Taiwan as well (table 5a). In contrast, while the time trend statistic is positive (0.325) for Korea and Taiwan as one moves along the diagonal (see table 6a), the test statistic is negative (-0.449) along the first row, although in neither case is the result particularly significant.

In sum, though we found a significant convergence between contemporaneous RCA indices of Japan, Korea, and Taiwan, there is even closer similarity between Japanese trade pattern in the early 1980s and more recent trade patterns in Korea and Taiwan. In other words, the trade specialization of Korea and Taiwan has been following in the footsteps of Japan's trade pattern to such a degree that at present the RCA rankings of these three countries have already become very close to each other. On the other hand, in contrast to the convergence of trade patterns between Japan-Korea and Japan-Taiwan, we did not identify any significant convergence between Korean and Taiwanese patterns of trade.

The presence of a positive trend between the two pairs with Japan does imply that, over time, the three are becoming more competitive and less complementary with one another. This means that they will increasingly compete in third country markets with one another. Nevertheless, it is important to recognize that trade

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[9] Trade in services was not covered because reliable data on international service transactions that are comparable across countries are not readily available.

patterns between Korea and Japan and Taiwan and Japan are somewhat different than global patterns (James 2000). For example, while machinery (SITC 7) makes up over half of Korea's global exports (1995 and 1996), it comprises only around 30% of its exports to Japan. Looking at this from the perspective of Japan, however, gives one a different impression. Imports of SITC 7 comprise only about 23% of Japan's global imports, yet account for over 30% of imports from Korea. Similarly, machinery accounts for almost 40% of Japan's imports from Taiwan, much higher than the overall share of machinery in imports from the world.

Exports of labor-intensive manufactures (defined as textiles, apparel, footwear and miscellaneous manufactures in SITC 65, 84, 851, and 89, respectively) account for a slightly larger share of exports to Japan than to the world. Yet from Japan's perspective, Korea is a much more important supplier of labor-intensive goods (about 22% of imports from Korea in 1995 and 1996) compared with imports from the world (about 12.5%). In the cases of both Taiwan and Korea, however, there is a sharp drop in the share of labor-intensive goods in exports to Japan particularly since 1994. Hence, the actual pattern of bilateral trade between Japan and Korea seems to be converging with the overall comparative advantage structure of the two countries.

The rising share of machinery in trade between the three (including in trade between Taiwan and Korea) indicates that there may be scope for expansion of intra-industry trade. Hence, this study on RCA structures should be augmented by studies of intra-industry trade.[10]

[10] James (2000) is an initial step in that direction. The study of bilateral intra-industry trade between Korea and Japan found that intra-industry trade has risen sharply over the period 1980 (bilateral IIT=32.22) to 1997 (IIT of 47.60).

IV. Implications.

The structure of comparative advantage in Japan and Korea is similar and is converging—both these statements are supported by statistical tests that indicate a significant correlation in RCA structures and trends. Given that Taiwan's RCA structure is also strongly and significantly correlated with those of Korea and Japan and is also converging with that of Japan, there would appear to be a substantial potential for trade diversion should Japan and Korea form a FTA. The scope for trade diversion is limited in the large Japanese domestic market because Japan has very low tariffs and maintains few explicit quantitative barriers that would be relaxed for Korean products but not for those of Taiwan under a FTA. The simple average tariff in Japan is less than 3 per cent and the trade-weighted average tariff is also very low.[11] Hence, the margin of preference offered to imports from Korea would be quite small and would probably not be too difficult for competitive firms in Taiwan to overcome. However, trade diversion in the Korean domestic market could be substantial. The simple average tariff in Korea is about 8 per cent, with numerous industries protected by fairly high tariffs[12]. It would be difficult for firms in Taiwan to meet Japanese competition enjoying a substantial margin of preference in the Korean market.

Trade Diversion Potential

We have identified 26 SITC 3-digit categories where Taiwan and Japan have a mutual revealed comparative advantage in the second sub-period (table 7). These are

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[11] IDE/JETRO (2000) reports a simple average tariff in Japan of 2.9 per cent. It is important to recognize that technical barriers to trade could still divert trade in Japan's market from Taiwan to Korea, however. For example, should Japan and Korea in the context of the FTA extend mutual recognition to one another's product testing standards but deny such treatment to imports from Taiwan, products from Taiwan might lose market share in Japan and Korea.

[12] According to the WTO Secretariat (http://www.wto.org/english/tratop_e/tpr_e/tp138_e.htm), this official tariff rate is biased downward, because Korean authorities calculate tariff averages with only "in-quota" tariffs, excluding "out-quota" tariffs. If both these tariffs are used, the WTO Secretariat estimates that the average tariff rate in Korea rises to 14.4%. Though this tariff adjustment is significant

categories where because of export similarity between Taiwan and Japan, competition in third country markets is likely to take place. If Korea joins with Japan in a FTA, then tariff discrimination against non-members may lead to trade diversion. In particular, if Korea maintains tariffs averaging 8% on imports from non-members but allows imports from firms in Japan to have duty free access, there is obvious potential for trade diversion in the Korean domestic market.

The 3-digit SITC categories in Table 7 could not be matched with available tariff data from Korea.[13] Instead, we report on average tariffs at the 3-digit ISIC (international standard industrial classification) for 29 industries (table 8). We report on average tariffs, tariff range and standard deviation and match these with trade data taken from OECD (2000). The data in table 8 are highly aggregated compared with the SITC trade data (29 vs. 217 industries or categories). Hence, they are at best indicative of the potential for trade diversion.

In this context, it is notable that for numerous industries average tariffs equivalent to 8 percent on an *ad valorem* basis are applied on all items in the industry (for example ISIC 351: industrial chemicals-fertilizer). The amount of trade affected cannot be predetermined without data on price elasticities. However, we report average trade and the maximum amount of trade between Japan and Korea and Taiwan and Korea[14]. It can be seen that for some sectors, in addition to the difficulty

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for agricultural products, there is a minor modification for manufacturing sectors. Therefore, we do not expect that the incomplete coverage of official tariffs in Korea may substantially affect our results.

[13] Tariff data are available from the APEC Secretariat homepage. However, tariffs are reported for thousands of individual Harmonized System (HS) codes. Aggregating these individual HS codes into 3-digit SITC categories can be done in principal. Such an exercise requires a great deal of effort, particularly if production-weighted tariffs are desired. We have not been able to identify any studies that have done this for recent tariffs and instead rely on sources that have aggregated tariffs so that they match the Korean standard industrial classification (KSIC). Noland (2000) reports on Korean tariffs using data from the United States Trade Representative's office (USTR 1998).

[14] To calculate export trade by 3-digit ISIC sector, we used 5-digit SITC (rev.2) trade data from OECD (2000) and a concordance between SITC and ISIC classifications, available at http://www.eiit.org/Trade.Resources/Concordances/FromSITC/sitc2.isic2.txt. Korean import data in

of lacking elasticity estimates, there is a wide tariff range (for machinery, ISIC 382-385, where most trade is concentrated tariffs range from 0-20 percent, for iron & steel, ISIC 371, they range from 1-8 percent). Thus, it would be necessary to carefully match tariffs and trade data at a more disaggregated level to accurately be able to estimate the potential trade diversion from Taiwan to Japan in the Korean market. In particular, some categories of IT products may have zero MFN tariffs in Korea because of the Information Technology Agreement reached at the Singapore Ministerial Meeting of the WTO in 1996. In spite of this, the potential scope for trade diversion is large, particularly if a local content rule of origin is chosen to implement the tariff preferences in the FTA. Such a rule of origin could lead Korean and Japanese producers to substitute local components for imported components from Taiwan in order to take advantage of the 8 percent tariff preference. Even though the components may have a zero MFN tariff, final goods that use components as inputs (VCRs, flat screen TVs, computer-controlled machinery) may have non-zero tariffs. Hence, the figures in table 8 for imports from Taiwan in the year of maximum trade can be thought of as an upper bound for the amount of trade diversion that could take place. The mean and maximum values of in table 8 ($1795.5 million and $3353.7 million) indicate that the potential trade diversion in the case of the Korean market from a FTA is not necessarily trivial.

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the OECD trade database were available for only 1994-1998, and we used instead more extended time series of Japanese and Taiwanese exports to Korea for 1990-1999. Our comparison of these two alternative sources with trade data for 1994 revealed that there were very few relative deviations that exceeded 10 per cent of reported Korean imports.

V. Conclusion

In this paper we investigated likely consequences of creating a FTA between Japan and Korea, paying particular attention to the similarity of their export patterns, as well as the extent to which third parties, particularly with reference to Taiwan, might be affected by trade diversion. To analyze the evolution of comparative advantage in Japan, Korea, and Taiwan in 1980-1996, we calculated RCA indices for these countries, and detected substantial transformations in the composition of industries that had top RCA indexes.

In particular, we found that starting from the early 1990s the comparative advantages of both Korea and Taiwan were no longer concentrated in labor-intensive products, but were increasingly clustered in products with high technological intensity, thus becoming more similar to the Japanese RCA pattern. To verify this hypothesis statistically, we run the non-parametric Daniel's test of Spearman rank correlations between RCA indices of Japan, Korea, and Taiwan.

The test identified a clear-cut convergence of comparative advantage of Japan and Korea, with the correlation coefficient rising from 0.43 to 0.55 over 1980-1996. Similarly, the correlation coefficient between RCA indexes of Japan and Taiwan increased from 0.37 to 0.54. Besides these contemporaneous correlations, we found that there was an even more significant correlation between recent patterns of Korean and Taiwanese comparative advantage and previous patterns of Japanese comparative advantage (for example, the correlation between Japanese RCA indices in 1980 and Korean RCA indices in 1996 was as much as 0.66), indicating that there is still some room in the convergence of trade patterns of Japan-Korea and Japan-Taiwan. In contrast, we did not identify any significant convergence of export patterns of Korea

and Taiwan. The correlation coefficient for export RCA indices of Korea and Taiwan was already as high as 0.65 in 1980, and was about 0.67 in 1996.

With such a similarity between export patterns of Japan, Korea, and Taiwan, there appears to be substantial potential for trade diversion should Japan and Korea form a FTA. To evaluate the magnitude of trade diversion for Taiwan, we focused on the Korean market rather than Japan, since explicit trade barriers in Korea are substantially higher than in Japan. Unfortunately, we could not find Korean tariff data that matches the SITC classification used to calculate RCA indices. The best available source of Korean tariff data was classified by 3-digit ISIC sectors. However, the wide range of tariff rates within the same ISIC sector makes it difficult to estimate trade diversion with any precision. Therefore we consider our present analysis as a preliminary study until a more comprehensive study can be launched in the future, once we compile a comprehensive database of Korean trade barriers.

We have neglected the possible trade creation effects of a Korea-Japan FTA in this paper. However, we would expect that the trade creation potential would be emphasized in the findings of the official study group (IDE/JETRO 2000). Moreover, we are deliberately drawing attention to the importance of the rules of origin and other details of implementation of the FTA in determining the extent to which trade diversion will take place. Key elements in the implementation of the FTA in this context (in addition to rules of origin) are mutual recognition agreements in the area of standards and product testing, dispute settlement procedures (particularly in the context of the application of national antidumping laws, competition policy and safeguard measures) and customs valuation and procedures.

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Table 1a. Ranked RCA indices for Japanese exports (top 10%).

SITC code and product category		1980-1987	SITC code and product category		1988-1996
762	Radio-broadcast receivers	5.21	759	Parts of and accessories suitable for office machines	4.18
881	Photographic apparatus and equipment, n.e.s.	4.99	881	Photographic apparatus and equipment, n.e.s.	4.07
761	Television receivers	4.41	764	Telecommunications equipment and parts	3.09
764	Telecommunications equipment and parts	4.36	793	Ships, boats and floating structures	2.89
785	Motorcycles, motor scooters	3.88	871	Optical instruments and apparatus	2.85
782	Motor vehicles for transport of goods	3.86	782	Motor vehicles for transport of goods	2.77
898	Musical instruments, parts and accessories	3.59	781	Passenger motor cars	2.77
781	Passenger motor cars	3.39	884	Optical goods, n.e.s.	2.42
884	Optical goods, n.e.s.	3.34	783	Road motor vehicles, n.e.s.	2.41
793	Ships, boats and floating structures	3.31	712	Steam & other vapor power units, steam engines	2.37
783	Road motor vehicles, n.e.s.	3.18	776	Thermionic, cold & photo cathode valves	2.35
871	Optical instruments and apparatus	3.14	743	Pumps & compressors, fans & blowers	2.25
678	Tubes, pipes and fittings, of iron or steel	3.08	785	Motorcycles, motor scooters	2.23
674	Universals, plates and sheets, of iron or steel	3.03	713	Internal combustion piston engines & parts	2.16
711	Steam & other vapor generating boilers	2.99	778	Electrical machinery and apparatus, n.e.s.	2.14
653	Fabrics, woven, of man-made fibers	2.90	736	Machine tools	2.10
885	Watches and clocks	2.82	724	Textile & leather machinery and parts	2.09
666	Pottery	2.71	882	Photographic & cinematographic supplies	2.03
759	Parts of and accessories suitable for office machines	2.63	762	Radio-broadcast receivers	2.02
696	Cutlery	2.51	711	Steam & other vapor generating boilers	1.99
625	Rubber tires, tire cases for wheels	2.39	895	Office and stationery supplies, n.e.s.	1.98
776	Thermionic, cold & photo cathode valves	2.31	678	Tubes, pipes and fittings, of iron or steel	1.95

Note: RCA indices were calculated as $(X_a^i / X_t^i) / (X_a^w / X_t^w)$, where X denotes export values, subscript a refers to any particular commodity, subscript t refers to all exported commodities, and subscripts i and w correspond to a particular country and the world, respectively.
Source: authors' calculations. Export values were taken from StatsCanada (1998) WTA trade database on CD-ROM.

Table 1b. Ranked RCA indices for Japanese exports (below top 10%).

SITC	code and product category	1980-1987	SITC	code and product category	1988-1996
673	Iron and steel bars, rods	2.23	752	Automatic data processing machines & units	1.89
778	Electrical machinery and apparatus, n.e.s.	2.17	772	Elect. app. such as switches, relays, fuses	1.85
895	Office and stationery supplies, n.e.s.	2.14	674	Universals, plates and sheets, of iron or steel	1.82
771	Electric power machinery and parts thereof	2.14	737	Metal working machinery and parts	1.77
712	Steam & other vapor power units, steam engines	2.13	628	Articles of rubber, n.e.s.	1.74
694	Nails, screws, nuts, bolts etc. of iron, steel	2.10	751	Office machines	1.73
736	Mach. tools	2.01	723	Civil engineering & contractors plant	1.72
716	Rotating electric plant and parts	1.99	716	Rotating electric plant and parts	1.70
741	Heating & cooling equipment and parts	1.98	898	Musical instruments, parts and accessories	1.70
882	Photographic & cinematographic supplies	1.96	625	Rubber tires, tire cases, etc. for wheels	1.69
677	Iron/steel wire	1.90	741	Heating & cooling equipment and parts	1.67
773	Equipment for distributing electricity	1.90	749	Non- electric parts and accessories of machines	1.66
744	Mechanical handling equip. and parts	1.79	718	Other power generating machinery and parts	1.65
037	Fish, crustaceans and mollusks	1.78	885	Watches and clocks	1.58
713	Internal combustion piston engines & parts	1.78	784	Parts & accessories of 722, 781, 782	1.57
722	Tractors fitted or not with power take off	1.77	744	Mechanical handling equip. and parts	1.54
752	Automatic data processing machines & units	1.76	323	Briquettes; coke and semi coke of coal	1.51
676	Rails and railway track construction mater	1.76	742	Pumps for liquids, liq. elevators and parts	1.49
775	Household type, elect.& non- electrical equipment	1.76	728	Machinery for particular purposes	1.48
772	Elect. apparatus such as switches, relays, fuses	1.72	663	Mineral manufactures, n.e.s.	1.47
693	Wire products and fencing grills	1.70	774	Electric apparatus for medical purposes	1.45
724	Textile & leather machinery and parts	1.70	771	Electric power machinery and parts thereof	1.43
743	Pumps & compressors, fans & blowers	1.69	266	Synthetic fibers suitable for spinning	1.40
266	Synthetic fibers suitable for spinning	1.68	761	Television receivers	1.40
737	Metal working machinery and parts	1.66	694	Nails, screws, nuts, bolts etc. of iron, steel	1.39
751	Office machines	1.63	872	Medical instruments and appliances	1.37
749	Non-electric parts and accessories of machines	1.59	695	Tools for use in hand or in machines	1.35
111	Non-alcoholic beverages, n.e.s.	1.51	676	Rails and railway track construction mater	1.31
723	Civil engineering & contractors	1.47	513	Carboxylic acids,& their anhydrides, halide	1.29
718	Other power generating machinery and parts	1.45	233	Synth. rubber	1.27
872	Medical instruments and appliances	1.44	726	Printing & bookbinding machines and parts	1.24
691	Structures & parts of structures (from iron, steel)	1.40	874	Measuring, checking, analyzing instruments	1.24
655	Knitted or crocheted fabrics	1.33	696	Cutlery	1.20
695	Tools for use in hand or in machines	1.22	722	Tractors fitted or not with power take off	1.17
515	Organic inorganic and heterocyclic compounds	1.19	515	Organic inorganic and heterocyclic compounds	1.16
784	Parts & accessories of 722, 781, 782	1.19	653	Fabrics, woven, of man made fibers	1.12
728	Machinery for particular purposes	1.15	621	Materials of rubber	1.07
323	Briquettes; coke and semi coke of coal	1.15	666	Pottery	1.07
786	Trailers & other vehicles, not motorized	1.14	677	Iron/steel wire	1.04

Note: formula to calculate RCA index is the same as in Table 1a.
Source: see Table 1a.

Table 2a. Ranked RCA indices for Korean exports (top 10%).

SITC code	and product category	1980-1987	SITC code	and product category	1988-1996
848	Articles of apparel & clothing accessories	12.91	883	Cinematograph film	8.09
844	Under garments of textile fabrics	9.75	653	Fabrics, woven, of man-made fibers	7.26
831	Travel goods, handbags, briefcases, purses	8.82	848	Articles of apparel & clothing accessories	7.18
793	Ships, boats and floating structures	8.27	786	Trailers & other vehicles, not motorized	6.83
653	Fabrics, woven, of man-made fibers	7.43	793	Ships, boats and floating structures	6.52
761	Television receivers	7.39	847	Clothing accessories of textile fabrics	4.53
851	Footwear	7.02	761	Television receivers	4.46
843	Outer garments, women's, of textile fabrics	6.78	851	Footwear	4.44
786	Trailers & other vehicles, not motorized	6.76	831	Travel goods, handbags, brief cases, purses	4.06
846	Under garments, knitted or crocheted	6.04	655	Knitted or crocheted fabrics	3.95
656	Tulle, lace, embroidery, ribbons	5.57	776	Thermionic, cold & photo-cathode valves	3.91
693	Wire products and fencing grills	5.47	696	Cutlery	3.88
696	Cutlery	5.46	762	Radio-broadcast receivers	3.61
845	Outer garments and other articles, knitted	5.32	611	Leather	3.55
847	Clothing accessories of textile fabrics	5.31	657	Special textile fabrics and related products	3.29
762	Radio-broadcast receivers	5.30	266	Synthetic fibers suitable for spinning	3.26
034	Fish, fresh (live or dead), chilled or frozen	5.02	656	Tulle, lace, embroidery, ribbons	3.17
842	Outer garments, men's, of textile fabrics	5.00	693	Wire products and fencing grills	2.87
894	Baby carriages, toys, games	4.19	697	Household equipment of base metal, n.e.s.	2.79
691	Structures & parts of structures (from iron, steel)	3.98	625	Rubber tyres, tyre cases, etc. for wheels	2.71
697	Household equipment of base metal, n.e.s.	3.97	674	Plates and sheets, of iron or steel	2.53
625	Rubber tyres, tyre cases, etc. for wheels	3.54	844	Under garments of textile fabrics	2.48

Note: formula to calculate RCA index is the same as in Table 1a.
Source: see Table 1a.

Table 2b. Ranked RCA indices for Korean exports (below top 10%).

SITC code and product category		1980-1987	SITC code and product category		1988-1996
036	Crustaceans and mollusks, fresh, chilled, frozen	2.90	037	Fish, crustaceans and mollusks	2.23
651	Textile yarn	2.82	612	Manufactures of leather	2.23
694	Nails, screws, nuts, bolts etc. of iron, steel	2.73	845	Outer garments and other articles, knitted	2.17
718	Other power generating machinery and parts	2.70	843	Outer garments, women's, of textile fabrics	2.15
658	Made-up articles, wholly/chiefly of textile	2.70	775	Household type, elect.& non-electrical equipment	2.13
037	Fish, crustaceans and mollusks	2.62	691	Structures & parts of structures (iron, steel)	2.13
612	Manufactures of leather	2.57	764	Telecommunications equipment and parts	2.09
672	Ingots and other primary forms, of iron or steel	2.56	661	Lime, cement, and fabricated construction materials	1.98
674	Universals, plates and sheets, of iron or steel	2.45	511	Hydrocarbons n.e.s.,& their derivatives	1.96
657	Special textile fabrics and related products	2.45	679	Iron & steel castings, forgings & stampings	1.91
666	Pottery	2.28	034	Fish, fresh (live or dead),chilled or froze	1.89
898	Musical instruments, parts and accessories	2.21	783	Road motor vehicles, n.e.s.	1.79
678	Tubes, pipes and fittings, of iron or steel	2.06	651	Textile yarn	1.76
771	Electric power machinery and parts thereof	2.01	899	Other miscellaneous manufactured articles	1.73
677	Iron/steel wire/wheth/not coated	1.99	846	Under garments, knitted or crocheted	1.71
673	Iron and steel bars, rods, angles, shapes	1.94	884	Optical goods, n.e.s.	1.54
899	Other miscellaneous manufactured articles	1.93	658	Made up chiefly/chiefly of text.ma	1.54
884	Optical goods, n.e.s.	1.80	583	Polymerization and copolymerization produc	1.44
883	Cinematograph film,exposed & developed	1.78	842	Outer garments,men's,of textile fabrics	1.43
885	Watches and clocks	1.77	894	Baby carriages,toys,games and sporting goods	1.42
035	Fish dried, salted	1.77	036	Crustaceans and molluscs,fresh,chilled,frozen	1.39
121	Tobacco	1.74	771	Electric power machinery and parts thereof	1.33
775	Household elect. & non-electrical equipment	1.69	752	Automatic data processing machines & units	1.27
676	Rails and railway track construction materials	1.63	678	Tubes, pipes and fittings, of iron or steel	1.27
562	Fertilizers, manufactured	1.62	673	Iron and steel bars, rods	1.24
652	Cotton fabrics, woven	1.61	582	Condensation, polycondensation	1.21
273	Stone, sand and gravel	1.43	871	Optical instruments and apparatus	1.20
764	Telecommunications equipment and parts	1.36	694	Nails, screws, nuts, bolts etc. of iron, steel	1.19
679	Iron & steel castings, forgings & stampings	1.31	292	Crude vegetable materials, n.e.s.	1.15
292	Crude vegetable materials, n.e.s.	1.28	652	Cotton fabrics, woven	1.07
773	Equipment for distributing electricity	1.20	897	Jewellery, goldsmiths	0.99
635	Wood manufactures, n.e.s.	1.17	513	Carboxylic acids,& their anhydrides	0.98
871	Optical instruments and apparatus	1.16	062	Sugar confectionery and other sugar preparations	0.97
699	Manufactures of base metal, n.e.s.	1.12	686	Zinc	0.97
634	Veneers, plywood, improved or reconstituted	1.11	334	Petroleum products, refined	0.95
098	Edible products and preparations n.e.s.	1.04	781	Passenger motor cars	0.93

Note: formula to calculate RCA index is the same as in Table 1a.
Source: see Table 1a.

Table 3a. Ranked RCA indices for Taiwanese exports (top 10%).

SITC code and product category		1980-1987	SITC code and product category		1988-1996
831	Travel goods, handbags, briefcases, purses	16.48	785	Motorcycles, motor scooters	9.57
894	Baby carriages, toys, games and sporting goods	11.82	655	Knitted or crocheted fabrics	7.37
785	Motorcycles, motor scooters	11.67	694	Nails, screws, nuts, bolts etc. of iron, steel,	5.18
635	Wood manufactures, n.e.s.	10.81	894	Baby carriages, toys, games and sporting goods	4.87
851	Footwear	9.82	657	Special textile fabrics and related products	4.59
845	Outer garments and other articles, knitted	8.45	612	Manufactures of leather	4.26
899	Other miscellaneous manufactured articles	7.91	656	Tulle, lace, embroidery, ribbons	4.13
666	Pottery	6.49	666	Pottery	3.78
842	Outer garments, men's	6.41	653	Fabrics, woven, of man-made fibers	3.67
655	Knitted or crocheted fabrics	6.14	899	Other miscellaneous manufactured articles	3.59
056	Vegetables, roots & tubers	5.33	812	Sanitary, plumbing, heating, lighting fixtures	3.55
893	Articles of materials	5.31	266	Synthetic fibers suitable for spinning	3.41
697	Household equipment of base metal, n.e.s.	5.27	752	Automatic data processing machines & units	3.30
612	Manufactures of leather	5.21	831	Travel goods, handbags, briefcases, purses	3.19
846	Under garments, knitted or crocheted	5.05	697	Household equipment of base metal, n.e.s.	3.11
764	Telecommunications equipment and parts	4.80	037	Fish, crustaceans and mollusks	3.03
821	Furniture and parts thereof	3.86	751	Office machines	2.93
694	Nails, screws, nuts, bolts etc. of iron, steel	3.79	771	Electric power machinery and parts thereof	2.87
034	Fish, fresh (live or dead), chilled or frozen	3.79	651	Textile yarn	2.79
657	Special textile fabrics and related products	3.63	695	Tools for use in hand or in machines	2.77
847	Clothing accessories of textile fabrics	3.55	884	Optical goods, n.e.s.	2.76
653	Fabrics, woven, of man-made fibers	3.48	291	Crude animal materials, n.e.s.	2.69

Note: formula to calculate RCA index is the same as in Table 1a.
Source: see Table 1a.

Table 3b. Ranked RCA indices for Taiwanese exports (below top 10%).

SITC code and product category		1980-1987	SITC code and product category		1988-1996
848	Articles of apparel & clothing accessories	3.47	034	Fish, fresh (live or dead),chilled or froze	2.62
291	Crude animal materials, n.e.s.	3.43	821	Furniture and parts thereof	2.55
037	Fish, crustaceans and mollusks	3.39	895	Office and stationery supplies, n.e.s.	2.47
696	Cutlery	3.37	611	Leather	2.43
651	Textile yarn	3.37	893	Articles of materials	2.36
884	Optical goods, n.e.s.	3.31	699	Manufactures of base metal, n.e.s.	2.27
695	Tools for use in hand or in machines	3.14	696	Cutlery	2.25
759	Parts of and accessories suitable for office machines	3.09	724	Textile & leather machinery and parts	2.23
812	Sanitary, plumbing, heating, lighting fixture	2.99	851	Footwear	2.19
679	Iron & steel castings, forgings & stampings	2.71	635	Wood manufactures, n.e.s.	2.08
775	Household elect.& non-electrical equipment	2.54	776	Thermionic, cold & photo-cathode valves	2.00
656	Tulle, lace, embroidery, ribbons	2.53	848	Articles of apparel & clothing accessories	1.91
036	Crustaceans and mollusks, fresh, chilled	2.45	845	Outer garments and other articles, knitted	1.90
895	Office and stationery supplies, n.e.s.	2.42	772	Electrical appliances such as switches, relays	1.75
266	Synthetic fibers suitable for spinning	2.19	773	Equipment for distributing electricity	1.74
771	Electric power machinery and parts thereof	2.15	847	Clothing accessories of textile fabrics	1.62
652	Cotton fabrics, woven	2.12	583	Polymerization products	1.59
661	Construction machinery	2.07	736	Mach. tools for working metal	1.55
699	Manufactures of base metal, n.e.s.	2.06	628	Articles of rubber, n.e.s.	1.52
885	Watches and clocks	1.97	778	Electrical machinery and apparatus, n.e.s.	1.50
716	Rotating electric plant and parts	1.96	775	Household elect.& non-electrical equipment	1.49
693	Wire products and fencing grills	1.86	652	Cotton fabrics, woven	1.42
776	Thermionic, cold & photo cathode valves	1.84	764	Telecommunications equipment and parts	1.41
844	Under garments of textile fabrics	1.78	871	Optical instruments and apparatus	1.40
786	Trailers & other vehicles, not motorized	1.77	658	Made-up articles, wholly/chiefly of textile materials	1.37
724	Textile & leather machinery and parts	1.71	011	Meat, edible fresh, chilled	1.35
058	Fruits	1.65	728	Machinery & equipment, specialized	1.25
658	Textile materials	1.39	881	Photographic apparatus and equipment, n.e.s.	1.25
665	Glassware	1.39	716	Rotating electric plant and parts	1.23
736	Mach. tools for working metal	1.28	582	Condensation, polycondensation & polyadditives	1.18
773	Equipment for distributing electricity	1.24	725	Paper & pulp mill machinery	1.08
625	Rubber tyres, tyre cases, etc. for wheels	1.23	885	Watches and clocks	1.07
054	Vegetables ,fresh, chilled, frozen	1.18	056	Vegetables, roots & tubers	1.06
778	Electrical machinery and apparatus, n.e.s.	1.17	233	Synth. rubber	1.05
628	Articles of rubber, n.e.s.	1.13	761	Television receivers	1.03
772	Electrical appliances such as switches, relays	1.13	842	Outer garments, men's, of textile fabrics	1.02
897	Jewellery, goldsmiths	1.06	897	Jewellery, goldsmiths	0.99
881	Photographic apparatus and equipment, n.e.s.	1.06	762	Radio-broadcast receivers	0.97

Note: formula to calculate RCA index is the same as in Table 1a.
Source: see Table 1a.

Table 4a. Spearman rank correlations between Japanese and Korean RCA indices (1986-1996).

	KOR80	KOR81	KOR82	KOR83	KOR84	KOR85	KOR86	KOR87	KOR88	KOR89	KOR90	KOR91	KOR92	KOR93	KOR94	KOR95	KOR96
JPN80	**0.432**	0.479	0.484	0.490	0.544	0.546	0.560	0.578	0.598	0.590	0.610	0.620	0.634	0.648	0.665	0.664	0.661
JPN81	0.414	**0.462**	0.468	0.476	0.528	0.534	0.548	0.562	0.589	0.581	0.601	0.610	0.624	0.639	0.657	0.658	0.653
JPN82	0.415	0.469	**0.477**	0.485	0.535	0.542	0.554	0.573	0.598	0.588	0.604	0.615	0.628	0.643	0.658	0.665	0.663
JPN83	0.402	0.449	0.458	**0.468**	0.515	0.524	0.538	0.557	0.582	0.570	0.586	0.594	0.606	0.624	0.640	0.646	0.648
JPN84	0.394	0.435	0.446	0.458	**0.495**	0.511	0.528	0.543	0.572	0.559	0.581	0.589	0.601	0.616	0.635	0.644	0.645
JPN85	0.385	0.424	0.434	0.447	0.480	**0.500**	0.517	0.528	0.563	0.553	0.575	0.585	0.599	0.615	0.635	0.647	0.644
JPN86	0.356	0.393	0.408	0.422	0.452	0.473	**0.490**	0.500	0.531	0.525	0.550	0.564	0.579	0.595	0.616	0.626	0.622
JPN87	0.329	0.364	0.378	0.392	0.421	0.442	0.456	**0.470**	0.505	0.498	0.525	0.541	0.557	0.572	0.592	0.611	0.615
JPN88	0.304	0.344	0.359	0.378	0.405	0.419	0.428	0.443	**0.481**	0.477	0.507	0.525	0.542	0.555	0.578	0.594	0.600
JPN89	0.296	0.338	0.355	0.375	0.403	0.415	0.420	0.437	0.471	**0.469**	0.498	0.519	0.536	0.556	0.578	0.591	0.594
JPN90	0.273	0.317	0.334	0.351	0.382	0.399	0.403	0.416	0.450	0.451	**0.481**	0.502	0.520	0.540	0.562	0.577	0.579
JPN91	0.273	0.315	0.335	0.352	0.382	0.400	0.402	0.416	0.446	0.448	0.476	**0.498**	0.517	0.541	0.564	0.577	0.574
JPN92	0.275	0.313	0.336	0.353	0.381	0.398	0.404	0.416	0.445	0.446	0.477	0.499	**0.520**	0.541	0.565	0.578	0.578
JPN93	0.267	0.308	0.336	0.352	0.380	0.397	0.401	0.412	0.441	0.443	0.473	0.495	0.514	**0.536**	0.559	0.572	0.575
JPN94	0.258	0.294	0.324	0.342	0.367	0.385	0.387	0.396	0.423	0.429	0.459	0.480	0.499	0.517	**0.546**	0.557	0.557
JPN95	0.241	0.277	0.306	0.325	0.350	0.368	0.369	0.378	0.406	0.411	0.445	0.466	0.488	0.508	0.534	**0.552**	0.555
JPN96	0.235	0.269	0.298	0.314	0.335	0.355	0.357	0.361	0.391	0.398	0.432	0.454	0.480	0.501	0.529	0.543	**0.545**

Source: see Table 1a.

Note: test for time trend in the cross-country correlations in the mean diagonal: 0.827 (p-value equals 0.000);
test for time trend in the cross-country correlations in the first row: 0.988 (p-value equals 0.000).

Table 4b. P-values for Spearman rank correlations between Japanese and Korean RCA indices (1986-1996).

	KOR80	KOR81	KOR82	KOR83	KOR84	KOR85	KOR86	KOR87	KOR88	KOR89	KOR90	KOR91	KOR92	KOR93	KOR94	KOR95	KOR96
JPN80	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN81	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN82	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN83	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN84	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN85	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN86	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN87	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN88	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN89	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN90	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000
JPN91	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000
JPN92	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000
JPN93	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000
JPN94	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
JPN95	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
JPN96	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**

Note: p-value close to zero indicates significant correlation.

Table 5a. Spearman rank correlations between Japanese and Taiwanese RCA indices (1986-1996).

	TWN80	TWN81	TWN82	TWN83	TWN84	TWN85	TWN86	TWN87	TWN88	TWN89	TWN90	TWN91	TWN92	TWN93	TWN94	TWN95	TWN96
JPN80	**0.374**	0.379	0.387	0.410	0.410	0.416	0.460	0.483	0.457	0.447	0.456	0.475	0.497	0.548	0.566	0.591	0.613
JPN81	0.365	**0.379**	0.386	0.410	0.408	0.422	0.461	0.482	0.456	0.448	0.456	0.477	0.499	0.549	0.568	0.592	0.614
JPN82	0.360	0.374	**0.382**	0.404	0.404	0.422	0.457	0.479	0.453	0.445	0.451	0.469	0.493	0.542	0.559	0.583	0.606
JPN83	0.348	0.364	0.371	**0.396**	0.399	0.414	0.452	0.474	0.452	0.443	0.450	0.469	0.491	0.542	0.557	0.581	0.605
JPN84	0.333	0.351	0.354	0.379	**0.381**	0.404	0.434	0.456	0.437	0.428	0.435	0.454	0.481	0.534	0.546	0.567	0.601
JPN85	0.333	0.354	0.356	0.380	0.384	**0.403**	0.441	0.463	0.440	0.432	0.440	0.458	0.488	0.541	0.551	0.572	0.604
JPN86	0.301	0.328	0.332	0.357	0.362	0.384	**0.419**	0.442	0.419	0.414	0.423	0.441	0.469	0.528	0.541	0.562	0.595
JPN87	0.279	0.307	0.313	0.333	0.341	0.363	0.392	**0.415**	0.394	0.386	0.401	0.418	0.446	0.503	0.519	0.545	0.583
JPN88	0.272	0.296	0.301	0.323	0.334	0.349	0.380	0.404	**0.379**	0.377	0.390	0.408	0.441	0.500	0.514	0.539	0.580
JPN89	0.272	0.299	0.304	0.325	0.338	0.345	0.385	0.411	0.384	**0.379**	0.394	0.411	0.445	0.505	0.521	0.545	0.582
JPN90	0.251	0.278	0.284	0.304	0.314	0.323	0.362	0.387	0.363	0.356	**0.372**	0.391	0.427	0.488	0.507	0.530	0.571
JPN91	0.245	0.276	0.283	0.304	0.312	0.319	0.361	0.384	0.363	0.357	0.372	**0.391**	0.427	0.487	0.506	0.531	0.571
JPN92	0.234	0.269	0.278	0.297	0.302	0.311	0.351	0.374	0.355	0.345	0.360	0.380	**0.413**	0.476	0.496	0.524	0.564
JPN93	0.234	0.267	0.275	0.294	0.299	0.307	0.343	0.365	0.348	0.337	0.352	0.373	0.406	**0.468**	0.490	0.517	0.559
JPN94	0.228	0.258	0.267	0.285	0.284	0.290	0.318	0.347	0.331	0.320	0.334	0.354	0.389	0.455	**0.475**	0.505	0.543
JPN95	0.225	0.255	0.263	0.280	0.278	0.288	0.314	0.340	0.322	0.310	0.327	0.348	0.385	0.450	0.471	**0.501**	0.542
JPN96	0.205	0.240	0.250	0.268	0.266	0.275	0.301	0.328	0.311	0.299	0.316	0.338	0.374	0.445	0.465	0.495	**0.536**

Source: see Table 1a.

Note: test for time trend in the cross-country correlations in the mean diagonal: 0.636 (p-value equals 0.006);
test for time trend in the cross-country correlations in the first row: 0.944 (p-value equals 0.000).

Table 5b. P-values for Spearman rank correlations between Japanese and Taiwanese RCA indices (1986-1996).

	TWN80	TWN81	TWN82	TWN83	TWN84	TWN85	TWN86	TWN87	TWN88	TWN89	TWN90	TWN91	TWN92	TWN93	TWN94	TWN95	TWN96
JPN80	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN81	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN82	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN83	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN84	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN85	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN86	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN87	0.001	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN88	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN89	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JPN90	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000
JPN91	0.004	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000
JPN92	0.005	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000
JPN93	0.005	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000
JPN94	0.007	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
JPN95	0.007	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
JPN96	0.015	0.004	0.003	0.001	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**

Note: p-value close to zero indicates significant correlation.

Table 6a. Spearman rank correlations between Korean and Taiwanese RCA indices (1986-1996).

	TWN80	TWN81	TWN82	TWN83	TWN84	TWN85	TWN86	TWN87	TWN88	TWN89	TWN90	TWN91	TWN92	TWN93	TWN94	TWN95	TWN96
KOR80	**0.649**	0.636	0.639	0.622	0.636	0.658	0.650	0.637	0.680	0.676	0.659	0.644	0.617	0.598	0.589	0.598	0.590
KOR81	0.670	**0.656**	0.664	0.644	0.657	0.688	0.679	0.669	0.708	0.704	0.683	0.666	0.646	0.624	0.615	0.627	0.618
KOR82	0.652	0.649	**0.659**	0.639	0.648	0.677	0.666	0.652	0.691	0.688	0.669	0.652	0.636	0.615	0.604	0.614	0.606
KOR83	0.648	0.653	0.665	**0.653**	0.662	0.682	0.685	0.674	0.697	0.699	0.680	0.666	0.656	0.638	0.623	0.628	0.615
KOR84	0.654	0.652	0.668	0.663	**0.668**	0.685	0.698	0.688	0.684	0.683	0.661	0.654	0.639	0.620	0.617	0.630	0.612
KOR85	0.621	0.633	0.647	0.646	0.658	**0.674**	0.696	0.677	0.672	0.668	0.648	0.639	0.631	0.623	0.620	0.628	0.610
KOR86	0.625	0.633	0.646	0.647	0.657	0.684	**0.709**	0.688	0.679	0.678	0.655	0.646	0.634	0.629	0.630	0.633	0.617
KOR87	0.614	0.624	0.634	0.637	0.651	0.680	0.704	**0.690**	0.674	0.682	0.652	0.639	0.627	0.621	0.624	0.631	0.612
KOR88	0.634	0.657	0.672	0.676	0.685	0.710	0.736	0.728	**0.711**	0.716	0.691	0.678	0.672	0.665	0.672	0.677	0.662
KOR89	0.642	0.667	0.686	0.691	0.696	0.713	0.739	0.734	0.722	**0.729**	0.707	0.696	0.689	0.686	0.693	0.701	0.686
KOR90	0.630	0.646	0.661	0.667	0.673	0.701	0.721	0.716	0.711	0.715	**0.696**	0.688	0.684	0.686	0.697	0.704	0.694
KOR91	0.615	0.627	0.643	0.652	0.660	0.684	0.715	0.710	0.703	0.707	0.687	**0.684**	0.683	0.686	0.700	0.710	0.700
KOR92	0.586	0.596	0.611	0.618	0.626	0.654	0.683	0.681	0.677	0.681	0.664	0.659	**0.664**	0.670	0.681	0.696	0.693
KOR93	0.560	0.574	0.589	0.607	0.615	0.621	0.667	0.664	0.655	0.660	0.648	0.646	0.658	**0.663**	0.673	0.689	0.686
KOR94	0.541	0.550	0.564	0.582	0.591	0.604	0.652	0.653	0.639	0.648	0.637	0.633	0.646	0.663	**0.674**	0.684	0.683
KOR95	0.518	0.535	0.549	0.561	0.570	0.589	0.620	0.623	0.611	0.615	0.615	0.609	0.629	0.636	0.643	**0.665**	0.670
KOR96	0.506	0.508	0.523	0.534	0.549	0.573	0.596	0.600	0.590	0.592	0.595	0.594	0.620	0.630	0.639	0.662	**0.666**

Source: see Table 1a.

Note: test for time trend in the cross-country correlations in the mean diagonal: 0.325 (p-value equals 0.203);
test for time trend in the cross-country correlations in the first row: -0.449 (p-value equals 0.071).

Table 6b. P-values for Spearman rank correlations between Korean and Taiwanese RCA indices (1986-1996).

	TWN80	TWN81	TWN82	TWN83	TWN84	TWN85	TWN86	TWN87	TWN88	TWN89	TWN90	TWN91	TWN92	TWN93	TWN94	TWN95	TWN96
KOR80	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KOR81	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KOR82	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KOR83	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KOR84	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KOR85	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KOR86	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KOR87	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KOR88	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KOR89	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KOR90	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000
KOR91	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000
KOR92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000
KOR93	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000	0.000
KOR94	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
KOR95	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
KOR96	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**

Note: p-value close to zero indicates significant correlation.

Table 7. Sectors of Potential trade diversion from Taiwan to Japan in the Korean Market.

SITC	Sector	RCA		Exports of Taiwan to Korea		
		Japan	Taiwan	Mean	Maximum	in year
233	Synth. rubber	1.27	1.05	4.1	5.8	1988
266	Synthetic fibers suitable for spinning	1.40	3.41	8.2	20.5	1990
628	Articles of rubber, n.e.s.	1.74	1.52	2.2	4.5	1996
653	Fabrics, woven of man-made fibers	1.12	3.67	28.6	42.2	1994
666	Pottery	1.07	3.78	0.4	0.8	1996
694	Nails, screws, nuts, bolts etc. of iron, steel	1.39	5.18	2.9	7.0	1996
695	Tools for use in hand or in machines	1.35	2.77	11.1	18.6	1996
696	Cutlery	1.20	2.25	0.2	0.6	1996
716	Rotating electric plant and parts	1.70	1.23	26.2	34.0	1988
724	Textile & leather machinery and parts	2.09	2.23	12.8	17.8	1995
728	Mach. & equipment specialized for particular purposes	1.48	1.25	19.3	38.8	1996
736	Machine tools for working metal machinery	2.10	1.55	27.5	36.5	1995
751	Office machines	1.73	2.93	55.6	142.5	1996
752	Automatic data processing machines & units	1.89	3.30	69.5	141.5	1996
761	Television receivers	1.40	1.03	0.2	0.7	1995
764	Telecommunications equipment and parts	3.09	1.41	58.6	74.0	1995
771	Electric power machinery and parts thereof	1.43	2.87	14.8	20.1	1988
772	Elect. apparatus such as switches, relays, fuses	1.85	1.75	42.8	65.2	1996
776	Thermionic, cold & photo-cathode valves	2.35	2.00	316.0	793.4	1996
778	Electrical machinery and apparatus, n.e.s.	2.14	1.50	30.4	39.6	1996
785	Motorcycles, motor scooters	2.23	9.57	13.2	20.0	1988
871	Optical instruments and apparatus	2.85	1.40	6.2	13.5	1996
881	Photographic apparatus and equipment, n.e.s.	4.07	1.25	14.9	21.2	1989
884	Optical goods, n.e.s.	2.42	2.76	2.0	2.3	1996
885	Watches and clocks	1.58	1.07	5.8	10.8	1995
895	Office and stationery supplies, n.e.s.	1.98	2.47	3.7	7.4	1996

Note: Exports are in millions of US dollars in current prices.

Table 8. Tariff protection in Korea and Potential Trade Diversion: Sectors in which Exports of Taiwan and Japan Compete

		Tariff protection in Korea			*Exports of Japan to Korea*			*Exports of Taiwan to Korea*		
ISIC	Sector	Average	Range	St. dev.	Mean	Maximum	in year	Mean	Maximum	in year
311	Food products	22.4	3-58	13.7	48.3	68.3	1999	27.4	54.1	1996
312	Food manufacturing	9.5	5-40	7.9	30.0	40.2	1997	3.5	7.1	1991
313	Beverages	25.4	5-30	9.1	3.3	6.4	1995	1.3	2.8	1991
314	Tobacco	40.0	40	0.0	53.1	135.6	1995	0.0	0.1	1995
321	Textiles	8.2	0.30	2.5	386.0	476.7	1991	145.3	210.6	1996
322	Wearing apparel	8.0	8	0.0	21.0	34.6	1997	4.5	9.4	1995
323	Leather products	8.0	8	0.0	48.1	111.1	1990	35.1	71.6	1996
324	Footwear	8.0	8	0.0	7.4	12.9	1991	11.8	20.4	1990
331	Wood products	9.4	8-30	5.0	18.0	37.1	1996	8.2	19.0	1996
332	Furniture & fixtures	8.0	8	0.0	16.5	31.7	1990	4.6	14.0	1990
341	Paper, paper products	8.0	8	0.0	137.1	186.5	1995	16.4	38.3	1996
342	Printing & publishing	3.1	0-8	3.9	26.4	31.2	1995	1.6	3.6	1990
351	Industrial chemicals, fertilizers	8.0	8	0.0	2,802.8	3,744.8	1995	292.3	530.2	1996
352	Chemical products	8.1	0-21.3	2.9	883.6	1,128.2	1994	31.6	86.4	1995
353	Petroleum refineries	7.0	1-8	1.7	390.1	832.0	1995	14.7	27.3	1999
354	Coal and petroleum products	8.0	8	0.0	80.4	117.9	1996	4.7	15.2	1995
355	Rubber products	7.6	1-8	1.2	106.9	151.7	1995	4.3	9.1	1993
356	Plastic products	8.0	8	0.0	73.0	94.4	1997	25.1	40.9	1996
361	Pottery, china, etc.	8.0	8	0.0	119.6	152.8	1990	2.1	4.6	1996
362	Glass products	8.0	8	0.0	219.3	376.3	1995	16.0	27.8	1991
369	Non-metallic mineral products	8.0	8	0.0	154.3	262.7	1996	6.0	7.8	1994
371	Iron & steel	7.3	1-8	1.5	1,648.7	2,347.1	1995	53.8	117.7	1996
372	Non-ferrous metals	8.0	8	0.0	476.3	665.1	1995	40.7	62.5	1995
381	Metal products	8.0	8	0.0	859.8	1,361.3	1995	54.7	93.8	1990
382	Non-electrical machinery	7.7	0-20	1.2	5,105.4	7,463.6	1996	285.9	504.7	1996
383	Electrical machinery	7.9	0-20	2.1	5,445.8	7,237.4	1999	588.5	1,136.3	1996
384	Transportation equipment	6.7	0-10	3.2	783.7	1,106.2	1995	31.6	90.5	1999
385	Precision instruments	8.0	0-15	0.8	1,586.6	2,679.7	1995	38.6	79.8	1999
39	Other manufacturing	7.9	0-23	2.4	183.0	239.6	1997	45.2	68.1	1999

Note: Exports are in millions of US dollars in current prices.