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The United States-Korea Free Trade Agreement (KORUS) and Its Impact on China's Textile and Apparel Exports to the United States

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Abstract

This study is an empirical evaluation of the impact of the U.S.-Korea Free Trade Agreement (KORUS) on China's textile and apparel (T&A) exports to the United States, with special focus on potential trade diversion effects of the agreement. On the basis of estimated export similarity index and trade elasticity of substitution values for T&A products of China and South Korea, trade diversion caused by the KORUS is predicted to most strongly affect China's apparel exports (in HS Chapters 60-63). The KORUS may also affect China's exports in other T&A categories (in HS Chapters 51, 52, 56, 57 and 59), but results suggest the effects will be limited. This study contributes to understanding the T&A-specific sectoral impacts of the KORUS and suggests a need to reconsider the competitiveness of China's T&A exports in the era following elimination in 2005 of Multi-Fiber Arrangement quantitative trade restrictions.

Keywords: U.S.-Korea Free Trade Agreement, textile and apparel, trade diversion effect

After years of waiting and debates, the U.S. Congress officially passed the U.S.-Korea Free Trade Agreement (KORUS) on October 20, 2011, which is widely recognized as THE most economically influential free trade agreement for the United States since the North America Free Trade Agreement (NAFTA) in 1994 (U.S. International Trade Commission [USITC], 2007; U.S. Trade Representative Office [USTR], 2011). The United States and South Korea first reached the KORUS in June 2007 and then signed a renegotiated version in December 2010. The KORUS is a comprehensive bilateral trade deal with wide coverage, including trade in goods and services, trade-related investment and government procurement issues (White House, 2011). It is estimated that the tariff cut arrangement alone in the KORUS could create over $10 billion[1] of additional merchandise exports annually for both countries (White House, 2011).

The textile and apparel (T&A) sector is one important component of the KORUS. Implementation of the agreement is expected to have direct impacts on related trade flows. According to estimates by the U.S. International Trade Commission, the KORUS can help South Korea increase its annual textile and apparel exports to the United States by $1.7 billion-$1.8 billion and $1.0 billion-$1.2 billion respectively (USITC, 2007) (a substantial boost to South Korea's $600 million of textile exports and $260 million of apparel exports to the United States in 2010 (Office of Textiles and Apparel [OTEXA], 2012). Correspondingly, the KORUS is estimated to increase the access of U.S.-produced T&A to South Korea's domestic market by $520 million-$590 million annually (USITC, 2007).

Potential impacts of the KORUS are not limited to the United States and South Korea alone, and extend to China, a critical stakeholder as the largest T&A supplier to the United States. On one hand, the trade diversion effects of this free trade agreement imply that China could lose U.S. market share in T&A products when competing South Korean products are no

longer subject to the current high tariff rates of 8%-30% after the KORUS tariff cuts are implemented (Clausing, 2001; USITC, 2007). On the other hand, China's demonstrated competitiveness and capacity in T&A exports raised concerns among U.S. T&A producers even while the KORUS was being negotiated. Under pressure from U.S. industry interest groups, the final version of the KORUS was written to include key clauses and mechanisms meant to curb some of China's current trade patterns and export behaviors (National Council of Textile Organizations [NCTO], 2011).

The main purpose of this study is to quantify the effects of the implementation of the KORUS on the quantity of China's T&A exports to the United States. Although some studies have provided assessments of economic impacts of the KORUS, most have focused on bilateral trade flows between the United States and South Korea at aggregated product levels (Cooper, Manyin, Jones, Cooney & Jurenas, 2011; Industry Trade Advisory Committee on Textiles and Clothing [ITAC], 2007; USITC, 2007). Results of this study will instead make important contributions to understanding the T&A-specific sectoral impacts of the KORUS, particularly its potential trade diversion effects. Additionally, China was expected to become the single largest T&A exporter, leaving many other suppliers as losers after the Agreement on Textiles and Clothing expired in 2005, eliminating the quantitative trade restrictions established under the Multi-Fiber Arrangement (Nordås, 2004). Results of this study will add a new trade policy factor (i.e., the KORUS free trade agreement) into considerations of the competitiveness of China's T&A exports at a disaggregated product level (i.e., the 2-digit Harmonized System code level instead of "textile products" or "apparel products" as a whole).

The paper is composed of four parts. The second part provides an overview of the key T&A clauses in the KORUS and related theories and empirical studies. A firm understanding of

the "rules of the game" is a prerequisite to analyzing its impacts (Wall & Dickerson, 1989). The third part is a detailed description of the research methods and data source of this study. The fourth part presents the empirical results and discussion of them. And the last part includes key findings and discussion of future research agendas.

Literature Review

Review of the Legal Text of the KORUS

Chapter 2 and Chapter 4 of the KORUS contain key clauses related to T&A. Specifically, Chapter 2 provides the detailed tariff reduction schedule for each T&A item at the 10-digit Harmonized System (HS) code level, and Chapter 4 stipulates the rules for determining product country of origin, customs enforcement, and other trade-related measures. On the basis of the legal texts, the potential impacts of the KORUS on China's T&A exports to the United States are concentrated in the following three areas:

Tariff cuts on South Korea's T&A exports to the United States. T&A imports are currently among the U.S. imports subject to peak tariffs, with applied weighted average rates up to 16.5% for apparel and 11.0% for other textile products (USITC, 2007). The KORUS requires the United States to gradually eliminate all tariffs on T&A imports from South Korea over a 10-year period (ITAC, 2007). This implies that the KORUS will imminently create price advantages in the U.S. market for T&A products from South Korea that directly compete with those from China, with the price advantages corresponding to the tariff reduction magnitudes (Table 1). In such case, the KORUS may result in market access conditions for China that are so unfavorable that a decline occurs in both its T&A exports to the United States and its U.S. T&A market share (Cooper et al., 2011; USITC, 2007).

Table 1 Here

Restrictive rules of origin. Similar to the NAFTA and Central America-Dominican Republic Free Trade Agreement (CAFTA-DR), the KORUS specifies the "yarn-forward" rules of origin. These rules require yarn production and all subsequent fabrication in either the United States or South Korea for T&A products to qualify for the KORUS duty rate (Gelb, 2003). Unlike the NAFTA and CAFTA-DR, however, the KORUS includes neither a "tariff preferential level" (TPL) nor an "accumulation clause". Either of these two clauses in a free trade agreement typically allows T&A products traded between members of the agreement to qualify for the preferential duty rate in the agreement even if composed of textile intermediates produced in a nonmember country. A relevant side point is that regional T&A production networks have operated in Asia for decades. These include a vertical division of labor between the T&A industries of South Korea and China. For example, South Korean firms export fabric and yarns to China where these materials are used to produce apparel exported to markets around the world (Dickerson, 1999). The omission of a TPL and accumulation clause from the KORUS is said to be intended to avoid loopholes for China to take advantage of preferential market access benefits of the agreement (ITAC, 2007).

Strict border enforcement. KORUS Article 4.3 explicitly requires South Korean firms to obtain and keep all records and documentation of the production and distribution of their T&A exports to the United States. It also authorizes U.S. officials to conduct on-site inspections of South Korean factories without prior notification. If illegal transshipment or any other violation of the rules of origin is found, the United States can take actions that include nullifying the eligibility of involved South Korean products for the KORUS duty rate. The border enforcement

rules articulated in the KORUS are much stricter than those in the NAFTA or CAFTA-DR, with the intent to deter illegal transshipment of products produced in China (ITAC, 2007).

In summary, implementation of the KORUS will affect bilateral trade flows between the United States and not only South Korea, but also China as an important stakeholder. On the basis of the legal texts, the most imminent direct impacts of the KORUS will likely come from the tariff reduction plan in the agreement. The rules of origin and border measures may also matter, but their impacts are potential and depend on enforcement of them. In light of these issues, the rest of the paper focuses on evaluating the impacts of the KORUS on China's T&A exports to the United States, specifically in terms of the tariff-cut clause in the agreement.

Trade Diversion Effects of the KORUS: Theoretical View

The KORUS is expected to affect China's T&A exports to the United States mainly through its trade diversion effects. As a common result of free trade agreements, trade diversion occurs when importers in a member country of such an agreement substitute imports from a lower-cost nonmember with imports from a higher-cost member that enjoys the preferential duty rates in the agreement (Aitken, 1973). Potential trade diversion caused by the KORUS and its impact on China's T&A exports to the United States can be shown theoretically as follows:

Assume that the T&A exports of China and South Korea to the United States in a particular product category in the Harmonized System are substitutes for each other, but not identical due to differences such as quality, brand, and consumer preferences (Carlton & Perloff, 2005). Therefore, according to the consumer model with differentiated products (Carlton & Perloff, 2005), the inverse demand functions in the U.S. market can be expressed as

$$p_c = Q - q_c - \delta q_k \quad (1)$$

$$p_k = Q - q_k - \delta q_c \quad (2)$$

In Equation 1 and Equation 2, Q denotes the total import demand in the United States; subscripts c and k respectively stand for China and South Korea; p and q refer respectively to the price of the exports of China or South Korea and the quantity of U.S. imports from China or South Korea in the T&A category in question; and $\delta(0 \le \delta \le 1)$ refers to the elasticity of substitution of the products of China and South Korea in this T&A category. The more mutually substitutable are the products of China and South Korea in the T&A categories in question, the more intense the competition between such products of these countries in the U.S. market.

$$c(q_i) = f_i + c_i q_i \text{, where } i = c \text{ or } k \quad (3)$$

Equation 3 is the cost function of a typical Chinese or South Korean firm exporting T&A to the United States. The total production cost $c(q_i)$ includes fixed costs f_i and variable costs $c_i q_i$. On the basis of the cost function, the profit function of a typical Chinese or South Korean firm can be expressed as

$$\pi_c = (p_c - t_c)q_c - (f_c + c_c q_c) \quad (4)$$

$$\pi_k = (p_k - t_k)q_k - (f_k + c_k q_k) \quad (5)$$

where π stands for profit and t is the tariff rate at the U.S. border.

To find the maximum profit of the firm, take the first order derivative of Equation 4 and of Equation 5. After rearranging and solving the resulting equations, the equation for the optimum quantity q^* of the T&A exports of a Chinese or South Korean firm to the United States in the product category in question turns out to be

$$q_c^* = \frac{(2-\delta)Q + \delta t_k - 2t_c - 2c_c}{4 - \delta^2} \quad (6)$$

$$q_k^* = \frac{(2-\delta)Q + \delta t_c - 2t_k - 2c_k}{4-\delta^2} \quad (7)$$

Our particular interest in this study is how much the quantity of China's T&A exports to the United States will change as a result of the KORUS tariff cuts on U.S. T&A imports from South Korea. We therefore took the partial derivative of Equation 6 with respect to t_k:

$$\frac{\partial q_c^*}{\partial t_k} = \frac{\delta}{4-\delta^2} \quad (8)$$

Because $0 < \delta \leq 1$, $\frac{\partial q_c^*}{\partial t_k} > 0$. This means that, holding other factors constant, reduced tariffs on U.S. T&A imports from South Korea (t_k) will lead to a decline in China's T&A export quantity to the United States (q_c^*); that is, trade diversion caused by the KORUS theoretically will result in a decline in China's T&A exports to the United States.

Empirical Studies of Trade Diversion Effects of Free Trade Agreements

Although specific trade diversion effects of the KORUS are yet to be explored, numerous studies have made important contributions to understanding trade impacts of other free trade agreements.

Using least squares regression, Aitken (1973) found that the European Economic Community (ECC) and the European Free Trade Association (ETA) had resulted in reduced trade flows between members and nonmembers of the ECC and ETA during 1959-1967 and suggested the existence of consistent trade diversion effects of these two agreements. On the basis of elasticity of substitution estimates, Wylie (1995) argued that NAFTA had resulted in diverting away from North American countries significant amounts of exports, especially in textiles, apparel and leather, from non-NAFTA members. To evaluate trade diversion effects of

the United States-ASEAN Free Trade Agreement, Naya and Plummer (2006) compared the export similarity index for ASEAN and China's exports to the United States and used a gravity model to estimate the potential impact of the agreement on trade flows between relevant trading partners. The authors argued that due to the highly similar product structures of the exports of ASEAN countries and China to the United States, implementation of this free trade agreement would significantly strengthen the competitive position of ASEAN countries over China in the U.S. market. Given that many of Thailand's exports go to other ASEAN countries, particularly Indonesia, Malaysia, the Philippines, and Singapore, Pholphirul (2010) used export similarity index estimates and other indicators to assess the effect of reaching the ASEAN Free Trade Agreement on Thailand's exports to these markets. The study showed that due to the highly similar product structures of the exports of Thailand and other ASEAN members, the trade diversion caused by this free trade agreement would reduce Thailand's exports to other ASEAN markets, despite increased intra-ASEAN trade. Further, Fukao, Okubo, and Stern (2003) developed and estimated a fixed-effects model with panel data and used the results to argue that NAFTA had had substantial trade diversion effects in T&A to the benefit of Mexico in particular. The study also showed the trade diversion to be positively associated with the magnitude of NAFTA tariff cuts and the elasticity of substitution of competing products.

In summary, previous studies have indicated that free trade agreements commonly have trade diversion effects. This implies that the KORUS could lead to a decline in China's T&A exports to the United States as suggested theoretically. In addition, although the analytical tools have varied in previous studies, the studies indicate that the structural similarity and elasticity of substitution of the exports of the members and nonmembers of a free trade agreement are closely associated with the magnitude of the trade diversion effects of the agreement. These two

analytical tools have limitations, however. Export product similarity index values vary with the scope and specification of the product or industry sectors for which they are calculated (e.g., Naya et al., 2006; Pholphirul, 2010). Furthermore, such values alone are considered insufficient *ex ante* measures of trade diversion effects on trade flows (Magee, 2008). A weakness of elasticity of substitution estimates (e.g., Aiken, 1973; Fukao et al., 2003), however, is their sensitivity to the country samples selected, the time periods examined, and the control variables included in regression models used for the estimations (Magee, 2008).

Methodology and Data Source

In order to provide comprehensive estimates of the effects of the KORUS on China's T&A exports to the United States, the evaluation of these effects includes determining the structural similarity and elasticity of substitution of the T&A exports of China and South Korea to the United States because previous studies have shown that the trade diversion effects of a free trade agreement strongly depend on these two factors.

Structural Similarity of the T&A Exports of China and South Korea to the United States

Because the KORUS tariff reduction schedule covers nearly all T&A product categories (HS Chapters 50-63), it is necessary to evaluate the overall structural similarity of the T&A exports of China and South Korea to the United States. A highly similar export structure would imply strong competition between the T&A exports of China and South Korea. In such case, competitive pressures on China's T&A exports to the United States would exist when the KORUS preferential duty rates begin to apply to South Korea's T&A products. On the other hand, low structural similarity would mean that the T&A exports of China and South Korea to

the United States are concentrated in different, noncompeting product categories. In this case, China's T&A exports to the United States would be affected little when South Korea's T&A products become subject to the KORUS preferential duty rate.

The export similarity index (ESI) developed by Finger and Kreinin (1979) and shown in Equation 9 was adopted in this study to calculate such index values for the T&A exports of China and South Korea to the United States.

$$ESI(ij,t) = \sum_{Kt} Min\left(s_{it}^{Kt}, s_{jt}^{Kt}\right) \times 100 = \sum_{Kt} Min\left(\frac{X_{it}^{Kt}}{X_{it}}, \frac{X_{jt}^{Kt}}{X_{jt}}\right) \times 100 \quad (9)$$

where:

- $ESI(ij,t)$ denotes the export similarity index for T&A products from country i and country j at time t. In this study, country i and country j respectively stand for China and South Korea.
- K denotes a specific T&A category among those listed in Table 2.
- s_{it}^{Kt} and s_{jt}^{Kt} stand for the market share of K category products of China and South Korea respectively in the U.S. T&A import market in year t.
- X_{it}^{Kt} and X_{ij}^{Kt} stand for the dollar value of the K category T&A exports of China and South Korea respectively to the United States in year t.
- X_{it} and X_{jt} stand for the dollar value of the T&A exports of China and South Korea respectively to the United States in certain product groupings in year t.[2]

The value of $ESI(ij,t)$ ranges from 0 to 100. The larger the value of ESI, the more similar is the product structure. If the T&A exports of China and South Korea to the United

States are in identical product categories, then $ESI(ij,t)=100$, but if the product categories of such exports of these countries do not overlap at all, then $ESI(ij,t)=0$.

To comprehensively compare the product structures of the T&A exports of China and South Korea, ESI was calculated separately for T&A in aggregate and for each of the following product categories: fiber & yarn, fabric, apparel and textile mill products (made-up textiles). The ESI values for each of these five categories for each year over 2005-2010 were calculated to capture possible structural changes in the exports over this period due to market changes such as the following: T&A trade patterns have substantially changed since the elimination in 2005 of the MFA system of quantitative restrictions, and China has made great efforts in recent years to upgrade its T&A export structure (Dicken, 2011; Dickerson, 1999; Huang, He, & Nie, 2006).

Data used to calculate ESI values are from the Office of Textiles and Apparel (OTEXA). The data provide dollar values of U.S. T&A imports annually from China and South Korea Korea in each T&A product group analyzed in this study (i.e., total textiles and apparel, fiber & yarn, fabric, apparel, and made-up textiles) as well as more disaggregated T&A product categories (OTEXA, 2011, 2012).

Trade Elasticity of Substitution of the T&A Exports of China and South Korea to the United States

ESI values reveal the overall magnitude of the competition between the T&A exports of China and South Korea in the U.S. market, but not the degree of price competition between such exports. The trade elasticity of substitution of these exports was therefore estimated to assess the extent of direct price competition between such exports of the two countries. The resulting values complement ESI values in evaluating how China's T&A exports to the United States

might change when the KORUS tariff cuts begin for Korean counterparts. Estimation of the trade elasticity of substitution is based on the empirical model developed by Shiells, Stern and Deardorff (1986):

$$In\left(X_{Kt}^{i}/X_{Kt}^{j}\right)=\beta_0+\beta_1 In\left(P_{Kt}^{j}/P_{Kt}^{i}\right)+\beta_2 In\left(X_{K(t-1)}^{i}/X_{K(t-1)}^{j}\right)+\mu_t \quad (10)$$

where:

$$P_{Kt}^{i}=\left(\frac{W_{ikt}Q_{ikt}}{\sum_k W_{ikt}Q_{ikt}}\right)W_{ikt},\ P_{Kt}^{j}=\left(\frac{W_{jkt}Q_{jkt}}{\sum_k W_{jkt}Q_{jkt}}\right)W_{jkt} \quad \text{and} \quad (11)$$

$$X_{Kt}^{i}=\left(\frac{\sum_k W_{ikt}Q_{ikt}}{P_{Kt}^{i}}\right),\ X_{Kt}^{j}=\left(\frac{\sum_k W_{jkt}Q_{jkt}}{P_{Kt}^{j}}\right) \quad \text{and} \quad (12)$$

- i, j denote China and South Korea respectively.
- K refers to a T&A product category at the 2-digit HS code level.
- P_{Kt}^{i} and P_{Kt}^{j} refer to the trade-volume weighted average price of the k type of products in the K category of T&A exports of China and South Korea respectively to the United States at time t. Each k product type is at the 10-digit HS code level. A weighted average price provides a more accurate estimate of export price than does a simple average price (Francois & Reinert, 1997).
- W_{ikt} and W_{jkt} denote the price of the k product type of T&A exports of China and South Korea respectively at the 10-digit HS code level at time t.
- Q_{ikt} and Q_{jkt} denote the quantity of the k product type (at the10-digit HS code level) in the T&A exports of China and South Korea respectively to the United States at time t.

- X^{i}_{Kt} and X^{j}_{Kt} denote the quantity of *K* category T&A exports of China and South Korea respectively to the United States at time *t*.

In Equation 10, parameter β_1 refers to the trade elasticity of substitution of the *K* category T&A exports of China and South Korea to the United States, that is the percentage change in the quantity of such exports of China per percentage change in the price of such exports of South Korea. If $\beta_1 > 0$, a drop in the price of South Korea's *K* category T&A exports to the United States would cause a decline in the quantity of China's *K* category T&A exports to the United States, implying that the *K* category T&A exports of these two countries are mutually substitutable in the U.S. market. The larger the value of β_1, the more substitutable the *K* category T&A exports of China and South Korea in the U.S. market. If $\beta_1 < 0$, however, the quantity of China's *K* category T&A exports to the United States would increase with a drop in the price of such exports of South Korea, indicating that the *K* category T&A exports of China and South Korea are complementary (Francois & Reinert, 1997).

To prevent biased estimates due to serial correlation, we followed a common practice in specifying time-series regression models (Wooldridge, 2006) by lagging one year the quantity ratio (i.e., $X^{i}_{K(t-1)} / X^{j}_{K(t-1)}$) on the right side of Equation 10; thus, a statistically significant value of β_2 would indicate that the relative quantities of the T&A exports of China and South Korea in one year directly affect the relative quantities of such exports the next year. If $\beta_2 < 0$, the effect is positive; if $\beta_2 > 0$, the effect is negative. Lastly, μ_t represents the unexplained residual.

Data from OTEXA (2012) on the annual quantity and dollar value of the T&A exports of China and South Korea to the United States over 2005-2010 were used to estimate the elasticity of substitution of these exports. Ten years of data were used to gain accuracy by estimating the

elasticity values over a relatively long period. Although the KORUS tariff reduction schedule is based on 10-digit HS codes, the schedule is generally the same at the 2-digit code level due to the similar nature and usage of the products within any one 2-digit HS category (USITC, 2007). The resulting values indicate the average degree of substitutability of the T&A exports of China and South Korea to the United States in each major product category.

The products considered in this study are in HS Chapter 51, 52, 54, 55, 56, 57, 59, 60, 61, 62 and 63. Elasticity values for products in Chapters 50 (silk), 53 (other vegetable textile fibers), and 58 (special woven fabrics) were not calculated, however, because the tariff rates applied at the U.S. border on such products from either China or South Korea were reduced to zero by 2009 (see Table 1), meaning that the KORUS tariff reductions will not affect the prices of such products.

Results and Discussions

Similarity of Product Structure in the T&A Exports of China and South Korea to the United States

Table 2 Here

Table 3 Here

Table 2 contains the estimates of the export similarity index for each year over 2005-2010 based on Equation 9. First, the estimated values indicate that the product structure of the aggregate T&A exports of China and South Korea to the United States was more similar early in the analysis period than later. The ESI value of 69.15 for 2005 suggests that the aggregate T&A exports of the two countries that year were in rather similar, thus directly competing, product categories. Table 2 shows, however, a much lower ESI value for T&A exports in aggregate for

2008, the year the world financial crisis began, and even lower ESI values for subsequent years. The ESI value of 40.67 for 2010 suggests that the aggregate T&A exports of China and South Korea to the United States were focused in much less similar product categories than in previous years.

Table 3 shows the share of each of four disaggregated product categories in the total dollar value of the T&A exports of China and South Korea to the United States by year during 2005-2010. The table shows that the relative shares of the export product categories changed much less for China than South Korea over the period. This suggests that the much lower ESI values for 2010 than 2005 owe mainly to structural changes in South Korea's T&A exports to the United States. In 2005, apparel accounted for 60.5% of the dollar value of South Korea's T&A exports to the United States, fabrics 53.7%; however, the apparel share slipped to only 30.1% by 2010, but the fabric share grew to 53.7%. These patterns imply possible structural changes in South Korea's T&A exports over 2005-2010, although such changes require further exploration. On the other hand, China's T&A exports to the United States had a relatively stable product structure over these years, with 72.7% of its exports still heavily concentrated in apparel by 2010. This result suggests that apparel assembly was China's main role in T&A production for export to the United States over 2005-2010.

Second, the ESI values for the four disaggregated T&A product categories considered in this study are much lower than those for T&A in aggregate (see Table 2), but nevertheless show patterns that help illuminate the basis for the lower ESI values for 2010 than 2005 for T&A in aggregate. The ESI values for the fiber & yarn, fabric, and made-up textiles categories are much lower, but that for apparel is somewhat higher for 2010 than 2005. These results suggest reduced competition in 2010 between the exports of China and South Korea to the United States in the

first three of those product categories, but perhaps intensifying competition in apparel. Table 2 also shows an ESI value below 32 for 2010 for each of the four disaggregated product categories, indicating that such exports of China and South Korea to the United States were quite dissimilar that year. One striking example is fabric, for which the ESI value of 19.32 for 2010 is far lower than the 39.83 value for 2005; this drop in ESI value is consistent with the Table 3 illustration of the relative export shares in fabric for China and Korea over 2005-2010.

Trade Elasticity of Substitution of the T&A Exports of China and South Korea to the United States

Table 4 Here

Table 4 shows the estimates of the trade elasticity of substitution (β_1) based on Equations 10-12. The estimates are statistically significant at the 95% or 99% confidence level for all the analyzed product categories except those in Chapters 51 (wool products), 54 (man-made filaments), and 55 (man-made staple fibers). In addition, the coefficient of determination (R^2) exceeds 0.8 for each regression to estimate the elasticity values, meaning that the changes in the dependent variables were mostly explained by the independent variables in the model. The following are specific results shown in Table 4.

First, the results indicate that the exports of China and South Korea to the United States are mutually substitutable in most of the analyzed product categories, hence that price competition exists between such export products of these two countries. Each statistically significant estimate of β_1 is larger than 1. This means that in each of these product categories, China's exports to the United States could decline when a price drop corresponding to the KORUS tariff reduction amount takes effect for South Korea's exports to the United States.

Second, the magnitudes of the elasticity of substitution estimates, thus the degrees of price competition, are unequal among the analyzed product categories. Two specific patterns in Table 4 can be noted: (a) Price competition tends to be more intense in finished products (e.g., products in Chapters 61-63) than semi-finished products or intermediates (e.g., yarns, fabrics); and (b) apparel products are more mutually substitutable than non-wearable products (e.g., industrial or home textiles in Chapters 56-59). These patterns can be linked to the different developmental stages of the T&A sectors in China versus South Korea (Ha-Brookshire & Lee, 2010). For example, the barriers to enter labor-intensive apparel manufacturing are relatively low, whereas the production of the more technology- and capital-intensive textile products in a country requires a higher level of industrialization than apparel manufacturing (Dickerson, 1999). The relatively high elasticity of substitution of the apparel exports of China and South Korea suggests that the apparel manufacturing capability of China is on par with that of South Korea; however, the relatively low elasticity of substitution of the man-made fiber exports (in Chapters 54 and 55) of China and South Korea suggests that the quality and market attractiveness of such products of China lag far behind those of South Korea.

Lastly, the estimated elasticity of substitution values were used to estimate potential trade diversion effects of the KORUS on China's T&A exports to the United States by multiplying the elasticity estimate for each product category by the negative of the current U.S. tariff on that category in Table 1 and by holding constant all other factors that could affect China's T&A exports to the United States. This multiplication yielded the projected percentage change in China's exports to the United States in each analyzed product category once all the KORUS tariff cuts on U.S. imports from Korea are implemented (see Table 5). As seen in Table 5, the intensified competition resulting from implementation of all the KORUS tariff cuts would most

strongly affect China's exports to the United States in products in HS Chapters 60-63 (mostly apparel), with steep drops of 18.21% to 38.73% in the exports. Two factors led to this result: (a) the high elasticity of substitution of the exports of China and South Korea to the United States in these product categories, indicating that China's exports of such products are highly sensitive to price changes in South Korea's competing products; and (b) the steep KORUS tariff cuts for these product categories, which will allow corresponding space for lowering the prices of the products. Trade diversion caused by the KORUS is also likely to have negative effects on China's textile exports to the United States in product Chapters 51, 52, 56, 57, and 59, but our results suggest the impact will be limited due to the relatively low elasticity of substitution of such products of China and Korea and the modest KORUS tariff cuts for these products.

It should be noted, however, that although the KORUS may give South Korea a competitive advantage over China in the U.S. apparel market, it remains to be seen whether South Korean firms will choose to exploit this advantage and reinvigorate their apparel exports. As part of the overall economic development of South Korea, firms in the country have moved away from their previous heavy participation in low-wage labor-intensive industries such as apparel manufacturing, shifting their role in such manufacturing to coordinating production networks involving other countries (Dickerson, 1999).

Table 5 Here

Conclusions

This study provides an empirical evaluation of potential impacts of the KORUS on China's T&A exports to the United States, with special focus on trade diversion effects of the agreement. The evaluation involved the use of data for 2005-2010 to estimate the export similarity index (ESI) values for the T&A exports of China and South Korea to the United States

and the elasticity of substitution of these exports in the U.S. market, along with the use of the elasticity estimates and data on current U.S. T&A tariffs to project the trade diversion effects of the KORUS. Major findings include the following.

First, the analyzed product categories in the T&A exports of China and South Korea to the United States were much more similar in 2005 than 2010, with the decline in similarity mainly due to changes in the product structure of South Korea's exports. In terms of major disaggregated T&A product categories, the apparel exports of China and South Korea were more similar than their exports of fiber & yarn, fabrics, or made-up textiles in 2010.

Second, a positive and statistically significant value in excess of 1 was found for the elasticity of substitution of each analyzed T&A export product category of China and South Korea to the United States, except for HS Chapter 51, 52, and 54 products. The statistically significant values indicate a predicted decline in the quantity of each relevant category of China's exports when such exports of South Korea become subject to the KORUS tariff cuts. In addition, the estimated elasticity of substitution values are higher for apparel and other finished products (e.g., in HS Chapters 61-63) than for semi-finished intermediates (e.g., in HS Chapters 52 and 56).

Third, the trade diversion effects of the KORUS that were estimated in this study suggest that apparel (in HS Chapters 61-63) is the product category in China's T&A exports to the United States that will be most subject to these effects. Although the KORUS will also have negative effects on China's exports in other product categories (in HS Chapters 51, 52, 56, 57, 59), the expected impact is limited.

Findings of this study augment our understanding of the T&A-specific sectoral impacts of the KORUS. The estimated trade diversion effects of the agreement, in particular, may

provide useful information for Chinese T&A exporters to evaluate U.S. market conditions after implementation of the KORUS. In light of the estimated trade diversion effects of the KORUS, Chinese T&A exporters could consider countermeasures such as adjusting their pricing strategies, exploring new markets, or even relocating production sites. Our findings may also provide valuable information for U.S. policymakers when designing and negotiating new free trade agreements involving T&A products.

In addition, for teaching and research in academia, findings of this study have two important implications for the competitiveness of China's T&A exports in the post-MFA era. First, our results imply that China is still far from dominating the overall U.S. T&A market in that it is a long way from becoming a competitive source of high-quality textiles. The ESI and elasticity of substitution values estimated in this study indicate that China's T&A exports to the United States remain focused on apparel; the more technology- and capital-intensive fiber, yarn, and fabric products comprise only a small portion of its exports as yet. China currently imports as much as $15 billion worth of textile intermediates per year from South Korea, Japan, and other developed countries due to domestic shortages of such materials (Dickerson, 1999; Global Trade Atlas, 2011). The relatively stable product structure of China's T&A exports to the United States over 2005-2010 is consistent with the point made by Gereffi and Frederick (2010) that the process of upgrading China's textile industry will take many years, as will its achievement of export competitiveness in textiles.

Second, our results imply that trade policy will continue to play a key role in shaping T&A trade patterns in the post-MFA era. As shown in Table 5, the implementation of the KORUS may substantially weaken China's competitiveness in the U.S. apparel market relative to South Korea's. It should be noted that the United States is currently negotiating the Trans-

Pacific Partnership (TPP) Agreement with eight countries in the pacific region, including Vietnam, its second largest supplier of T&A imports today. The product structure of China's T&A exports to the United States is currently more similar to that of Vietnam than South Korea (Goto, Natsuda, & Thoburn, 2011); therefore, when Vietnam begins to enjoy the TPP preferential duty rate, China will likely face much stronger competition and trade diversion effects than under the KORUS in its T&A exports to the United States.

Despite the interesting and meaningful results of the findings, several changes might be made to improve the quality of future similar studies. First, although including the one period-lagged X^{i}_{Kt} / X^{j}_{Kt} term on the right side of Equation 10 helped to prevent serial correlation problems, the error term μ_t likely contained factors that were correlated with X^{i}_{Kt} / X^{j}_{Kt} and thus affected the consistency of the estimates. Applying econometric tools such as instrumental variables and simultaneous equations could enhance the validity of the estimated values. Second, researchers could evaluate the competition between the T&A exports of China and South Korea in the U.S market at more disaggregated product levels than in this study. Third, researchers could expand evaluation of the KORUS trade diversion effects by assessing such effects on the T&A exports of additional major T&A suppliers to the U.S. market. It also would be interesting to examine whether the KORUS leads to expanded U.S. exports to Asian countries, thereby contributing to the formation of new T&A production–trade networks in the Asia-Pacific region.

Notes

[1] In this paper, $ refers to the U.S. dollar.

[2] In the calculation of ESI for T&A in aggregate, X_{it} and X_{jt} in Equation 9 refer to the total value of the T&A exports of China and South Korea respectively to the United States in year *t*, including the total

value of all the exports of T&A products (category 0), plus that of all the *K* category export products, those in fiber & yarn (category 11), fabric (category 12), apparel (category 13), and made-up textiles (category 14) in the OTEXA (2011) product classification system. In the calculation of ESI for fiber & yarn, fabric, apparel, or textile mill products (made-up textiles), X_{it} and X_{jt} in Equation 9 refer to the total value of the T&A exports of China and South Korea respectively to the United States in year *t* in the product category in question, plus that of all the subcategories of export products in that category in the OTEXA (2011) product classification system.

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Table 1

Average Applied Most-favored-nation Tariff Rates for T&A Imports at the U.S. Border in 2009*

Harmonized System (HS) Chapter	Tariff Rate (%)
50: Silk	0.00
51: Wool	2.80
52: Cotton	5.68
53: Other vegetable textile fibers	0.00
54: Man-made filaments	11.40
55: Man-made staple fibers	7.50
56: Wadding, felt and nonwovens	4.95
57: Carpets	4.50
58: Special woven fabrics	0.00
59: Technical textiles	5.55
60: Knitted or crocheted fabrics	13.10
61: Knitted or crocheted apparel	15.90
62: Not knitted or crocheted apparel	18.10
63: Other made-up textiles	11.40

Note. Data are adapted from WTO (2011).
*: The KORUS requires the United States to gradually eliminate all tariffs on T&A imports from South Korea over a 10-year period (ITAC, 2007), therefore, duty rates shown in the table also reflect the tariff reduction magnitude of the KORUS.

Table 2

Export Similarity Index Values for the T&A Exports of China and South Korea to the United States

	Export Similarity Index Values by Year					
Product Category	2005	2006	2007	2008	2009	2010
Textiles and apparel	69.15	64.26	55.84	54.14	42.83	40.67
Fiber & yarn	34.81	29.68	28.60	33.46	26.49	26.44
Fabric	39.83	39.19	30.81	26.33	22.35	19.32
Apparel	29.24	28.19	28.93	29.24	29.63	31.75
Made-up textiles	26.74	36.43	53.80	35.38	29.99	22.14

Table 3

Product Structures of the T&A Exports of China and South Korea to the United States:

Percentage Shares of Product Categories (by Dollar Value)

	China					
	2005	2006	2007	2008	2009	2010
Apparel	67.6	68.4	70.4	70.1	74.0	72.7
Fiber & yarn	0.3	0.3	0.3	0.3	0.2	0.3
Fabric	3.7	3.3	3.1	3.4	2.7	3.0
Made-up textiles	28.4	28.0	26.3	26.2	23.0	24.0
	South Korea					
	2005	2006	2007	2008	2009	2010
Apparel	60.5	54.8	47.3	45.2	34.9	30.1
Fiber & yarn	3.2	3.7	5.7	6.8	8.1	8.9
Fabric	31.7	35.6	41.8	42.7	52.0	53.7
Made-up textiles	4.7	5.9	5.2	5.3	5.0	7.3

Table 4

Estimates of Trade Elasticity of Substitution (β_1)

Harmonized System (HS) Chapters	β_0	β_1	β_2	R^2	F
51: Wool	-0.71*	2.65	0.40	0.93	47.69**
	(0.01)	(0.07)	(0.22)		(0.00)
52: Cotton	-0.42*	1.46**	-0.06	0.90	33.62**
	(0.02)	(0.00)	(0.73)		(0.00)
54: Man-made filaments	-0.44	0.43	1.05**	0.63	6.09*
	(0.43)	(0.49)	(0.01)		(0.02)
55: Man-made staple fibers	-0.76	-0.01	0.64	0.39	2.29
	(0.44)	(0.97)	(0.08)		(0.17)
56: Wadding, felt and nonwovens	-1.68**	1.01**	0.23*	0.92	210.32**
	(0.00)	(0.00)	(0.03)		(0.00)
57: Carpets	-3.85**	1.11**	-0.30	0.78	12.96**
	(0.00)	(0.01)	(0.34)		(0.00)
59: Technical textiles	-0.78**	1.29**	0.19**	0.95	233.3**
	(0.00)	(0.00)	(0.01)		(0.00)
60: Knitted or crocheted fabrics	-0.15	1.39*	0.76**	0.79	13.77**
	(0.67)	(0.05)	(0.00)		(0.00)
61: Knitted or crocheted apparel	-0.72**	1.64**	0.79	0.96	199.34**
	(0.00)	(0.00)	(0.00)		(0.00)
62: Not knitted or crocheted apparel	-0.97**	2.14**	0.99**	0.97	154.33**
	(0.00)	(0.01)	(0.00)		(0.00)
63: Other made-up textiles	-3.42**	2.51**	0.27**	0.98	591.54**
	(0.00)	(0.00)	(0.01)		(0.00)

Note. p values are shown in parentheses; * indicates statistically significant at the 95% confidence level; ** indicates statistically significant at the 99% confidence level. Additionally, Chapter 51 includes wool fiber, yarn and woven fabric; similarity, Chapter 52 includes cotton fiber, yarn and woven fabric.

Table 5

Estimated Trade Diversion Effects of the KORUS on China's T&A Exports to the U.S.

HS Chapter	Change in China's exports to the U.S. (%)
50: Silk	0.00
51: Wool*	-7.34
52: Cotton	-8.29
53: Other vegetable textile fibers	0.00
54: Man-made filaments*	-4.90
55: Man-made staple fibers*	0.08
56: Wadding, felt and nonwovens	-5.00
57: Carpets	-5.00
58: Special woven fabrics	0.00
59: Technical textiles	-7.16
60: Knitted or crocheted fabrics	-18.21
61: Knitted or crocheted apparel	-26.08
62: Not knitted or crocheted apparel	-38.73
63: Other made-up textiles	-28.61

Note. The percentage change in China's exports to the United States in a product category = the trade elasticity of substitution for that category (from Table 3) × the tariff reduction rate for that category (i.e., the negative of the rate in Table 1). It is assumed that the prices of South Korea's T&A exports to the United States will decline under the KORUS by amounts that correspond to the magnitudes of the KORUS tariff reductions. The estimated trade diversion effects account for only the total cumulative tariff cuts under the KORUS.

*: Because the elasticity of substitution estimate for this category is not statistically significant, the corresponding figure in the table is for reference only.