World Trade Review (2014), 13: 3, 499–515
 doi:10.1017/S1474745613000323 First published online 12 November 2013

Determinants on utilization of the Korea–ASEAN free trade agreement: margin effect, scale effect, and ROO effect

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Abstract: In this paper we empirically examine the determinants on utilization of the Korea–ASEAN Free Trade Agreement (KAFTA) by employing a database provided by the Korea Customs and Trade Development Institute. We find that, although three effects, namely preferential margin (margin effect), rules of origin restrictiveness (ROO effect), and average export volume (scale effect), contribute to determining the utilization of the FTA, the scale effect has the greatest impact. Our results suggest that, since firms with relatively small volumes of trade are usually small and medium-size enterprises (SMEs), policy assistance for reducing administrative costs should be geared toward SMEs. Our results further indicate that policymakers should also try to negotiate more extensive tariff reductions on products not only where MFN rates are high but also where shipments are large.

1. Introduction

The most common form of preferential arrangement in international trade is a free trade agreement (FTA), which eliminates tariffs, import quotas, and preferences on most, if not all, goods and services trade between member countries. Unlike a customs union, an FTA does not impose a common external tariff and therefore FTA member countries use the system of rules of origin (ROOs) in order to avoid tariff evasion through re-exportation. Within the ROOs system, there is a requirement for a minimum extent of local material inputs and local transformation adding value to the goods. In order to comply with the ROOs, users may need to

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This research was conducted as part of a project undertaken by the Japan External Trade Organization: 'Causes and Consequences of Firms' FTA Utilization in Asia'. We would like to thank two anonymous referees for their invaluable comments.

change their original pattern of procurement. Since the original pattern of procurement is likely to be optimal, given the market conditions, the procurement costs may rise. Also, the administrative costs involved in investigating the possible use of FTAs and applying for preferential rates can be substantial.[1]

On the other hand, the use of an FTA will generate benefits for firms in terms of saving on tariff payments as the preferential rates are lower than most favoured nation (MFN) tariff rates. The larger the tariff margin – the gap between MFN rates and FTA rates – the greater will be the benefits for firms that have successfully applied for FTA rates. Therefore, when considering the possibility of trading under an FTA, firms will weigh the gains (i.e., tariff margin) from the use of the FTA against the costs (i.e., ROO-related adjustment and administration costs). It is to be expected that the greater the tariff margin and the less restrictive the ROOs, the greater will be the likelihood that firms will use the FTA preference. Also, the size of an export transaction *per se* is very important because a larger export volume leads to a larger saving on tariff payments, even if the tariff margin is small. In sum, there are three key elements determining the utilization rate of an FTA: tariff margin, rules of origin restrictiveness, and average volume of trade. In this paper, the effects of these three elements are called 'margin effect', 'ROO effect', and 'scale effect', respectively.

In the academic field, there have been only a limited number of studies analyzing the determinants on the utilization of preferential regimes. Two similarities are noticeable among these studies. First, most studies have examined unilateral preferential schemes, rather than bilateral FTAs. Bureau *et al.* (2007) examine utilization of the Generalized System of Preferences (GSP) granted by the European Union (EU) and the United States (US) to developing countries in the agri-goods sector, while Cadot *et al.* (2006) focus on the trade of the EU and US with their preferential trading partners. Francois *et al.* (2006) and Manchin (2006) examine the preferential trade relations between the EU and non-least-developed African, Caribbean, and Pacific (ACP) countries under the Cotonou Agreement, while Hakobyan (2010) examines US GSP utilization by 143 GSP-eligible countries. Exceptionally, Keck and Lendle (2012) analyze utilization of both unilateral and bilateral preferences not only by EU and US but also by Australia and Canada.

1 For example, in order to verify compliance with the ROOs, participating firms, and in particular exporters, need to obtain several kinds of documents from all the suppliers within the supply chain. These include a list of inputs, a production flow chart, production instructions, invoices for each input, a contract document, and so on. Using these supporting documents, firms need to apply for certificates of origin to be issued by the relevant authority, which will then determine the eligibility of the product based on many ROOs. These requirements under the relevant administrative procedures generally become a significant monetary/non-monetary burden. Also, in order to comply with the pertinent formalities, firms may need to establish a physical system or organizational divisions. In short, firms need to bear significant total start-up costs for the use of FTA schemes, and these will become fixed costs for FTA use.

Second, the elements examined to find the determinants on the utilization of preferential regimes are almost identical and yield similar results. That is, preference utilization rates are higher for trade in products with a larger tariff margin and a larger volume of trade but smaller for trade in products in which ROOs are more restrictive.

Two dissimilarities are also noteworthy among the earlier papers. First, the definition of the FTA utilization rate with a specifically associated preferential rate differs across various studies. Some studies define this concept as the share of trade value under FTA preferential schemes in the total trade value or in the trade value of products with a positive tariff margin. The share of the number of preferential rate users in the total number of firms is also used. Second, the estimation technique is also different across various papers, based on their respective motivation. For example, Francois *et al.* (2006) and Manchin (2006) employ the threshold regression technique to estimate the tariff equivalents of the above-mentioned costs for the use of preferential regimes. In order to examine the differences across the various tariff schemes, including not only MFN rates and FTA rates but also GSP rates, Bureau *et al.* (2007) employ the multinomial probit model rather than binomial models. Also, Manchin (2006) includes observations with zero-valued FTA utilization rates by employing the Heckman sample selection model. Hakobyan (2010) and Keck and Lendle (2012) use a fractional logit because the utilization rate ranges from zero to one.

In this paper, we examine the utilization of bilateral FTAs by South Korea. As of February 2013, Korea has eight FTAs that have become effective (Korea–Chile FTA, Korea–Singapore FTA, Korea–EFTA FTA, KAFTA, Korea–India CEPA, Korea–EU FTA, Korea–Peru FTA, and Korea–US FTA).[2] Among these FTAs, we focus on the utilization of the Korea–ASEAN FTA (KAFTA) in goods trade; this entered into force on 1 June 2007 between Korea and the ASEAN signatories that had completed the domestic procedure for implementation.

Specifically, using the data on Korea's imports from ASEAN during the period from June 2007 to December 2011, this paper explores the role of the above-mentioned three effects in determining the level of FTA utilization. As in previous studies, it is to be expected that the margin effect and scale effect will be positively associated with FTA utilization, while the ROO effect will be negatively associated with FTA utilization.

Our measure of FTA utilization is calculated as the share of trade values under FTA schemes in total trade values at the HS 10-digit level. The variables necessary

2 Korea has also signed FTAs with Turkey and Columbia, respectively, and these are expected to become effective soon. In addition, Korea is engaged in FTA negotiations with a number of countries including Australia, Canada, Indonesia, New Zealand, and Vietnam. In 2012, Korea also started negotiations for a Korea–China FTA, a trilateral FTA between Korea, China, and Japan, and a Regional Comprehensive Economic Partnership (RCEP) which includes ASEAN-10 plus Australia, China, India, Japan, Korea, and New Zealand.

to calculate utilization rates (i.e., the total value of imports from ASEAN countries and the types of imposed tariff) are taken from the database provided by the Korea Customs and Trade Development Institute (KCTDI) and the utilization rate is calculated at the HS 10-digit level. The tariff margin is also constructed at the 10-digit level by using MFN and preferential tariff rates from KAFTA's phase-out program for the corresponding year. The trade value per application is measured as total dutiable imports at the HS 10-digit level divided by the number of claims reported to Korean Customs in the corresponding year. The ROO restrictiveness index, however, is constructed at the 6-digit level, since ROOs in KAFTA were negotiated at the 6-digit level.

Our analysis exhibits three novel features, as compared with the literature. First, while almost all existing studies focus on the unilateral preferences of either the US or the EU, this study is concerned with bilateral FTA utilization by Korea. The study closest to ours is Kim and Cho (2010), which tests the impact of tariff margin and ROOs on utilization of KAFTA. This paper improves on Kim and Cho (2010) by extending the period of study, quantitatively comparing the scale effect in addition to margin effect and ROO effect, and employing various estimation techniques, including a fractional logit.[3]

Second, we explore the transaction-level trade values in order to examine the scale effect. Most of the previous studies (e.g., Hakobyan, 2010) examine the product-country-level trade values. Keck and Lendle (2012) mimic the transaction-level trade values by employing trade data by month at the customs district/member level for the US and European Union, and they call these data 'pseudo-transaction-level' trade values. On the other hand, we have access to transaction-level data and thus can examine trade values per application, which can be taken as a proxy for *per-firm* trade values. Since the decision on FTA use is made at firm level, not country level, our use of per-firm trade values is more appropriate for examining the scale effect. Third, this is the first paper that evaluates the relative contribution of *all* of the three effects to FTA utilization *simultaneously*. So far, two of the effects have been investigated simultaneously in the literature, but, with the exception of Hakobyan (2010), all of the three effects have not been explored together.[4] By accomplishing the relative evaluation of the three effects, we can propose significantly more effective policies for enhancing FTA utilization.

3 There has been much research regarding the impact of Korea's FTAs on bilateral trade, GDP, and/or foreign direct investment (FDI), including, for example, Choi (2009), Kim and Oh (2007), and Ahn *et al.* (2005).

4 Hakobyan (2010) examines the effects of three elements for US GSP utilization. However, in the case of US GSP, a 35% real value-added content criterion is applied commonly to all products. Thus, consideration is given to the variation in difficulty of complying with this criterion across *industries* through examining input-output structures (e.g., industry-level share of value added in output). On the other hand, our paper focuses on the variation in the restrictiveness of ROOs *per se* across *products*, which will yield more precise estimates on the ROO effects relevant specifically to KAFTA.

The remainder of this paper is organized as follows. Section 2 provides our empirical framework on firms' choices regarding FTA use and then specifies our empirical equations to be estimated. After giving an overview of the utilization of KAFTA in Section 3, we conduct an econometric analysis, the results of which are reported in Section 4. Finally, we provide concluding remarks in Section 5.

2. Empirical framework

This section specifies our empirical framework for examining firms' choices on FTA use. As mentioned in the introductory section, three elements are crucial in firms' FTA use: margin effect, ROO effect, and scale effect. It is to be expected that, while the ROO effect will be negatively associated with FTA utilization, both margin effect and scale effect will be positive. In addition to these three elements, administrative costs to obtain certificates of origin may also play a significant role. The significance of all of these elements is theoretically demonstrated in Demidova and Krishna (2008). In the present paper, however, we quantify the relative contributions of these elements to product-level FTA utilization rates.

In our empirical analysis, we focus on one country's imports from several FTA partner countries. Our estimation equation is simply formalized as follows:

$$\begin{aligned}\text{Utilization}_{ipt} = {} & \beta_1 \text{ Tariff Margin}_{ipt} + \beta_2 \ln \text{ Average Trade}_{ipt} \\ & + \beta_3 \text{ Restrictiveness Index}_{ip} + \mathrm{u}_i + \mathrm{u}_t + \mathrm{u}_s + \varepsilon_{ipt}\end{aligned} \tag{1}$$

Utilization$_{ipt}$ is the FTA utilization rate in imports from country i for product p in year t. As mentioned in the previous section, a product is defined at the 10-digit level of the Harmonized System (HS). 'Average Trade$_{ipt}$' is the per-application average trade value of country i for product p in year t, and 'Tariff Margin$_{ipt}$' is the absolute difference between FTA rate and MFN rate on product p from country i in year t. 'Restrictiveness Index$_{ip}$' indicates the restrictiveness of ROOs in the FTA with country i for product p. Since a higher index indicates more restrictive ROOs, we expect its coefficient to be negative. We also introduce dummies for some fixed effects: exporting country dummy (u_i), industry dummy (u_s), and year dummy (u_t). The industry dummy is defined at the 2-digit section-level of the HS. The role of (physical) administrative costs is expected to be controlled by the exporting country dummy because such costs depend on the effectiveness of customs in exporting countries and thus differ mainly by exporting country. We control differences in the difficulty in complying with ROOs among industries by the industry dummy variable.

As explained in the previous section, the utilization rate is defined as the share of imports that actually receive preferential treatment in the total imports that are eligible to receive such preferential treatment. The term 'eligible' means 'applicable' for preferential tariff rates under a certain preferential agreement. By definition, this rate lies in the unit interval, i.e., [0, 1]. This characteristic in the dependent variable

https://doi.org/10.1017/S1474745613000323 Published online by Cambridge University Press

might be one noteworthy issue. The traditionally popular method to estimate this kind of model is the Tobit estimation technique, particularly the two-limit Tobit model in our case. The pseudo-Poisson maximum likelihood (PPML) estimation technique has recently become a popular method in gravity studies, because this method can naturally include zero-valued dependent variables.[5]

Hakobyan (2010) and Keck and Lendle (2012) employ the fractional logit model, which was proposed by Papke and Wooldridge (1996). The fractional logit model ensures that, unlike ordinary least squares (OLS) and PPML, the predicted values of the dependent variable are in the unit interval. It also imposes less restrictive assumptions than the Tobit model (requiring the normality and homoskedasticity of the dependent variables). In sum, the fractional logit model is more natural and appropriate for estimating our model.[6] Thus, our most preferred method uses the fractional model but, for the sake of comparison, we also present the results obtained by the simple ordinary least squares (OLS) method, the PPML method, and the 2-limit Tobit model.[7]

3. Data issues

In our analysis, we focus on the FTA between Korea and ASEAN, or KAFTA. KAFTA on trade in goods entered into force on 1 June 2007 between Korea and the ASEAN member countries that had completed the domestic procedure for implementation. Indonesia, Malaysia, Myanmar, Singapore, and Vietnam were the first group of signatories to give effect to KAFTA on 1 June 2007. Then followed the Philippines (1 January 2008), Brunei (1 July 2008), Lao PDR (1 October 2008), Cambodia (1 November 2008), and Thailand (1 January 2010). The agreement stipulates detailed temporal tariff reduction commitments for each member country. It is noted here that, on considering the two FTAs with Singapore (Korea–Singapore FTA and Korea–ASEAN FTA in which Singapore participates as a

5 Francois *et al.* (2006) apply a logistic transformation of the observed utilization rate after setting zero to 0.001 and one to 0.999. Manchin (2006) estimates the Heckman model, in which the first stage model (selection model) is designed to estimate whether trade under a preferential regime is zero or positive.

6 In order to estimate fixed costs for FTA use (e.g., administrative costs), Francois *et al.* (2006) applied the threshold regression approach, which was developed by Hansen (2000), to the utilization rate of Cotonou preferences and found their range to be between 4% and 4.5%. Applying this approach to our data, we find that those costs are around 8% (available upon request). However, our primary purpose is to quantify the relative contribution of three effects (margin, scale, and ROO effects). Therefore, we do not employ the threshold regression approach in this paper, as it makes the quantification of the three effects difficult through the introduction of threshold 'dummy' variables on tariff margin. For more details on the estimates of fixed costs for FTA use, see also Cadot and de Melo (2007) and Hayakawa (2011).

7 One may argue that average trade is endogenous because the use of FTA preference may increase the value of trade. However, we think that endogeneity is not a serious issue because, if the use of FTA preference increases, it may increase not only the total value of trade but also the number of applications for preferences. Nonetheless, to account for any possible endogeneity problem, we also estimated the models with a one-year lag of the explanatory variables and found similar results, which are not reported here for brevity but are available from the authors upon request.

https://doi.org/10.1017/S1474745613000323 Published online by Cambridge University Press

member of ASEAN), we exclude Singapore from calculating the utilization rate to avoid any possible bias.[8]

The tariff reduction schedule distinguishes two tracks, namely normal track and sensitive track, and the sensitive track is further divided into sensitive product and highly sensitive product. Products under normal track accounted for 90% of total tariff lines and 90% of total import value in 2005, while products classified as sensitive track accounted for the remaining 10%. Special and differential treatment were applied in the tariff elimination and reduction process, depending on the levels of development among the participating countries; tariffs on products under normal track were/are scheduled to be eliminated by January 2008 for Korea, January 2010 for ASEAN 6 (Brunei, Indonesia, Malaysia, Philippines, Singapore, and Thailand), January 2013 for Vietnam, and January 2015 for Cambodia, Laos, and Myanmar.[9] On the other hand, tariff reduction for products classified under sensitive track was not to start in our sample period; the first obligation for sensitive track products was to reduce tariffs by 20% in 2012, and this was to be followed by additional tariff reductions later on. Therefore, our data regarding FTA utilization for Korea's imports from ASEAN cover only products under normal track.

Our data on FTA utilization for Korea's imports from ASEAN cover the period from June 2007 to December 2011, and we specify five sequential periods: June 2007–December 2007, 2008, 2009, 2010, and 2011. The cross-sectional components of the data are organized at the 10-digit level of the HS. Our measure of FTA utilization is calculated at the HS 10-digit level as the share of trade values under FTA schemes in total trade values with positive tariff margin.[10]

Table 1 shows the utilization rates in 2011 by exporting country and industry, i.e. Section-level product groups of the HS.[11] In total, Malaysia and Thailand have the lowest utilization rates (35%), while Myanmar has the highest rate of 96%. Taking a look across industries, there are many country-industry pairs with very high rates of utilization. Some pairs even have 100% utilization rates (wood products from Brunei, animal/vegetable fats and oils from Indonesia, and food products from Myanmar). There are a large number of pairs with rates higher than 90%. Also, there are several pairs with rates lower than 50%, and some show

8 Other than with Singapore, Korea does not have overlapping FTA regimes with other ASEAN member countries. Lao PDR and Korea are members of the Asia Pacific Trade Agreement (APTA), but its coverage includes only 1,495 products in HS 10-digit, which are subject to about 30% tariff reduction, not tariff elimination. For all of these products imported from Lao PDR in the period 2007–2011, KAFTA preferential tariff rates were lower than APTA preferential tariff rates.

9 Some of the ASEAN 6 countries are allowed to have an additional two-year grace period within 5% of normal track products.

10 Positive tariff margin means that products with zero MFN rates and/or whose MFN rates are equal to KAFTA preferential rates at the HS 10-digit level are dropped from our data.

11 Table 1 shows the utilization rate at the industry level by country. This is to illustrate the effectiveness of the Korea–ASEAN FTA in general; however, in our empirical analysis, the dependent variable (utilization rates) is calculated based on the HS 10-digit level.

https://doi.org/10.1017/S1474745613000323 Published online by Cambridge University Press

Table 1. FTA utilization rates in 2011 by exporting country and industry

	Brunei	Indonesia	Cambodia	Laos	Myanmar	Malaysia	Philippines	Thailand	Viet Nam
Live animals		93%	0%		99%	99%	95%	99%	99%
Vegetable products	0%	66%	0%	16%	94%	95%	95%	68%	29%
Animal/vegetable fats and oils		100%			0%	99%	89%	95%	95%
Food products	0%	99%	95%	0%	100%	90%	89%	20%	98%
Mineral products	74%	60%	0%			36%	99%	74%	97%
Chemical products	66%	49%	0%	0%	0%	59%	58%	73%	90%
Plastics and rubber	0%	90%	77%		26%	76%	73%	87%	84%
Leather products	0%	77%	0%		99%	12%	73%	77%	81%
Wood products	100%	97%	69%	48%	37%	88%	85%	75%	89%
Paper products	0%	0%	0%		0%	0%	0%	0%	0%
Textiles	0%	90%	73%	0%	96%	91%	83%	74%	90%
Footwear		86%	58%		85%	13%	79%	83%	74%
Stone, ceramic, and glass products		92%	0%		0%	84%	96%	83%	90%
Precision metal products		3%	0%	0%	0%	0%	11%	24%	74%
Basic metal products	0%	87%	0%	100%	0%	81%	86%	67%	41%
Machinery	0%	50%	66%	0%	0%	4%	5%	15%	32%
Transport equipment	0%	3%			0%	1%	0%	1%	4%
Precision machinery	0%	69%	0%	0%		20%	45%	16%	50%
Arms and ammunition	0%	28%	0%	0%	85%	38%	74%	67%	42%
Total	74%	63%	67%	44%	96%	35%	42%	35%	78%

Source: Authors' calculations based on data from the Korea Customs and Trade Data Institute (KCTDI).

zero utilization rates. In sum, the utilization rates vary widely across exporting countries and industries.

The tariff margin is also constructed at the 10-digit level by using MFN and preferential tariff rates from KAFTA's phase-out program for the corresponding year. In order to precisely calculate the tariff margin, we do not include products that are subject to a tariff rate quota, since it would then be difficult to calculate the tariff margin.[12] Also, products whose MFN tariff rates are zero or whose MFN rates are equal to KAFTA preferential rates[13] are dropped from our data.[14] The scale effect, trade volume per application, is measured at the HS 10-digit level by country and defined as the value of dutiable imports at the HS 10-digit level divided by the number of claims reported to Korean Customs in the corresponding year. It is to be expected that if the trade volume per application is large, the importer (or exporter) will be able to save large sums in tariff payments. That is, the importer's (or exporter's) incentive to use KAFTA preferential tariff treatment should become stronger as the total trade volume per application increases, and hence we expect a positive relation between the two.

The ROO restrictiveness index, however, is constructed at the 6-digit level, since ROOs in the FTAs were negotiated at the 6-digit level. For a quantitative measure of restrictiveness in ROOs, we adopt the method proposed by Estevadeordal (2000). His restrictiveness index was designed to perform quantitative analysis on ROOs for NAFTA, ranging from 1 to 7 by category. Estevadeordal and Suominen (2004) developed this further. Their restrictiveness index is based on changes in tariff classification rules. The basic idea of a restrictiveness index is that the higher the index, the more restrictive are the ROOs. They give a higher restrictiveness score for a change in tariff chapter (CTC, HS 2-digit) and wholly obtained criteria (WO), whereas a lower restrictiveness score is given for a lower level change in tariff classification and regional value content criteria.

However, the ROOs in the case of KAFTA are more complicated. Given that many modified types of ROOs are adopted, we need a certain degree of adjustment, for example on how to deal with combination and/or selective ROOs or how to index rules that are based on a change in chapter but with some exceptions. Where ROOs are selective, we use the average of the ROOs. If the ROOs for a certain product are changed in chapter sub-heading (CTSH, restrictiveness index of 3) or show a regional value content of 40% (restrictiveness index of 4), we use 3.5 as the

12 There were fewer than eighty products (all of them are agricultural or fishery products) in terms of HS 10-digit that were subject to tariff rate quota, which varied year to year. Considering the fact that there are about 11,000 products at the HS 10-digit level, eighty products would have only marginal impact on our results.

13 According to the KAFTA tariff concession schedule, the tariff elimination/reduction process starts a few years after the effectuation of KAFTA for some products. Such products have been taken into account in our utilization rate calculation only after their first tariff reduction started.

14 That is, utilization rates in our analysis capture the share of imports under the KAFTA preferential regime in total imports which are 'eligible' to receive KAFTA preferential tariff treatment.

https://doi.org/10.1017/S1474745613000323 Published online by Cambridge University Press

restrictiveness index for that product, this being the average of the two relevant selective ROOs. Also, if a certain ROO has an additional restriction (such as a change in tariff heading, excluding some products, CTH + ECTC (Exception)), we add 0.5 to reflect the additional restrictiveness of the ROO. We also differentiate regional value content (RVC) by its required regional content percentage; we give a restrictiveness index score of 4 for RVC 40%, and for RVC 60% we impose a restrictiveness index score of 5, whereas for a ROO with RVC 25% we give a restrictiveness score of 3.[15]

As a result, in KAFTA there are 16 types of ROOs used for 3,509 products in HS 6-digit and these types are reported in Table 2.[16] The selective rule of change in heading (CTH) or RVC 40% is the most frequently used decision rule, which is applied for 1,728 product groups. This is followed by RVC 50% (1,337 product groups). The distribution of restrictiveness indices by Section-level product groups of the HS is summarized in Table 3. As is evident from Table 3, most of the product groups in each section have a score of 4.0. However, as compared with others, it is clearly seen that mineral products, chemical products, and machinery industries (including machinery, transport equipment, and precision machinery) have a relatively large number of products with a score higher than 4.0, particularly the score of 4.5, which is assigned to RVC 50%. Also, it is noteworthy that there are relatively many products with the score of 5.5 in textiles, in which the ROO requires meeting an RVC of 50% and a specific procedure in the production process.

4. Empirical results

The results obtained by several estimation techniques are reported in Table 4.[17] In the case of OLS, we also tried the inclusion of industry dummy variables at the HS

15 Consistently, we vary the restrictiveness score for products whose RVC requires 41–49% and/or 21–39%.

16 The data cover the period June 2007–December 2011; the Korea–ASEAN FTA was effectuated on 1 June 2007 between Korea and those ASEAN member countries that had by then completed their domestic procedure for the effectuation of the Korea–ASEAN FTA (Indonesia, Vietnam, Malaysia, and Myanmar). Five further countries exhibit different dates of entry into force, and we have counted imports from each ASEAN member country only after the effectuation of the Korea–ASEAN FTA for that particular country, respectively. (We did not take into account imports from Singapore because Korea has a bilateral FTA with Singapore which entered into force on 2 March 2006. Imports from Singapore could take place under either the Korea–Singapore FTA or the Korea–ASEAN FTA, and this situation could bias the utilization rate of the Korea–ASEAN FTA for imports from Singapore.) The number of observations by exporting country and year is shown in Table A2 (p. 20). The total number of observations was 42,190 in HS 10-digit and these 42,190 products included 3,509 products in HS 6-digit. Tables 2 and 3 show ROO types and distribution of restrictiveness index for the 3,509 products, the ROO being defined at HS 6-digit level.

17 Sample statistics are provided in the Appendix. The number of observations by exporters measures the number of exported products from each ASEAN member country at HS 10-digit. It is also based on the effectuation of KAFTA; therefore, no observations were recorded for Brunei, Cambodia, Lao, and the Philippines for 2007 and Thailand for 2007–09.

Table 2. ROO types in the Korea–ASEAN FTA

ROO Types	Score	Frequency
(CTC + SP) or RVC 40%	5.5	6
(CTC + WO) or RVC 40%	5.5	1
(CTC + WO + SP) or RVC 40%	5.5	1
CTC or RVC 40%	5	8
CTH	4	11
CTH or RVC40%	4	1,728
CTSH or RVC 40%	3	10
(CTSH or RVC 40%) or (CTH or RVC 40%)	3.5	1
RVC 25%	3	14
RVC 30%	3.5	15
RVC 40%	4	54
RVC 45%	4.3	1
RVC 50%	4.5	1,337
RVC 60%	5	61
SP + RVC 50%	5.5	253
WO	7	8
Total		3,509

Notes: Abbreviations are as follows: CTC (Change in Chapter), CTH (Change in Heading), CTSH (Change in Sub-heading), RVC (Regional Value Content), WO (Wholly Obtained), and SP (Technical Specification).
Source: Authors' calculations based on data from the Korea Customs and Trade Data Institute (KCTDI)

6-digit level and the HS 10-digit level instead of those at the HS 2-digit level because the difficulty in complying with ROOs might be different across the more detailed industries. However, the restrictiveness index had to be dropped because ROOs are defined at HS 6-digit level in KAFTA and are common across products within the same HS 6-digit code (i.e. perfect multicollinearity).[18] Thus, we focus mainly on the results for equations with an HS 2-digit code dummy.

All of the coefficients (marginal effects) are estimated to be significant with the expected signs, except for the restrictiveness index in Tobit (V). Larger tariff margins and larger average trade values contribute significantly to raising FTA utilization rates. The coefficient for the restrictiveness index is estimated to be significantly negative, indicating that more restrictive ROOs lead to lower rates of FTA utilization. Another noteworthy point is that the estimated coefficients differ greatly by estimation method in terms of magnitude.

18 In the cases of the Tobit, Poisson, and Fractional logit models with such detailed industry dummy variables, we could not obtain convergence of log-likelihood or could not compute standard errors.

https://doi.org/10.1017/S1474745613000323 Published online by Cambridge University Press

Table 3. Distribution of ROO Restrictiveness Index in the Korea–ASEAN FTA (number of products)

	3.0	3.5	4.0	4.3	4.5	5.0	5.5	7.0	Total
Live animals			61					5	66
Vegetable products			101					3	104
Animal/vegetable fats and oils			29						29
Food products			131			1			132
Mineral products			91						91
Chemical products			15		416				431
Plastics and rubber			70		109				179
Leather products			53						53
Wood products			52						52
Paper products			86						86
Textiles			395			8	261		664
Footwear			46						46
Stone, ceramic, and glass products			126						126
Precision metal products			32		6				38
Basic metal products			328		19	56			403
Machinery	10	1	47		581				639
Transport equipment		3	20	1	39	4			67
Precision machinery	14	12	40		123				189
Arms and ammunition			70		44				114
Total	24	16	1,793	1	1,337	69	261	8	3,509

Note: This table reports the number of products (HS 6-digit level) by restrictiveness scores of ROOs.
Source: Authors' calculations based on data from the Korea Customs and Trade Data Institute (KCTDI).

Next, we evaluate the relative contribution of three effects to FTA utilization.[19] Specifically, we multiply the respective regression coefficient by the average value of the corresponding variable. For example, the contribution of the tariff margin effect is computed by the regression coefficient of Tariff Margin (reported by the fractional logit model under VI in Table 4) multiplied by the sample means of Tariff Margin. The contribution of each effect is calculated by exporting country. The results are reported in Table 5.

There are two noteworthy points. One is that the scale effect is the most important in FTA utilization. In all countries, the scale effect provides a more than ten times larger contribution than the margin and ROO effects (in absolute terms). Also, the tariff margin and ROO effects have almost the same magnitude of contribution to FTA utilization. Second, Cambodia has a relatively large

19 Such relative contribution may be evaluated by computing the standardized coefficients. In the case of the OLS results, those for Tariff Margin, ln Average Trade, and Restrictiveness Index are estimated to be 0.0438, −0.0227, and 0.4674, respectively. Thus, as shown below for the fractional logit model, ln Average Trade plays a most quantitatively important role.

https://doi.org/10.1017/S1474745613000323 Published online by Cambridge University Press

Table 4. Estimation results: marginal effects

Estimation Method	(I) OLS	(II) OLS	(III) OLS	(IV) Poisson	(V) Tobit	(VI) Fractional
Tariff Margin	0.004***	0.011***	0.013***	0.023***	0.017***	0.005***
	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.001]
ln Average Trade	0.077***	0.072***	0.072***	0.377***	0.329***	0.085***
	[0.001]	[0.001]	[0.001]	[0.004]	[0.004]	[0.001]
Restrictiveness Index	−0.021***			−0.033*	−0.016	−0.010**
	[0.005]			[0.017]	[0.018]	[0.005]
Exporter Dummy	YES	YES	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES	YES	YES
Industry Dummy (HS 2-digit)	YES	NO	NO	YES	YES	YES
Industry Dummy (HS 6-digit)	NO	YES	NO	NO	NO	NO
Industry Dummy (HS 9-digit)	NO	NO	YES	NO	NO	NO
Number of observations	42,190	42,190	42,190	42,151	42,190	42,190
Adj R-squared	0.3452	0.4568	0.4850			
Log (pseudo) likelihood				−20218	−27508	−15409

Notes: The dependent variable is FTA utilization. The parentheses are standard errors. ***, **, and * show 1%, 5%, and 10% significance, respectively.

Table 5. Contribution to the average rates of FTA utilization by exporters

	Tariff Margin	AverageTrade	Restrictiveness Index
Brunei	0.0241	0.4188	−0.0263
	0.06	1	−0.06
Indonesia	0.0498	0.7670	−0.0490
	0.06	1	−0.06
Cambodia	0.0499	0.4919	−0.0348
	0.10	1	−0.07
Laos	0.0319	0.3848	−0.0266
	0.08	1	−0.07
Myanmar	0.0656	0.8251	−0.0513
	0.08	1	−0.06
Malaysia	0.0363	0.5792	−0.0367
	0.06	1	−0.06
Philippines	0.0396	0.5023	−0.0355
	0.08	1	−0.07
Thailand	0.0439	0.6262	−0.0397
	0.07	1	−0.06
Viet Nam	0.0516	0.7522	−0.0483
	0.07	1	−0.06
All	0.0455	0.6608	−0.0428
	0.07	1	−0.06

Notes: The upper figures in this table report the marginal effects multiplied by the mean values of 'Average Trade', 'Tariff Margin', and 'Restrictiveness Index'. The marginal effects are based on the results provided under (VI) in Table 4. Both the marginal effects and the mean values are calculated by exporting countries. The lower figures show the respective contribution when the contribution of Average Trade is normalized to the value one.

margin effect. This is somewhat surprising because the scale effect is expected to be more important for low-income countries, where exporters are small firms for which sunk costs of using preferences are larger in relative terms. We suspect that this result might be due to the fact that exporters from Cambodia to Korea are mostly Korean firms' affiliates and thus relatively large-sized. In other words, since most of the exporters in Cambodia are large enough, firm size may not be a major factor, and the other elements, particularly tariff margin, may play a more important role, as compared with other countries. However, this point deserves further investigation in a new study.

5. Concluding remarks

Utilization rate is a key indicator of how effectively an FTA is implemented. A low utilization rate means that tariff elimination or reduction under the FTA fails to

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bring out an expected economic benefit. Often referred to as a hidden non-tariff barrier, rules of origin are regarded as a factor that can act counter to the efficient practice of an FTA. In this paper, we have empirically assessed the effect of ROO restrictiveness, along with the relative magnitude of the effects of tariff margin and average size of each transaction, on FTA utilization for Korean imports under KAFTA. We have found that all three effects are statistically significant in affecting FTA utilization; however, we have also shown that the scale effect is much more important than the margin effect or the ROO effect.

First of all, the results confirm the negative correlation between restrictiveness of ROOs and FTA utilization. This implies that complex and strict requirements under ROOs increase the compliance cost for exporters and importers, thus offsetting the gains from preferential treatment, and this results in reduced use of the FTA. On the other hand, our results show a positive impact of tariff margin and average size of each transaction on FTA utilization.

Given that ROOs are in practice a necessity in connection with preferential trade agreements in order to prevent abuse due to free-riding, our results imply that even though complying with a ROO is costly, this cost can be effectively compensated if the tariff margin is large. This suggests that the use of an FTA will increase as the FTA tariff elimination/reduction process goes ahead. In addition, we can infer that complete elimination of a tariff would be more effective than partial tariff reduction in terms of FTA utilization, thereby providing policymakers with a stimulus to negotiate more extensive tariff elimination.[20] Also, the fact that the compliance cost of a ROO can be offset if the volume of exports is large means that substantial support should be provided for small and medium-size enterprises (SMEs). SMEs are likely to export relatively small volumes per transaction; therefore, it may be onerous for SMEs to make full use of the scale effect. Accordingly, policy assistance for reducing administrative costs should be geared toward SMEs. For example, holding seminars and/or providing on-line and/or on-site consulting services on how to make best use of preferences will help SMEs to gain optimal benefit from an FTA.

Finally, we can infer from our results that the use of an FTA can increase as the tariff elimination/reduction process goes ahead. Also, there can be a learning-by-doing effect regarding ROOs. That is, the compliance cost of a ROO decreases as exporters build relevant experience and know-how, so that the impact of the restrictiveness of a ROO on FTA utilization declines, possibly even to the point of becoming insignificant in the long run. It would be an interesting issue to determine whether any structural break-even point or threshold level can be identified. Having only six years of experience of implementation, however, we need a longer period for empirical testing, and this would constitute an interesting future research topic.

20 We thank one of the referees for suggesting this point.

https://doi.org/10.1017/S1474745613000323 Published online by Cambridge University Press

References

Ahn, C., I. Cheong, Y. Fukagawa, and T. Ito (2005), 'Korea–Japan FTA: Toward a Model Case for East Asian Economic Integration', KIEP Working Paper 05-01.

Bureau, J., R. Chakir, and J. Gallezot (2007), 'The Utilisation of Trade Preferences for Developing Countries in the Agri-food Sector', *Journal of Agricultural Economics*, **58**(2): 175–198.

Cadot, O. and J. de Melo (2007), 'Why OECD Countries Should Reform Rules of Origin', *World Bank Research Observer*, **23**(1): 77–105.

Cadot, O., C. Carrere, J. De Melo, and B. Tumurchudur (2006), 'Product-specific Rules of Origin in EU and US Preferential Trading Arrangements: An Assessment', *World Trade Review*, **5**(2): 199–224.

Choi, N. (2009), 'Determinants of Staging Categories for the Tariff Elimination in the FTA Negotiation', KIEP Working Paper 09-01.

Demidova, S. and K. Krishna (2008), 'Firm Heterogeneity and Firm Behavior with Conditional Policies', *Economics Letters*, **98**(2): 122–128.

Estevadeordal, A. (2000), 'Negotiating Preferential Market Access: The case of the North American Free Trade Agreement', *Journal of World Trade*, **34**: 141–200.

Estevadeordal, A. and K. Suominen (2004), 'Rules of Origin in FTAs in Europe and in the Americas: Issues and Implications for the EU–Mercosur Inter-Regional Association Agreement', INTAL-ITD Working Paper 15.

Francois, J., B. Hoekman, and M. Manchin (2006), 'Preference Erosion and Multilateral Trade Liberalization', *World Bank Economic Review*, **20**(2): 197–216.

Hakobyan, S. (2010), 'Accounting for Underutilization of Trade Preference Programs: US Generalized System of Preferences', mimeo, University of Virginia.

Hansen, B. (2000), 'Sample Splitting and Threshold Estimation', *Econometrica*, **68**(3): 575–604.

Hayakawa, K. (2011), 'Measuring Fixed Costs for Firms' Use of a Free Trade Agreement: Threshold Regression Approach', *Economics Letters*, **113**(3): 301–303.

Keck, A. and A. Lendle (2012), 'New Evidence on Preference Utilization', Staff Working Paper ERSD-2012-12, World Trade Organization.

Kim, H. and M. Cho (2010), 'Impact of Rules of Origin on FTA Utilization in Korean FTAs', KIEP Working Paper 10-08.

Kim, J. and Y. Oh (2007), 'Determinants of Intra-FDI Inflows in East Asia: Does Regional Economic Integration Affect Intra-FDI?', KIEP Working Paper 07-01.

Manchin, M. (2006), 'Preference Utilisation and Tariff Reduction in EU Imports from ACP Countries', *The World Economy*, **29**(9): 1243–1266.

Papke, L. E. and J. M. Wooldridge (1996), 'Econometric Methods for Fractional Response Variables with an Application to 401(k) Plan Participation Rates', *Journal of Applied Econometrics*, **11**(6): 619–632.

Appendix: Sample statistics

Table A1. Basic statistics

Sample	Variable	Obs	Mean	Std. Dev.	Min	Max
All						
	Utilization	42,190	0.261	0.406	0	1
	Tariff Margin	42,190	8.571	4.098	0.4	50
	Restrictiveness Index	42,190	4.275	0.447	3	7
	ln Average Trade	42,190	7.769	2.446	−0.693	17.917
Utilization = 0						
	Tariff Margin	27,640	8.387	3.798	0.4	50
	Restrictiveness Index	27,640	4.302	0.455	3	7
	ln Average Trade	27,640	6.964	2.427	−0.693	17.390
0 < Utilization < 1						
	Tariff Margin	10,612	8.953	4.590	1	50
	Restrictiveness Index	10,612	4.222	0.418	3	7
	ln Average Trade	10,612	9.234	1.519	0	17.917
Utilization > 1						
	Tariff Margin	3,938	8.838	4.604	1	50
	Restrictiveness Index	3,938	4.233	0.450	3	7
	ln Average Trade	3,938	9.475	1.827	0.693	17.836

Table A2. Number of observations by exporters and years

	2007	2008	2009	2010	2011	All
Brunei		13	26	26	40	105
Indonesia	1,439	2,006	2,054	2,157	2,544	10,200
Cambodia		47	235	275	324	881
Laos		12	29	31	34	106
Myanmar	116	171	203	223	282	995
Malaysia	1,291	1,725	1,806	1,861	2,305	8,988
Philippines		1,363	1,443	1,456	1,773	6,035
Thailand				2,275	2,753	5,028
Viet Nam	1,273	1,862	2,017	2,143	2,557	9,852
All	4,119	7,199	7,813	10,447	12,612	42,190

https://doi.org/10.1017/S1474745613000323 Published online by Cambridge University Press