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Firm-level Utilization Rates of Regional Trade Agreements: Importers' Perspective☆

Kazunobu Hayakawa [a], Nuttawut Laksanapanyakul [b], Taiyo Yoshimi [c,*]

[a] Bangkok Research Center, Institute of Developing Economies, Thailand
[b] Science and Technology Development Program, Thailand Development Research Institute, Thailand
[c] Faculty of Economics, Chuo University, Japan

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ABSTRACT

This study provides evidence of firm-level utilization of regional trade agreements (RTAs) using transaction-level import data for Thailand. Two stylized facts are presented: some firms use RTA schemes in imports from RTA partner countries, whereas others do not; among firms that import from RTA partner countries under RTA schemes, some use RTA schemes for all transactions but others use them only for some transactions. To interpret these observations, we focus on the role of importers' demand size. Specifically, we reveal that import firm-product-level RTA utilization rates are higher for larger-size importers in terms of demand, indicating that the difference in the share of utilization of RTA schemes across importers stems from the difference in the importers' demand size. We also find that the utilization rates are higher when the preference margin, defined as most-favored-nation tariff rate minus RTA rate, is larger.

1. Introduction

Recent studies on regional trade agreements (RTAs) employ trade data according to tariff schemes such as RTA schemes or most-favored-nation (MFN) schemes. Traditionally, RTAs have been empirically investigated by employing regular trade data; this approach is unable to identify the tariff scheme used in trade. Such traditional studies have mainly examined the existence of trade-creation effects arising from RTAs.[1] More recently, in contrast, trade researchers have started to employ product-level trade data according to tariff schemes. In particular, such studies show that not all exporters necessarily utilize RTA schemes even when exporting to RTA partner countries.[2] Furthermore, prior studies have also examined the determinants of preferential trade utilization rates (share of preferential trade values in total trade values) and found that the utilization rates are higher for products with larger preference

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* Correspondence to: 742-1 Higashinakano, Hachioji-shi, Tokyo 192-0393, Japan.
E-mail address: yoshimi@tamacc.chuo-u.ac.jp (T. Yoshimi).

[1] Some studies using such trade data include those by Baier and Bergstrand (2007) and Magee (2008).

[2] Those include studies by Bureau et al. (2007), Cadot, Carrereet al. (2006), Francois et al. (2006), Manchin (2006), Hakobyan (2015), and Hayakawa et al. (2019, 2021).

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margins (difference between MFN rates and preferential rates), larger trade volumes, and less restrictive rules of origin (RoOs).[3] These studies have obtained fruitful findings that have yet to be clarified in traditional studies employing regular trade data.

In this study, we explore how often RTA schemes are used in imports by using transaction-level Thai import data, which are more detailed compared with product-level data and enable the identification of tariff schemes chosen in each transaction. Our focus on imports is based on the general limitation on data in the existing literature. Trade data according to tariff schemes are usually available from the import side, based on customs records. Some information on RTA utilization is also available from the export side, based on certificates of origin (CoOs). However, when a self-certification system is adopted in RTAs,[4] there is no way of knowing the tariff scheme used by the exporter since the CoO information is retained by the exporting companies. Furthermore, exporters do not necessarily export products under RTA schemes even after they have obtained CoOs. Thus, export-side data based on the issuance of CoOs are likely to overestimate the true value of RTA exports. As a result, using import-side data, we can more precisely investigate factors that affect the utilization of RTA schemes.[5]

The main reason for our use of data for Thailand is, as noted, that the transaction-level import data that can identify tariff schemes (e.g., MFN or RTAs) used by import firms are available. They can be obtained from the Customs Office of the Kingdom of Thailand and cover all commodity imports in Thailand. Although several recent studies employ transaction- or firm-level trade data, few studies have employed data with tariff-scheme details so far. One of the limited examples is Cherkashinet al. (2015). However, their dataset covered only the apparel industry, while our dataset covers all sectors. Industry coverage is important for our study because we need sufficient variation in preference margins, an essential determinant of the firms' RTA utilization. As a result, our analysis will uncover new evidence on RTA utilization from the viewpoint of import firms.

Our particular focus is the heterogeneity in RTA utilization among *import firms*. We first reveal two striking pieces of evidence. First, we find that some firms use RTA schemes in imports from RTA partner countries, whereas others do not. This finding will be referred to as Stylized Fact 1. Second, among firms that import from RTA partner countries under RTA schemes, it is revealed that some use RTA schemes for all their transactions but others use RTA schemes only for some transactions. This fact will be referred to as Stylized Fact 2. These Facts not only indicate the existence of significant divergence in RTA utilization frequency across importers but also motivate us to explore how importers' characteristics are related to import firm-level RTA utilization. Therefore, next, we investigate the role of importers' characteristics in determining frequency of RTA scheme utilization in imports. We especially focus on the role of importers' total demand size, which is captured by their imports from the world. Our results indicate that importer RTA utilization rates, which are defined as an importer's share of preferential imports in total imports, are positively correlated with importers' demand size.

The positive effect of importers' demand size in their RTA utilization rates can be interpreted as follows. Existing studies such as Demidova and Krishna (2008) have assumed that exporters mainly decide what tariff scheme to use as they practically pay the majority of the cost to utilize RTA tariff schemes. However, importers' characteristics, such as their size, should affect exporters' decisions because exporters consider those characteristics when calculating their profits from transactions with each importer. The major cost for RTA utilization is the fixed cost for documentation preparation to obtain CoOs, and is borne by exporters. Thus, exporters are more likely to use RTA schemes if importers are larger in terms of demand size as well as more profitable so that exporters can earn enough profits to cover the costs entailed in RTA utilization. As a result, it would appear that large importers use RTA schemes in all transactions and small importers use MFN schemes in all transactions. This provides a rationale for Stylized Fact 1. Furthermore, when trading with medium-sized importers, some exporters use RTA schemes but others do not. Thus, such importers engage in import transactions under both RTA and MFN schemes, supporting Stylized Fact 2. In sum, importers with a larger demand size will have a higher share of preferential imports.

The rest of this paper is organized as follows. Section 2 offers an overview of firm-level RTA utilization and presents some pieces of evidence. This section also highlights the significance of RTA scheme "partial users" (importers that use both RTA and MFN schemes), which has never been highlighted in the literature. We investigate the role of importers' demand size in determining RTA utilization in Section 3. In addition, since almost all previous studies on RTA utilization are conducted at the product level, we also demonstrate product-level analysis. Section 4 discusses the implications of our results and Section 5 concludes this study.

2. Stylized facts

As our dataset is unique and not often used in existing studies, this section summarizes the data and presents several new pieces of evidence on firm-level RTA utilization in imports. The data have been obtained from the Customs Office of the Kingdom of Thailand and cover all commodity imports of Thailand. Our dataset contains harmonized system (HS) eight-digit code, exporting country, firm identification code, tariff scheme (e.g., RTA or MFN), and import values in Thai Baht (THB). We use data on imports aggregated by years in addition to that aggregated by source countries, HS eight-digit codes, firms, and tariff schemes. We classify tariff schemes into three categories, namely MFN scheme, RTA scheme, and other schemes. Tariff payments for imports under "other schemes" are exempted on the basis of five schemes: bonded warehouses, free zones, investment promotion, duty drawback for raw materials imported for the production of exports, and duty drawback for re-exportation.

[3] Also, several other studies investigated the effects of preference utilization on prices and found export prices rise after RTA schemes are utilized. Examples are Cadotet al. (2005), Olarreaga and Ozden (2005), Ozden and Sharma (2006), and Cirera (2014).

[4] For example, these include NAFTA, the U.S.–Australia Free Trade Agreement (FTA), the U.S.–Singapore FTA, the Trans-Pacific Partnership, the Singapore–New Zealand FTA, the Thailand–New Zealand FTA, the Australia–New Zealand FTA, the Mexico–Chile FTA, and the U.S.–Korea FTA.

[5] The role of exporters' characteristics can be explored if *import* data include the information on exporters.

Table 1
Number of RTA non-users and users in Thailand's Imports in 2008.

	Number of	Non-users		Users	
	Eligible Products	Number	Share (%)	Number	Share (%)
Australia	5,783	10,835	89	1356	11
China	2,415	44,582	81	10,501	19
India	238	1,220	96	57	4
Japan	5,147	91,585	98	1,565	2
New Zealand	5,784	1,427	78	401	22
Indonesia	6,280	6,613	71	2,679	29
Cambodia	6,280	352	91	36	9
Lao PDR	6,280	740	88	102	12
Myanmar	6,280	1,178	94	69	6
Malaysia	6,280	17,747	87	2,704	13
Philippines	6,280	3,358	86	529	14
Singapore	6,280	31,967	98	590	2
Vietnam	6,280	4,213	83	879	17

Source: Authors' computation
Note: The table shows the number/share of firm-HS eight-digit observations according to RTA use. The export country-product observations are restricted to those in which RTA rates are lower than MFN rates, i.e., those eligible for RTAs.

Table 2
Number of RTA partial users and full users in Thailand's imports in 2008.

	Partial-users		Full-users	
	Number	Share (%)	Number	Share (%)
Australia	376	28	980	72
China	2,719	26	7,782	74
India	17	30	40	70
Japan	994	64	571	36
New Zealand	77	19	324	81
Indonesia	590	22	2,089	78
Cambodia	4	11	32	89
Lao PDR	17	17	85	83
Myanmar	12	17	57	83
Malaysia	802	30	1,902	70
Philippines	182	34	347	66
Singapore	281	48	309	52
Vietnam	184	21	695	79

Source: Authors' computation
Note: The table shows the number/share of firm-HS eight-digit observations according to the extent of RTA use. The export country-product observations are restricted to those in which RTA rates are lower than MFN rates.

We first show the number of RTA users in 2008. In that year, Thailand had six RTAs. The first RTA concluded by Thailand was the ASEAN free trade agreement (FTA), which entered into force in 1993. It became effective among Brunei, Indonesia, Malaysia, the Philippines, Singapore, and Thailand. More countries later joined this FTA (Vietnam in 1995, Laos and Myanmar in 1997, and Cambodia in 1999). Thailand also has bilateral RTAs with India, Japan, Australia, and New Zealand, which were entered into force in 2004, 2007, 2005, and 2005, respectively. In the bilateral RTA with India, only the early harvest program (i.e., limited coverage of liberalized products) was made available. The RTA with China, concluded with ASEAN members as the ASEAN–China FTA, entered into force in 2005. Except for the bilateral RTA with Japan, tariff rates in all RTAs were basically reduced on January 1 every year.[6]

Table 1 reports the number/share of import firm-product-level observations according to RTA use and export countries. "Product" is defined at an HS eight-digit level. Export country-product observations are restricted to those in which RTA rates are lower than MFN rates.[7] The number of such RTA-eligible products is largest for imports from ASEAN countries, followed by New Zealand and Australia. We can immediately see that the majority of importers do not use RTA schemes. The highest share of RTA users can be found among those importing from Indonesia, followed by New Zealand, at 29% and 22%, respectively. In absolute terms, the number of RTA users is outstanding in the case of importing from China despite the relatively low number of RTA-eligible products. While being greater than

[6] More precisely, in the ASEAN–China FTA, tariff rates are reduced not later than January 1. Thus, it is unclear exactly when tariff rates are reduced each year. Also, in the Thailand–India FTA's early-harvest program, tariff reduction was completed on September 1, 2006, which is before our sample period.

[7] Therefore, products with zero-MFN rates are automatically dropped. In addition, in the case of exports from ASEAN, not only the ASEAN FTA but also the ASEAN–China FTA is available. In this case, we restrict our analysis to products in which either/both of these two FTAs provide lower preferential rates compared with MFN rates.

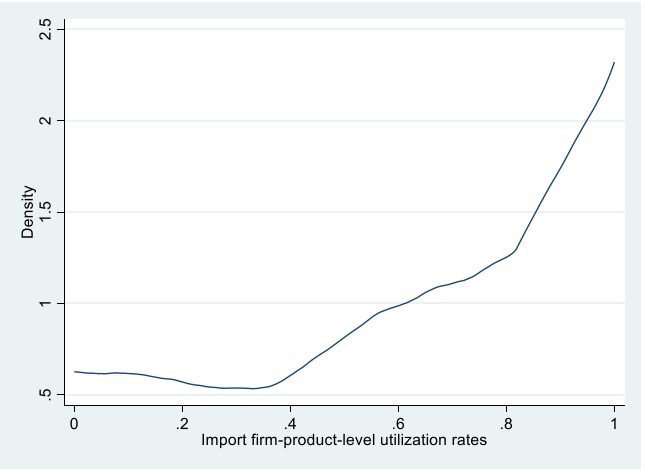

Fig. 1. Density of Partial Utilization Rates in Imports from Australia in 2008. *Source*: Customs, Kingdom of Thailand.

10,000 in number, the share is only 19%. Our finding here can be simply summarized as follows:

Stylized Fact 1. *Some firms use RTA schemes in imports from RTA partner countries, whereas others do not.*

Next, we decompose RTA users into partial users and full users. The former are defined as those who import under both MFN and RTA schemes, whereas the latter have positive imports under RTA schemes but no imports under the MFN scheme. The number and share of each type are shown in Table 2. Although the number of full users is larger than the number of partial users in most cases, the presence of partial users is not negligible. For example, the share of partial users is around 30% in the cases of Australia, China, India, Malaysia, and the Philippines. Moreover, it is larger than the share of full users in the case of Japan.[8] The case of Singapore also exhibits a relatively high share of partial users (48%). In short, there are a significant number of partial users when RTA utilization is examined from the viewpoint of importers. This fact has rarely been discussed in the literature. This finding is simply summarized as follows:

Stylized Fact 2. *There are both full users and partial users among firms who import from RTA partner countries under RTA schemes.*

Finally, we offer an overview of the distribution of firm-product-level RTA utilization rates for partial users to show how such utilization rates vary. Those rates are computed on a value-basis, i.e., the share of imports under RTA schemes in total imports at a firm-product-level. We do not include imports under other schemes in the total imports, i.e., the denominator of the share. The tendency is similar across export countries, so we only report the case of Australia.[9] Fig. 1 depicts such a distribution in imports from Australia. Note that tariff rates in the case of the RTA with Australia are reduced on January 1 every year. The figure shows that the density of observations rises with the utilization rate. In particular, it dramatically rises from around 0.4. These findings reveal that partial users mainly use RTA schemes rather than MFN schemes.

What is the mechanism behind the above evidence? We focus on the difference in demand sizes across import firms. Existing studies (e.g., Demidova and Krishna, 2008) have assumed that decisions on tariff scheme choices rest with the exporters because the majority of the cost for RTA utilization (i.e., cost for documentation preparation to obtain CoOs) is paid by exporters in practice.[10] However, exporters are supposed to consider the importers' characteristics such as the demand size while making decisions. Exporters utilize an RTA scheme if the benefits from lower RTA tariff rates exceed the costs for its utilization. If an importer is a large-size importer in terms of its demand size and a more important customer to an exporter, the benefits from using RTA tariff rates increase, and the exporter becomes more willing to utilize the RTA scheme.

This mechanism enables us to interpret the above two observations.[11] Specifically, the difference in importers' demand size plays a key role. Regarding Stylized Fact 1, exporters are more likely to utilize RTA schemes in transactions with large-size importers. Thus, there would appear large importers who use RTA schemes for all transactions and small importers who use the MFN scheme for all transactions. Regarding Stylized Fact 2, the frequency of RTA utilization would differ even among large importers. If an importer is large enough, all exporters doing business with this importer may use RTA schemes. However, if an importer's demand size is not large

[8] This larger share of partial users may be partly attributable to the timing of tariff reduction in RTAs with Japan. Every year, RTA rates are changed on April 1, which marks the beginning of the Japanese fiscal year. Therefore, in the case of the first year of tariff reductions during the phase-in period, firms may import under MFN schemes from January to March and then under RTA schemes from April. Namely, when the RTA tariff rates are introduced at a time that is different from the calendar year, the number of partial users is likely to be larger.

[9] Figures for other countries are available upon request.

[10] Importers can use an RTA scheme by submitting CoOs to customs. However, exporters must prepare these CoOs. All the variable and fixed costs to obtain the CoOs should be borne by exporters. Therefore, unless exporters choose to obtain CoOs, importers cannot use the RTA scheme. In this sense, it is more natural to assume that exporters rather than importers make the decision regarding tariff schemes.

[11] In Appendix A, we present a model of international trade where exporters and importers are heterogeneous in terms of the productivity. Further, Section A5 of the appendix provides our predictions on the effect of the importer size and preference margin on RTA utilization rates as Propositions 1 and 2, respectively.

Table 3
RoOs in Australia–Thailand RTA: Tariff-line level.

RoOs	Number	Share (%)
CC	1,223	15
CC&RVC	238	2.9
CC&RVC&SP	329	4.0
CH	3,160	38
CH&RVC	899	10.8
CH&SP	22	0.3
CS	2,296	28
CS&RVC	44	0.5
CS&SP	6	0.07
RVC	9	0.1
SP	10	0.1
WO	64	0.8

Notes: "CC," "CH," and "CS" indicate change-in-chapter, change-in-heading, and change-in-subheading, respectively. "RVC," "SP," and "WO" are regional value content rule, technical requirement/specific process rule, and wholly obtained rule, respectively. Two or three of these rules might be combined. Total number is equal to the total number of tariff lines in Thailand, i.e., 8300.

enough, some exporters will use RTA schemes but others would not. Thus, importers with a range of demand sizes will have import transactions under both RTA and MFN schemes, leading to Stylized Fact 2. In sum, importers' demand size is positively related to their RTA utilization frequency.

3. Empirical framework

Based on the discussion in the previous section, this section examines more closely how import firms' RTA utilization is related to their demand size. Specifically, we investigate the determinants of import firm-product-level utilization rates. The analysis focuses on imports from Australia, as explained below. Thus, our sample dimension is import firm-product-year. To examine the role of the importers' demand size, we estimate the following equation:

$$U_{fpt}^{Firm-Product} = \gamma_1 Margin_{pt} + \gamma_2 \ln TotalImports_{fpt} + u_{RoO} + u_t + \epsilon_{fpt} \quad (1)$$

The dependent variable is the import firm-product-level RTA utilization rate, which lies in the range of [0,1]. As in the previous empirical studies, we introduce $Margin_{pt}$, which represents the preference margin of product p in year t and is defined as the difference between MFN and RTA rates.[12] Specifically, the preference margin is defined as MFN rates minus RTA rates at the product-year level. Thus, larger preference margin indicates that the RTA scheme is less costly than the MFN scheme in terms of tariff rates. In other words, RTA schemes become more attractive for exporters relative to the MFN scheme as the preference margin becomes larger. Thus, we expect a positive sign for γ_1. $\ln Total\ Imports_{fpt}$ is a log of firm f's total imports of product p from the world (except for Australia) in year t, which is a proxy for this importer's demand size in the market.[13] As discussed above, the sign on the coefficient for this variable should be positive because large-size importers in terms of demand tend to bring enough benefits to exporters such that the exporters can cover the fixed costs of RTA utilization.

We should also emphasize some other characteristics that affect import firm-product-level utilization rates. In particular, exporters have to comply with RoOs when exporting under an RTA scheme. For instance, exporters have to prove that the share of the total value of inputs imported from non-member countries is less than a certain percentage (e.g., 40%) of the price of exported products when the regional value content (RVC) rule is applied to their exporting products.[14] If the RoOs are more restrictive for exporters, more exporters will hesitate to use the RTA scheme. As a result, other things being equal, RTA utilization rates will fall for each importer when RoOs are more restrictive. To control for these effects of the RoOs, we introduce RoO dummy variables (u_{RoO}), explained below. Year fixed effects (u_t) capture the effects of year-specific macro shocks such as changes in exchange rates.

We estimate this model by employing the fractional logit estimation technique proposed by Papke and Wooldridge (1996) because our dependent variable lies in the unit interval. The fractional logit model (FRAC) ensures that, unlike the ordinary least-squares (OLS) method, predicted values for the dependent variable are in the unit interval. In addition, unlike the log-odds ratio model and beta regression model, it can naturally define dependent variables for the boundary values 0 and 1. It also imposes less restrictive

[12] The preference margin is defined in the form of ratio (μ_{ijl}^{-1}) in our theoretical model, as presented in Appendix A, mainly for ease of mathematical computation. In our empirical analysis, on the other hand, we use a measure that is most frequently used in the empirical literature, i.e., the difference between MFN and RTA rates.

[13] Alternatively, we may be able to use the share of a firm's total imports from Australia to Australia's total exports to the world to capture a firm's demand size. However, we use a firm's total imports from Australia as the denominator of our dependent variable, thus the use of this kind of share variable causes a simultaneity issue. Therefore, we decided to employ current definition to capture a firm's demand size for imports from Australia.

[14] Other examples of RoOs are the change-in-tariff classification rule, technical requirement/specific process rule, and wholly obtained rule.

Table 4
Basic statistics.

	Obs	Mean	Std. Dev.	Min	Max
Import firm-product-level					
Utilization rates	19,878	0.0608	0.2314	0	1
Margin	19,878	0.0638	0.0793	0	2.5971
ln Total Imports	19,878	13.4323	3.1783	0.6931	25.9552
Product-level					
Utilization rates	9,655	0.0976	0.2724	0	1
Margin	9,655	0.0735	0.1009	0	2.5971
Mean in firm-level imports	9,655	14.3377	1.6904	5.8406	25.1926

Source: Authors' computation

Table 5
Firm-product-level regression.

	All		Positive margin	
	(I)	(II)	(III)	(IV)
	OLS	FRAC	OLS	FRAC
Margin	0.7826	8.8977	0.796	7.877
Heteroscedasticity-consistent	[0.0414]* **	[0.3311]* **	[0.0513]* **	[0.3594]* **
Cluster firm	[0.0839]* **	[0.6120]* **	[0.0963]* **	[0.6819]* **
Cluster product	[0.1190]* **	[0.9766]* **	[0.1378]* **	[1.0786]* **
ln Total Imports	0.0072	0.1359	0.0099	0.1612
Heteroscedasticity-consistent	[0.0005]* **	[0.0102]* **	[0.0007]* **	[0.0115]* **
Cluster firm	[0.0009]* **	[0.0179]* **	[0.0012]* **	[0.0198]* **
Cluster product	[0.0011]* **	[0.0204]* **	[0.0016]* **	[0.0232]* **
Log pseudolikelihood		-3406.23		-3089.35
Adjusted R-squared	0.146		0.152	
Number of observations	19,878	19,878	15,049	15,049

Notes: * ** , * *, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Parentheses contain various kinds of standard errors. All specifications include RoO dummy variables in addition to year fixed effects. "OLS" and "FRAC" indicate that we estimate this model by OLS and fractional logit model, respectively. In the "Positive margin" column, we restrict sample products to those with a positive preference margin only.

assumptions than the Tobit model, which requires normality and homoscedasticity of the dependent variables (for more details, see Ramalho et al., 2011). For comparison purposes, we also estimate our model by OLS. Since the use of non-linear models makes the inclusion of more detailed fixed effects (e.g., import firm fixed effects) computationally difficult, we later introduce various types of fixed effects in the OLS estimation.

We employ the same dataset as in Section 2. In particular, we focus on imports by Thailand from Australia during 2007–2009.[15] This focus aims to obtain a significant number of observations and avoid analyzing firms' complicated decisions on tariff schemes. In this period, Australia had only one RTA with Thailand, a bilateral one that was entered into force in 2005. In contrast, for example, Japan has not only a bilateral RTA but also a plurilateral RTA with Thailand, particularly from 2009. When multiple RTA schemes are available, firms can choose a tariff scheme from among MFN rates, bilateral RTA rates, and plurilateral RTA rates rather than simply choosing between MFN and RTA rates (see, for example, Hayakawa et al., 2019).

We also avoid examining plurilateral RTAs. In this period, for example, the other ASEAN member states and China had such RTAs with Thailand. However, those include diagonal cumulation rules among several countries. Such rules are expected to affect firms' decisions and impact mechanisms of determination of RTA utilization rates particularly in plurilateral RTAs (see, for example, Hayakawa, 2014). As a first step of the discussion, this study focuses on bilateral RTAs.[16] Finally, although India and New Zealand also had single bilateral RTAs with Thailand in this period, as shown in Table 1, the number of import observations is too small to be empirically investigated.

Table 3 reports the distribution of RoOs in Australia–Thailand RTA, where "CC," "CH," and "CS" indicate change-in-chapter, change-in-heading, and change-in-subheading, respectively, and "RVC," "SP," and "WO" are regional value content rule, technical requirement/specific process rule, and wholly obtained rule, respectively. Two or three of these rules may be combined. "Number" indicates the number of tariff-line codes in each type of RoOs. In Australia–Thailand RTA, RoOs are set for each HS six-digit level code. As shown in the table, the major types are change-in-tariff classification, i.e., CC, CH, or CS. A combination with RVC (e.g., CC&RVC or CH&RVC) is also relatively common. In order to control for the role of RoOs, we create dummy variables indicating each type of RoOs and introduce our estimation equation.

[15] This period includes the global financial crisis in 2007/2008. Although this crisis may have reduced the number of exporters/importers, i.e., that of observations, we believe that it does not change how exporters make a decision on tariff schemes.
[16] Also in the model presented in Appendix A, we investigate only bilateral RTAs.

Table 6
Robustness checks by fractional logit model: firm-product-level regression.

	Excluding others		Lagged demand		More controls	
	(I)	(II)	(III)	(IV)	(III)	(IV)
Margin	8.6530 * **	7.7276 * **	9.2137 * **	8.3547 * **	0.9972 * **	0.9308 * **
	[0.3624]	[0.3955]	[0.5660]	[0.6316]	[0.1504]	[0.1663]
ln Total Imports	0.1322 * **	0.1578 * **	0.1232 * **	0.1503 * **	0.0023 * **	0.0029 * **
	[0.0109]	[0.0124]	[0.0160]	[0.0183]	[0.0006]	[0.0007]
Product	All	Positive	All	Positive	All	Positive
Method	FRAC	FRAC	FRAC	FRAC	OLS	OLS
RoO Dummy	X	X	X	X		
Product Dummy					X	X
Year Dummy	X	X	X	X	X	X
Firm Dummy					X	X
Log pseudolikelihood	-2890.38	-2600.49	-1295.29	-1152.32		
Adjusted R-squared					0.642	0.667
Number of observations	19,048	14,328	4,486	3,501	17,571	13,241

Notes: * ** , * *, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Parentheses contain heteroscedasticity-consistent standard errors. In the "Excluding others" column, we exclude importers who have positive import values under "other schemes." The "Lagged demand" column focuses on observations for 2009 and the total imports for 2007. "Positive" means that we restrict sample products to those with a positive preference margin only.

4. Estimation results

This section reports our estimation results. We first estimate Eq. (1) using the data at an import firm-product-year level. Then, for comparison purposes, the estimation results obtained from the analysis at a product-year level are also presented. Basic statistics for empirical analysis are provided in Table 4.

4.1. Firm-level analysis

The estimation results of Eq. (1) are shown in the column labelled "All" in Table 5. This column includes all products, including those in which RTA rates are the same as MFN rates (i.e., including products with zero MFN rates). We cluster standard errors at various levels. In cases of both OLS and FRAC and at any level of clustering, coefficients for both *Margin* and *Total Imports* are estimated to be significantly positive at a 1% significance level. Specifically, import firm-product-level utilization rates of RTA schemes are higher for products with a larger preference margin and when importers are large-size importers in terms of total imports from the world. These results are consistent with our prediction and remain unchanged even when excluding products for which RTA rates are the same as MFN rates, as shown in the column labeled "Positive margin."[17] These results indicate that exporters are more willing to utilize RTA schemes in transactions with large-size importers because they gain larger benefits, which enable them to cover the fixed costs of RTA utilization for these transactions. The results also imply that RTA schemes are more attractive when the preference margin is larger.

We conduct three types of robustness checks on the above results. First, we exclude importers who have positive import values under "other schemes." This exclusion reflects the fact that importers may follow a different decision process whenever "other schemes" are available. In this case, importers' choice becomes not binary but multiple (i.e., MFN, RTA, and other schemes), unlike the scenarios discussed in the previous sections. Therefore, we drop the above-mentioned importers, i.e., other-scheme users. The results are shown in the "Excluding others" column in Table 6. As in Table 5, we estimate the model for all products as well as products with a positive preference margin. Both cases show significantly positive coefficients on both preference margin and importer size.

Second, we use a lagged variable of total imports. Our empirical analysis was not intended to capture the causal effect of the importers' demand size; we have focused on its correlation with the importers' RTA utilization rates. Nevertheless, we also examine the role of more exogenous characteristics. Specifically, we restrict sample observations to those for 2009 and then introduce a variable for total imports for 2007. The margin variable is measured in 2009. However, this estimation would not completely eliminate endogeneity if there is persistence in demand size over time. The results are reported in the "Lagged demand" column in Table 6. We again found significantly positive coefficients on preference margin and importer size. Additional noteworthy points are that compared with the results in Table 5, this estimation shows a larger coefficient for preference margin and smaller coefficient for importers' sizes.

Finally, we control for more detailed fixed effects in our OLS estimation. Specifically, we introduce product fixed effects (HS eight-digit codes), firm fixed effects, and year fixed effects. Due to the introduction of product fixed effects, we drop RoO dummy variables, which are time-invariant. The results are reported in the "More controls" column in Table 6. The coefficients on both *Margin* and *Total Imports* are again estimated to be significantly positive. Owing to our estimation of linear models, it is easy to quantitatively interpret our results. Column (IV) indicates that a 10-percentage-point rise in preference margin leads to a 9-percentage-point rise in firm-level utilization rates. Also, a doubling (i.e., 100% increase) of an importer's size raises its utilization rates by 0.3% points. Namely, the

[17] To save space, we do not report the estimation results in RoO dummy variables, which are available in Appendix B.

Table 7
Product-level regression.

	All		Positive margin	
	(I)	(II)	(III)	(IV)
	OLS	FRAC	OLS	FRAC
Margin	0.714	6.6488	0.6676	5.6575
Heteroscedasticity-consistent	[0.0595]* **	[0.4279]* **	[0.0656]* **	[0.4560]* **
Cluster HS 6-digit code	[0.0931]* **	[0.5629]* **	[0.1023]* **	[0.6010]* **
Mean in firm-level imports	0.0164	0.1832	0.0283	0.2585
Heteroscedasticity-consistent	[0.0018]* **	[0.0197]* **	[0.0026]* **	[0.0232]* **
Cluster HS 6-digit code	[0.0026]* **	[0.0275]* **	[0.0036]* **	[0.0320]* **
Log pseudolikelihood		-2374.884		-2075.833
Adjusted R-squared	0.1565		0.1582	
Number of observations	9,655	9,655	7,020	7,020

Notes: * ** , * *, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Parentheses contain heteroscedasticity-consistent standard errors. In all specifications, RoO dummy variables in addition to year fixed effects are included. "OLS" and "FRAC" indicate that we estimate this model by OLS and fractional logit model, respectively. In the "Positive margin" column, we restrict sample products to those with a positive preference margin only.

quantitative effect of firm size on firm-level utilization rates looks trivial, compared with the case of preference margin.

4.2. Product-level analysis

Most previous studies examined preference utilization at a product level. Thus, it is worth discussing how product-level RTA utilization rates, which are defined as the share of imports under RTA schemes out of total imports at a product level, are related to the importers' size. As counterparts to the above firm-level analysis, we examine how the average size of importers can be correlated with product-level RTA utilization rates[18]; these are expected to be higher when the share of importers that provide exporters with enough profits to cover the fixed cost of RTA utilization is higher. This is more likely to happen when importers' average demand size is larger.

As in our firm-level analysis, we also introduce a variable of preference margin. We predict that product-level RTA utilization rates in imports are higher when the preference margin is larger. When this is the case, more exporters can earn export profits sufficient to cover the fixed costs of RTA utilization. Taking other things as given, a larger preference margin boosts the utilization of RTA schemes in each firm's import transactions. Furthermore, owing to lower tariff rates, exporters under RTA schemes have larger trade values than those under MFN schemes. As a result, product-level RTA utilization rates in imports rise with the preference margin.

For our product-level analysis, we aggregate our firm-product-level dataset to product-level data, i.e., data at an HS eight-digit level. This analysis aims to not only test the validity of the above predictions but also check consistency with previous product-level studies. On the basis of the aggregated dataset, we estimate the following equation:

$$U_{pt}^{Product} = \beta_1 Margin_{pt} + \beta_2 \ln Mean_{pt} + u_{RoO} + u_t + \epsilon_p \tag{2}$$

The dependent variable is product-level RTA utilization rates in importing from Australia. A larger margin is supposed to lead to higher product-level RTA utilization rates. Thus, β_1 is expected to be positive. We introduce $\ln Mean_{pt}$, the log of (simple) averaged imports of product p from the world over all sample importers from Australia. Its coefficient is expected to be positive. This "size" variable is different from the one introduced in the previous studies. For example, it was measured by the annual total import values in Hakobyan (2015), monthly average of import values in Hayakawa and Laksanapanyakul (2017), and customs district-level monthly average of import values in Keck and Lendle (2012). Our variable will be more suitable from the viewpoint of the above conjecture.

The estimation results are reported in Table 7. For all products, results from both OLS and FRAC show a significantly positive coefficient on margin, indicating that product-level RTA utilization rates are higher for products with a larger preference margin. This result is consistent with previous studies' findings on the determinants of product-level RTA utilization. The mean for firm-level imports also has significant coefficients. Its sign is found to be positive, indicating that product-level RTA utilization rates are higher for products with a higher mean importers' demand size.

5. Concluding remarks

Previous studies have linked exporters' characteristics to their choice of tariff schemes without explicitly considering heterogeneity among importers. However, empirical analysis of RTA utilization is generally only possible by employing import-side trade data. To fill this gap, this study investigated RTA utilization from the importers' perspective. Specifically, we focus on the role of importers' demand size in determining RTA utilization rates. Using highly detailed import data for Thai imports from Australia during the 2007–2009 period, we find that import firm-product-level utilization rates of RTA schemes are positively affected by importers'

[18] Section A6 of Appendix A provides supports for our predictions on product-level RTA utilization as Corollaries 1 and 2 using some specific assumptions.

demand size and preference margin. Similarly, we also demonstrate that product-level utilization rates of RTA schemes are higher for products with larger preference margin and larger average importers' demand size. These findings provide a basis for interpreting the evidence on the heterogeneous use of RTA schemes across the importers that form part of this study.

Our results have the following policy implication. In public, policy measures for exporters have been proposed to enhance RTA scheme utilization. In particular, since the major costs of RTA utilization arise in the process of complying with RoOs and obtaining CoOs, discussions have considered how such processes could become more business-friendly. Namely, this discussion concerns how to encourage exporters to utilize RTA schemes because exporters basically bear responsibility for undertaking these processes. However, our results show that policy measures for importers also have the potential to enhance the RTA scheme utilization in international trade. In particular, we found positive effects arising from the importers' demand size. Therefore, policy measures to help importers improve their productivity and expand in size should in turn enhance the use of RTA schemes in imports.

Data availability

The data that has been used is confidential.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.asieco.2023.101610.

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