



WORLD CUSTOMS ORGANIZATION

*WCO Research Paper No. 42*

# **Customs Policies and Trade Efficiency**

(August 2017)

**Yeon Soo CHOI**

## **Abstract**

Acknowledging the importance of performance measurement in the Customs context, the World Customs Organization (WCO) developed Customs policy indicators; Achieving Excellence in Customs (AEC). Utilizing Customs policy indicators from the WCO AEC survey (2016) and data from other international organizations, this paper estimated the correlation of Customs policies with trade efficiency (time & cost).

Customs modernization policies presented statistically significant correlation with trade efficiency. The ratification of Revised Kyoto Convention (RKC), a blueprint for modern and efficient Customs procedures, was associated with less import time on average by 62~64%, lower import cost by 63~64% and less export time by 63~69%. Among countries which ratified the RKC, additional 1 year since the RKC ratification (1 more year implementation of RKC provisions) was associated with less import time by 6~7% and lower import cost by 9%. The implementation of SAFE Framework of Standards (SAFE), balancing trade facilitation and security through Customs-business partnership, was significantly correlated with less import time by 65~71%, lower import cost by 68%, less export time by 70~78% and lower export cost by 71%. This result deserves high attention as it evidences that Customs policies for facilitating trade and securing trade safety are not incompatible. In other words, trade could be more facilitated even when trade security is properly guaranteed.

## **Key words**

Customs policy indicator, Revised Kyoto Convention (RKC), SAFE Framework of Standards (SAFE), Trade time, Trade cost

## **Acknowledgements**

This paper was written by Yeon Soo CHOI of the WCO's Research Unit. The author is very grateful to Cyril Chalendar, Thomas Cantens, Hyoung Jeong, Luc De Blic and Armen Manukyan for their suggestions.

## **Disclaimer**

The WCO Research Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about Customs issues. The views and opinions presented in this paper are those of the authors and do not necessarily reflect the views or policies of the WCO or WCO Members.

## **Note**

All WCO Research Papers are available on the WCO public website: [www.wcoomd.org](http://www.wcoomd.org). The author may be contacted via [research@wcoomd.org](mailto:research@wcoomd.org).

-----

## **Table of contents**

Executive summary .....	1
I. Introduction .....	3
II. Empirical specifications and data .....	4
III. Results .....	9
IV. Limitations & implications .....	13
References .....	21

## Executive Summary

### [Data and Methodology]

Acknowledging the importance of performance measurement in the Customs context, the World Customs Organization (WCO) developed Customs policy indicators; *Achieving Excellence in Customs (AEC)*. Utilizing policy indicators<sup>1</sup> from the WCO AEC survey (2016) and data from other international organizations, this paper estimated *the correlation of Customs policies with trade efficiency* (time & cost).

The estimation methodology is to analyze the average difference in trade efficiency between countries with each Customs policy and countries without it after controlling for the countries' economic, administrative and geographical characteristics.

### [Results]

*Customs modernization policies* presented statistically significant correlation with trade efficiency. The ratification of *Revised Kyoto Convention (RKC)*, a blueprint for modern and efficient Customs procedures, was associated with less trade time and cost; import time on average by 62~64%, import cost by 63~64% and export time by 63~69%. Among countries which ratified the RKC, RKC duration (the number of years since a country ratified the RKC) was correlated with less import time and less import cost. In details, *additional 1 year since the RKC ratification* (1 more year implementation of RKC provisions) was associated with less import time by 6~7% and lower import cost by 9%.

The implementation of *SAFE Framework of Standards (SAFE)*<sup>2</sup>, balancing trade facilitation and security through Customs-business partnership, was significantly correlated with the decrease of import time by 65~71%, import cost by 68%, export time by 70~78% and export cost by 71%. This result deserves high attention as it evidences that Customs policies for facilitating trade and securing trade safety are not incompatible. In other words, **trade could be more facilitated even when trade security is properly guaranteed.**

### [Limitations & Implications]

As this paper does not use time-series data, country-specific characteristics other than Customs policies are not fully controlled for, being exposed to the risk of various omitted variable problems. To mitigate this concern, dummy variables of income level and regional location were used to alternatively capture as much as unobserved characteristics of countries at the group levels. Still, the coefficients of Customs policies

---

<sup>1</sup> Revised Kyoto Convention (RKC), SAFE Framework of Standards (SAFE), Time Release Study (TRS), Electronic Customs Declaration (E\_dec), WCO Data Model type (DM), Coordinated Border Management (CBM), Authorized Economic Operator (AEO), Single Window (SW)

<sup>2</sup>17 standards: Integrated supply chain management; Cargo inspection authority; Modern technology in inspection equipment; Risk management systems; Selectivity&profiling & targeting; Advance electronic information; Targeting and communication; Performance measurement; Security assessment; Employee integrity; Outbound security inspections; Partnership; Security; Authorisation; Technology; Communication; and Facilitation.

should be interpreted as correlation, not as causality. And further research to analyze not just the correlation but the causality (impact of Customs policies on trade and their mechanism) remains to be covered.

Dependent variables sourced from the WB DB are not actual trade time & cost, but perceived data by the selected private sectors. Therefore, the OLS estimates heavily rely on the assumption that the perceived data are objective, at least not too much subjective.

As some policy variables such as RKC and SAFE include various specific measures as policy-packages, it was impossible to separately estimate the correlation of individual measures. For example, the SAFE variables take the value of "1" when a member implements more than 12 individual policies out of 17. Therefore, "which policy measure has more critical impact on the trade efficiency" could not be analyzed. In this regard, it could be advised that questions in the AEC survey shall be refined to address each specific Customs policy, of course with the consideration of survey fatigue of members.

In spite of above limitations, this paper is the first attempt to quantify the correlation of Customs policies with trade efficiency, utilizing the WCO AEC survey result. More future replies from members, refined questionnaire of the WCO AEC surveys and research on mechanism through which Customs policy affects trade performance will enrich the research results.

## I. Introduction

Acknowledging the importance of performance measurement in the Customs context, the World Customs Organization (WCO) developed the Achieving Excellence in Customs (AEC), consisting of 20 indicators to measure policy implementation of members in the four categories; Trade Facilitation and Security; Fair and Effective Revenue Collection; Protection of Society; and Institutional and Human Resource Development.

Utilizing indicators<sup>3</sup> from the WCO AEC survey (2016) and trade efficiency data from other international organizations, this paper estimated *the correlation of Customs policies with trade efficiency (time & cost)*.

The estimation methodology is to analyze the average difference in trade efficiency between countries with each Customs policy and the other countries without it after controlling for countries' economic, administrative and geographical characteristics. The OLS estimation was utilized, and AEC indicators of countries which have not responded to the WCO AEC survey (2016) were predicted with the OECD Trade Facilitation Indicators (TFI) as well as control variables above mentioned.

[Figure 1] Achieving Excellence in Customs (developed by the WCO)

Category	Sub-category	AEC Indicators
Trade Facilitation and Security	Modernized Procedures	Revised Kyoto Convention
		SAFE Frameworks of Standard
		Time Release Study
	Information Technology	Electronic Declarations
		Data Model
	Partnership & Connectivity	CBM
		AEO
		Single Window
	Fair and Effective Revenue Collection	Classification
Origin		WTO Origin Agreement
Valuation		WTO Valuation Agreement
Cross-cutting Issues		Advance rulings
	PCA	
Protection of Society	Risk Management	Risk Management: Conv., Cargo, Passenger (API/PNR)
	Network & Technology	Control Infrastructure & Partnership
	Operational Activities	Enforcement Capacity
	Investigations	Post Border Control Capacity
Institutional and Human Resource Development	Strategic Management	Strategic Planning
	Human Resource	Human Resource Development Policy
	Integrity & Governance	Legal Basis for Anti-corruption

<sup>3</sup> Only 8 indicators in the Trade Facilitation and Security were used in the estimations.

## II. Empirical Specifications and Data

### Specifications for OLS estimation

$$Y_i = \alpha + \beta_{1j} Policy_{ij} + \beta_2 Income_i + \beta_3 Landlocked_i + \beta_4 Governance_i + \beta_5 Landarea_i + \beta_6 Region_i + \varepsilon_i$$

Where,

- i: Country
- j: Customs policy
- Policy: Customs policy indicator from the WCO AEC
- Income: GNI per capita (or income level)
- Landlocked: Having direct access to sea or not
- Governance: Level of governance and Impartiality from OECD TFI
- Landarea: Size of country's land (squared km)
- Region: WCO regional category (6)

### Interpretation of coefficients ( $\beta_{1j}$ ) of policy indicators

A coefficient of each Customs policy variable could be interpreted as “the average difference in a dependent variable (Y) between the countries with a specific Customs policy j and the countries without the policy” after controlling for other factors' impact on Y.

As this paper used logged value of trade time and cost as dependent variables (logged import time, logged import cost, logged export time and logged export cost), implementing a policy j is associated **with ( $\beta_{1j} \times 100$ )% change** in the respective dependent variables.

### Dependent variables

Dependent variables of trade efficiency were sourced from the World Bank Doing Business (DB) 2017. Overviews of data resources and summary statistics of dependent variables are presented in Table 1 and Table 2.

[Table 1] Data sources of dependent variables

Organization	Report	Data source	# of respondents	# of countries
World Bank <sup>4</sup>	Doing Business 2017	Survey from domestic contributors	12,500	190

<sup>4</sup> Data of trade cost & time were sourced from: <http://www.doingbusiness.org/data/distance-to-frontier>

**[Table 2] Summary statistics of dependent variables**

Variables <sup>5</sup>	Data Source	Value description	Obs	Min	Mean	Max	Std.Dev
Import <sup>6</sup> time	WB DB 2017	Time to import (document <sup>7</sup> & border <sup>8</sup> compliance), hours	172	0	144.38	1330.00	170.86
Import cost	WB DB 2017	Cost to import (document & border compliance), US\$	172	0	585.91	3914.00	563.13
Export <sup>9</sup> time	WB DB 2017	Time to import (document & border compliance), hours	172	0	122.71	1212.88	145.08
Export cost	WB DB 2017	Cost to import (document & border compliance), US\$	172	0	512.74	4722.69	544.71

### **Control variables**

Trade efficiency of a country is affected not only by Customs policies but also by various factors. This paper tried to capture and isolate the impact of economic development, governmental efficiency & transparency, geographical characteristics and regional location by including control variables in Table 3.

**[Table 3] Summary statistics of control variables**

Variables	Data Source	Value description	Obs <sup>10</sup>	Min	Mean	Max	Std.Dev.
Landlocked	Wikipedia	1 if a member is a landlocked country;	39 (22.7%)	-	-	-	-
		0 otherwise	133 (77.3%)	-	-	-	-
		Total	172	-	-	-	-
Governance (Governance & Impartiality)	OECD TFI 2016 <sup>11</sup>	Values between 0 and 2 (Clearly established and transparent structures and function, sanction against misconduct, Ethics policy, internal audit system, etc.)	172	0	1.01	2.00	0.71

<sup>5</sup> For time and cost variables, transformed logged value ( $\ln(Y+1)$ ) were used to enhanced goodness-of-fit of regressions.

<sup>6</sup> Defined as "Importing containerized auto parts from its natural import partner (from which it imports the largest value)" by the WB DB 2017

<sup>7</sup> Defined as "Obtaining, preparing and submitting documents during transport, clearance, inspections and port or border handling in origin economy; Obtaining, preparing and submitting documents required by destination economy and any transit economies; Covers all documents required by law and in practice, including electronic submissions of information as well as non-shipment-specific documents necessary to complete the trade" by the WB DB 2017

<sup>8</sup> Defined as "Customs clearance and inspections by customs; Inspections by other agencies (if applied to more than 10% of shipments); Port or border handling at most widely used port or border of economy" by the WB DB 2017

<sup>9</sup> Defined as "Exporting a product of comparative advantage (defined by the largest export value) to its natural export partner (the economy that is the largest purchaser of this product)" by the WB DB 2017

<sup>10</sup> As these are the numbers of observations only used in the estimations, they are different from original data sources.

<sup>11</sup> OECD Trade Facilitation Indicators sourced from <http://sim.oecd.org/default.ashx?ds=TFI>



Landarea	WB 2016	Squared km	172	300	745,781	16,376,870	1,941,488
Income <sup>12</sup> (GNI per capita)	WB 2015	GNI per capita 2015, Atlas method (current US\$)	172	260	13,397	93,530	18,808
Income group <sup>13</sup>  (GNI per capita)	WB 2017	High income (>=\$ 12,476 in 2015)	51 (29.5%)	-	-	-	-
		Low income (<=\$1,025)	29 (17.3%)	-	-	-	-
		Lower middle income (<=\$4,035)	48 (27.8%)	-	-	-	-
		Upper middle income (<=\$12,475)	44 (25.4%)	-	-	-	-
		Total	172	-	-	-	-
Region	WCO 2017	Middle East&North Africa	17 (9.8%)	-	-	-	-
		West&Central Africa	23 (13.3%)	-	-	-	-
		East&South Africa	23 (13.9%)	-	-	-	-
		Latin and Northern America	28 (16.2%)	-	-	-	-
		Europe	49 (28.3%)	-	-	-	-
		Asia&Pacific	32 (18.5%)	-	-	-	-
		Total	172	-	-	-	-

In the specification (1) of regressions (Table 6 ~ 12), **GNI per capita (logged)**, being **Landlocked**, **Governance & impartiality**, **Land area (logged)** and dummy variables of **Region** were included as control variables. In the specification (2), GNI per capita (logged) was replaced with dummy variables of **Income level** (Low-, Lower middle-, Upper middle- and High-income). Including both of *region* and *income* dummy variables affected the statistical significance of some estimates negatively with enlarged standard errors. However, dummies seem to effectively capture unobserved characteristics at each group level, mitigating omitted variable concerns with enhanced power to explain the variation of dependent variables (higher R<sup>2</sup>/adjusted R<sup>2</sup>).

All control variables except **Landlocked**<sup>14</sup> presented significant coefficients and expected signs in the regressions of trade efficiency. The regressions of dependent variables on these control variables are presented in Table 6.

<sup>12</sup> <http://data.worldbank.org/indicator/NY.GNP.ATLS.CD>

<sup>13</sup> <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

<sup>14</sup> Coefficients of landlocked were not significant mainly due to the correlation with regional dummy variables.

### Independent variables with Multiple Imputations (MICE package of R)

Independent variables on Customs policies are collected from the WCO AEC survey 2016. However, only 106 members out of 181 responded to the WCO AEC survey 2016, and in the process of matching the survey data with the dependent and control variables from other sources, only 101 data survived.

**[Table 4] Observed data of independent variables**

Variables	Data Source	Value description	Number of observed data		
			Total	Value=0	Value=1
RKC	WCO	1 if a member ratified the Revised Kyoto Convention; 0 otherwise	181	71	110
SAFE	WCO AEC 2016	1 if a member's Customs legislation complies with more than 11 out of 17 standards in SAFE Framework; 0 otherwise	101	38	63
SW	WCO AEC 2016	1 if a Single Window system was established; 0 otherwise	101	67	34

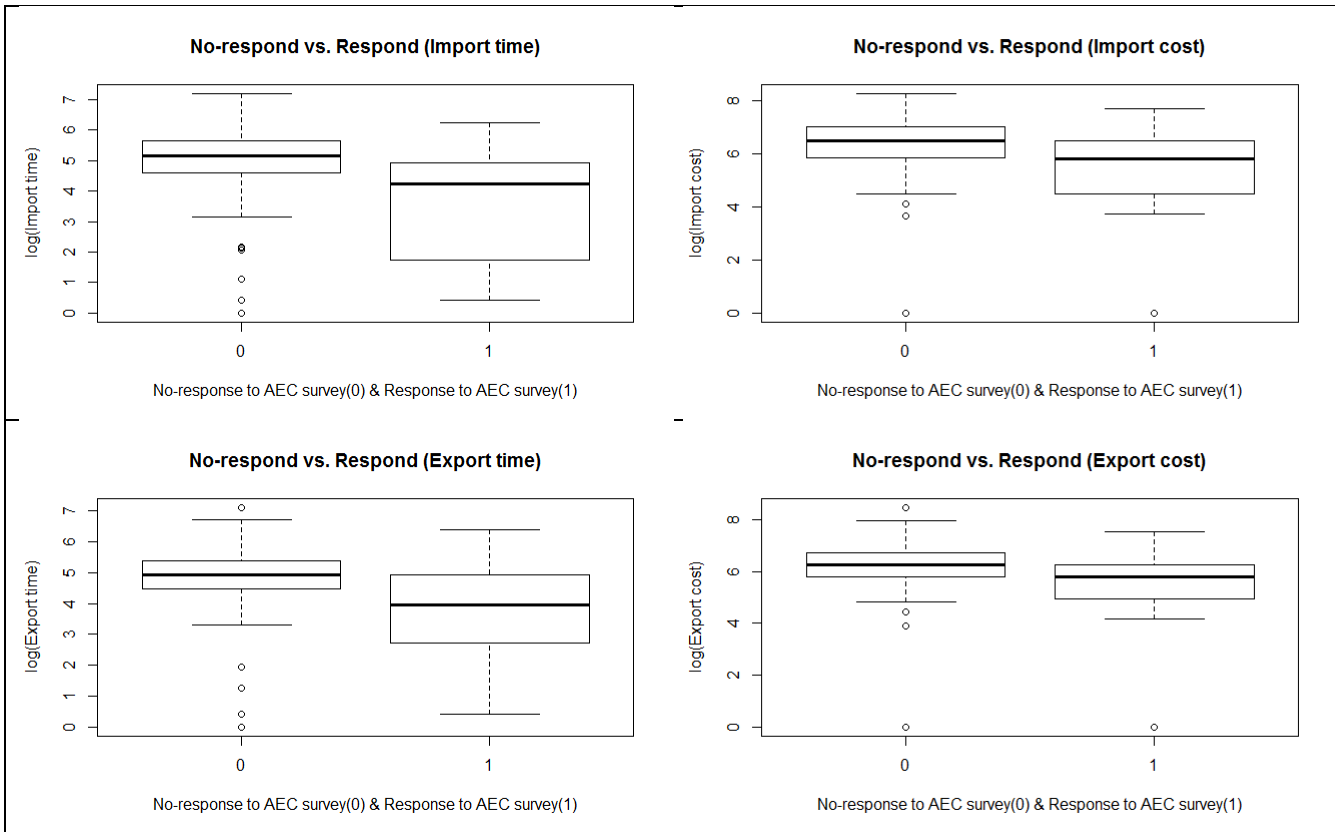
This independent variable data has two limitations. One is the small sample size, and the other is a concern that this sample may not properly represent the world statistics, as countries with less trade efficiency are less likely to report their trade related policy data. Table 5 and Figure 2 present that countries which did not respond to the WCO AEC survey have longer import/export time and higher import/export cost compared to countries which responded to the survey, evidencing that the second concern above is plausible. All the differences in trade time & cost between two groups are statistically significant at the 1% significance level<sup>15</sup>.

**[Table 5] Comparison of trade time & cost between the responded and the no-responded countries**

	All countries				Countries with response to WCO AEC survey				Countries with no response to the WCO AEC survey			
	Obs	Mean	Min	Max	Obs	Mean	Min	Max	Obs	Mean	Min	Max
Import time	172	144.4	0	1330.0	101	92.8	0.5	505.0	71	217.8	0	1330.0
Import cost	172	585.9	0	3914.0	101	459.6	0.0	2255.9	71	765.6	0	3914.0
Export time	172	122.7	0	1212.9	101	84.6	0.5	598.8	71	176.9	0	1212.9
Export cost	172	512.7	0	4722.7	101	395.4	0.0	1837.5	71	679.7	0	4722.7

<sup>15</sup> The null hypothesis that true difference in mean between two groups is equal is rejected at the 1% significance level for import time, import cost, export time and export cost. T-statistics of t-test are respectively 4.54, 3.42, 3.89 and 3.15.

[Figure 2] Comparison of trade efficiency between No-responded and Responded countries



To mitigate problems from a small and biased sample, the MICE package of R were used<sup>16</sup> to predict missing (not reported) variables of 71 countries. Each missing value was predicted by OLS estimate based on its correlation with OECD Trade Facilitation Indicators (TFI) as well as the control variables in the specifications. The predicted values are good proxies of missing values (WCO AEC indicators), as the OECD TFIs are designed to measure the extent to which countries are implementing the WTO Trade Facilitation Agreement (TFA), and most provisions of the WTO TFA are mainly composed of Customs policy tools and instruments.

<sup>16</sup><https://cran.r-project.org/web/packages/mice/mice.pdf>

### III. Results<sup>17</sup>

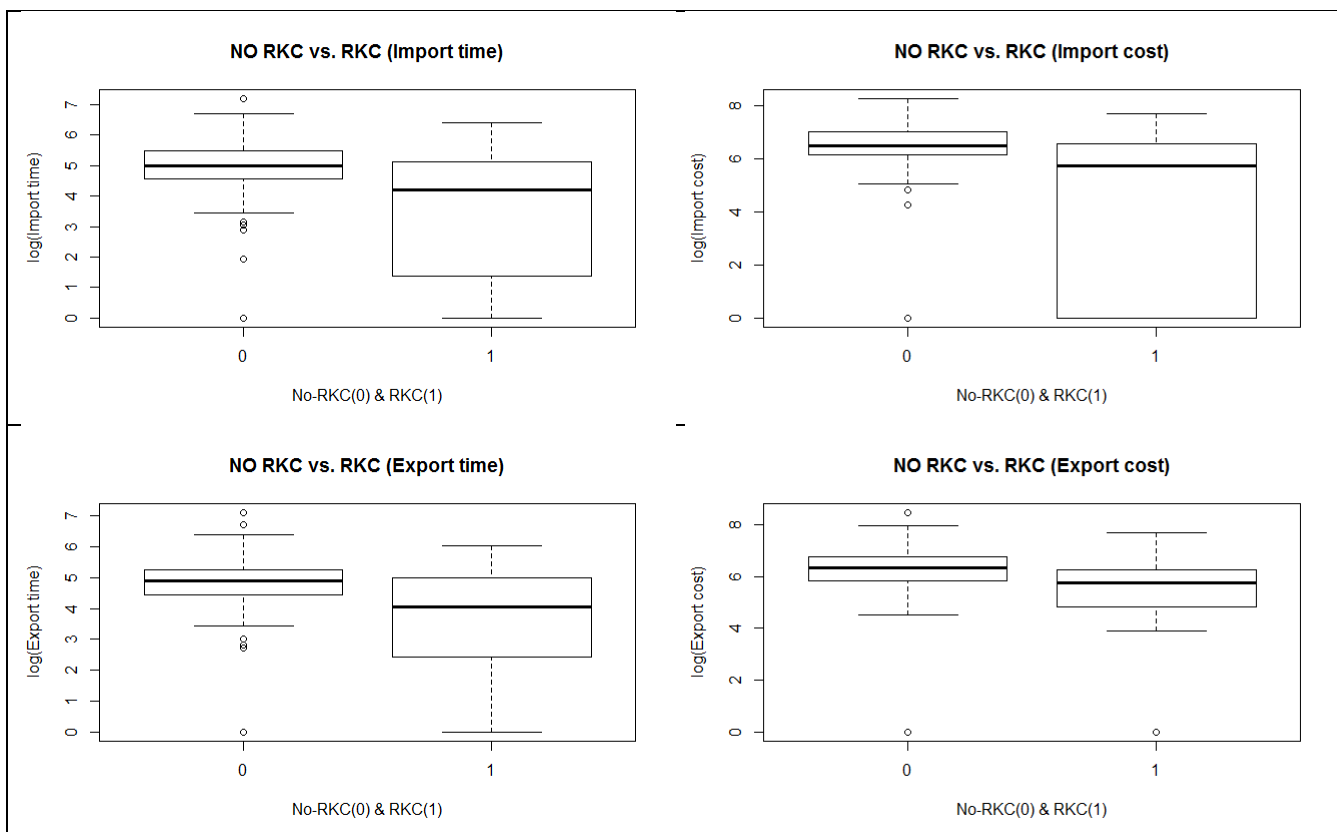
Among 8 AEC indicators in the category of “trade facilitation and security”, only **RKC** and **SAFE** presented statistically significant correlation with trade efficiency. The OLS estimates with predicted data (by MICE packages) and with only observed data are respectively presented in Table 7 ~ 12.

#### Revised Kyoto Convention (RKC)<sup>18</sup>

The ratification of **Revised Kyoto Convention (RKC)**, a blueprint for modern and efficient Customs procedures, presented statistically significant correlation with trade efficiency indicators.

Without consideration of countries’ economic and geographical characteristics and administrative development level, simple comparisons of trade efficiency indicators between countries that ratified the RKC and those that have not are presented in Figure 3. The box plots visualize that countries with the RKC are more likely to have less import time, lower import cost, less export time and lower export cost.

[Figure 3] Comparison of trade efficiency between No-RKC vs. RKC countries



<sup>17</sup>Due to the high correlation among independent variables, coefficients of each independent variable were estimated separately to avoid multicollinearity problems such as such as low significance levels, wrong sign or an implausible magnitude of coefficients.

<sup>18</sup>[http://www.wcoomd.org/en/topics/facilitation/instrument-and-tools/conventions/pf\\_revised\\_kyoto\\_conv.aspx](http://www.wcoomd.org/en/topics/facilitation/instrument-and-tools/conventions/pf_revised_kyoto_conv.aspx)

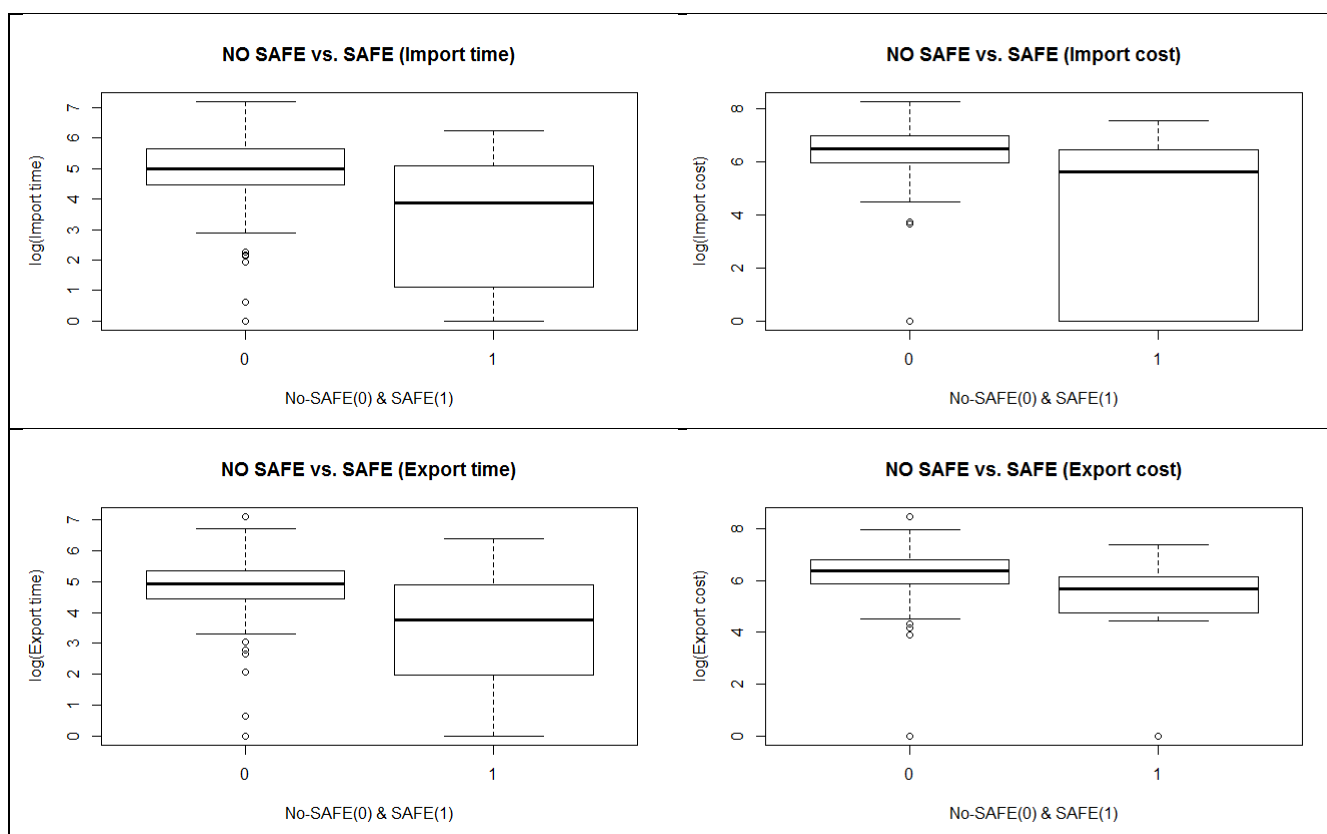
With consideration of control variables (OLS estimation), the RTA ratification was associated with the **less import time on average by 62~64%, lower import cost by 63~64% and less export time by 63~69%** (Table 7). Among countries which ratified the RKC, RKC duration (the number of years since a country ratified the RKC) was significantly correlated with the less import time and lower import cost. In details, **additional 1 year since the RKC ratification** (1 more year implementation of RKC provisions) was associated with **less import time by 6~7%** and **lower import cost by 9%** (Table 8).

### **SAFE Framework of Standards (SAFE)<sup>19</sup>**

The implementing more than 12 out of 17 **SAFE Framework of Standards (SAFE)**, balancing trade facilitation and security measures through Customs-business partnership, was significantly correlated with trade efficiency indicators.

Without consideration of countries' economic and geographical characteristics and administrative development level, simple comparisons of trade efficiency indicators between countries that implement the SAFE packages and those that have not are presented in Figure 4. The box plots visualize that countries with the SAFE are more likely to have less trade time and cost.

**[Figure 4] Comparison of trade efficiency between No-SAFE vs. SAFE countries<sup>20</sup>**



<sup>19</sup> 17 standards: Integrated supply chain management; Cargo inspection authority; Modern technology in inspection equipment; Risk management systems; Selectivity & profiling & targeting; Advance electronic information; Targeting and communication; Performance measurement; Security assessment; Employee integrity; Outbound security inspections; Partnership; Security; Authorisation; Technology; Communication; and Facilitation.

<sup>20</sup> Data are from the first set out of 50 which are predicted by the MICE package.

With consideration of control variables, implementing the SAFE packages was significantly correlated with **less import time by 65~71%, lower import cost by 68%, less export time by 70~78% and lower export cost by 71%** (Table 9).

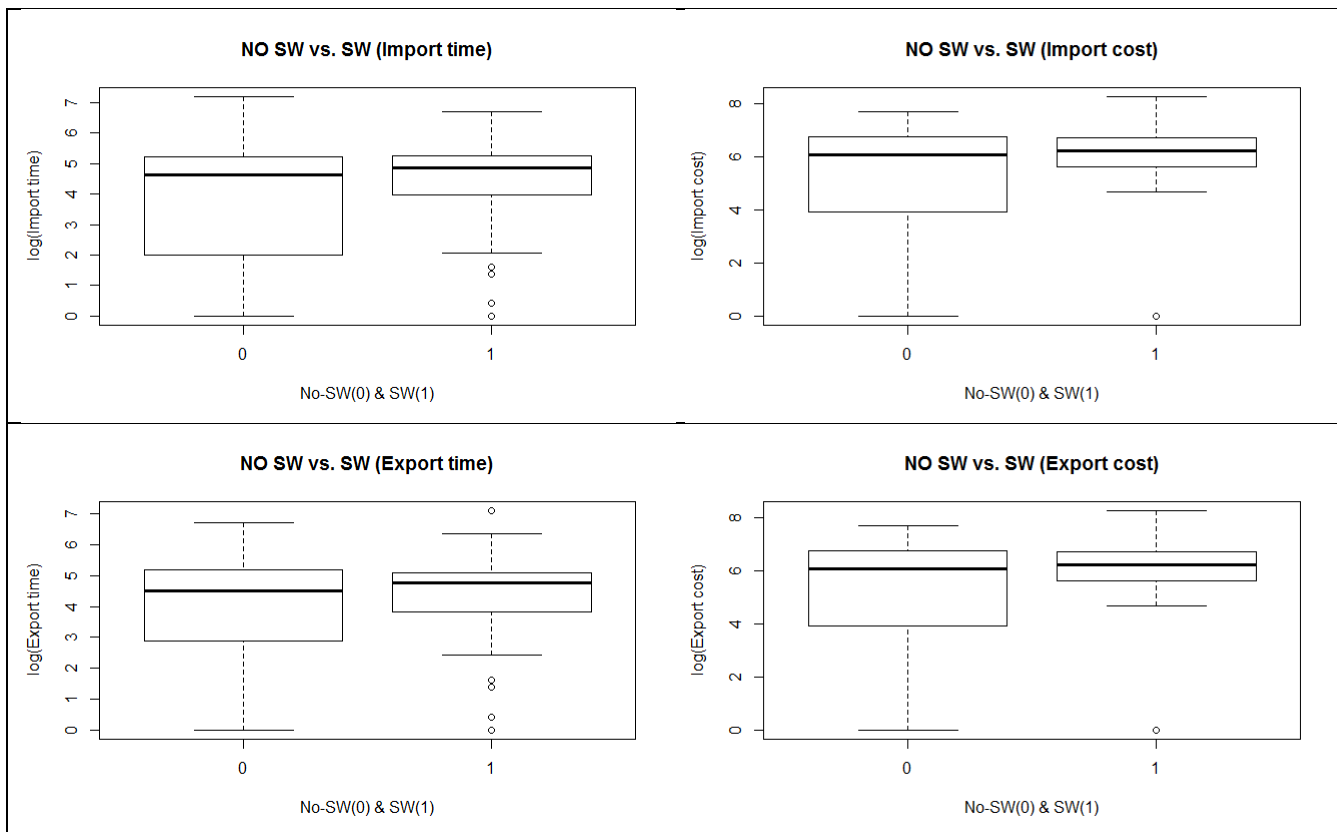
This correlation deserves high attention as it evidences that Customs policies for facilitating trade and securing trade safety are not incompatible. In other words, **trade could be more facilitated even when trade security is more guaranteed**. Regressions only with observed data presented similar results, which are presented in Table 10.

### Single Window (SW)

**Single Window (SW)** presented no significant correlation with trade efficiency indicators in the OLS estimation of MICE package. However, in contrast to the RKC and SAFE, unexpected results were found in the simple comparison (Figure 4) and OLS estimation with only observed dataset (Table 12).

Simple comparisons of trade efficiency indicators between countries with the SW and those without it are presented in Figure 5. The box plots visualize that countries with the SW are distributed in the higher area of trade time and cost, and the means of two groups are similar to each other in trade time and cost.

[Figure 5] Comparison of trade efficiency between No-SW vs. SW countries<sup>21</sup>



<sup>21</sup> Data are from the first set out of 50 which are predicted by the MICE package.

Furthermore, given data and methodology, the OLS estimation only with observed data showed unexpected positive correlation between SW and trade time & cost (Table 12).

An expert group in the WCO pointed out that a successful implementation of SW requires not only the establishment of a system, but also strong commitment of the government, sound coordination among border management agencies and advanced data exchange among all stakeholders. Therefore, most members have been taking a phased-approach in SW implementation, which may temporarily lead to more administrative burden and cost during the transitional and immature periods. From a data perspective, this unexpected result may be attributed to measurement errors due to the ambiguous definition of SW in the AEC survey. For example, only 27.5% of high-income countries declared that they established the SW, while 35% of the rest income groups responded that they have SWs.

#### **IV. Limitations & implications**

As this paper does not use time-series data, country-specific characteristics other than Customs policies are not fully controlled for, being exposed to the risk of various omitted variable problems. To mitigate this concern, dummy variables of income level and regional location were used to alternatively capture as much as unobserved characteristics of countries at the group levels. Still, the coefficients of Customs policies should be interpreted as correlation, not as causality. And further research to analyze not just the correlation but the causality (impact of Customs policies on trade and their mechanism) remains to be covered.

Dependent variables sourced from the WB DB are not actual trade time & cost, but perceived data by the selected private sectors. Therefore, the OLS estimates heavily rely on the assumption that the perceived data are objective, at least not too much subjective.

As some policy variables such as RKC and SAFE include various specific measures as policy-packages, it was impossible to separately estimate the correlation of individual measures. For example, the SAFE variables take the value of “1” when a member implements more than 12 individual policies out of 17. Therefore, “which policy measure has more critical impact on the trade efficiency” could not be analyzed. In this regard, it could be advised that questions in the AEC survey shall be refined to address each specific Customs policy, of course with the consideration of survey fatigue of members.

In spite of above limitations, this paper is the first attempt to quantify the correlation of Customs policies with trade efficiency, utilizing the WCO AEC survey result. More future replies from members, refined questionnaire of the WCO AEC surveys and research on mechanism through which Customs policy affects trade performance will enrich the research results.



[Table 6] Control variables check for Trade Performance

	ln(import time)		ln(import cost)		ln(export time)		ln(export cost)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Low income		1.233*** (0.449)		0.915 (0.641)		0.511 (0.424)		0.251 (0.611)
Lower middle income		0.991*** (0.309)		0.956** (0.442)		0.733** (0.292)		0.519 (0.421)
Upper middle income		0.895*** (0.284)		1.051** (0.407)		0.713*** (0.269)		0.956** (0.388)
GNIpc(log)	-0.243** (0.101)		-0.120 (0.144)		-0.153 (0.095)		0.032 (0.137)	
Governance	-0.481*** (0.171)	-0.421** (0.166)	-0.667*** (0.244)	-0.529** (0.237)	-0.571*** (0.161)	-0.531*** (0.156)	-0.842*** (0.233)	-0.681*** (0.226)
Landlocked	0.070 (0.253)	0.039 (0.253)	0.179 (0.361)	0.136 (0.362)	-0.070 (0.238)	-0.040 (0.239)	-0.109 (0.344)	-0.112 (0.345)
Landsize(log)	0.102** (0.045)	0.080* (0.045)	-0.051 (0.064)	-0.088 (0.065)	0.143*** (0.042)	0.126*** (0.043)	0.054 (0.061)	0.014 (0.062)
Region MENA	0.217 (0.391)	0.307 (0.387)	0.166 (0.559)	0.316 (0.554)	-0.546 (0.369)	-0.491 (0.366)	-0.417 (0.533)	-0.290 (0.528)
Region WCA	-0.038 (0.370)	0.050 (0.387)	0.224 (0.528)	0.365 (0.554)	-0.137 (0.349)	0.106 (0.366)	0.015 (0.504)	0.193 (0.528)
Region ESA	-0.578 (0.356)	-0.517 (0.368)	-0.194 (0.509)	-0.125 (0.526)	-0.532 (0.336)	-0.357 (0.348)	-0.120 (0.486)	-0.077 (0.501)
Region AMS	0.112 (0.323)	0.086 (0.329)	0.424 (0.461)	0.385 (0.471)	-0.092 (0.304)	-0.124 (0.311)	0.088 (0.440)	-0.019 (0.449)
Region EUR	-2.346*** (0.305)	-2.218*** (0.309)	-3.147*** (0.436)	-2.940*** (0.442)	-1.958*** (0.288)	-1.870*** (0.292)	-2.122*** (0.416)	-1.961*** (0.421)
Constant	6.039*** (1.054)	3.394*** (0.552)	8.262*** (1.505)	6.754*** (0.790)	4.946*** (0.994)	3.235*** (0.522)	5.996*** (1.436)	6.081*** (0.753)
Observations	172	172	172	172	172	172	172	172
R <sup>2</sup>	0.593	0.610	0.522	0.542	0.527	0.545	0.364	0.391
Adjusted R <sup>2</sup>	0.570	0.584	0.496	0.510	0.500	0.514	0.329	0.349

Note: Standard errors in parentheses. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

[Table 7] RKC and Trade Performance

	ln(import time)		ln(import cost)		ln(export time)		ln(export cost)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
RKC	-0.618** (0.249)	-0.635** (0.246)	-0.634* (0.359)	-0.641* (0.355)	-0.633*** (0.234)	-0.688** (0.230)	-0.515 (0.344)	-0.529 (0.339)
Low income		1.002** (0.450)		0.682 (0.650)		0.261 (0.422)		0.058 (0.621)
Lower middle income		0.896*** (0.306)		0.860* (0.442)		0.630** (0.287)		0.440 (0.422)
Upper middle income		0.863*** (0.280)		1.019** (0.404)		0.679** (0.263)		0.930** (0.386)
GNIpc(log)	-0.193* (0.101)		-0.069 (0.146)		-0.102 (0.095)		0.074 (0.140)	
Governance	-0.375** (0.174)	-0.301* (0.169)	-0.559** (0.250)	-0.408* (0.244)	-0.463*** (0.163)	-0.401** (0.159)	-0.754*** (0.239)	-0.581** (0.234)
Landlocked	0.059 (0.249)	0.036 (0.249)	0.167 (0.359)	0.133 (0.360)	-0.082 (0.234)	-0.043 (0.234)	-0.118 (0.343)	-0.115 (0.344)
Landsize(log)	0.128*** (0.046)	0.105** (0.045)	-0.024 (0.066)	-0.063 (0.066)	0.170*** (0.043)	0.153*** (0.043)	0.076 (0.063)	0.035 (0.063)
Region MENA	0.230 (0.385)	0.324 (0.381)	0.180 (0.556)	0.333 (0.550)	-0.532 (0.362)	-0.473 (0.357)	-0.406 (0.531)	-0.276 (0.526)
Region WCA	0.013 (0.365)	0.132 (0.382)	0.276 (0.526)	0.448 (0.552)	-0.084 (0.343)	0.195 (0.358)	0.058 (0.503)	0.262 (0.527)
Region ESA	-0.515 (0.352)	-0.438 (0.363)	-0.129 (0.507)	-0.045 (0.524)	-0.467 (0.331)	-0.271 (0.340)	-0.067 (0.485)	-0.011 (0.501)
Region AMS	-0.266 (0.353)	-0.307 (0.357)	0.036 (0.508)	-0.012 (0.517)	-0.480 (0.331)	-0.550 (0.335)	-0.227 (0.486)	-0.347 (0.494)
Region EUR	-2.328*** (0.301)	-2.196*** (0.304)	-3.129*** (0.433)	-2.917*** (0.439)	-1.939*** (0.283)	-1.846*** (0.285)	-2.107*** (0.414)	-1.942*** (0.420)
Constant	5.637*** (1.050)	3.490*** (0.544)	7.850*** (1.514)	6.852*** (0.786)	4.535*** (0.987)	3.340*** (0.511)	5.661*** (1.447)	6.162*** (0.751)
Observations	172	172	172	172	172	172	172	172
R <sup>2</sup>	0.608	0.626	0.532	0.551	0.547	0.569	0.373	0.400
Adjusted R <sup>2</sup>	0.583	0.598	0.502	0.517	0.519	0.537	0.334	0.354

Note: Standard errors in parentheses. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

[Table 8] RKC duration and Trade Performance

	ln(import time)		ln(import cost)		ln(export time)		ln(export cost)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
RKC duration	-0.073** (0.030)	-0.055* (0.030)	-0.089* (0.045)	-0.062 (0.046)	-0.045 (0.028)	-0.034 (0.029)	-0.048 (0.045)	-0.023 (0.046)
Low income		1.551** (0.613)		0.989 (0.945)		0.601 (0.594)		0.390 (0.944)
Lower middle income		1.031** (0.436)		0.541 (0.672)		0.514 (0.422)		0.201 (0.672)
Upper middle income		1.091*** (0.381)		1.093* (0.587)		0.642* (0.369)		0.920 (0.587)
GNIpc(log)	-0.175 (0.131)		0.111 (0.198)		-0.059 (0.124)		0.209 (0.197)	
Governance	-0.200 (0.254)	-0.036 (0.253)	-0.532 (0.383)	-0.257 (0.391)	-0.455* (0.240)	-0.340 (0.245)	-0.953** (0.380)	-0.680* (0.390)
Landlocked	-0.198 (0.315)	-0.277 (0.315)	-0.265 (0.476)	-0.371 (0.485)	-0.432 (0.298)	-0.445 (0.305)	-0.415 (0.472)	-0.477 (0.485)
Landsize(log)	0.150** (0.065)	0.109* (0.065)	-0.035 (0.098)	-0.096 (0.100)	0.186*** (0.061)	0.162** (0.063)	0.098 (0.097)	0.041 (0.100)
Region MENA	0.427 (0.494)	0.719 (0.494)	-0.098 (0.746)	0.325 (0.761)	-0.663 (0.467)	-0.476 (0.478)	-0.916 (0.740)	-0.523 (0.760)
Region WCA	0.326 (0.474)	0.283 (0.491)	0.433 (0.715)	0.322 (0.756)	0.077 (0.448)	0.132 (0.475)	0.060 (0.709)	0.019 (0.755)
Region ESA	-0.117 (0.448)	-0.291 (0.455)	0.655 (0.676)	0.267 (0.701)	0.020 (0.424)	-0.050 (0.441)	0.695 (0.671)	0.332 (0.701)
Region AMS	-0.442 (0.712)	-0.383 (0.697)	0.562 (1.075)	0.752 (1.074)	-1.274* (0.673)	-1.234* (0.675)	-0.354 (1.066)	-0.177 (1.073)
Region EUR	-2.288*** (0.380)	-2.103*** (0.392)	-3.586*** (0.574)	-3.320*** (0.604)	-2.035*** (0.360)	-1.927*** (0.379)	-2.415*** (0.569)	-2.193*** (0.603)
Constant	4.963*** (1.418)	2.772*** (0.900)	6.662*** (2.140)	7.221*** (1.387)	3.775*** (1.341)	2.905*** (0.871)	4.488** (2.124)	6.089*** (1.385)
Observations	109	109	109	109	109	109	109	109
R <sup>2</sup>	0.658	0.684	0.581	0.596	0.592	0.604	0.403	0.416
Adjusted R <sup>2</sup>	0.623	0.644	0.539	0.545	0.551	0.555	0.343	0.343

Note: Standard errors in parentheses. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

[Table 9] SAFE and Trade Performance (MICE package)

	ln(Import time)		ln(Import cost)		ln(Export time)		ln(Export cost)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
SAFE	-0.712** (0.281)	-0.65** (0.282)	-0.676* (0.386)	-0.511 (0.385)	-0.783** (0.255)	-0.704** (0.258)	-0.71* (0.36)	-0.508 (0.358)
Low income		1.074** (0.45)		0.789 (0.649)		0.342 (0.422)		0.127 (0.618)
Lower middle income		0.776** (0.32)		0.787* (0.459)		0.502* (0.3)		0.352 (0.437)
Upper middle income		0.7** (0.293)		0.896** (0.423)		0.503* (0.274)		0.802** (0.402)
GNIpc(log)	-0.166 (0.105)		-0.047 (0.15)		-0.07 (0.097)		0.108 (0.142)	
Governance	-0.417** (0.172)	-0.356** (0.167)	-0.609** (0.246)	-0.479** (0.24)	-0.499** (0.162)	-0.458** (0.158)	-0.779** (0.235)	-0.63** (0.229)
Landlocked	0.057 (0.251)	0.002 (0.253)	0.167 (0.361)	0.108 (0.364)	-0.086 (0.235)	-0.08 (0.238)	-0.122 (0.344)	-0.141 (0.346)
Landsize(log)	0.117** (0.045)	0.096** (0.045)	-0.036 (0.065)	-0.075 (0.065)	0.161*** (0.042)	0.144** (0.042)	0.07 (0.061)	0.026 (0.062)
Region MENA	0.224 (0.385)	0.317 (0.382)	0.171 (0.556)	0.321 (0.553)	-0.536 (0.36)	-0.479 (0.358)	-0.41 (0.529)	-0.283 (0.527)
Region WCA	-0.158 (0.382)	-0.147 (0.402)	0.108 (0.542)	0.209 (0.573)	-0.266 (0.362)	-0.106 (0.38)	-0.106 (0.517)	0.038 (0.545)
Region ESA	-0.745** (0.358)	-0.736* (0.374)	-0.355 (0.516)	-0.298 (0.541)	-0.712** (0.333)	-0.591* (0.349)	-0.286 (0.491)	-0.247 (0.514)
Region AMS	-0.124 (0.334)	-0.112 (0.337)	0.198 (0.48)	0.226 (0.486)	-0.348 (0.309)	-0.336 (0.314)	-0.148 (0.456)	-0.175 (0.461)
Region EUR	-2.317*** (0.3)	-2.191*** (0.305)	-3.121*** (0.434)	-2.921*** (0.442)	-1.923*** (0.281)	-1.84*** (0.286)	-2.093*** (0.413)	-1.941*** (0.421)
Constant	5.568*** (1.054)	3.693*** (0.562)	7.817*** (1.519)	6.992*** (0.81)	4.435*** (0.984)	3.556*** (0.525)	5.533*** (1.443)	6.317*** (0.771)
Observations	172	172	172	172	172	172	172	172
R <sup>2</sup>	0.618	0.631	0.536	0.55	0.566	0.576	0.385	0.402
Adjusted R <sup>2</sup>	0.594	0.603	0.507	0.516	0.539	0.544	0.347	0.357

Note: MICE packages were used to replace missing variables of 71 countries. The results obtained from 50 imputations are combined into a set of result. Standard errors in parentheses. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

[Table 10] SAFE and Trade Performance

	ln(Import time)		ln(Import cost)		ln(Export time)		ln(Export cost)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
SAFE	-0.525*	-0.482*	-0.664	-0.460	-0.638**	-0.635**	-0.492	-0.329
	(0.279)	(0.264)	(0.460)	(0.447)	(0.263)	(0.260)	(0.445)	(0.440)
Low income		1.822***		1.248		1.100**		0.540
		(0.561)		(0.950)		(0.552)		(0.934)
Lower middle income		0.957**		0.931		0.749**		0.463
		(0.375)		(0.635)		(0.369)		(0.624)
Upper middle income		1.108***		1.194**		0.724**		0.719
		(0.302)		(0.511)		(0.297)		(0.502)
GNIpc(log)	-0.305**		-0.120		-0.256**		-0.007	
	(0.125)		(0.207)		(0.118)		(0.200)	
Governance	-0.275	-0.189	-0.558	-0.371	-0.282	-0.274	-0.690**	-0.548*
	(0.211)	(0.198)	(0.349)	(0.335)	(0.200)	(0.194)	(0.337)	(0.329)
Landlocked	-0.158	-0.144	-0.029	-0.035	-0.449	-0.405	-0.500	-0.499
	(0.307)	(0.306)	(0.507)	(0.518)	(0.290)	(0.301)	(0.491)	(0.510)
Landsize(log)	0.117**	0.093*	-0.014	-0.058	0.188***	0.179***	0.059	0.027
	(0.057)	(0.054)	(0.093)	(0.092)	(0.053)	(0.054)	(0.090)	(0.091)
Region MENA	0.465	0.540	0.488	0.547	-0.346	-0.342	-0.052	-0.008
	(0.459)	(0.445)	(0.757)	(0.752)	(0.433)	(0.437)	(0.732)	(0.740)
Region WCA	0.092	0.239	0.369	0.481	-0.049	0.075	0.127	0.197
	(0.613)	(0.596)	(1.012)	(1.009)	(0.579)	(0.586)	(0.979)	(0.993)
Region ESA	-0.909**	-1.069**	-0.286	-0.390	-0.433	-0.428	0.063	-0.006
	(0.440)	(0.444)	(0.725)	(0.752)	(0.415)	(0.437)	(0.702)	(0.740)
Region AMS	-0.134	-0.138	0.163	0.260	-0.227	-0.238	-0.225	-0.154
	(0.362)	(0.351)	(0.597)	(0.595)	(0.342)	(0.346)	(0.577)	(0.585)
Region EUR	-2.277***	-2.194***	-3.280***	-3.105***	-1.821***	-1.776***	-2.147***	-2.036***
	(0.312)	(0.314)	(0.514)	(0.531)	(0.294)	(0.309)	(0.497)	(0.523)
Constant	6.421***	3.106***	8.191***	6.519***	5.276***	2.565***	6.500***	6.115***
	(1.288)	(0.625)	(2.125)	(1.057)	(1.216)	(0.614)	(2.055)	(1.040)
Observations	101	101	101	101	101	101	101	101
R <sup>2</sup>	0.698	0.729	0.595	0.618	0.655	0.664	0.420	0.433
Adjusted R <sup>2</sup>	0.665	0.692	0.550	0.566	0.617	0.619	0.355	0.356

Note: Standard errors in parentheses. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

[Table 11] Single Window and Trade Performance (MICE package)

	ln(Import time)		ln(Import cost)		ln(Export time)		ln(Export cost)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
SW	0.147 (0.289)	0.12 (0.294)	0.484 (0.372)	0.456 (0.38)	0.063 (0.267)	0.025 (0.27)	0.4 (0.356)	0.335 (0.358)
Low income		1.253** (0.453)		0.983 (0.645)		0.516 (0.427)		0.301 (0.616)
Lower middle income		1.012** (0.313)		1.03** (0.446)		0.739** (0.296)		0.573 (0.425)
Upper middle income		0.877** (0.288)		0.989** (0.409)		0.708** (0.272)		0.908** (0.391)
GNIpc(log)	-0.251** (0.102)		-0.142 (0.145)		-0.157 (0.096)		0.014 (0.138)	
Governance	-0.479** (0.171)	-0.424** (0.166)	-0.658** (0.244)	-0.53** (0.237)	-0.571** (0.162)	-0.533** (0.157)	-0.835*** (0.233)	-0.683** (0.226)
Landlocked	0.09 (0.256)	0.052 (0.256)	0.245 (0.365)	0.186 (0.365)	-0.062 (0.242)	-0.037 (0.242)	-0.055 (0.348)	-0.077 (0.348)
Landsize(log)	0.101** (0.045)	0.079* (0.045)	-0.054 (0.064)	-0.088 (0.065)	0.143** (0.043)	0.126** (0.043)	0.051 (0.061)	0.014 (0.062)
Region MENA	0.228 (0.393)	0.318 (0.39)	0.203 (0.561)	0.355 (0.556)	-0.539 (0.371)	-0.488 (0.368)	-0.386 (0.535)	-0.26 (0.531)
Region WCA	-0.025 (0.375)	0.059 (0.391)	0.263 (0.538)	0.396 (0.561)	-0.128 (0.353)	0.111 (0.369)	0.049 (0.512)	0.216 (0.534)
Region ESA	-0.572 (0.358)	-0.506 (0.37)	-0.17 (0.51)	-0.081 (0.529)	-0.529 (0.338)	-0.354 (0.35)	-0.099 (0.487)	-0.045 (0.504)
Region AMS	0.129 (0.325)	0.111 (0.335)	0.485 (0.463)	0.481 (0.477)	-0.086 (0.307)	-0.119 (0.317)	0.136 (0.442)	0.05 (0.455)
Region EUR	-2.292*** (0.324)	-2.169*** (0.332)	-2.98*** (0.456)	-2.764*** (0.468)	-1.932*** (0.305)	-1.856*** (0.312)	-1.982*** (0.436)	-1.83*** (0.446)
Constant	6.034*** (1.056)	3.324*** (0.581)	8.221*** (1.502)	6.484*** (0.821)	4.95*** (0.996)	3.22*** (0.549)	5.964*** (1.434)	5.884*** (0.783)
Observations	172	172	172	172	172	172	172	172
R <sup>2</sup>	0.596	0.613	0.532	0.55	0.529	0.548	0.374	0.398
Adjusted R <sup>2</sup>	0.571	0.584	0.503	0.516	0.5	0.513	0.335	0.352

Note: MICE packages were used to replace missing variables of 71 countries. The results obtained from 50 imputations are combined into a set of result. Standard errors in parentheses. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

[Table 12] Single Window and Trade Performance

	ln(Import time)		ln(Import cost)		ln(Export time)		ln(Export cost)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
SW	0.434*	0.351	1.067***	1.021**	0.232	0.178	0.786**	0.754*
	(0.245)	(0.246)	(0.393)	(0.400)	(0.237)	(0.247)	(0.385)	(0.399)
Low income		2.046***		1.584*		1.345**		0.785
		(0.560)		(0.913)		(0.563)		(0.910)
Lower middle income		1.223***		1.341**		1.034***		0.762
		(0.368)		(0.600)		(0.370)		(0.598)
Upper middle income		1.204***		1.182**		0.894***		0.706
		(0.295)		(0.481)		(0.297)		(0.479)
GNIpc(log)	-0.402***		-0.263		-0.362***		-0.112	
	(0.118)		(0.189)		(0.114)		(0.185)	
Governance	-0.278	-0.222	-0.567*	-0.429	-0.281	-0.305	-0.696**	-0.591*
	(0.212)	(0.199)	(0.339)	(0.325)	(0.205)	(0.200)	(0.332)	(0.324)
Landlocked	-0.058	-0.058	0.200	0.126	-0.387	-0.325	-0.331	-0.381
	(0.312)	(0.309)	(0.499)	(0.504)	(0.302)	(0.311)	(0.489)	(0.502)
Landsize(log)	0.085	0.066	-0.059	-0.089	0.152***	0.146***	0.025	0.005
	(0.055)	(0.053)	(0.088)	(0.087)	(0.053)	(0.054)	(0.086)	(0.086)
Region MENA	0.569	0.591	0.718	0.689	-0.277	-0.314	0.117	0.097
	(0.462)	(0.449)	(0.739)	(0.732)	(0.447)	(0.452)	(0.724)	(0.730)
Region WCA	0.292	0.419	0.755	0.749	0.118	0.273	0.412	0.393
	(0.616)	(0.597)	(0.987)	(0.974)	(0.596)	(0.601)	(0.966)	(0.971)
Region ESA	-0.806*	-0.907**	-0.107	-0.125	-0.336	-0.260	0.195	0.187
	(0.440)	(0.445)	(0.705)	(0.726)	(0.426)	(0.448)	(0.690)	(0.724)
Region AMS	0.140	0.121	0.605	0.678	0.053	0.032	0.101	0.151
	(0.350)	(0.347)	(0.561)	(0.565)	(0.339)	(0.349)	(0.549)	(0.563)
Region EUR	-2.117***	-2.043***	-2.879***	-2.649***	-1.740***	-1.707***	-1.852***	-1.699***
	(0.326)	(0.335)	(0.522)	(0.547)	(0.316)	(0.337)	(0.511)	(0.545)
Constant	7.039***	2.783***	8.909***	5.869***	6.064***	2.283***	7.032***	5.639***
	(1.241)	(0.636)	(1.986)	(1.037)	(1.200)	(0.640)	(1.944)	(1.033)
Observations	101	101	101	101	101	101	101	101
R <sup>2</sup>	0.697	0.725	0.617	0.640	0.637	0.644	0.438	0.452
Adjusted R <sup>2</sup>	0.663	0.688	0.575	0.591	0.596	0.595	0.375	0.377

Note: Standard errors in parentheses. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

## **References**

Moisé, E., T. Orliac and P. Minor (2011). Trade Facilitation Indicators: The Impact on Trade Costs, OECD Trade Policy Papers, No. 118, OECD Publishing. <http://dx.doi.org/10.1787/5kg6nk654hmr-en>

Moisé, E. and S. Sorescu (2013). Trade Facilitation Indicators: The Potential Impact of Trade Facilitation on Developing Countries' Trade, OECD Trade Policy Papers, No. 144, OECD Publishing. <http://dx.doi.org/10.1787/5k4bw6kg6ws2-en>

World Bank. (2016). Connecting to Compete 2016: Trade Logistics in the Global Economy \_ The Logistics Performance Index and its Indicators.

World Bank. (2017). Doing Business 2017: Equal opportunity for all.

World Customs Organization. (2016). Performance Measurement (Policy Commission document SP0583E1a).

World Customs Organization. (2017). List of Contracting parties to the Revised Kyoto Convention. Retrieved from <http://www.wcoomd.org/-/media/wco/public/global/pdf/about-us/legal-instruments/conventions-and-agreements/revised-kyoto/20170515e110.pdf?db=web>

World Economic Forum and Global Alliance for Trade Facilitation. (2016). The Global Enabling Trade Report 2016.

Zhang, X. & Hillberry, R. (2015). Policy and Performance in Customs – Evaluating the Trade Facilitation Agreement (Policy research working paper no.7211).