

Food Safety, Non-tariff Measures and International Trade – focusing on Maximum Residue Limits(MRLs)



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Profile

Education

- 2017-Present Sungkyunkwan University PhD. ABD in International Trade
- 2012-2014 City, University of London's Business School MSc. Insurance and Risk Management
- 2004-2008 Peking University BSc. Economics, Specialised in Insurance and Risk Management

Work Experience

- 2020-Present Managing Director, Bonnie Kim and Company
- 2019-2021 Researcher, National Food Safety Information Service
- 2017-Present Researcher, Sungkyunkwan University
- 2017-2014 Managing Director, Bonnaki
- 2013-2014 Financial Institution Underwriter, Newline Group, Lloyds of London

Publications

- May. 2021 An Assessment of Overexploitation Risk Faced by Penaeus Shrimps in Pakistan by Using SPMS: Management Perspectives and Economic Consequences, Pakistan Journal of Zoology
- Aug. 2020 4차 산업혁명, 디지털혁신과 금융보험, e-Purple
- Sep.2020 The Relationship on Risk type, Risk Management and Business Performance, Journal of Korea Trade, 23 (5)
- Sep.2019 How does Medical Expenditure Affect Economic Development – Evidence from OECD Countries, IRFC, 4(1)
- Dec.2017 Empirical Study of Reinsurance Effect on Chinese Property-Liability Insurers' ROA, Journal of International Trade and Insurance, 18(4)



Prelude: Blueberries



Many different chemical substances used
Different requirements for different countries ?

MRLs for Blueberries(Unit: ppm)

Chemical Name	Codex	USA	Australia	Canada	EU	Japan	Korea
Carbaryl	0.0	3.0	0.0	7.0	0.01	7.0	0.5
Chlorantraniliprole	1.0	2.5	3.0	0.35	1.5	3.0	1.0
Norflurazon	0.0	0.2	0.05	0.0	0.0	0.2	0.1
Iron Phosphate	Missing	Exempt	Missing	Missing	Missing	Missing	Missing

Prelude: Banana

Changes in residue regulations?



Before 2020



After 2020

MRLs for Prochloraz(Unit: ppm)

Chemical Name	Previous	New	Previous	New	Previous	New	Enforcement Date
Prochloraz	Banana		Mango		Pineapples		
	0.05	0.03	5	0.03	5	0.03	

Source: Commission Regulation (EU) 2020/192

Prelude: the number of pesticides by country

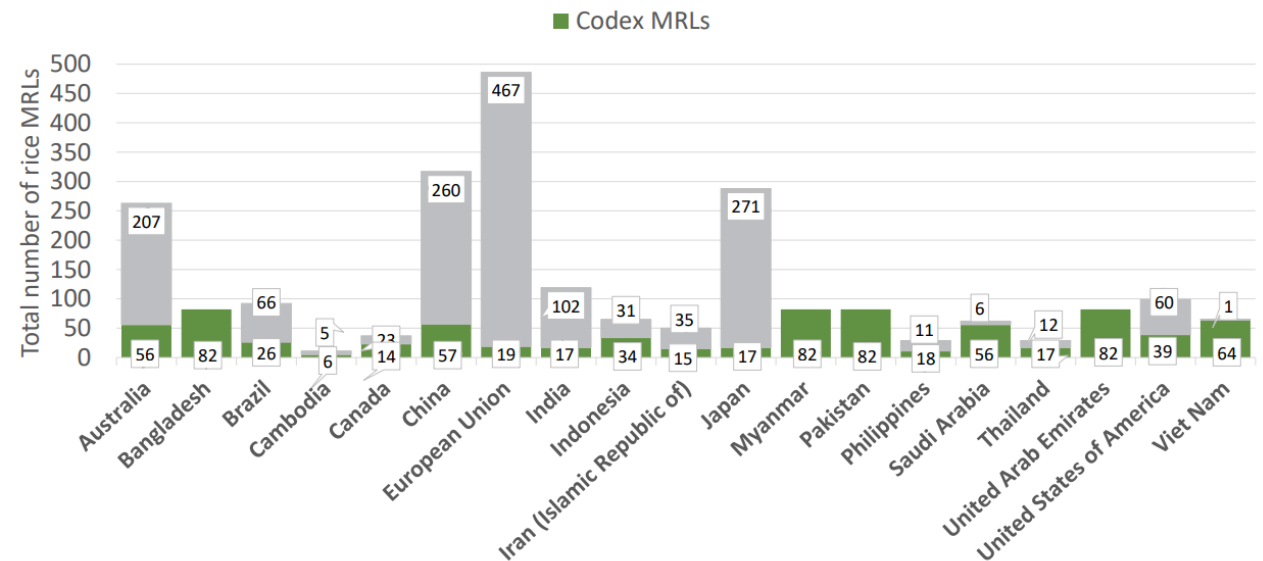
- Despite longstanding efforts towards **international harmonisation** of allowable thresholds for pesticide residues in foods, differences in national implementation of MRLs continue to exist, raising questions with regard to their impact on trade.
- Although many countries defer to suggestions, and guidelines by **Codex**, Codex is **not a substitute for, or alternative to national legislation**. Every country's law and administrative procedures contain provisions with which it is essential to comply (FAO).

The Number of Pesticides Registered by Country

CODEX	Japan	EU	The US	Korea	China
196	824 (incl. feed additives)	545	394	451	483

Source: Ministry of Food and Drug Safety Korea (2020)

The Number of MRLs for Rice by Country



Source: Codex (2020)

Research Question

1. How does MRLs as a food safety measure affect agricultural trade?

(positively or negatively?)

Maximum Residue Limits (MRLs) are the maximum concentration of a pesticide residue (expressed as mg/kg) to be legally permitted in or on food commodities and animal feeds

2. Do stricter MRL regulations severely deter agricultural trade?

(trade-reducing or enhancing?, short-term or long-term?)

3. How do major countries regulate pesticide use and determine MRLs?

(Codex, Zero tolerance, positive list system, or national standards?)

4. What do the research findings and case studies suggest?

Key words: Food Safety, International Trade, MRL, Trade-enhancing Effect, Trade-detering Effect

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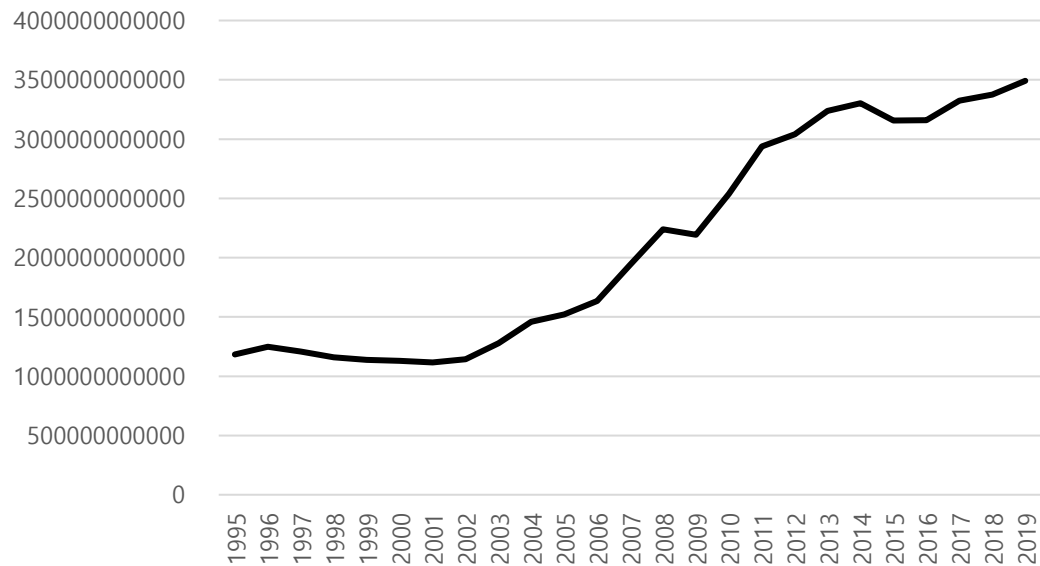
VI. Summary

I . Research Background & Purpose

1. Food Safety and International Trade

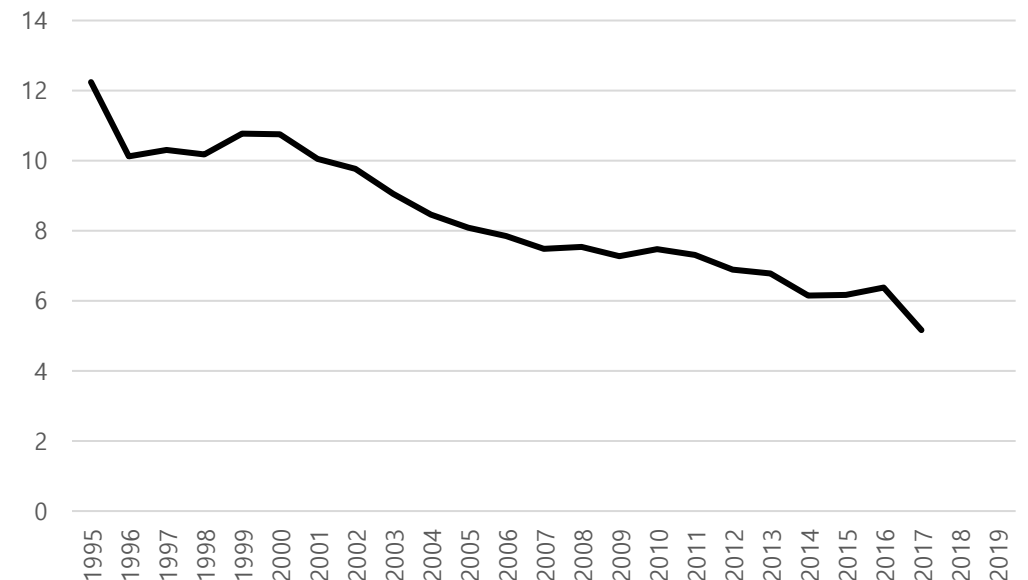
- Since the creation of the WTO in 1995, which **has fostered the liberalization of international trade**, the size of agriculture, forestry, and fishing markets* has almost **tripled**, from **USD 1.185 trillion in 1995 to USD 3.492 trillion in 2019**(World Bank, 2019).
- At the same time, **the average tariff rate**** has reduced by more than **50%** since 1995.

The Volume of Agricultural Production*



Source: World Bank(<https://data.worldbank.org/>)

The Average Tariff Rate, all products**



Source: World Bank (<https://data.worldbank.org/>)

*Agriculture, forestry, and fishing, value added (current USD),

**Tariff rate, simple mean, all products(%)

I . Research Background & Purpose

1. Food Safety and International Trade

- **The tariff barrier** has been remarkably lowered largely due to the **WTO and FTAs**.
- However, in order to **protect domestic industries, food safety and the environment**, each country has imposed **a strict requirement on pesticide residues in trade** or often amended the requirements, which has acted as a non-tariff measure in agricultural trade.
- **The use of pesticides is an essential process** to protect agricultural products from insect pests, weeds and fungal diseases, but improper use can have **a negative impact** on human, environment and livestock.
- The FAO/WHO Codex Alimentarius defines **Maximum Residue Limits(MRLs)** are the maximum concentration of a pesticide residue (expressed as mg/kg) to be legally permitted in or on food commodities and animal feeds; it is one of **the growing non-tariff measures**, but its stringency varies by country, commodity, or risk assessment.
- **The awareness of food safety has increased** in the aftermath of food safety accidents(BSE outbreak, Fukushima radiation in seafood, and so on) in major economies, and the importance of imported food safety (including residues) has been rising significantly.

I . Research Background & Purpose

2. The Rising Importance of Non-tariff Measures

- **Definition of non-tariff measures:** policy measures other than ordinary customs tariffs that can potentially have an **economic effect** on international trade in goods, changing quantities traded, or prices or both (UNCTAD, 2012).
- **Although there is an ongoing controversial debate, strictly speaking, non-tariff measures** are different from **non-tariff barriers**, which are the polices that induce an adverse impact on trade due to the specific discriminatory and protectionist intent (UN ESCAP, 2019).

Non-tariff Measures(NTM)



Non-tariff Barriers(NTB)

I . Research Background & Purpose

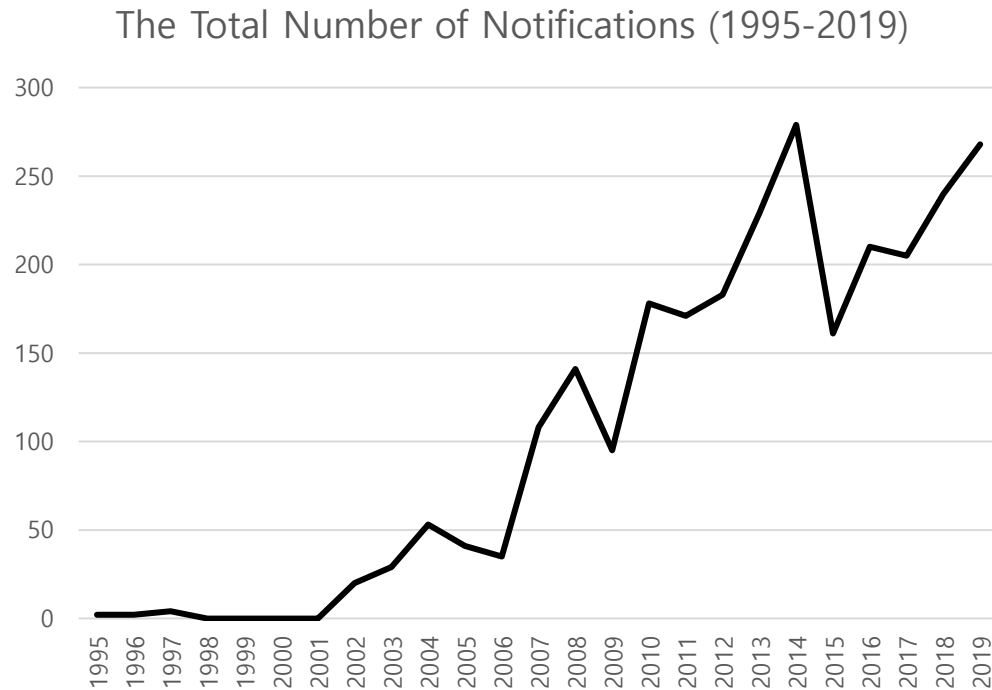
2. The Rising Importance of Non-tariff Measures: Technical Measures

Year		Trade Remedy			Technical Measures		Other			Total
Year	Total	AD	CVD	SG	TBT	SPS	Import	Export	Other	Total
2012	257	210	23	24	2196	1219	22	129	13	3836
2013	338	287	33	18	2140	1299	31	139	7	3954
2014	304	236	45	23	2240	1634	25	130	12	4345
2015	277	229	31	17	1977	1681	45	172	15	4167
2016	343	298	34	11	2332	1392	20	105	13	4205
2017	298	249	41	8	2580	1479	19	89	14	4479
2018	279	205	55	19	3065	1632	18	108	1	5103
2019	145	100	15	30	3337	1762				

Source: WTO(Trade Policy Review Body, Annual Report 2019/Overview of Developments in the int'l trading environment 2019)

I . Research Background & Purpose

2. The Rising Importance of Non-tariff Measures: MRLs



Source: Sanitary and Phytosanitary Information Management System (<http://spsims.wto.org/>)

Country	Total Number of MRL Notifications (1995-2019)
Canada	1584
Brazil	587
Australia	138
EU	103
Japan	76
United States	47
Other	119
Total	2654

Source: Sanitary and Phytosanitary Information Management System (<http://spsims.wto.org/>)

- The total number of notifications related to MRLs between 1995 and 2019 shows the continuous increasing trend.
- The largest number of notifications mainly comes from developed countries, including Canada, Australia, EU, Japan, and the United States.

I . Research Background & Purpose

Food Safety

**The Rising
Importance of NTMs
and MRLs**

**The Effect of MRL
on International Trade**

Research Questions(Recap.)

- How does MRLs as a food safety measure affect agricultural trade?
- Do stricter MRL regulations severely deter agricultural trade?
- How do major countries regulate pesticide use and determine MRLs?
- Why are MRL policies internationally inconsistent?
- What do the research findings and case studies suggest?

Discussion

- Literature Review on the effect of MRLs on agricultural trade
- Overview of MRLs
- MRL regulations in major countries
- Case Study: Impact of MRLs on agricultural trade

II. Literature Review

2.1 Key Summary

- Studies on the effects of non-tariff measures on trade have been conducted relatively **recently since the 2000s**.
- Most of the previous research has focused on the relationship between **trade and TBT/SPS as non-tariff measures**.

(Disdier, et al., 2008; Bao & Qiu 2012; Li & Beghin, 2012; Bao & Chen, 2013; Jang & Seo, 2014; Jang, 2017; Yoon & Jang, 2019)

- The effect of non-tariff measures has **varied by methodology, country, product, and non-tariff measure proxy**.
- Overall, **agricultural trades are negatively affected** by technical measures including MRLs.

(Disdier, Fontagne & Mimouni, 2008; Li & Beghin, 2012; Lee Woong, Lee Jung-mi, Kim Sin-ju, & Jang Yong-joon, 2017; Moenius, 2004; Li & Ki-Kwan Yoon, 2012; Wei, Huang & Yang, 2012; Xiong & Beghin (2014), Nugroho (2014))

- **Gravity model** has been dominantly estimated for the analysis.
- Li & Beghin (2012) suggest studies using MRLs tend to evidence more trade-impeding effects than other measures because they focus on a specific technical measures.
- **Developing countries** have found to be **more prone to non-tariff measures** imposed by importing countries.

(Disdier et al., 2008; Bao & Qiu, 2012; Li & Beghin, 2012; Wei et al., 2012; Xiong & Beghin, 2014; Oscar Melo et al., 2015)

- Non-tariff measures can positively affect trade by enhancing consumer trust in importing countries.

(Jang, 2017; Lee et al., 2017; Yoon & Jang, 2019; Xiong & Beghin, 2014, Moenius, 2004; Fugazza, 2013, Blind et al., 2013; Beghin¹⁴ et al., 2015)

II. Literature Review

2.1 Key Summary (Cont.)

- Little research has considered the effect of changes in MRLs on agricultural trade for the short- and long term.

e.g.) trade-reducing effect, the burden of production cost in the short term



safety enhancement, consumer trust



trade-increasing in the long term

- No comparative or cross-country studies have been carried out on the effect of MRL regulations by country or by standards.

II. Literature Review

2.1 TBT/SPS and Trade

Author(Year)	Title	Model	Dependent Variables	Independent Variables	Observed Countries	Period	Key Findings	+/-
Disdier et al.,(2008)	The Impact of Regulations on Agricultural Trade: Evidence from the SPS and TBT Agreements	Gravity Model	Import	GDP, Distance, Border, Language, Colonial links, Tariff & Frequency Index of TBT and SPS Notifications	OECD Countries	2004	<ul style="list-style-type: none"> SPS and TBT measures have a negative impact on agricultural trade OECD exporters are not significantly affected by these measures within their exports to other OECD members Export from developing and least developed countries are significantly reduced by SPS and TBT measures 	+/-
Bao & Qiu (2012)	How do Technical Barriers to Trade Influence Trade?	Modified Two-Stage Gravity Model (Probit, NLS & OLS)	Export	No. TBT Notifications, GDP, Distance& dummy variables(common borders, common official language, colonial history, same country group)	105 WTO Countries	1995-2008	<ul style="list-style-type: none"> A country's TBT notifications decrease other countries' probability of exporting, but increase their export volume A developing country's TBT has a significant effect on other developing countries' exports but not on the developed countries' exports A developed country's TBT has a significant effect on the exports from both type of countries 	+/-
Li & Beghin (2012)	A Meta-analysis of Estimates of the Impact of Technical Barriers to Trade	Meta-analysis (OLS, Robust regression & MNL regressions)	n/a	n/a	618 Observations the no. of estimates)	n/a	<ul style="list-style-type: none"> Agriculture and food industries tend to be more impeded or less enhanced by technical measures and barriers than other sectors SPS regulations on agricultural and food trade flows from low-income exporters to high-income importers are more likely to be trade impeding Studies using MRLs tend to evidence more trade-impeding effects than other measures and clearer policy implications because they focus on a specific technical measures. 	-

II. Literature Review

2.1 TBT/SPS and Trade

Author(Year)	Title	Model	Dependent Variables	Independent Variables	Observed Countries	Period	Key Findings	+/-
Bao & Chen (2013)	The Impacts of Technical Barriers to Trade on Different Components of International Trade		No. of TBT Notification, GDP, Distance & Transaction cost(common borders, common official language, colonial history, same country group)	Export	103 Countries	1995-2008	<ul style="list-style-type: none"> TBT imposes inconsistent impacts on the different components of trade and the effects differ by country TBT reduces trade probability but increases the volume and duration of existing trade relationships The positive effect of TBT on trade volume is mainly driven by an increase in the extensive margin, and the effect on the intensive margin is not statistically significant TBT raised by developed countries has a stronger negative impact on trade probability, while TBT implemented by developing countries have a greater positive effect on trade volume 	+/-
Jang & Seo (2014)	The Impact of Technical Barriers to Trade(TBT) on Bilateral Trade: A Case of Korea	Arellano-Bond Estimator (GMM)	Export Import	No. of TBT notifications, TSI(Trade Specialization Index), RCA(Revealed Comparative Advantage) & Technical Intensity	US, China, EU and Japan	1995-2009	<ul style="list-style-type: none"> TBT negatively affects Korea's trade in the short term, but the effect is diminished or switched to positive in the long term TBT less affects the industries with higher competitiveness or comparative advantage, while more affects the industries with higher technical intensity 	+/-

II. Literature Review

2.1 TBT/SPS and Trade

Author(Year)	Title	Model	Dependent Variables	Independent Variables	Observed Countries	Period	Key Findings	+/-
Jang (2017)*	Effects of Overseas TBT and SPS on Korea's Export: Export Cost Effect and Demand Increase Effect	Gravity Model (Pooled OLS, Fixed Effect, Random Effect)	Export	GDP, RCA, Tariff, Distance, & Technical measures(the no. of import rejections)	Korea's Trading Countries	2012-2015	<ul style="list-style-type: none"> Technical measures imposed by importing countries do not affect Korea's export 'Trade restriction effect by compliance cost' is offset by 'trade promotion effect by the increased consumer trust' 	/
Yoon & Jang (2019)*	The Effects of TBT and SPS Measures on Halal Food Export	Gravity Model (PPML, Fixed Effects, Hausman-Taylor)	Export	GDP, Distance, Tariff, FTA, & No. of Technical Measures (TBT+SPS)	Brazil, India, US, China, Thailand, Australia, France, Russia, Turkey & Ukraine	2004-2017	<ul style="list-style-type: none"> Technical measures imposed by importing countries positively affects export – the level of consumer trust is higher than that of trade cost Technical measures can help reduce the transaction cost by providing relevant market information(Fugazza,2013) 	+

II. Literature Review

2.2 Food Safety and Trade

Author(Year)	Title	Model	Dependent Variables	Independent Variables	Observed Countries	Period	Key Findings	+/-
Otsuki et al., (2001)	What price precaution? European Harmonization of Aflatoxin Regulations and African Groundnut Exports	Gravity Model	Export in African country to EU country	GNP Distance Maximum Aflatoxin level imposed on groundnut product, Rainfall and Colonial tie	Europe and Africa	1989-1998	<ul style="list-style-type: none"> • The trade-impeding impact of tightening the standards is greatest for edible groundnuts • A 10% reduction of maximum allowable level of Aflatoxin B1 will lead to an 11% reduction of export of edible groundnuts, whereas the aflatoxin regulations did not affect trade in groundnuts for oilseed 	-
Moenius(2004)	Information versus Product Adaptation: The Role of Standards in Trade	Gravity Model	Trade Volume	The number of shared standards, GNP and Distance	Austria, Australia, Belgium, Switzerland, Germany, Spain, France, UK, Japan, Netherlands, Norway, Poland, Turkey & US	1985-1995	<ul style="list-style-type: none"> • Trade volumes are higher if countries share more standards. • Country-specific standards of importers reduce imports for agriculture, they do promote trade in the manufacturing sector • Country-specific standards of the importing country offer valuable information for adapting the product to that market 	+/-
Chen et al.,(2008)	Measuring the Effect of Food Safety Standards on China's Agricultural Exports	Gravity Model	Export	Output of Commodity (garlic, onions, spinach), Importing Country's GDP, Distance, MRL, Tariff,	China's Vegetable Trading Partners	1992-2004	<ul style="list-style-type: none"> • Food safety standards imposed by importing countries have a negative effect on China's agricultural exports • Changes in food safety measures impacts the trade effect 	-

II. Literature Review

2.2 Food Safety and Trade

Author(Year)	Title	Model	Dependent Variables	Independent Variables	Observed Countries	Period	Key Findings	+/-
Li & Yoon(2012)	The Impact of WTO TBT/SPS on Agricultural Trade	Gravity Model (Hausman-Taylor & Generalised 2 Step Least Squares)	Export	GDP, Distance, Neighbouring Country, Tariff and MRLs	OECD Countries and 16 Exporting Countries	1999-2008	<ul style="list-style-type: none"> • Food safety standard imposed by importing countries has a negative effect on agricultural product export 	-
Wei et al., (2012)	The Impacts of Food Safety Standards on China's Tea Exports	Gravity Model (OLS, Fixed Effect)	Export	GDP, Production(lagged), Distance, Tariff, and MRL of Endosulfan, Fenvalerate & Flucythrinate	31 Countries/ Regions	1996-2009	<ul style="list-style-type: none"> • MRL imposed by importing countries significantly affects China's tea efforts • An 1% increased in the regulatory stringency (ppm) on endosulfan and fenvalerate can lead to a 22% decrease of tea exports from China • Different and tighter restrictions from developed countries on food safety standards, and increasing coverage of regulated pesticides suggest developing countries will face great challenges in exporting food products 	-
Xiong & Beghin(2014)*	Disentangling Demand-Enhancing and Trade-Cost Effects of Maximum Residue Regulations	Gravity Model			OECD Countries	2007,2008, 2011 and 2012	<ul style="list-style-type: none"> • MRL can create unnecessary trade barriers, but it can also increase demand via risk mitigation or quality assurance • Among OECD countries, MRLs jointly enhance the import demand and hinder foreign exporters' supply • Developing countries are more prone to the MRL restrictions than developed nations 	+/-

II. Literature Review

2.2 Food Safety and Trade

Author(Year)	Title	Model	Dependent Variables	Independent Variables	Observed Countries	Period	Key Findings	+/-
Nugroho (2014)	The Impact of Food Safety Standard on Indonesia's Coffee Exports	Gravity Model (OLS, Fixed Effect & Random Effect)	Export	GDP, Production(lagged), Distance & MRL	Indonesia's 10 Coffee Trading Countries	2002-2011	<ul style="list-style-type: none"> Regulation on Ochratoxin has a negative impact on Indonesia's coffee exports 	-
Oscar Melo et al. (2015)	Do Sanitary, Phytosanitary, and Quality-related Standards Affect International Trade? Evidence from Chilean Fruit Exports	Gravity Model	Relative bilateral intensity (RI) of trade	Language, Production, Tariff, MRL, Shipping days, Time trend & Stringency Index	15 Countries	2005-2009	<ul style="list-style-type: none"> A multidimensional stringency index was constructed to examine the food safety standard on Chilean fresh fruit trade (pest and quarantine treatments, MRLs, labeling, marking, and packaging requirements, GAPs, Quality standards, pest monitoring) An increase in stringency has a negative effect on Chilean fruit exports, and the effect is higher if stringency increases in developed countries Phytosanitary and MRLs have detrimental effects on trade, but GAP has a positive impact on trade 	+/-

III. Overview of MRLs

1.1 Pesticides and MRL Regulations as Food Safety in Agricultural Trade

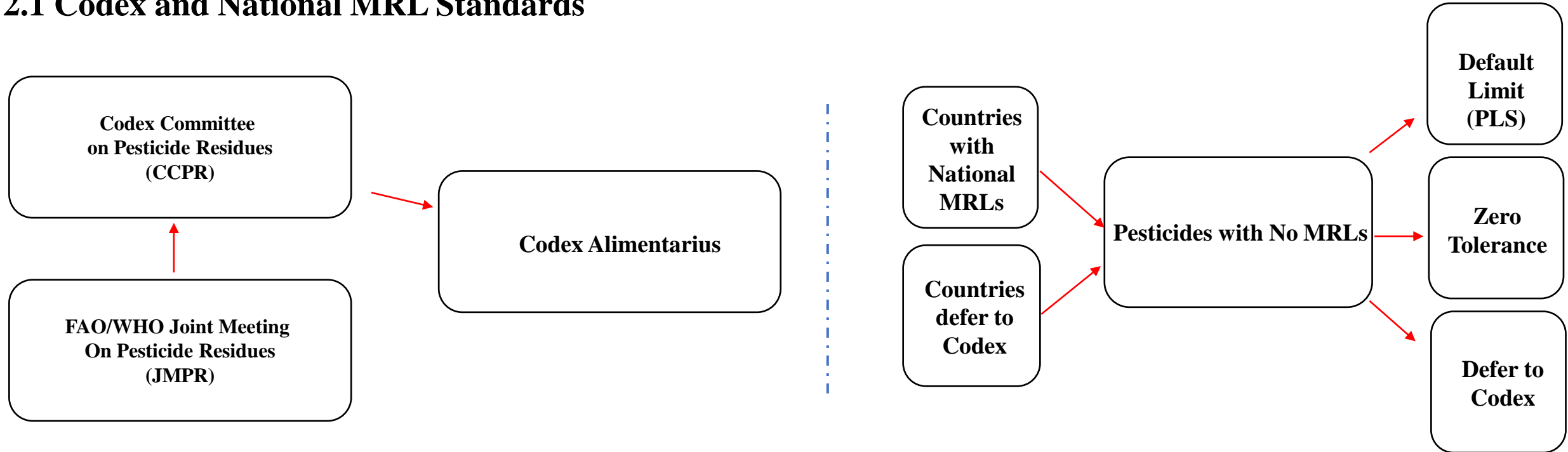
- Regulations on food safety and environmental protection, including MRLs, have important implications for international trade, the use of pesticides helped the increase in food productivity over the past several decades(Wilson & Otsuki, 2012).
- Pesticides are often hazardous substances that cause harmful effects on human or animal and plant(Drogue & DeMaria, 2008), but it also improves storage and distribution of agricultural commodities(Wilson & Otsuki, 2012).
- In order to protect consumer health and to promote good agricultural practices, maximum residue limits have been set worldwide(Drogue & DeMaria, 2008).

1.2 MRLs as Non-tariff Barriers in Practice

- The continuous trade negotiations and agreements among countries have led to a substantial reduction in the impact of tariffs on global trade, as a consequence, it has brought the great number of the use of non-tariff measures in regulating international trade (Kareem, 2016).
- The total number of MRL-related SPS/TBT notification reported to WTO has increased for the past decades, but from the perspective of producers and processors, the cost of complying with the SPS or TBT regulations can be high(Xiong & Beghin, 2014).
- In exporting countries, standards can be trade-impeding as cost incurs at all levels of the supply chain. In contrast, in importing markets, however, tighter regulations can be trade-enhancing(FAO, 2020).

IV. Codex and National MRL Standards

2.1 Codex and National MRL Standards



- Codex Alimentarius is a **collection of internationally adopted food standards and related texts presented in a uniform manner**. These food standards and related texts aim at protecting consumers' health and ensuring fair practices in the food trade. It is intended to guide and promote the elaboration and establishment of definitions and requirements for foods to assist in their harmonization and in doing so to facilitate international trade(FAO)
- Codex standards and related texts are **not a substitute for, or alternative to national legislation**. Every country's laws and administrative procedures contain provisions with which it is essential to comply.
- International harmonization of MRLs does not exist at a global level(Drogu & DeMaria, 2010)

IV. Codex and National MRL Standards

2.2 Established Pesticide MRLs

Category	Countries	Notes
Countries with National Standards	Argentina, Australia , Brazil, Canada , Chile, China, India, Indonesia, Israel, Japan , Korea , Russia, Singapore, Switzerland, South Africa, Taiwan, Thailand, Turkey, New Zealand, Vietnam, United Arab Emirates, Malaysia	Some countries defer to Codex if there is no established MRL standards for certain commodities
Countries defer to Codex	Algeria, Angola, Barbados, Bermuda, Bahamas, Bangladesh, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Egypt, El Salvador, Guatemala, Hong Kong, Honduras, Jordan, Kenya, Lebanon, Morocco, Netherlands Antilles, Nicaragua, Pakistan, Panama, Peru, Philippines, Trinidad and Tobago, Tunisia, Venezuela	
Countries defer to EU Standards	Belgium, Denmark, Finland, French Pacific Islands, France, French West Indies, Germany, Greece, Ireland, Italy, Jamaica, Netherland, Norway, Poland, Portland, Spanish, Sweden, United Kingdom	
Countries defer to GCC Standards	Bahrain, Kuwait, Saudi Arabia, Oman, Qatar	
Countries defer to Exporting Countries' Standards	Albania, Antigua and Barbuda, Cayman Island, Haiti, Nevis, Sri Lanka, St. Lucia	
Countries defer to US Standards	US , Mexico	

IV. Codex and National MRL Standards

2.3 Default Values for Non-Established Pesticide MRLs: Positive List System (0.01 ppm)

Country	Year of Adoption	Description (from regulatory authorities)	Source
Japan	2006	The Minister of Health, Labour and Welfare has established the level given below, based on the provision of Paragraph 3, Article 11 of the Food Sanitation Law, as the amount unlikely to cause damage to human health that the provision requires the Minister to set; it will take effect on May 29, 2006. Notwithstanding this notification, food products that are manufactured or processed on or before May 28, 2006 may observe the existing regulations, instead of the regulations to be applied from the given date. The amount unlikely to cause damage to human health that the provision of Paragraph 3, Article 11 of the Food Sanitation Law requires the Minister to set is 0.01 ppm.	Ministry of Health, Labour and Welfare Notification No. 497
EU	2008	The products covered by Annex I shall not contain, from the time they are placed on the market as food or feed, or fed to animals, any pesticide residue exceeding: (a) the MRLs for those products set out in Annexes II and III; (b) 0.01 mg/kg for those products for which no specific MRL is set out in Annexes II or III , or for active substances not listed in Annex IV unless different default values are fixed for an active substance in accordance with the procedure referred to in Article 45(2) while taking into account the routine analytical methods available. Such default values shall be listed in Annex V.	REGULATION (EC) No 396/2005 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 February 2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC
Korea	2016 (for tropical fruits and tree nuts) 2019 (fully enforced)	Pesticides MRLs of agricultural products are specified on [Appendix 4]. When group MRLs and specific MRLs conflict, specific MRLs are applied first. ② If MRLs are not established on [Appendix 4], uniform MRLs of 0.01 mg/kg will be adapted.	Ministry of Food and Drug Safety Notification No. 2015-78 Pesticide MRLs for Agricultural Commodities

IV. Codex and National MRL Standards

2.4 Default Values for Non-Established Pesticide MRLs (Zero Tolerance)

Country	Year of Adoption	Description (from regulatory authorities)	Source
US	1960s	<p>A zero tolerance means that no amount of the pesticide chemical may remain on the raw agricultural commodity when it is offered for shipment. A zero tolerance for a pesticide chemical in or on a raw agricultural commodity may be established because, among other reasons:</p> <p>(a) A safe level of the pesticide chemical in the diet of two different species of warm-blooded animals has not been reliably determined.</p> <p>(b) The chemical is carcinogenic to or has other alarming physiological effects upon one or more of the species of the test animals used, when fed in the diet of such animals.</p> <p>(c) The pesticide chemical is toxic, but is normally used at times when, or in such manner that, fruit, vegetables, or other raw agricultural commodities will not bear or contain it.</p> <p>(d) All residue of the pesticide chemical is normally removed through good agricultural practice such as washing or brushing or through weathering or other changes in the chemical itself, prior to introduction of the raw agricultural commodity into interstate commerce.</p>	40 CFR 180.5 Zero tolerances
Australia	1980s	<p>Any chemicals that are not approved, or exempted from approval, cannot be used as active constituents in an agricultural or veterinary chemical product, unless an application is made for approval of the active.</p>	Australian Pesticides and Veterinary Medicines Authority
Canada	2006	<p>Divisions 15 and 16 of the Food and Drug Act Regulations (FDAR) govern the MRLs of agricultural and veterinary chemicals in foods in Canada. If a food contains a residue at a level higher than that specified in the FDAR, the food is considered 'adulterated' and is prohibited from the food supply. Canada has a zero tolerance approach to all agricultural and veterinary chemicals not listed in Divisions 15 and 16 of the FDAR</p>	FOOD REGULATION PUBLIC CONSULTATION PAPER ON DRAFT MINISTERIAL POLICY GUIDELINES FOR The regulation of residues of agricultural and veterinary chemicals in food.

IV. Codex and National MRL Standards

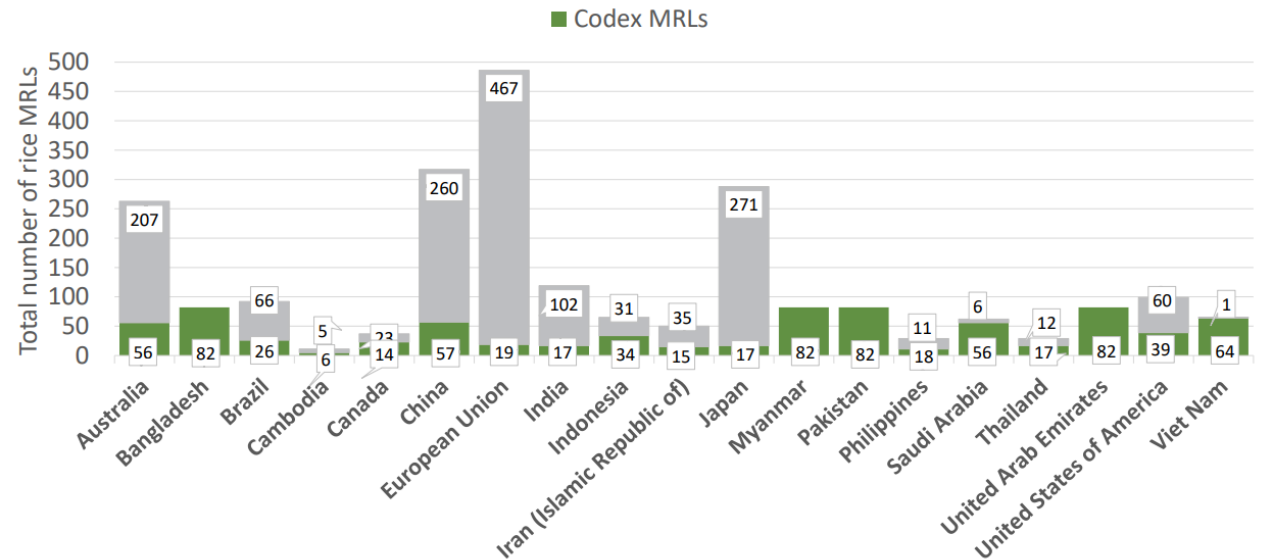
- Despite longstanding efforts towards **international harmonisation** of allowable thresholds for pesticide residues in foods, differences in national implementation of MRLs continue to exist, raising questions with regard to their impact on trade.
- Although many countries defer to suggestions, and guidelines by **Codex**, Codex is **not a substitute for, or alternative to national legislation**. Every country's law and administrative procedures contain provisions with which it is essential to comply (FAO).

The Number of Pesticides Registered by Country

CODEX	Japan	EU	The US	Korea	China
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Source: Ministry of Food and Drug Safety Korea (2020)

The Number of MRLs for Rice by Country



Source: Codex (2020)

IV. Codex and National MRL Standards

MRLs for Blueberries(Unit: ppm)

Chemical Name	Codex	USA	Australia	Canada	EU	Japan	Korea
Carbaryl	0.0	3.0	0.0	7.0	0.01	7.0	0.5
Chlorantraniliprole	1.0	2.5	3.0	0.35	1.5	3.0	1.0
Norflurazon	0.0	0.2	0.05	0.0	0.0	0.2	0.1
Iron Phosphate	Missing	Exempt	Missing	Missing	Missing	Missing	Missing

Source: Maximum Residue Limits for USA and Common Foreign Trade Markets(2018)

MRLs for Prochloraz(Unit: ppm)

Chemical Name	Previous	New	Previous	New	Previous	New	Enforcement Date
Prochloraz	Banana		Mango		Pineapples		
	0.05	0.03	5	0.03	5	0.03	4.Sep. 2020

Source: Commission Regulation (EU) 2020/192

IV. Codex and National MRL Standards

— PLS VS Zero Tolerance

	PLS	Zero Tolerance
Benefits	-(for regulators) improved pest management, enhanced food safety management for imported food products and prevention of misuse/abuse of pesticides -(for regulators) strict food safety management achievable	
Challenges	<ul style="list-style-type: none">-Lowered MRLs perceived as restrictive and generally result in the inability to use the related pesticide(USITC,2020)-Some of pesticides no longer allowed to use for import-PLS varies by market, ranging from 0.01ppm to 0.1ppm, which can block market access-Trade-decreasing from lower MRLs	<ul style="list-style-type: none">- Scientifically and administratively unreasonable(Food, Durg, Cosmietice Law Journal, 1965)- Contrary to the empirical reality(Hanekamp & Kwakman, 2004)- Any detected level of an unapproved active substance could lead to a rejected shipment(USITC, 2020)-Blocks market access for imported crops treated by a pesticide for which an MRL doe not exist in the import market-Creates more negative impact than PLS in trade-(growers and pesticide manufactures) PLS preferred (to zero tolerance)

VI. Summary

- The majority of previous studies evidenced that **MRLs have a negative impact on trades, especially agricultural trades.**
(Otsuki et al., 2001; Chen et al., 2008; Li & Yoon, 2012; Winchester et al., 2012; Wei et al., 2012; Nugroho, 2014; Melo et al., 2014)
- In particular, the more stringent MRL regulations are applied, the more deterrent effect it has on trades – changes in MRLs may act as non-tariff measures to exporting countries.
- However, the effect of non-tariff measures on trade can be explained as a trade-off between the trade restriction effect and the trade promotion effect (Lee et al. 2016).
- ✓ Trade Restriction Effect: (Lee et al., 2016; Disdier et al., 2008; Li & Beghin, 2012, Li & Yoon, 2012)
- ✓ Trade Promotion Effect: (Moneius, 2004; Fugazza, 2013; Blind et al., 2013; Beghin et al., 2015)
- Little research has considered the effect of changes in MRLs on agricultural trade for the short- and long term.
- No comparative or cross-country studies have been carried out on the effect of MRL regulations by country or by standards.
- In the future research, with the major agricultural import/export data (e.g., rice, banana, etc.) in some major exporting countries (tentatively, ASEAN nations), different effects by MRL standard/by country will be examined as well as trade enhancing/detering effect before and after the changes in MRL regulations.

Thank you.

Reference

Book

Na, H.(2020). *아세안의 WTO 무역분쟁연구*, Seoul: 서울대학교 출판문화원.

Bergeijk, P. A.G.V., & Brakman, S.(2011). *The Gravity Model in International Trade: Advances and Applications*. London: Cambridge University Press

Tinbergen, J. (1962). *Shaping the World Economy; Suggestions for an International Economic Policy*. Retrieved from <http://hdl.handle.net/1765/16826>

Journal Article

Bao, X., & Chen, W. (2013). The Impacts of Technical Barriers to Trade on Different Components of International Trade. *Review of International Economics*, 17(3), 447-460.

Bao, X., & Qiu, L. (2012). How do Technical Barriers to Trade Influence Trade?. *Review of International Economics*, 20(4), 691-706.

Chen, C., Yang, J., & Findlay, C.(2008). Measuring the Effect of Food Safety Standards on China's Agricultural Export. *Review of World Economics*, 144(1), 83-106.

Disdier, A. C., Fontagne, L., & Mimouni, M. (2008). The Impact of Regulations on Agricultural Trade: Evidence from the SPS and TBT Agreements. *American Journal of Agricultural Economics*, 90(2), 336-350.

Drogue, S., & DeMaria, F. (2010). Do Different Regulations in Maximum Residue Levels of Pesticides Affect Trade Competitiveness? The Case of Apples and Pears. *European Commission Specic Targeted Research Project, Contract no. FP7 KBBE.2008.1.4.05*.

Fontagne, L., Kirchbach, F. V., & Mimouni, M.(2005). An Assessment of Environmentally-Related Non-tariff Measures. *World Economy*, 28(10) 1417-1439.

Fugazza, M. (2013). The Economics Behind Non-tariff Measures: Theoretical Insights and Empirical Evidence. *UNCTAD Policy Issues in International Trade and Commodities Studies Series. No.57*.

- Jang, Y. (2014). The Impact of Technical Barriers to Trade(TBT) on Bilateral Trade: A Case of Korea. *Journal of International Trade and Industry Studies*, 19(3), 1-33.
- Jang, Y. (2017). 해외 TBT와 SPS의 한국 수출에 대한 효과 분석, *Korean Public Management Review*, 31(3), 319-343.
- Kareem, O. I. (2016). Food safety regulations and fish trade: Evidence from European Union-Africa trade relations. *Journal of Commodity Markets*, 2(1), 18–25.
- Kim, S., & Kang, M. (2018). A Study on the Influence of Non-Economic Factors of Fishery Safety on Fishery Trade among Countries. *Journal of Korea Research Association of International Commerce*, 19(3), 45-68.
- Li, Y., & Beghin, J. C. (2012). A Meta-Analysis of Estimates of the Impact of Technical Barriers to Trade. *Journal of Policy Modeling*, 34(3), 497–511.
- Li, Z., & Yoon, K. (2012). The Impact of WTO TBT/SPS on Agricultural Trade. *Korea Trade Review*, 8(4), 167-184.
- Melo, O., Engler, A., Nahuehual, L., Cofre, G., & Barrena, J.(2013). Do Sanitary, Phytosanitary, and Quality-related Standards Affect International Trade? Evidence from Chilean Fruit Exports. *World Development*, 54, 350–359.
- Nugroho, A. (2014). The Impact of Foods Safety Standard on Indonesia’s Coffee Exports. *Procedia Environmental Sciences*, 20, 425-433/
- Pak, M., Choi, B., & Kim, B. (2005). A Study on the Safety Standards of CODEX Alimentarius Commission(CAC) in Fishes and Seafood. *Journal of Maritime Business*, 5, 85-109.
- Pak, Y., & Pak M.(2019). A Study on Effects of SCM and CSR of Food Export Corporation on Food Safety. *Korea Trade Review*, 44(2), 63-82.
- Wei, G., Huang, J., & Yang, J. (2012). The Impacts of Food Safety Stands on China’s Tea Exports. *China Economic Review*, 23(2), 253-263.
- Yoon, J., & Jang, Y.(2019). The Effects of TBT and SPS Measures on Halal Food Exports. *Journal of International Trade and Industry Studies*, 24(2), 1-22.
- Yang, J., & Oh, B. (2018). Effects of Food Labelling on International Trade. *Korea International Commerce Review*, 33(3), 39-59.
- Xiong, B., & Beghin, J. (2014). Disentangling Demand-Enhancing and Trade-Cost Effects of Maximum Residue Regulations. *Economic Inquiry*, 52(3), 1190-1203.

Website

The ASEAN Secretariat (2020). *ASEAN Statistical Yearbook 2020*. https://www.aseanstats.org/wp-content/uploads/2020/12/ASYB_2020.pdf accessed on 05.May.2021

The ASEAN Secretariat (2020). *ASEAN Key Figures 2020*. https://www.aseanstats.org/wp-content/uploads/2020/11/ASEAN_Key_Figures_2020.pdf accessed on 10.April.2021

CEPII(n.d.) *GeoDist*. http://www.cepii.fr/cepii/en/bdd_modele/bdd.asp on 10.April.2021

European Commission (2019). *Global Food Supply and Demand Consumer Trends and Trade Challenges*, https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/farming/documents/market-brief-food-challenges-sep2019_en.pdf accessed on 10.April.2021

FAO(2019). *Major Tropical Fruits Statistical Compendium*. <http://www.fao.org/3/cb0717en/cb0717en.pdf> accessed on 10.April.2021

FAO (2020). *Understanding International Harmonization of Pesticide Maximum Residue Limits with Codex Standards*. <http://www.fao.org/3/cb0463en/CB0463EN.pdf> accessed on 30.May.2021

Ministry of Trade, Industry and Energy & Korea Trade Investment Promotion Agency (2020). *비관세장벽 애로해소 사례집*. <https://news.kotra.or.kr/user/reports/kotranews/20/usrReportsView.do?page=1&reportsIdx=12065&hotClipType=&orderByType=image&searchStartDate=&searchEndDate=&searchReportGbn=title&searchText=&searchAreaCd=&searchIndustryCateIdx=&CSRFToken=ed0be4f4-5179-4b77-952a-4636f6abda2a> accessed on 10.April.2021

OECD(2020). *OECD-FAO Agricultural Outlook*. https://www.oecd-ilibrary.org/agriculture-and-food/oecd-fao-agricultural-outlook-2020-2029_1112c23b-en accessed on 15.April.2021

United States International Trade Commission (2020). *Global Economic Impact of Missing and Low Pesticide Maximum Residue Levels, Vol.1* <https://www.usitc.gov/publications/332/pub5071.pdf> accessed on 30.May. 2021

United States International Trade Commission (2020). *Global Economic Impact of Missing and Low Pesticide Maximum Residue Levels, Vol.2* <https://www.usitc.gov/publications/332/pub5160.pdf> accessed on 30.May. 2021

United Nations Economic and Social Commission for Asia and the Pacific (2019). *Asia-Pacific Trade and Investment Report 2019: Navigating Non-tariff Measures towards Sustainable Development* <https://www.unescap.org/publications/APTIR2019#> accessed on 30.May. 2021

World Bank (n.d.). Agriculture, Forestry, and Fishing, Value Added (current US\$) <https://data.worldbank.org/indicator/NV.AGR.TOTL.CD> accessed on 15.April.2021

WTO (n.d.). Overview of Developments in the International Trading Environment. https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S009-DP.aspx?Language=E&CatalogueIdList=260412,259315&CurrentCatalogueIdIndex=1&FullTextHash=371857150 accessed on 10.April.2021

WTO(n.d.). *GDP(constant 2010 USD)*. <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD?end=2019&start=1995&view=chart> accessed on 15.April.2021

WTO (n.d.). *Sanitary and Phytosanitary Information Management System*. <http://spsims.wto.org/en/Notifications/Search?DoSearch=True&NotificationFormats=1&NotificationFormats=7&NotificationFormats=200&NotificationFormats=201&NotificationFormats=202&NotificationFormats=203&NotificationFormats=8&NotificationFormats=9&DistributionDateFrom=01%2F01%2F1995&DistributionDateTo=31%2F12%2F2019&DisplayChildren=true&SearchTerm=mrl> accessed on 15.April.2021

WTO(n.d.) *Tariff rate, applied, simple mean, all products(%)*. <https://data.worldbank.org/indicator/TM.TAX.MRCH.SM.AR.ZS?end=2019&start=1995> accessed on 15.April.2021

WTO Tariff Analysis Online (n.d.) <http://tao.wto.org/default.aspx> accessed on 15.April.2021