Master's Thesis of Public Policy

Embracing Technical Barriers to Trade

The Country-level Responses to European REACH Regulations

기술무역장벽(TBT) 끌어안기:

수출국의 유럽연합 화학물규제(REACH) 대응사례 분석

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Abstract

Technical Barriers to Trade (TBTs) are being spotlighted at a time when the shadow of protectionism grows ominous over the entire global economy. They are known to be trade-restrictive and some of them place more burdens, especially on foreign suppliers. The primary question of this study is who embraces technical barriers to trade better than others and why. This study examines how different countries have responded to the European Union's REACH regulations, and what factors have induced some, if not all, of them to harmonize their domestic policies with the REACH regulations. Through a panel regression analysis, this study finds a strong statistical support for three policy harmonization mechanisms, namely transnational communication, intergovernmental institution and competitive pressure for export markets, which show that TBTs themselves are not necessarily restrictive to trade. It is noteworthy that TBTs can promote regulatory innovation and race to the top, depending on how exporting countries react to new foreign regulations.

Keyword: technical barriers to trade, technical regulation, EU REACH regulations, regulatory policy, policy harmonization, regulatory race to the top

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Table of Contents

List of Tables

Chapter 1. Introduction

Technical Barriers to Trade (TBTs) are being spotlighted at a time when the shadow of protectionism grows ominous over the entire global economy. The number of TBTs notified to the World Trade Organization (WTO) has set the highest record every year since the establishment of the WTO in 1995. This contrasts sharply with the lowering of tariff barriers to the extent that the actual tariff rate is close to zero in advanced countries. According to the 2017 WTO Annual Review of the Implementation and Operation of the TBT Agreement, a total of 82 member countries submitted 2,585 TBT notifications in 2017, compared to an average of 2,179 submissions over the past five years (G/TBT/40, para. 3.1).

It is known that technical regulations are inherently restrictive to trade. They impose specific burdens, such as labeling requirements, technical specification standards and quality standards, not only on domestic producers but also on overseas suppliers. On the surface, all the purposes of technical regulation seem justifiable.[1] Underneath the surface, however,

[1] All the TBT notifications to the WTO in 2017 can be categorized as follows by their objectives: 1) protection of human health or safety, 1,233 (43.5%); 2) quality requirements, 448 (15.8%); 3) protection of the environment, 322 (11.4%); 4) prevention of deceptive practices and consumer protection, 290 (10.2%); 5) consumer information and/or labeling, 231 (8.2%); 6) others, 103 (3.6%); 7)

some regulations are more burdensome than others, especially for foreign suppliers. It was not surprising that the TBT committee discussed 178 Specific Trade Concerns (STCs) in 2017, the largest number ever. Among them, 151 cases have been repeatedly raised, showing their tenacious characteristic.

In terms of technical regulations, the United States (US) and the European Union (EU) stand out as the most enthusiastic participants, ranked first and third in the TBT hierarchy, respectively. They have also been leading the way in which the norms of technical regulation are formed and implemented (Kelemen and Vogel, 2010; Young, 2015; Filipec, 2017; Michida, 2017).

As one of the most notable TBTs, the EU adopted progressive chemical regulations in 2007, named as the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). The principle of "no data, no market" is known as one of the strictest regulations on chemicals and chemical-containing products. Chemicals covered in these regulations cannot enter the European market unless they are in accordance with the

harmonization, 91 (3.2%); 8) protection of animal or plant life or health, 71 (2.5%); 9) reducing trade barriers and facilitating trade, 38 (1.3%); 10) national security requirements, 6 (0.2%); and 11) cost saving and productivity enhancement, 1 (0.04%) (G/TBT/40, para. 3.17)

REACH requirements (Heyvaert, 2009: 111–112; Naiki, 2010: 182–183).

Since the EU informed the WTO TBT Committee of its implementation plan as a TBT in 2003, the REACH has raised a series of concerns for the EU's trading partners.[2] During the period from 2003 to 2017, a total of 36 countries raised 329 STCs on the REACH at the WTO TBT Committee sessions. Most of the concerns were about the REACH's negative impact on international trade. For example, the TBT Committee in November 2004 recorded the member countries' concern that "the REACH would be more difficult for non-EU manufacturers to comply with than for EU manufacturers" (G/TBT/M/34, para. 23). The rest of the opinions did not deviate significantly from this point of view: the REACH could put foreign suppliers under more trade-restrictive conditions than domestic producers (G/TBT/M/35, paras. 15–24; G/TBT/M/36, paras. 10-17; G/TBT/M/39, paras. 45–52; G/TBT/M/40, paras. 43–52, etc.).[3]

Despite some concerns, the new regulations encourage new

[2] WTO members who adopt new technical regulations are required to inform the TBT Committee of their plans in advance. The EU notified other members of its adoption plan four years ahead of its implementation in 2007.

[3] For instance, having raised the STC regarding the REACH 32 times, Australia mentioned that "although the REACH legislation required registration of chemical products regardless of origin, the fact that substances already registered in the European Communities were not required to be re-registered when bought by a downstream producer in the European Communities was likely to put imported products at a competitive disadvantage" (G/TBT/M/36, para. 11).

technologies and a more efficient allocation of scarce resources under certain conditions (Porter, 1990; Porter and Linde, 1995). In fact, as demonstrated by the increase in chemical exports to the EU between 2007 and 2017, some foreign suppliers have better adapted to the new trading environment of the EU than others. For example, the average annual growth rates of South Korea, China and Taiwan were 15%, 11% and 9%, respectively, while the global average growth rates stood at 4% during the same period.[4] This observation raises a puzzling question: who embraces technical barriers to trade better than others and why?

This study commences with this question, and aims to investigate how different countries have responded to REACH regulations, and what factors, if not all, induced them to harmonize their domestic policies with the REACH regulations. Of course, individual companies try to adjust themselves to the new regulatory environment of the export market through innovation. Nevertheless, the regulatory policies of exporting countries are equally or more important than the responses of individual companies. For foreign governments, voluntary harmonization of regulatory policies is essential to maintain and encourage the competitiveness of their exporters in

[4] This was calculated by the author using UNCOMTRADE data extracted from HS Nos.28–38 chemical products, except for No.30, since pharmaceutical products are not subject to the REACH.

the European market. Other things being equal, regulatory harmonization and convergence can promote trade and induce innovation (Blind, 2001; Blind and Jungmittag, 2005; De Frahan and Vancauteren, 2006; Portugal-Perez et al., 2010; Vigani et al., 2012).

The rest of this study is developed as four chapters. Chapter 2 discusses the theoretical background of regulatory harmonization as a source of adaptive innovation on the part of an exporting country. TBTs exist due to differences in standards, technical regulations, and conformity assessment, and they can be trade-restrictive unless properly harmonized. This section identifies three distinct mechanisms that lead to the harmonization of technical regulations: communication-based, institution-based, and competition-based harmonization.

Chapter 3 identifies three causal mechanisms of policy convergence that are related to the EU REACH case: transnational communication, intergovernmental institution, and competition pressure for export markets. Based on the existing harmonization and convergence literature, this chapter lays out a theoretical foundation for the following empirical work.

Chapter 4 conducts a panel regression analysis to test the causal relationship between the three causal mechanisms and the level of regulatory convergence to the REACH. The estimation results present

strong statistical support for all the three harmonization mechanisms as expected. They also indicate that TBTs themselves are not necessarily trade-restrictive depending on how exporting countries respond to new foreign regulations.

Chapter 5 summarizes the main findings and derives policy implications. It highlights the fact that TBTs are inherently trade-restrictive to some extent at least, but they can also promote regulatory innovation and Race-to-the-Top competition in some exporting countries when there are relevant driving factors, particularly the three convergence mechanisms in action: transnational communication, intergovernmental institution, and competitive pressure for export markets.

Chapter 2. Theoretical Backgrounds

2.1. Three Mechanisms of Regulatory Harmonization

TBTs include various measures that countries adopt to regulate "product characteristics or their related processes and production methods, including the applicable administrative provisions, with which compliance is mandatory" (technical regulation) or to provide "rules, guidelines or characteristics for products or related processes and production methods, with which compliance is not mandatory" (standard) (TBT Agreement Annex 1.1). These measures are generally used for public purposes such as regulating markets, protecting consumers, and/or preserving natural resources.

However, they can be used to discriminate against imports in order to protect domestic industries and producers that compete with foreign suppliers. Regardless of whether it is intentional or consequent, country-specific technical regulations might provide advantages for local producers by imposing mandatory standards that foreign suppliers find more difficult to comply with. (Swan et al., 1996: 1298–1299). As overseas suppliers are deterred from entering the market, domestic producers will be able to

increase their supplies and enjoy an additional "producer surplus", which is transferred from foreign suppliers.

There are two options that foreign governments can choose. They can either complain about the trade restrictiveness of importing countries' new regulations and challenge them at the WTO[5], or adopt similar regulations on their own to alleviate the adverse effect of new barriers to trade. The latter approach of regulatory harmonization is of interest to this study. By adopting similar measures at home, foreign governments can encourage their exporting producers to comply with a new regulatory environment abroad more easily.

Then why do some exporting countries promote regulatory harmonization and market-conforming policies instead of resolving the differences through international arbitration? Why do some countries embrace otherwise trade-restrictive regulations imposed by other countries? Based on the existing policy harmonization literature, this study identifies three distinct but relevant mechanisms through which regulatory harmonization and policy convergence take place *vis-à-vis* REACH

[5] In the meantime, the precise meaning of trade restrictiveness remains ambiguous. In many WTO disputes, the existence or degree of the trade restrictiveness of a measure under challenge is neither clearly defined nor thoroughly addressed, although the question of whether a measure is more trade-restrictive than necessary is crucial to the legality of such measures (Voon, 2015).

regulations—that is, transnational communication, intergovernmental regime or institution, and competitive pressure for exporting market.[6]

2.2. Transnational Communication

Transnational communication can promote policy convergence by disseminating most exemplary policy practices. Regular meetings and information sharing among governments can motivate them to emulate policy measures that work well in other countries (Dimaggio and Powell, 1991; Simmons and Elkins, 2004: 175). Most notably, Allport's (1954) contact hypothesis, also known as inter-group contact theory, is that under certain conditions interpersonal contact has a positive impact on the relationship between individuals and groups, and that close contact effectively reduces prejudice between them. This can also be extended to inter-state relations. The simple act of intergovernmental communication can facilitate international cooperation (Haas, 1964). The key mechanism, having an effect, is a better understanding and appreciation of others and

[6] Among the policy diffusion mechanisms found in the extant literature, a coercion mechanism through which changes in incentives are wrought by powerful actors is not considered here because of the intrinsic nature of technical regulations—namely, trade restrictiveness. Other things being equal, there is no incentive for an importing country to force an exporting country to quickly comply with its new regulations.

their ways, customs, practices, and concerns. Policy diffusion can be further accelerated if intergovernmental communication channels are formalized rather than remaining *ad hoc* or temporary features that may disappear over time (Strang and Meyer, 1993; Kern et al., 2001). They can also take the form of loose networks of policy experts (Haas, 1992).[7]

2.3. Intergovernmental Regime or Institution

Regime-based harmonization can emerge when countries of the same mind work together to solve common global or regional problems such as climate change, biodiversity, and infectious diseases. Due to the cross-border nature of such problems, national efforts alone fall short of addressing the negative

[7] Of course, the communication mechanism does not necessarily work if there is no social capital such as "shared norms, values, beliefs, trust, networks, social relations, and institutions that facilitate cooperation and collective action for mutual benefits" (Bhandari and Yasunobu, 2009: 480). The lack of social capital may foster a sense of dependence and inequality between individuals and groups, particularly in an anarchic setting (Hirschman, 1980 [1945]). For the critics of contact theory, it does not matter whether individuals and groups communicate with each other because increased contact creates potential opportunities for disagreement. For them, the settlement of conflict depends on the structural conditions rather than the attributes of individuals or groups themselves (Waltz, 1979). In addition, governments under anarchy must worry about the relative gains accruing from international cooperation because those asymmetric gains might later be turned into military advantage (Gowa, 1994). Some studies found that contact between individuals reduces prejudices, but increased contact between countries is likely to result in conflict (Forbes, 1997).

externalities of certain issues (Holzinger et al., 2008: 557). Increased communication and connectivity between government officials and non-governmental actors can help develop an international regime, defined as "sets of implicit or explicit principles, norms, rules and decision–making procedures around which actors' expectations converge in a given area of international relations" (Krasner, 1982). If there is an international regime or institution around which countries' expectations come together, cooperation and collaboration among like-minded countries would become much easier. In particular, compact networks of intergovernmental organization (IGO) membership are known to contribute to the peaceful resolution of mutual conflicts because acquired and shared knowledge in common through participation in IGOs can reduce uncertainty and the transaction cost of international interactions (Drezner, 2001: 60).[8] In fact, the pace of network building, official and unofficial, formal and informal, and bilateral and multilateral, has grown considerably in the field of technical regulations over the past decades.[9]

[8] Neoliberal institutionalists argue that international regimes modify state incentives in favor of cooperation "by lengthening the shadow of the future, increasing the reputational costs for cheating, monitoring compliance, facilitating issue linkages, and offering salient solutions" (Koo, 2010: 37).

[9] According to the International Organization for Standardization (ISO), from the year 1996, the starting year of the archive, to the latest year of 2018, the total number of international standards and standard-type documents in technical sectors more than doubled from 10,745 to 22,467, and the number of newly published ones

2.4. Competitive Pressure for Export Markets

Regulatory harmonization can also result from cut-throat competition over the export markets. This competitive pressure can work in two opposite directions. It can facilitate the "regulatory race to the bottom" in which countries continue to lower the level of regulatory standards to reduce production costs (Dobbin et al., 2007: 457–460).[10] Alternatively, the "regulatory politics of vortex" or "regulatory race to the top" can encourage competitors in the export market to adopt higher technical standards to better respond to foreign consumer preferences for eco-friendly and high-quality products (Vogel, 1997; Holzinger and Knill, 2004; Holzinger et al., 2011: 24–26; Perkins and Neumayer, 2012). This is especially true in large export markets such as the EU. As Drezner (2005: 843) mentions, "the larger the economy, the stronger the pull for producers to secure and exploit market excess. As demand increases, firms will have greater incentives to

has gradually increased during the last five-year period. In 1996–2018, the number of different national standards bodies participating in the ISO increased from 120 to 162, and they are selling and adopting the ISO standards nationally (https://www.iso.org/iso-in-figures.html).

[10] Ecological economists argue that excessive competition for foreign investments causes severe environmental damage because big multinational firms can induce governments to reduce environmental regulations by threatening to relocate their polluting production facilities to countries where environmental regulations are less rigid. Some empirical evidence has shown that fierce competition for capital leads to a regulatory race to the bottom in some developing countries (Massey, 1999; Kunce and Shogren, 2002; Copeland and Taylor, 2003).

mirror that market's preferences." Well-informed and shrewd governments competing for a fixed amount of trade have little choice but to abide by new technical regulations to keep their exports competitive, especially when other countries competing in the same export market have already done so (Dobbin et al., 2007: 457). Prakash et al. (2006) present empirical evidence linking the market size of an importing country with the regulatory harmonization of the exporting country. They found that trade encourages exporting countries to adopt ISO 14001, the high-level environmental standard, when their major export markets have already adopted that standard.

Chapter 3. Empirical Setting for Analysis

3.1. Estimation Model and Method

This study uses a panel data regression method for 78 WTO member countries whose records of exporting chemical products to the EU during the period of 1995–2017 are consistent. Twenty-seven EU countries are subject to examination, excluding Croatia, which joined the EU in 2013 after the EU REACH regulation came into force in 2007. Meanwhile, Iceland and Norway are included in the analysis as EEA (European Economic Area) countries that are pursuant to the REACH. The UNCOMTRADE database is used as it classifies total exports by product categories according to the Harmonized System (HS) code. Export data on chemical products numbered as 28–38 are extracted, with the exception of No.30 because pharmaceutical products are exempted from the application of the REACH.

This study modifies the gravity model to estimate the degree to which exporting countries harmonize their regulatory policies with the REACH at the bilateral level. There are a number of studies that utilize the broad applicability of the gravity model when measuring the trade policy

effects of tariff and/or non-tariff measures on a pair of trading partners (Otsuki et al., 2001; Anders and Caswell, 2009; Liu and Yue, 2009; Bao and Qiu, 2010; Ferro et al., 2014; Crivelli and Groeschl, 2016; Koo and Kim, 2018). Even the WTO-UNCTAD guidance book introduces the gravity equation as an appropriate analytical tool for analyzing trade policy (WTO and UNCTAD, 2012: 103–105).

This study uses a random-effects generalized least-squares (GLS) regression model to estimate parameters.[11] Since this study tries to present the different degrees of regulatory harmonization among countries according to their different reactions to the REACH, the parameters should be able to explain not only the variance of the dependent variable within a country, but also the variance between countries. Unlike the parameters of a random-effects model, fixed-effects parameters cannot reveal the variance between countries. It should be noted that fixed-effect parameters are more likely to be consistent than random-effects ones, since the latter are calculated based on a strong assumption that explanatory variables and error terms are not correlated. However, it has turned out that the case considered in this study is not subject to such a problem. The Hausman test illustrates

[11] Random-effects parameters should be estimated by the GLS method rather than ordinary least squares (OLS) in order to resolve the first-order autocorrelation problem among the error terms.

that random-effects panel regression parameters are nearly as consistent as the fixed-effects ones. The Hausman test result does not reject the null hypothesis that there is no correlation between the explanatory variables and error terms, and thus the random-effects regression model turns out to be the most suitable one for the analysis.

The estimation equation is shown as follows.

$$
\begin{aligned}
&Convergence_{it} \\
&\quad = communication_{it} + insitution_{it} + competition_{it} + REACH\ impact_t \\
&\quad + \ln(GDP\ per\ capita_{it} \times EU\ GDP\ per\ capita_t) \\
&\quad + \ln(population_{it} \times EU\ population_t) + EU\ GSP_{it} + EU\ FTA_{it}
\end{aligned}
$$

3.2. Dependent Variable

The dependent variable, *convergence*, is a five-point scale variable for measuring the degree to which a country adopts chemical regulations in accordance with the EU REACH in a given year. The five points are derived from a step-by-step hierarchy in terms of chemical regulatory harmonization with the REACH.[12]

[12] As a result, the data produced by this method are ordered-categorical in nature. For this type of panel data, the random-effects ordered logistic regression model is an ideal statistical tool to analyze the association between a multi-nominal

The scale to be used in this study is as follows.

0 = Minimal or no chemical regulations notified to the WTO TBT Committee are present. The exporting country makes no effort to harmonize its regulatory policy with the EU REACH.

1 = Regulations of partial control on certain chemical substances and products such as fertilizer or detergent are present. The exporting country makes a moderate or partial adjustment but does not adopt a REACH-like integrated control system on chemicals.[13]

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dependent variable and independent variables. However, in comparison with the random-effects panel data regression model, there has been no established testing method to determine the correlation between independent variables and error terms (endogeneity)—that is, the consistency of estimators for the random-effects ordered logistic regression model (Greene and Hensher, 2010; 278). This study thus chooses to use the random-effects panel data regression model by treating the ordered-categorical dependent variable as continuous. In social sciences, it is not uncommon to treat ordered-categorical data as if they were continuous and measured on an interval scale. As noted by Hox et al. (2017), "the consequences of treating ordered-categorical data as continuous are well known…The general conclusion is that if there are at least five categories, and the observations have a symmetric distribution, the bias introduced by treating categorical data as continuous is small."

[13] The two major advanced economies, the US and the EU, have recognized the necessity of comprehensive chemical control and management to optimize the protection of citizens and have taken the initiative to develop a normative set of regulations in the world for the past decades. The REACH is the latest outcome of those efforts (Applegate, 2008).

2 = Relevant regulations used as a basis for REACH-like integrated chemical control and management are present, implying that the exporting country manages chemicals in a comprehensive way. Examples include identification, classification, and labelling requirements for all chemicals. These requirements are a prerequisite for implementing the entire REACH-like procedures.[14]

3 = Regulations requiring registrants to submit and register safety data for all new chemicals to a national regulatory authority are present, which explicitly shows that the exporting country applies a REACH-like integrated control to chemicals.

4 = Regulations requiring registrants to submit and register safety data for all existing chemicals to a national

[14] In this connection, the EU has a regulation called the Classification, Labelling and Package (CLP) of substances and mixtures. There is much evidence that the CLP has become the basis of the REACH: 1) the classification and labeling information made pursuant to the CLP must be included on the safety data sheet (SDS), which registrants should submit and register pursuant to the REACH, 2) the CLP classification is used to examine whether a substance is carcinogenic, mutagenic, and toxic to reproduction (CMR), which is subject to the authorization procedure of the REACH, and 3) registrants do not have to notify the European Chemical Agency (ECHA) of their classification and labeling information additionally, since the CLP information stated in the registration dossier is automatically quoted (Herbatschek et al., 2013: 104–105).

regulatory authority year after year are present. This level of chemical regulation is exactly equivalent to that of the REACH.[15]

Using the TBT notification archive (WTO TBT IMS), all the relevant chemical regulation policies notified by 78 countries as TBTs have been coded accordingly.[16]

3.3. Independent Variables

Following the convergence literature, this study hypothesizes the relationship between the degree of regulatory convergence to the REACH and the regulatory harmonization mechanisms.

[15] The major difference between previous chemical regulations and the REACH is that, unlike the previous ones, the REACH requires verification of the safety of existing substances. When designing the REACH, EU legislators found that, even though at least 90% of the total volume of all the chemical substances circulated in the EU market were previously existing, they were exempted from the previous regulations, and thus there was no information available to control them to the same degree as new chemicals (Bergkamp and Penman, 2013: 3–4). Among others, the US and Japan complained that strengthening the regulatory framework for existing substances would seriously weaken industrial activities (Naiki, 2010; Botos et al., 2018).

[16] For instance, South Korea and Taiwan were coded as 4 in 2011 and 2012. All coding results by country are reported in Appendix 1.

Hypothesis 1: If an exporting country communicates more with the EU vis-à-vis the REACH than others and/or than before, the exporting country will harmonize its chemical regulations with the EU's REACH more than others and/or than before.

The communication hypothesis emphasizes the exchange of information through regular channels. There might be many different paths to transfer and obtain information about potentially better forms of technical regulation. Among them is the TBT Committee, which allows WTO members to discuss any STCs that they believe are necessary for further information and consultation during the WTO TBT Committee sessions. In fact, it is a privilege available for all WTO members under Article 10 of the WTO TBT Agreement, which requires a regulation-adopting country to answer all inquiries from other member states. In terms of regular channels, the WTO holds TBT Committee meetings three times a year. It can be posited that if a country participates in a discussion session and thus communicates formally with the EU, the country will adopt similar or equivalent chemical regulations to the REACH, unless it reaches the conclusion that the REACH is not suitable for its own needs.

During the period of 1995–2017, the most frequently cited reason for STCs was to "seek further information and clarification" from TBT-adopting countries, which means that the parties involved are more likely to "work towards mutually acceptable solutions" (G/TBT/40, para. 3.32).[17] Indeed, despite the increasing number of STCs that are raised every year, most of them disappear before they grow into formal WTO litigations, according to some studies (Horn et al., 2013; Holzer, 2019).[18]

In the estimation model, *communication* measures how many times a country communicated with the EU at STC discussion sessions during the period of 2003–2017. It counts how many times a country has raised STCs on the REACH. Once an STC is brought up, bilateral or multilateral forums for consultation must follow between STC-raising countries and respondent

[17] There were eleven different types of concerns raised during the same period: 1) further information and clarification, 371 cases (17.8%); 2) unnecessary barrier to trade, 333 (15.9%); 3) transparency, 308 (14.7%); 4) other issues raised, 250 (12.0%); 5) rationale and/or legitimacy, 232 (11.1%); 6) international standards, 216 (10.3%); 7) discrimination, 170 (8.1%); 8) time to adapt at a "reasonable interval", 136 (6.5%); 9) non-product-related process and production method (PPM), 43 (2.1%); 10) special and differential treatment (SDT), 23 (1.1%); and 11) technical assistance, 8 (0.4%)

[18] Horn et al. (2013) and Holzer (2019) find that the STC discussion procedure plays a key role in resolving the differences in views on TBT measures. The number of STCs raised has grown during the period of 1995-2017 (G/TBT/42, para.4.2). In contrast, the formal WTO disputes citing the TBT Agreement have remained at a relatively small level—a total of 54 cases during the whole WTO term (https://www.wto.org/english/tratop_e/dispu_e/dispu_agreements_index_e.htm?id=A22#selected_agreement).

countries. As noted earlier, Australia has submitted the largest number of STCs (32), followed by the US (31), China (27), Japan (24), and Canada (23). A total of 30 out of 78 countries have raised STCs on the REACH and thus communicated either bilaterally or multilaterally with the EU.[19]

Hypothesis 2: If a country has a joint membership with the EU in international IGOs, it will harmonize its chemical regulations with the EU's REACH more than others without a joint membership and/or than before when a joint member is absent.

There are two main conditions that stimulate the institutional mechanism to work: one is the pan-regional nature of problems and the other is the presence of an international regime or institution to coordinate matters. The case considered here satisfies the first condition in that the objective of REACH regulation is to protect people and the environment from the misuse of chemical substances. The case satisfies the second condition as well in that the United Nations (UN) has proactively promoted chemical safety. The United Nations Environmental Program (UNEP) has

[19] More details about STCs from 30 countries are presented in Appendix 2.

endorsed a chemical policy framework called the Strategic Approach to International Chemicals Management (SAICM) and led member countries to make a commitment to follow in 2006 (Lee, 2015: 400). In addition, a multilateral consensus to create globally harmonized chemical classification standards was first formed in 1992. In 2002, it was formally institutionalized by the United Nations as the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) (Winder et al., 2005; United Nations, 2017). According to the United Nations Economic Commission for Europe (UNECE), it is confirmed that 72 countries have so far implemented the GHS standard in various ways.[20] If a country participates in these regimes and institutions, it is more likely to adopt chemical regulations in accordance with the REACH.

Institution is a binary variable to measure the participation in the UN's institution: a value of one is given from the year that a country implements the GHS for the first time; it is zero, otherwise. A total of 37 out of 78 countries are confirmed to have implemented the GHS standard in

[20] In this regard, the implementation of REACH means that the EU is making a strong contribution to the ongoing international harmonization effort at chemical management. In fact, the EU stipulates a commitment to SAICM in the REACH Preamble (6). Moreover, it has adopted and implemented the regulation of CLP (Classification, Labelling and Packaging) based on the UN GHS.

their own ways.[21]

Hypothesis 3: If a country has more commercial interests to protect in the European chemical market than others or than before, the country will harmonize its chemical regulations with the EU's REACH more than others and/or than before.

It is clear that the European market is attractive enough for many exporters to make any changes necessary to survive in that market. In spite of the strict level of regulation, many countries will be induced to make their regulations compatible with the EU REACH. As a matter of fact, two export-oriented countries, Taiwan and South Korea, have revised their previous chemical regulations and adopted new ones in accordance with the EU REACH (level 4). As a dominant exporter of chemicals, China has also been obviously affected by the REACH as illustrated by its adoption of a new set of chemical regulations (level 3) (EU SME Centre, 2011).[22]

[21] The year that each of these 37 countries started to adopt the UN GHS is reported in Appendix 3.

[22] This is confirmed by their submitted TBT notifications to the WTO: Taiwan (G/TBT/N/TPKM/102; G/TBT/N/TPKM/175), South Korea (G/TBT/N/KOR/305), China (G/TBT/N/CHN/210/Rev. 1).

Competition measures, in one country, how much the export of chemical products to the EU contributes to the export revenue of all goods to the world in a given year during 1995-2017. This variable is a proxy reveals the competitive pressure felt by exporting country from the EU chemical market: it is posited that if a country is relatively more dependent on the chemical export to the EU market for its national accounts than other countries do, it will feel more pressure in maintaining its EU market share. In this sense, the variable appears as ratio of total export revenue of chemical products to the EU in US dollars to total export revenue of all goods to the world in a given year. As mentioned, all the trade record data rest on the UNCOMTRADE. This is finally transformed into logarithmic form to reduce the variance in distribution and be more normalized.

$$Competiton = log\left(\frac{Total\ annual\ export\ revenue\ of\ chemical\ products\ to\ the\ EU}{Total\ annual\ export\ revenue\ of\ all\ goods\ \ to\ the\ world}\right)$$

3.4. Control Variables

This study contains a set of control variables that can affect regulatory harmonization. *REACH impact* is a binary variable that measures the effect

of policy implementation *per se*. It gives a value of one from 2007 when the regulation was implemented (2007–2017); otherwise, it is zero (1995–2006). This study sets a time lag of one year.

In accordance with the gravity model, *GDP per capita*×*EU GDP per capita* and *population*×*EU population* are included to measure the effect of the multiplication of the per capita incomes and populations between an exporting country and the EU on the level of convergence. Other things being equal, the richer and more populous a country is, the more likely it is to adopt stringent regulations on chemical hazards.

EU GSP, a dummy variable, stands for the Generalized System of Preferences which is offered to developing countries by the EU. The concept of GSP is to help the least developed and developing countries stand on their own feet: if the EU designated them to be in the GSP group, they can receive many trade benefits and preferences from the EU, including discounted tariff rates. Therefore, it is posited that GSP countries are placed in a more advantageous position in terms of adjusting their regulatory policies to the EU.[23]

[23] The variable includes the status of GSP, GSP+, and EBA (everything but arms). There are some differences in their specific terms and degrees of favor, but the purpose is the same.

Finally, *EU FTA* measures the effect of free trade agreement between an exporting country and the EU on policy convergence. It is coded as one if there is a concluded FTA in a given year; otherwise, it is zero. If other conditions remain the same, FTA member countries are more likely to harmonize their regulations with the REACH. Table 1 shows the descriptive statistics of all the variables.

Table 1. Descriptive statistics

Variable	Source	M	SD	Min	Max	Grp	Obs
Convergence	WTO TBT IMS	0.61	0.86	0	4	78	1794
Communication	WTO TBT IMS	1.74	5.03	0	32	78	1794
Institution	UNECE, WTO TBT IMS	0.23	0.42	0	1	78	1794
Competition	UNCOMTRADE (USD)	-6.34	2.42	-18.02	-0.67	78	1719[a]
REACH Impact	1995-2006: 0 2007-2017: 1	0.48	0.50	0	1	78	1794
ln(GDP per capita × EU GDP per capita)	IMF (USD)	18.33	1.49	14.89	21.90	78	1794
ln(Population × EU Population)	IMF (million people)	8.71	1.83	3.59	13.47	78	1794
EU GSP	European Commission	0.28	0.45	0	1	78	1794
EU FTA	European Commission	0.20	0.40	0	1	78	1794

a. The UNCOMTRADE omits some pieces of data and thus this study considers them as missing values and regresses the model without including them.

Chapter 4. Estimation Results

The estimation results show strong statistical support for all three diffusion mechanisms as predicted. These results effectively show who embraces technical barriers to trade better than others and why, and they also demonstrate that TBTs themselves are not necessarily trade-restrictive. Table 2 displays the whole information of the estimation results.

First of all, the estimation result statistically supports Hypothesis 1 that the intergovernmental communication mechanism will facilitate regulatory convergence. Other things being equal, a one-unit increase in communication measures causes a 0.04-unit increase in the level of convergence, with a *p* value less than the 1% significance level. This can be interpreted in two different but related terms: on the one hand, if a country has one unit of more communication with the EU than other countries, its regulations will be more harmonized with the REACH than the others by 0.04 units (“between” effect). On the other hand, if a country has one unit of more communication with the EU than before, its regulations will be more similar to the REACH than before by 0.04 units (“within” effect).

Table 2. Estimation results

Random-effects GLS regression model for panel data (1995–2017)	
Variables	*Convergence* (Standard errors)
Communication	0.042*** (0.004)
Institution	0.110** (0.043)
Competition	0.035*** (0.009)
REACH impact (one year lagged)	0.105*** (0.038)
ln(GDP per capita × EU GDP per capita)	0.277*** (0.026)
ln(population × EU population)	0.097*** (0.029)
EU GSP (GSP, GSP+, EBA)	0.300** (0.133)
EU FTA	0.151*** (0.043)
ρ	0.502
Breusch–Pagan LM test: $\chi^2(1)$	3827.31^a
θ	0.792
Overall R^2	0.494
Within R^2	0.426
Between R^2	0.541
Number of group	78
Observation	1660
Hausman test: $\chi^2(7)$	8.59^b

*, **, and *** denote the level of significance at 10%, 5%, and 1% respectively.
a. p value < 1%
b. p value > 10%

Secondly, Hypothesis 2 is statistically supported with a *p* value less than 5%. Other things being equal, joint membership in the UN institution brings a 0.11-unit increase in the level of regulatory convergence. This is also interpreted in two different ways: there is a 0.11-unit difference in the level of convergence between countries who join the same institution as the EU and the others who do not, and there is a 0.11-unit difference before and after joining within the same country. This implies that the joint participation of countries in a credible international institution generates strong commitment or peer pressure to comply with the institution's guidelines.

Thirdly, the finding statistically supports the idea that competition pressure in the European chemical market is a significant cause for exporting countries to harmonize their regulations with the REACH. This implies that a one-unit increase in the competition score, either between countries or within a country, will lead to a higher level of convergence by 0.04 units either than that of other countries or than before (*p* value < 1%). As predicted, strong commercial ties have a strong influence on regulatory harmonization: if the total export revenue of a country relatively more depends on the chemical export to the EU market than other countries do, that country feels more pressure to maintain the current market share, and

therefore it is more likely to harmonize its regulatory policies with the REACH. This finding is of particular interest because it strongly supports the theory of the regulatory politics of vortex or the regulatory race to the top, as opposed to the theory of the regulatory race to the bottom.

In regard to the control variables, the estimation result shows that the implementation of the REACH has a statistically significant positive impact on the level of regulatory harmonization. It indicates that, other things being equal, the enforcement of the REACH causes a 0.10-unit increase in the level of convergence.

The classical gravity model variables—the multiplication of GDP per capita and population—also have a statistically significant positive impact on the level of regulatory harmonization with *p* values less than 1%. The greater the log-transformed multiplication of GDP per capita between an exporting country and the EU, the higher the expected level of regulatory harmonization ($\beta = 0.277$), indicating that rich countries can afford stronger protection for their citizens from chemical hazards. In a similar vein, the log-transformed multiplication of population between an exporting country and the EU has a statistically significant positive impact on the level of regulatory harmonization ($\beta = 0.097$). Other things being equal, populous countries are more conscious about hazardous chemicals and thus adopt

more stringent measures to regulate them.

Finally, the estimation result shows that the institutional proximity variables—*EU GSP* and *EU FTA*—have a statistically significant positive impact on the level of regulatory harmonization.

Chapter 5. Conclusion and Implications

This study began with the observation that technical barriers to trade are being spotlighted over the world trade economy. This is an uncomfortable situation for most of state-level economies because TBTs are inherently restrictive to trade. For some among them, however, TBTs are not necessarily disadvantageous because they can provide incentives for regulatory innovation and a race to the top under certain conditions. Then why are some countries better at addressing new regulatory challenges imposed by an importing country than others?

By using the case of the European REACH regulations, this study sought to uncover the hidden causal mechanisms for regulatory harmonization in the field of technical barriers to trade. The study first examined how different exporting countries have responded to the REACH regulations and then set up three causal mechanisms for regulatory harmonization: transnational communication, intergovernmental regime or institution, and competitive pressure for export markets.

The random-effects panel data regression model yielded very strong estimation results, which can be summarized as follows. 1) If an exporting country communicates more with the EU *vis-à-vis* the REACH than others

and/or than before at the STC discussion sessions, it will harmonize its chemical regulations with the EU's REACH more than others and/or than before due to greater understanding and clarity. 2) If a country has joint membership with the EU in the UN GHS, it will harmonize its chemical regulations with the EU's REACH more than otherwise due to the same knowledge foundation. 3) If a country has more market share in the European chemical market than others or than before, the country will harmonize its chemical regulations with the EU's REACH more than others and/or than before due to greater competitive pressure.

The main implications of these findings are: Given the fact that all three different harmonization mechanisms work on the REACH, the technical regulations adopted by the REACH are market-friendly rather than market-distorting. This, in turn, suggests that technical regulations that are bilaterally or multilaterally understood through communication, stand on agreed knowledge, and involve huge commercial interests, are not necessarily trade-restrictive; rather, they can create upward pressure for global regulatory harmonization.

South Korea, Taiwan, and China among others demonstrate this point. It seems extraordinary that these export-oriented Asian countries have earned more than the others (and more than before) in the European

chemical market since the REACH came into force. The key is in the regulatory harmonization that these countries have adopted in accordance with the REACH. This empirical analysis rejects the conventional view that developing or emerging Asian economies do less care about societal issues such as public health and environmental protection than Western societies do.

This conclusion makes a great contribution to the extensive literature on regulatory harmonization and convergence, and the quantitative and qualitative effects of technical regulations and standards in various areas ranging from agriculture to food safety (McDonald, 2005; Mangelsdorf et al., 2012; Vigani et al., 2012; Lazo and Sauve, 2018). Notwithstanding, these findings and implications cannot be overgeneralized due to the limitations in the data and the estimation model. As noted above, there is an unresolved problem in relation to ordered-categorical variables, both dependent and independent. For future research, more sophisticated statistical methods, including multinomial logistic regression models and measurements of communication, institution, and competition, need to be developed to reduce analytical biases if there are any.

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Appendix

Appendix 1. The level of stringency of chemical management by 78 WTO member countries for the period of 1995-2017

Level	0	1	2	3	4
South Korea	1995-2000	-	2001-2010 *Identification & classification of hazardous chemicals (G/TBT/N/KOR/8)*	-	2011-2017 *Registration of existing chemicals (G/TBT/N/KOR/305)*
Taiwan	1995-2003	2004-2006 *Partial control: safety requirements for fuming products (G/TBT/N/TPKM/16)*	2007-2010 *Classification & labelling of chemicals (G/TBT/N/TPKM/49)*	2011-2013 *Registration of new chemicals (G/TBT/N/TPKM/102)*	2014-2017 *Registration of existing chemicals (G/TBT/N/TPKM/175)*
Albania	1995-2007	2008-2011 *Partial control: registration of fertilizers (G/TBT/N/ALB/32)*	2012-2014 *Classification & listing of chemicals (G/TBT/N/ALB/53)*	2015-2017 *Integrated chemical controls including registration of new chemicals (G/TBT/N/ALB/71)*	-
Australia	1995	1996-2003 *Partial control: standardization of disinfectants (G/TBT/Notif.96/212)*	-	2004-2017 *Registration & assessment of new chemicals (G/TBT/N/AUS/34)*	-
Brazil	1995-2002	2003-2015 *Partial control: registration & evaluation of pesticides (G/TBT/N/BRA/137)*	-	2016-2017 *Registration & evaluation of new chemicals (G/TBT/N/BRA/686)*	-

Canada	1995-1998	-	1999-2003 *Labelling requirement for chemicals (G/TBT/Notif.99/650)*	2004-2017 *Registration of new chemicals (G/TBT/N/CAN/110)*	-
Chile	1995-2004	2005-2016 *Partial control: registration of pesticides (G/TBT/N/CHL/42)*	-	2017 *Registration of new chemicals (G/TBT/N/CHL/422)*	-
China	1995-2001	2002-2004 *Partial control: inspection & verification of cosmetics (G/TBT/N/CHN/2)*	2005-2008 *Identification & classification of toxicity in chemicals (G/TBT/N/CHN/79)*	2009-2017 *Registration of new chemicals (G/TBT/N/CHN/210/Rev.1)*	-
Costa Rica	1995-2005	2006-2016 *Partial control: registration of Pesticides (G/TBT/N/CRI/51)*	-	2017 *Registration of new chemicals (G/TBT/N/CRI/164)*	-
Switzerland	1995	-	1996-2003 *Classification & Labelling of hazardous chemicals (G/TBT/Notif.96/37)*	2004-2017 *Registration of new chemical substances (G/TBT/N/CHE/35)*	-
Argentina	1995-2000	-	2001-2017 *Identification & prohibition of hazardous substances (G/TBT/N/ARG/19)*	-	-
Colombia	1995-2009	2010-2016 *Partial control: registration of pesticides, cosmetics, etc. (G/TBT/N/COL/153)*	2017 *Classification & labelling of chemicals (G/TBT/N/COL/229)*	-	-

Egypt	1995-2004	2005-2008 *Partial control: standardization of chemical products (G/TBT/N/EGY/3)*	2009-2017 *Comprehensive requirements for control of hazardous substances (G/TBT/N/EGY/8)*	-	-
Ghana	1995-2005	-	2006-2017 *Identification of quality & safety of chemical products (G/TBT/N/GHA/3)*	-	-
India	1995-2007	2008-2011 *Partial control: registration of cosmetics (G/TBT/N/IND/33)*	2012-2017 *Classification & labelling of hazardous substances (G/TBT/N/IND/42)*	-	-
Israel	1995-2003	-	2004-2017 *Identification & classification of chemicals (G/TBT/N/ISR/63)*	-	-
Japan	1995	-	1996-2017 *Identification & classification of hazardous substances (G/TBT/Notif.96/1)*	-	-
New Zealand	1995-2007	2008-2014 *Partial control: restriction of certain paint products (G/TBT/N/NZL/43)*	2015-2017 *Comprehensive management including classification of hazardous substances (G/TBT/N/NZL/71)*	-	-
Philippines	1995-1998	-	1999-2017 *Comprehensive import control including classification of chemical products (G/TBT/Notif.99/393)*	-	-

Singapore	-	1995-1997 *Partial control: labelling requirement for paints (G/TBT/Notif.95/84)*	1998-2017 *Identification & classification of hazardous substances (G/TBT/Notif.98/573)*	-	-
South Africa	1995-1997	1998-2008 *Partial control: disinfectants & detergent-disinfectants (G/TBT/Notif.99/351)*	2009-2017 *Identification & restriction of hazardous substances (G/TBT/N/ZAF/106)*	-	-
Thailand	1995-1997	1998 *Partial control: standardization & management of detergents (G/TBT/Notif.98/219)*	1999-2017 *Identification & classification of hazardous substances (G/TBT/Notif.99/342)*	-	-
Turkey	1995-2008	2009-2012 *Partial control: inspection & management of fertilizers (G/TBT/N/TUR/3)*	2013-2017 *Comprehensive import control including classification of chemicals (G/TBT/N/TUR/21)*	-	-
Uganda	1995-2008	-	2009-2017 *Comprehensive import control including classification of chemical products (G/TBT/N/UGA/45)*	-	-
United States	1995-1998	1999-2003 *Partial control: registration of pesticides (G/TBT/Notif.99/487)*	2004-2017 *Identification & classification of toxic substances (G/TBT/N/USA/87)*	-	-

Armenia	1995-2003	2004-2017 *Partial control: safety requirements for paints & varnishes (G/TBT/N/ARM/7)*	-	-	-
Bolivia	1995-1997	1998-2017 *Partial control: standardization of sanitation materials (G/TBT/Notif.98/528)*	-	-	-
Cameroon	1995-2006	2007-2017 *Partial control: standardization of consumer chemical products (G/TBT/N/CMR/3)*	-	-	-
Dominican Republic	1995-2012	2013-2017 *Partial control: standardizing & labelling requirements for paints (G/TBT/N/DOM/199)*	-	-	-
Ecuador	1995-2010	2011-2017 *Partial control: standardizing & labelling requirements for thinners (G/TBT/N/ECU/82)*	-	-	-
El Salvador	1995-2009	2010-2017 *Partial control: labelling requirements for pesticides (G/TBT/N/SLV/144)*	-	-	-
Georgia	1995-2009	2010-2017 *Partial control: registration of hazardous industrial objects (G/TBT/N/GEO/7)*	-	-	-

Guatemala	1995-1999	2000-2017 *Partial control: classification & labelling of pesticides (G/TBT/Notif.00/287)*	-	-	-
Guyana	1995-2002	2003-2017 *Partial control: labelling requirements of cosmetics (G/TBT/N/GUY/9)*	-	-	-
Honduras	1995-2008	2009-2017 *Partial control: registration of fertilizers (G/TBT/N/HND/57)*	-	-	-
Indonesia	1995-2001	2002-2017 *Partial control: standardization of fertilizers (G/TBT/N/IDN/4)*	-	-	-
Jamaica	1995-2013	2014-2017 *Partial control: labelling requirements for pesticides (G/TBT/N/JAM/42)*	-	-	-
Jordan	1995-2011	2012-2017 *Partial control: restriction of products containing certain biocides (G/TBT/N/JOR/32)*	-	-	-
Kazakhstan	1995-2015	2016-2017 *Partial control: safety requirements for cosmetics (G/TBT/N/KAZ/9)*	-	-	-

Kyrgyzstan	1995-2015	2016-2017 *Partial control: safety requirements for cosmetics (G/TBT/N/KGZ/38)*	-	-	-
Malaysia	1995-1996	1997-2017 *Partial control: quality requirements for solutions using sodium hypochlorite (G/TBT/Notif.97/762)*	-	-	-
Mexico	1995-2002	2003-2017 *Partial control: quality requirements for chemical products of animal use (G/TBT/N/MEX/48)*	-	-	-
Moldova	1995-2013	2014-2017 *Partial control: prohibition of certain hazardous chemical substances (G/TBT/N/MDA/21)*	-	-	-
Morocco	1995-2011	2012-2017 *Partial control: registration of cosmetics & toiletries (G/TBT/N/MAR/25)*	-	-	-
Mozambique	1995-2011	2012-2017 *Partial control: uniform framework of standardization (G/TBT/N/MOZ/5)*	-	-	-

Oman	1995-2004	2005-2017 *Partial control: safety requirements for certain paints (G/TBT/N/OMN/5)*	-	-	-
Paraguay	1995-2008	2009-2017 *Partial control: registration of pesticides (G/TBT/N/PRY/22)*	-	-	-
Peru	1995-1999	2000-2017 *Partial control: registration of pesticides (G/TBT/Notif.00/362)*	-	-	-
Russia	1995-2012	2013-2017 *Partial control: safety requirements for synthetic detergents & household chemicals (G/TBT/N/RUS/3)*	-	-	-
Saint Lucia	1995-2002	2003-2017 *Partial control: labelling requirements for pesticides (G/TBT/N/LCA/5)*	-	-	-
Saudi Arabia	1995-2014	2015-2017 *Partial control: safety & labelling requirements for cosmetics (G/TBT/N/SAU/861)*	-	-	-
Sri Lanka	1995-1999	2000-2017 *Partial control: test requirements for safety of baby soap (G/TBT/Notif.00/465)*	-	-	-

Tanzania	1995-2008	2009-2017 *Partial control: test requirements for safety of certain fertilizers (G/TBT/N/TZA/9)*	-	-	-
North Macedonia	1995-2009	2010-2017 *Partial control: restriction of chemical substances depleting ozone layer (G/TBT/N/MKD/6)*	-	-	-
Trinidad & Tobago	1995-2000	2001-2017 *Partial control: safety & labelling requirements for certain detergents (G/TBT/N/TTO/3)*	-	-	-
Ukraine	1995-2007	2008-2017 *Partial control: safety requirements for detergents (G/TBT/N/UKR/4)*	-	-	-
Uruguay	1995-1998	1999-2017 *Partial control: restriction of chemical substances depleting ozone layer(G/TBT/N/MKD/6) (G/TBT/NOTIF.99/37)*	-	-	-
Zambia	1995-2003	2004-2017 *Partial control: safety requirements for paints & varnishes (G/TBT/N/ZMB/3)*	-	-	-
Bangladesh	1995-2017	-	-	-	-
Barbados	1995-2017	-	-	-	-
Belize	1995-2017	-	-	-	-

Benin	1995-2017	-	-	-	-
Botswana	1995-2017	-	-	-	-
Burkina Faso	1995-2017	-	-	-	-
Côte d'Ivoire	1995-2017	-	-	-	-
Gambia	1995-2017	-	-	-	-
Hong Kong	1995-2017	-	-	-	-
Madagascar	1995-2017	-	-	-	-
Malawi	1995-2017	-	-	-	-
Mauritius	1995-2017	-	-	-	-
Namibia	1995-2017	-	-	-	-
Niger	1995-2017	-	-	-	-
Nigeria	1995-2017	-	-	-	-
Senegal	1995-2017	-	-	-	-
Seychelles	1995-2017	-	-	-	-
Suriname	1995-2017	-	-	-	-
Togo	1995-2017	-	-	-	-
Tunisia	1995-2017	-	-	-	-

Source: WTO TBT Information Management System (IMS)

Appendix 2. STCs raised by 30 WTO member countries *vis-à-vis* the REACH

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Australia	3	3	2	2	3	3	3	3	3	3	2	2	0	0	0	32
United States	3	3	3	3	3	3	3	3	3	0	2	2	0	0	0	31
China	2	3	3	3	2	3	3	1	2	2	1	2	0	0	0	27
Japan	3	3	3	2	3	3	3	3	1	0	0	0	0	0	0	24
Canada	2	3	2	1	2	2	3	3	2	0	0	0	0	2	1	23
Chile	1	3	3	3	3	3	3	3	0	0	0	0	0	0	0	22
Thailand	2	3	0	0	1	3	3	3	2	2	0	0	0	0	0	19
Argentina	0	0	0	0	1	3	2	3	3	2	1	0	0	0	0	15
South Korea	3	2	2	1	3	3	1	0	0	0	0	0	0	0	0	15
Mexico	2	3	3	2	1	2	1	0	0	0	0	0	0	0	0	14
Brazil	2	2	0	0	2	3	2	0	0	0	1	0	0	0	0	12
India	0	0	0	0	0	0	0	2	3	3	3	0	0	0	0	11
Taiwan	2	3	0	1	1	3	1	0	0	0	0	0	0	0	0	11
Philippines	0	0	0	0	0	1	0	1	3	0	3	0	0	0	0	8
Malaysia	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Colombia	0	2	0	0	0	0	1	1	0	0	0	0	0	0	0	4
Uruguay	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	4
Egypt	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	3
El Salvador	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	3
Indonesia	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	3
Russia	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	3
South Africa	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3
Singapore	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
Saudi Arabia	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	3
Israel	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	2
Bolivia	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Botswana	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Costa Rica	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Dominican Republic	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Switzerland	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Total	28	41	23	20	26	43	32	31	23	12	14	7	0	3	1	304

Source: WTO TBT Information Management System (WTO TBT IMS)

Appendix 3. Starting year of the UN GHS adoption: 37 WTO member countries

Year	Country (total 37)
2001	Brazil, New Zealand, Zambia
2002	South Africa
2003	South Korea
2004	Madagascar, Mauritius, Philippines, Thailand, United States
2005	Bolivia, Colombia, Ecuador, Gambia, Indonesia, Nigeria, Peru, Senegal, Singapore, Uruguay
2006	Argentina, Japan, Switzerland
2007	China, Taiwan
2008	Canada, Chile
2009	Russia
2011	Australia, Mexico
2013	Guatemala, Israel, Malaysia
2014	Jamaica
2015	Albania, Kyrgyzstan, Turkey

Source: United Nations Economic Commission for Europe (UNECE), WTO TBT IMS

Abstract in Korean

국문 초록

기술무역장벽(TBT) 끌어안기:
수출국의 유럽연합 화학물규제(REACH) 대응사례 분석

차유진

서울대학교 행정대학원

정책학 전공

보호무역주의의 그림자가 전 세계 경제에 드리워지는 상황에서 기술무역장벽(Technical Barriers to Trade, TBTs)이 부각하고 있다. 이들은 무역행위에 제약을 주는 것으로 알려져 있으며 그중 많은 경우는 특히 해외 공급업자에게 더 많은 부담을 주고 있다.

이 연구의 주요 의문은 누가 그리고 왜 다른 이들보다 타국의 기술무역장벽을 더 잘 수용하느냐는 것이다. 본 연구는 대표적 기술무역장벽 사례인 유럽연합의 화학물규제법(REACH)에 여러 국가들이 어떻게 대응해왔는지, 어떤 요인들이 해당 규제에 국내정책을 조화시키도록 동기를 부여했는지 살펴본다. 패널 회귀분석을 통해 본 연구는 기술무역장벽 자체가 반드시 무역행위에 제약을 주는 것은 아님을 보여주는 세 가지 정책조화(Policy Harmonization and Convergence) 메커니즘을 확립한다. 그것은 다국적 교류 및 통신(Transnational Communication), 다자간 기구

또는 제도(Intergovernmental Regime or Institution), 수출시장에 대한 경쟁 압력(Competitive Pressure for Export Markets)이다. 마지막으로 본 연구는 기술무역장벽이 수출국들이 수입국의 새 규제에 어떻게 반응하느냐에 따라 규제 혁신과 규제의 상향경쟁(Regulatory Race to the Top)을 촉진할 수 있다는 점을 언급한다.

주제어: 기술무역장벽, 기술규제, 유럽연합 화학물규제법, 규제정책, 정책조화, 정상으로의 규제경주

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