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The Policy Impact of Product-Related Environmental Regulations in Asia

Etsuyo MICHIDA*

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Abstract

This paper focuses on EU chemical regulations, RoHS and REACH, and shows these EU regulations have driven Asian countries to introduce regulations that are similar yet modified versions to the EU regulations. Asia as the world manufacturing center has extensive production networks where parts and components of a final good are traded across borders. We discuss how product-related environmental regulations could impact on firms' activities then show that if Asian countries with complex supply chains introduce different product related chemical regulations without coordinating with neighboring countries, it could work as trade barrier for manufacturing activities in the region.

Keywords: Product-related environmental regulation, trade, RoHS, REACH, Asia
JEL classification: F18, O2

* Associate Senior Research Fellow, Environment and Natural Resource Studies Group, Inter-Disciplinary Studies Center, IDE (Etsuyo_Michida@ide.go.jp)

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INSTITUTE OF DEVELOPING ECONOMIES (IDE), JETRO
3-2-2, WAKABA, MIHAMA-KU, CHIBA-SHI
CHIBA 261-8545, JAPAN

Introduction

Environmental and health regulations that impose requirements on products, product-related environmental regulations (PRERs), have been introduced in many countries, and both the number and variety of PRERs has increased in recent years. PRERs are intended to improve safety and the environment within the particular jurisdiction, but the economic and political impact of a PRER spreads beyond borders. For firms, failure to adapt to a PRER is equivalent to a loss of market access to a regulated market, and so PRERs might impede firms' competitiveness. Firms located in a regulating country are affected, but the firms located abroad that are exporting to the regulating country are also required to comply with PRERs. A PRER introduced in one country could affect politics overseas as some governments introduce policies to support domestic firms' efforts to comply with PRERs introduced in an export market. Moreover, introduction of a PRER in one part of the world signals to both voters and consumers that environmental and health related problems might need to be addressed in their own regulations; thus, similar PRERs tend to be introduced in multiple countries. The enactment of a PRER will induce extensive reaction, both in and out of the enacting jurisdiction.

Among other regulations, the European Union (EU) has introduced the End-of-Life Vehicle Directive, which prohibits the use of hazardous substances in automobiles, and the EU RoHS Directive (Directive of the European Parliament and of the Council on restriction of the use of certain hazardous substances in electrical and electronic equipment), which was implemented in 2006 and restricts the amount of hazardous substances[1] that is permitted in electronic and electrical (E&E) equipment. The EU REACH Regulations (Regulation of the European Parliament and of the Council concerning Registration, Evaluation, Authorization and Restriction of Chemicals), implemented in 2007, regulate chemical substances and chemicals contained in products that cause serious concern for consumer health and the environment[2]. PRERs such as the REACH Regulations of the EU are relevant not only to chemical industry but also to other industries because chemicals are used extensively in products such as garment, wood products, and E&E products. PRERs impact a wide range of industries and are introduced in different countries.

PRERs are aimed at protecting consumer health, safety, and the environment by requiring products sold in regulated markets to meet certain requirements. An important characteristic of PRERs is that regulations on products sold in markets apply equally to

[1] The prohibited substances are lead, mercury, cadmium, PBB (polybrominated biphenyl), and PBDE (polybrominated diphenyl ether).
[2] The chemicals contained in products regulated by EU REACH are called SVHCs (Substances of Very High Concern).

those domestically produced and imported products that fall within the scope of the regulations. Therefore, such regulations affect both domestic and foreign firms. For RoHS and REACH specifically, the regulations have imposed requirements on all firms that produce products exported to EU markets, not only those within EU jurisdiction but also those outside the EU.

Moreover, PRERs introduced in important export markets can impact policy in other countries and provide a new mechanism for affecting other countries' policies through trade. In fact, implementation of EU PRERs triggers Asian governments to enact policies in response. Developed countries such as the United States and EU members have been the primary regulators for a long time, but in recent years China, South Korea, Vietnam, and other Asian countries have introduced PRERs similar to EU RoHS and EU REACH. Newly regulating countries are not exclusively in Asia. More recently, United Arab Emirates has passed new regulation, effective in 2014, on packaging materials. This regulation requires firms using plastic products for shopping bags and other packaging materials, including those that are used for trading, to use only registered biodegradable plastics. The regulation has affected manufacturers that use plastic packaging materials in various industries and also firms that use UAE ports for transits of shipments. This regulation has affected all industries that use plastic

packaging.

PRERs have been introduced around the globe and impacts not only domestic firms but also foreign firms that export to the regulated country. Some governments introduce PRERs to tackle their own environmental, health, and safety problems, such as waste and safe products; others do so to improve access to export markets, with a similar PRER introduced across industries and borders. Introducing PRERs is not used solely to mitigate environmental and health related risks in each country, PRERs can also change industry competitiveness. Asia is not exceptional in having production networks extensively impacted, but it is one of the most important areas in which firms could have been affected by PRERs and thus need to take adaptation measures. Increased trade volume in the Asian region along with globalization implies that the impact of PRERs is increasingly important.

This paper discusses EU PRERs, specifically the EU RoHS directive and REACH regulations, which have impacted Asian firms and Asian policies. Section 1 shows how REACH and RoHS impact Asian firms, and Section 2 describes the effect on Asian adaptation policy. Section 3 shows how REACH and RoHS affects PRER development in Asian countries.

1. Impact of PRERs on Asian firms

There has been little research done on PRERs in environmental economics. Environmental regulations such as air and water pollution control regulations have been examined extensively in the literature of environmental economics since the 1970s (see Jaffe, Peterson, and Portney, 1995) but research on PRERs has received limited attention until recently. As number, variation, and coverage of the PRERs has increased in recent decades, more research has been recently conducted (e.g., Angerer, Nordbeck, and Sartorius, 2008). PRERs and pollution control regulations differ in objectives, actors, geographical coverage, and mechanism of effect. Regulations on air pollution and water effluent from factories are aimed at protecting workers, residents, and the environment at production sites. PRERs, in contrast, are aimed at protecting consumer health and safety at consumption sites and the environment at end-of-life disposal sites, such as e-waste provisions in the EU RoHS. The actors who must adapt to pollution control regulations are producers and factories within the regulators' jurisdictions. Individual factories are required take necessary measures for pollution control, and the choice of measures can made by the factory management does not require help from input suppliers. On the other hand, PRERs impose requirements on both producers of

a final good and of the input parts and components. Firms that produce final goods are often required to obtain information from their suppliers about the compliance of the parts and components of the final goods because compliance with PRERs requires compliance at each step. Suppliers asked by customers to comply with a PRER must ask the same of their own suppliers: each supplier along a supply chain must manage its suppliers as well. Therefore, in contrast to pollution control measures, which can be unilaterally addressed by a single factory, PRERs require supply chain or life cycle management by firms exporting to regulated markets. The extent and complexity of PRERs' impact has been made clear through an examination of the supply chain management required to meet regulations, such as RoHS directives and REACH regulations, on chemicals contained in products. Chemicals are used to improve the standard of living in a variety of ways. When chemicals contained in a final product are regulated, it becomes necessary to redesign, monitor, and test the materials, parts, and components composing the final product to prove that they meet the stipulated chemical thresholds. Further complicating compliance, although many PRERs regulate products in specific industries, the impact of PRERs that regulate chemicals spreads to various industries. REACH affects industries beyond the chemical industry: textile, garment, wood products, plastic, rubber, machinery, electric and electronic industries, and many

others are affected. Adaptation is complex for industries whose products are composed of various materials. For example, a chair may contain wood, plastic, metal, cloth, and synthetic materials such as polyester; it may even contain some electric parts if it is equipped with extra features, such as an automatic reclining system. To export such a chair, all related suppliers across various industries must comply with the PRERs for the final product to be placed in the EU market. This means that the chemical information must be transmitted through a supply chain that includes multiple industries.

Due to globalization of production, the parts and components necessary to manufacture a final product are often produced by different firms located in different countries. Many suppliers who will need to comply with product regulations will be located beyond the regulator's jurisdiction. Because parts and components suppliers are located across jurisdictional borders, supply chain, value chain, and production network management takes cooperative effort from multiple firms, industries and countries. Suppliers may be located in various countries, including in developing countries. In Asia, the impact of PRERs seems significant. De facto globalization has enabled manufacturing firms to procure product parts from different countries, selecting on the basis of comparative advantage, and such activities have led to the formation of

extensive supply chain networks in the region. However, an Asian manufacturer's long and complex supply chain might adversely affect its compliance with PRERs because each supplier at all production stages needs to comply with the PRERs for the final product to have market access. For a firm at the top of the production pyramid, obtaining the complex supply chain information from thousands of suppliers spread around different countries can be a formidable challenge. Moreover, some suppliers are direct exporters and thus fully aware of their market destination, but other suppliers are indirect exporters and may know neither how their products will be used nor to which markets the products are destined. For firms, both domestic and foreign, with suppliers in developing countries, it may be necessary to audit suppliers to verify compliance. A firm cannot simply take measures to restrict the amount of regulated chemicals entering its products; it must also disseminate chemical information to its customers. Some large multinational firms have started to select only those suppliers that are able to comply with relevant PRERs and provide credible information on environmental performance[3].

Those firms that lack the capacity to comply with PRERs by collecting information and adopting compliance technologies will lose market access. PRERs can thus act as

[3] For example, Japanese Electric and electronic assembler SONY has made its criteria for selecting suppliers public. http://www.sony.net/SonyInfo/procurementinfo/activities/index.html (accessed on Oct. 30, 2013)

technical barriers to trade (TBTs). If firms are unable to supply to multinational firms selling products in regulated markets, this is an entry barrier for the firms. The supply chain management required to comply with PRERs can create entry barriers for lower capacity firms wishing to participate in export markets; participation in multinational firms' supply chains is an important mechanism for allowing firms to gain access to regulated markets. In terms of both TBTs and entry barriers, PRERs have a large impact on firms, especially on small and medium enterprises (SMEs) and on firms in developing countries that have less capacity to comply. Therefore, the capacity to comply with PRERs is an additional component of being part of global production networks and continuing to export to regulated markets. However, for a majority of SMEs in developing countries, collecting the necessary information and complying with the regulations requires additional capabilities and imposes a cost burden; this create a new hurdle for exporting.

Michida, Ueki, and Nabeshima (2014) present the results of a survey of firms on how Asian firms are impacted by chemical-related PRERs, including EU RoHS and REACH. The survey was conducted in Penang, Malaysia in 2012 on a sample (n = 370) of manufacturing industry firms. From their results, 60.9% of Malaysian firms have taken measures to comply with regulations on chemicals in products: 78.3% of foreign

owned firms and 55.8% local firms answered had taken measures. Among the firms, 9.2% faced customer rejection due to chemicals in products; this was higher for foreign owned firms than for local firms. These results show that a significant number of firms find it necessary to comply with regulations on chemicals in products, even outside of the EU. The impact in Malaysia is significant. When asked if they had changed destination markets due to PRERs, 1.8% of firms answered that they had. This result implies that some firms have lost export market access due to PRERs.

2. Impact of EU PRERs on Asian policy

PRERs introduced in important export markets can impact policy making in other countries and provide a new mechanism to affect other countries' policies through trade. In fact, implementation of the EU PRERs has triggered Asian governments to enact policy measures in response.

PRERs imposed on important export markets, such as the EU, have raised concern among exporting countries. Exported products that do not satisfy regulatory requirements cannot be placed in regulated markets, and firms might thus lose market access. Otsuki et al. (2001) examines regulations on food safety in the EU and

empirically measures the magnitude of impact on exports from African countries to EU markets. Honda (2012) has shown the impact of EU RoHS directives on trade from outside the EU. Both studies suggest that regulations significantly impact trade. Sankar (2007) addresses concerns about the impact of regulation on the Indian leather industry and examines the market structure of the industry. The worry that PRERs could have a negative impact on export is widespread among governments of exporting countries, both developed and developing. These concerns have been raised and shared in the WTO TBT Committee. From 1995 to June 2011, the most frequently raised trade concerns center on EU REACH regulations: 34 member countries expressed concern about the EU REACH regulations, and 13 member countries[4] expressed concern about EU RoHS directives.

Concern about the impact of PRERs is especially keen in East and Southeast Asia, which has been the center of the world manufacturing for decades and in which many suppliers of parts and components to global assemblers are located. Although developing Asian countries have increased manufacturing capability, the capacity of firms to comply with technical regulations seems limited. This is primarily because PRERs have been mainly implemented in EU countries, and the underlying concepts are

[4] WTO Committee on Technical Barriers to Trade document G/TBT/GEN/74/Rev.9, issued on October 17, 2011

relatively new to many Asian countries. Modern technical regulations such as RoHS and REACH-SVHC require the control of chemical substances in products, but the specifics are not always clearly understood by either supplying or buying firms. Each actor imposes its own interpretation of RoHS and REACH-SVHC requirements in writing its procurement specifications (Nudjarin, Michida, and Nabeshima, 2013). Faced with this situation, Asian governments have basically reacted to the EU RoHS and EU REACH in one of two manners. Here, we discuss one type of reaction; the other will be discussed in the next section.

Some Asian governments provide policy support to affected firms so that firms can continue exporting by smoothly adapting production to PRERs. Thailand is notable for this approach. As soon as the EU regulatory body disclosed the contents of the RoHS directives as part of a public comment period, the Thai government took substantial action and established an EU WEEE & RoHS impact assessment subcommittee comprising representatives from manufacturers, an industrial association, the Chamber of Commerce, relevant government agencies, and research institutes. This was begun during the EU drafting of the RoHS directives, as early as 2001 (Nudjarin, Michida, and Nabeshima, 2013). The Thai government acted in proactive and preparatory ways to build a platform to assist firms in building capacity to meet the various PRERs

requirements. In Singapore, the SPRING Singapore, a statutory board of the Ministry of Trade and Industry, took action by providing technical information on the PRERs[5]. SPRING Singapore provides support for firms by distributing a booklet on RoHS that provided information on RoHS for SMEs in 2007 and incorporated a list of RoHS compliant suppliers in 2009. It also publishes a booklet on REACH called “Complying with REACH: A Guide for SMEs”; this began in 2007, which is the year of that REACH was implemented in the EU and was revised in 2009. Vietnam delayed response to PRERs until much later. The Vietnamese government established Chemicals Agency (*Vinachemia*) in 2009 and a RoHS/REACH information center was opened to assist firms with UNIDO support in 2011. In contrast to these countries, the governments of Cambodia, Laos, and Myanmar have lagged behind in assisting firms with PRER compliance.

Smooth adaptation of regulations implemented in export markets is key to maintaining market access. Many development stages can be found among Asian countries. The extent and timing of government support to firms in providing regulatory and technical information varies, and this might contribute to widening the development gap between countries in terms of local firm capacities and competitiveness for global production and in terms of investment environment for MNCs.

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3. PRERs spreading across Asian countries

Vogel (2012) presents an in-depth and interesting comparison of regulatory introduction between the US and the EU, revealing that environmental and safety regulations are introduced as a result of interactions among various factors such as consumer concerns, institutional influence, politics, and the actions of other countries. In Asia, the introduction of PRERs seems to be driven by concerns about industrial competitiveness. PRERs trigger Asian and other countries to introduce similar regulations and standards. Japan, Korea, China, and Vietnam have introduced RoHS-like regulations or standards (Table 2). This is the second types of reaction by Asian governments to EU RoHS implementation. In some countries, regulations are mandatory, as the EU RoHS is. In other countries, non-binding standards are introduced. J-Moss, a Japanese RoHS, is a set of regulatory requirements. However, in contrast to the EU RoHS, products are not required to be free of the restricted substances so long as they are labeled according to the levels of the substances contained in products. An orange label must be placed on every product whose regulated substances exceed the limit; a green label can be placed on product containing no more of regulated substances than the limit. The Thai version

of RoHS was introduced in 2009, also as a non-binding and voluntary standard. The Chinese version of RoHS, implemented in 2007, imposes labeling requirements similar to those of J-Moss, although the targeted products differ from those targeted in the EU RoHS. California's regulations are also similar to EU RoHS, but the range of targeted products is narrower.

Nudjarin, Michida, and Nabeshima (2013) describes three motives for the development of a Thai RoHS: coordinating product specifications to avoid the burden of multiple standards; increasing the initial volume of local-RoHS compliant supplies; and providing industry with the technical infrastructure to guide acceptable practices and verify product compliance. The development of Thai RoHS was driven by industry demands. An additional motive is preventing products that do not meet EU regulations from flowing into the country. Import of such products may raise concern among consumers and also increase the risk that the country's exported products might use noncompliant import goods as intermediate goods.

Vogel (1995, p5-8) called the situation "the California Effect," which refers to the critical role of powerful and wealthy green political jurisdictions in promoting a regulatory "race to the top" among trading partners. The California effect especially well describes the national patterns of regulation on health, safety, and the environment.

Not all countries race to the top in regulations, and there are a number of Asian countries that have not followed. Uperlainen (2010) describes the situation as a “partial race to the top” in his theoretical model, and this correctly shows the Asian situation.

In the Asian region, countries have different comparative advantages and play complementary roles in production. Depending on the comparative advantage, firms extend production networks, such as by procuring materials in a resource-rich country and producing parts from these materials by transporting them to other countries for labor-intensive processes and then sending the outputs to another neighboring country for assembly before final export. The Asian region acts a production hub for such production chains through the complementation of countries. However, the above-mentioned reaction of Asian governments to the EU RoHS may impede the competitiveness of the Asian region as a production hub.

The problem with the current situation is that the approach and scope of products covered varies among countries, which impedes smooth trade in the region. Whenever parts, components, and final goods are exported to different countries, it is necessary to meet or address different labeling and manufacturing requirements. While harmonization of PRERs at the global level seems difficult, how each country should respond in an efficient and effective way needs to be considered.

4. Conclusion

This paper discussed the impact of chemical-related PRERs on Asian firms and policies. Asian firms have been affected by these regulations, and many of the firms have taken measures to adapt to the EU regulations. Traditional environmental regulations, such as pollution control regulations, affect firms in only the regulated location. On contrast, the mechanism of PRERs can require firms that operate in non-regulated countries to meet prescribed environmental and health standards. PRERs can be considered as a newer approach with the potential to change environmental governance. Developing countries are often weak in enforcement of environmental regulations, and if PRERs work, they might be effective measures for influence environmental governance in developing countries. However, the EU RoHS and REACH aim at protecting consumer health and the environment at the sites of consumption and disposal, and the regulations do not necessarily improve the environment in developing countries. These regulations do not impose any standards on traditional pollution at production sites. Therefore, the regulations may contribute to production of cleaner products, but it is too much to expect that the regulations will help maintain clean

production sites.

An important issue is the multiplicity of similar regulations across Asia as well as in other parts of the world. When looking at the progress of globalization, production activities are rarely completed in a single country. Rather, parts and components are produced in different countries, depending on comparative advantage, before being assembled into a final product. Asian countries have individually tried to enhance their firms' competitiveness in the EU market by assisting in firms' adaptation to EU regulations. However, such actions by individual countries are not the best solution because the compliance of final products requires compliance by other firms in the supply chains, and these firms may be located in other countries. Contrary to their original intentions, requirements set by different countries could introduce unnecessary complexity for firms seeking to produce export products. This complexity will be quite disadvantageous for small and medium enterprises, which lack the capacity to learn the complex requirements of export markets. More coordinated policy efforts among countries are necessary. Governments now need to take into consideration the global production network of firms beyond their jurisdictions to set optimal policies.

The purpose of PRERs is to provide environmentally friendly and safe products to consumers, not to create trade barriers. Because of the diversity of Asian countries in

terms of their stages of development, the capacities of governments and firms, and their needs, policy coordination within the region is essential, but this is not an easy task. The question of how to pursue coordination efforts in a way that efficiently and equitably helps firms needs to be examined in the international arena.

If the world agrees on a common target in threshold levels of chemicals contained in products, having multiple versions of similar regulations is obviously inefficient; different versions create different requirements. However, while achieving such global consensus and harmonizing regulations will be difficult, the current competition among countries pushes exporting countries to enact their own regulations. This is a big challenge in the area of regulation of trade and technical barriers to trade.

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Table 1: Examples of PRERs

Country	Year Enacted	Regulation	Description
EU	1994	Packaging and Packaging Waste Directive	Requirement for packaging to minimize packaging volume and weight and to use design to permit reuse or recovery
	2000	ELV (End-of-Life Vehicle)	Recycle rate of ELV to be 95% by 2015
	2005	WEEE (Waste Electrical and Electronic Equipment)	Recycle rate of WEEE to 70–80%
	2006	RoHS (Restriction of the use of certain Hazardous Substances)	Restriction of lead, mercury, cadmium, hexavalent chromium, PBB, and PBDDE in E&E products
		Battery Directive	Setting maximum quantities for certain chemicals and metals in certain batteries
	2007	REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals)	Chemical regulations that regulate chemicals in articles
	2009	Toys Safety Directive	Restriction of chemicals, toxic substances and allergenic fragrances that are harmful for children under 14 years old
	2009	Regulations on Automobile Exhaust Gas	Emission regulation
	2009	Rules on Exhaust for Greenhouse Gasses from Automobiles	Regulation on CO_2 emission from new automobiles
	2009	ErP (Energy related Products)	Products that do not have an eco-friendly design through

			procurement, production, packaging, transport, consumption, and disposal are not permitted to be put on markets.
U.S.	1978	CAFÉ (Energy Policy and Conservation Act of 1975 & Motor Vehicle Information and Cost Saving Act)	Requires automobiles that are sold in US market to meet average fuel efficiency standards.
China	2007	China RoHS (Electronic and Information Product Pollution Prevention Act)	Relating to the regulation of 6 substances in the Chinese market
UAE	2013	Prohibition of Unregistered Biodegradable Plastic Products Circulation	Decision obliging manufacturers and suppliers of plastic products to register 15 new biodegradable plastic products, the plastic products need to conform with UAD standard No.2009:5009

Table 2: RoHS like regulations and standards in various countries

Year of Implementation	Country/Region	Name	Memo
2006/July	EU	RoHS Directive	Revised by 2011/65/EU
	Japan	JIS C0950 (J-Moss)	
2007/January	California, USA	Electric Waste Recycling Act of 2003	Regulation on contained hazardous substances was implemented

2007/March	China	Administrative Measure on the Control of Pollution Caused by Electronic Information Products	The first step of the implementation
2008/January	South Korea	Act for Resource Recycling of Electrical and Electronic Equipment and Vehicles	
2008/January	Norway	Prohibition on Certain Hazardous Substances in Consumer Products	Regulate 18 substances for consumer products
2009/Februrary	Thailand	MorOorKor. 2368-2008	Thai Industrial Standard TIS 2368-2551
2009/June	Turkey	Turkey RoHS	Turkey WEEE and RoHS implemented in 2012
2010/January	California, USA	Assembly Bill No.1109 CHAPTER 534 the California Lighting Efficiency and Toxics Reduction Act	
2012/January	India	E-waste（Management and Handling）Rules, 2011	RoHS part is implemented in 2014.
2012/December	Vietnam	Circular No.30/2011/TT-BCT	