



Globalization and Sustainability: De Jure and De Facto Approach

6

Kaoru Nabeshima

Abstract

This chapter covers sustainability issues from the industrial development and international trade perspectives. Issues covered can be broadly regarded as Goal 12: “Ensure sustainable consumption and production patterns” but touches upon various goals. In pursuing the goal of sustainability in economic activities, the society can take two different approaches. One is based on laws (including international agreements), *de jure* approach. The other is based more on the market force, such as based on Voluntary Sustainability Standards (VSS), *de facto* approach. Within the *de jure* approach, the chapter will cover efforts at global level (international agreements) and efforts at domestic levels. At the international levels, the chapter introduces some of the key areas and the motivations behind these agreements. For the discussions on the domestic levels, the chapter introduces the differences between the production-based environmental regulations and the product-related environmental regula-

tions, and how this has influenced the industrial activities and international trade. In the part for VSS, the chapter will focus mainly on private standards with third-party certification schemes and how these diffuse across countries through trade linkages and implications to producers especially in developing countries. Finally, the chapter touches upon the governance issues related to regulations and private standards.

Keywords

International trade · Regulations · Private standards · Sustainability

6.1 Introduction

Sustainable Development Goals (SDGs) cover sustainability issues in many economic activities. One focus of the SDGs is to promote sustainable consumption and production in Goal 12 such as on chemical management (target 12.4). Achieving this goal will have impacts on the industrial activities and international trade, and Goal 12 is related to many other goals specified in SDGs. For instance, Goal 2 (target 2.4) focuses on development of sustainable agriculture; Goal 3 (target 3.9) on reducing deaths from pollution; Goal 5 (target 5.1) on gender discrimination; Goal 6 (target 6.3) on reducing water pollution; Goal 7 (target 7.2) on renewable energy; Goal 8

This work was supported by a Japan Society for the Promotion of Science (JSPS) Grant-in-Aid for Scientific Research (c) 18K01591.

K. Nabeshima (✉)
Waseda University, Tokyo, Japan
e-mail: kknabeshima@waseda.jp

(target 8.4) on decoupling economic growth and environmental degradation (which is also covered in Goal 12), elimination of forced labor, and other labor issues (target 8.7 and 8.8); Goal 11 (target 11.6) on city environment; Goal 14 (target 14.4) on regulating harvesting and overfishing; Goal 15 on forest management, to name a few.

To achieve these targets specified in Goal 12 and other related goals, introductions of new regulations (including international agreements) or revisions to the existing regulations may be needed to change the behavior of producers and/or consumers. In recent years, in addition to regulations, some firms are actively utilizing Voluntary Sustainability Standards (VSS) to make their products and/or processes to be more sustainable. This chapter will introduce some of these efforts and offer economic analysis on how these will affect the industrial development and international trade, especially for developing countries. This chapter is organized as follows. Section 6.2 presents a simple economic model based on the Melitz model (Melitz 2003). The key concept is the existence of fixed costs associated with exports which affect the entry decision of firms to export market. Then Sect. 6.3 covers regulatory approaches done at the international level (international agreements) and at the domestic level. Furthermore, in Sect. 6.3, the impact of differences in regulations among exporter and importer countries is discussed. Section 6.4 examines the efforts stemming from the private sector, focusing on the VSS and highlights the motivations behind the increasing use of VSS and issues faced by producers in developing countries. And Sect. 6.5 concludes.

6.2 Theoretical Discussion

To achieve sustainability goals and to encourage responsible production and consumption, we need to change how goods are produced and consumed. When it is left to the market force, we tend to underestimate (or ignore completely) the burden we impose on environment (and society) since in many instances these costs are not borne by the economic agents. Therefore, to correct this

tendency and change our behaviors, a set of rules are required. Sometimes, that rules are agreed upon a group of countries and become international agreements especially true for the global public good (Rodrik 2019). In other occasions, these are introduced as domestic regulations. Private entities (firms or consumers) may establish new rules, called private standards. In any circumstances, introductions of new rules will have impacts on economic activities.

6.2.1 Entry and Exit Decision of Firms

The impacts of the introduction of new “rules” on international trade can be analyzed by the Melitz model (Melitz 2003). In the Melitz model, there is a large number of firms, each with different productivity levels. Firms decide to stay in the “market” or exit the market depending on whether they can make profits given their productivity level. To operate in the market, a firm must make an initial investment, a fixed cost.¹ Figure 6.1 graphically represents this simple case. In Fig. 6.1, profit a firm earns is represented in the vertical axis. The horizontal axis represents the productivity of firms. To operate in the market, a firm needs to incur fixed cost, F . The curve that represents firms profit starts out with $-F$ (i.e., for a firm that does not produce any quantity). The point A in the graph is where a firm with a particular productivity makes zero profit. For any firm that has lower productivity than firm A , they will exit the market and do not produce. The market will be left with firms with productivity that is higher than firm A .

Now, suppose that a country introduces a new regulation, say a clean water regulation which requires firms to install a wastewater facility to prevent untreated discharge of contaminated wastewater to the nature. To comply with this regulation, firms need to make an additional investment to install wastewater facility. Further

¹In this simple representation, we abstract away from variable costs (costs that firms incur for each unit of goods produced) and focus only on fixed costs (costs that firms incur regardless of quantity produced).

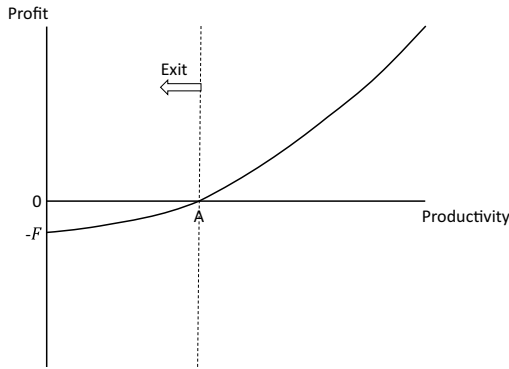


Fig. 6.1 Melitz model only entry/exit decision. *Source* Created by the author

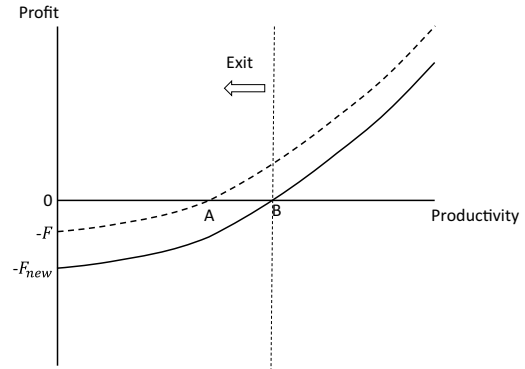


Fig. 6.2 Effect of increase in a fixed cost. *Source* Created by the author

assume that the cost that is required to install wastewater facility is fixed regardless of the production level of the firm. Figure 6.2 shows the impact of increase in the fixed cost in graphical manner. With the increase in the fixed cost by the new regulation, the profit that a firm can make goes down (a curve representing firms' profits shift down from the dashed-line curve to the solid-line curve). As a result, the firm that makes zero profit changes from firm A to firm B. With the introduction of a new regulations, firms that have lower productivity than firm B will exit from the market. Since more firms exit from the market compared to the previous case illustrated in Fig. 6.1, there is a smaller number of firms operating in the market, with the result that only more productive firms survive. Thus, the market is left with fewer number of firms, yet with higher productivity.

6.2.2 Firm's Decision to Export

Now consider the case with some firms exporting. Let us assume that there is a fixed cost that is associated with exporting, represented by F_x .² Firms will first serve the domestic market and then decide to export if and only if that can

generate higher profits. In Fig. 6.3, there are two curves representing the profits of firms. The dotted-line curve represents the profit of firms that serve only the domestic market. The dashed-line curve represents the profit of firms that serve both the domestic and foreign markets. The assumption here is that at any given level of productivity, the revenues of firms are higher for exporting firms. The profit will be lower for some of the firms because of the additional fixed cost associated with exports, F_x . Similar to the case shown in Fig. 6.1, firms with productivity lower than Firm A will exit the market. Firms with productivity higher than Firm C will export since the profits from exporting (dashed line) are higher than only serving the domestic market (dotted line). Those firms that are located between Firm A and Firm C will serve only the domestic market.

Let us consider the last case, where the importing country introduces a new regulation which leads to increase in a fixed cost for exporting firms (from F_x to F'_x). This situation is illustrated in Fig. 6.4. Profits earned by exporting firms are now represented in a solid-line curve. Similar to the case in Fig. 6.3, firms with productivity lower than Firm A will exit the market. Firms with productivity between Firm A and Firm C will serve only the domestic market. However, because of the increase in the fixed cost, only firms with productivity that are higher than Firm D will export. That means firms with

²The literature has identified a number of factors that can be considered as fixed costs associated with exports such as gathering market information, consumer preferences, and regulations in the destination markets.

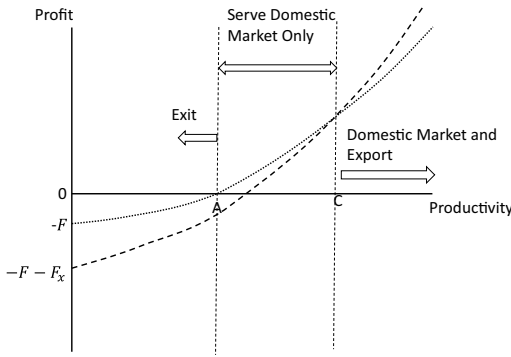


Fig. 6.3 Case of exports. *Source* Created by the author

productivity between Firm C and Firm D will exit from the export market and serve only the domestic market. Overall, the number of exporting firms decreases. Those that stay in exporting markets have higher productivity than the situation in Fig. 6.3.

6.2.3 Implications from the Theoretical Model

In this section, the Melitz model was used to illustrate the relationship between fixed costs and entry/exit decisions of firms for domestic and foreign markets. When there are fixed costs associated with production, some firms will decide to exit from the market altogether, because the revenue that they can generate cannot even cover the fixed costs. When fixed costs increase, then additional firms will exit from the market.

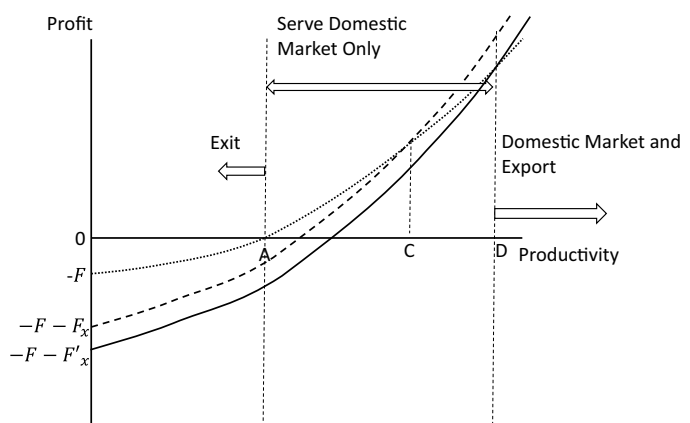
This mechanism holds true for the exporting market also when there are fixed costs associated with exporting. When fixed costs of exporting increase, then some firms may decide to exit from the export market and concentrate on serving the domestic market. To the extent that development of export industry is an important element for sustaining growth in developing countries, reductions in the number of firms are of great concern.

There are many factors that can lead to increase in fixed costs of exporting, one of which is the introductions of new “rules”. Such “rules” can include international agreements, regulations in the importing countries, and/or the use of private standards. In the next sections, we will cover official rules (international agreements and government regulations) and unofficial rules (private standards).

6.3 De Jure Approach

When left to the market force alone, economic agents may overdo certain activities when the costs of such activities are not borne by the economic agents. For instance, if the economic agents do not bear the costs of extinction of certain species, and such species (or some parts of) have economic values, they tend to overhunt or overfish, leading to possible extinction of the species. In another case, it may be chemical substances that are harmful to human health and/or environment. If such chemical substances

Fig. 6.4 Effect of increase in fixed costs for exporting. *Source* Created by the author



are economically useful, firms will use them, especially when the firm does not bear the costs of ill human health and/or environmental damages resulting from such use.

To correct these problems, often “regulations” are created to control the behavior of economic agents. In this chapter, we will make a distinction between “regulations” and “standards”. *Regulations* are created and enforced by public agents, are mandatory, and legally bounding. Often, the violations of regulations carry some penalties. In contrast, *standards* are created by either public or private entities, and standards are voluntary in nature. They are not legally binding and do not carry any (official) penalties when one does not follow standards. We will discuss the nature of standards in more detail in the next section.

Here, we focus on the regulations (mandatory rules). When one thinks of regulations, there are regulations that are supranational in nature (including international agreements) and domestic regulations. In the following subsections, we will cover international agreements and then domestic regulations and assess their impacts on international trade.

6.3.1 International Agreements

There are many international agreements in force focusing on sustainability issue. Each of them focuses on a certain issue. Let us look at some of the agreements below.

One of the well-known agreements is “Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)”. The main purpose of this international agreement is to make sure that international trade in wild animals and plants does not cause harm to their survival, and it covers a wide range of wild animals and plants. Wild animals and plants listed in Appendix I mean that they are threatened with extinction, and, in general, commercial international trade³ of these is prohibited. Those listed in Appendix II are not facing immediate

extinction risk, if and only if international trade is controlled sufficiently. Appendix III includes wild animals and plants that are already subject to regulations by a country and require cooperation from other countries (importing countries) to ensure that these are not traded illegally (Table 6.1).

The main mode of regulation takes the form of quotas, the restrictions on quantity.⁴ Those listed in Appendix I, the commercial international trade is prohibited; hence, the quota is zero. For those in Appendix II, if they are captured in accordance with domestic regulations, catch or extraction of these do not threaten the survival of the species (which is verified in scientific manner), and have requisite certificates and permits that can be traced through the trade, then international trade is allowed in limited quantity. The quota can be set by the domestic country or through collective agreement.

The previous example was wild animals and plants and trading of species or their artifacts. In addition to this, there are many international agreements related to chemicals that may be harmful to human health and/or environment. For instance, “Montreal Protocol on Substances that Deplete the Ozone Layer” aims to phase out the consumption and production of nearly one hundred ozone depleting substances (ODSs) such as chlorofluorocarbons (CFCs), halon, carbon tetrachloride, and others.⁵ Use of CFCs was widespread in our lives such as in air conditioners and refrigerators as refrigerants and aerosol cans as propellants. CFCs were also used in some medical device such as inhaler for asthma patients. ODSs are also widely used in

³ In some instance, international trade for scientific purpose is allowed.

⁴ Similar kind of approach is taken in many different efforts for conservation. For instance, Atlantic bluefin tuna is regulated by the International Commission for the Conservation of Atlantic Tunas (with contracting party of 52) to control the catchment of tuna in the Atlantic Ocean. They determine the amount of quota based on the stocks of bluefin tuna. This is an important fish for Japanese since much of bluefin tuna ends up as sushi or sashimi consumed in Japan. For year 2022, the quota for Japan increased by 257 tons for a total of 3,483 tons (Japan Times 2021).

⁵ For a complete listing of the substances, please see Ozone Secretariat (2020).

Table 6.1 Number of species and subspecies covered by CITES

	Appendix I	Appendix II	Appendix III
Number of species	1082 species and 36 subspecies	37,420 species and 15 subspecies	211 species and 14 subspecies and 1 variant

Note Appendix I lists wild animals and plants threatened with extinction. Appendix II lists those that are not immediate risk of extinction but requires tight control on international trade. Appendix III lists those that are subject to regulations by a country and require cooperation from other countries to prevent illegal trade

Source CITES (2021)

the manufacturing processes. The adoption of the Montreal Protocol has led to the changing in production process as well as changes in products mainly by the use of alternative substances. The Kigali Amendment aims to phase down the projected consumption and production of hydrofluorocarbons (HFCs), which was developed as substitute for CFCs yet known to be greenhouse gases. The goal is to reduce the consumption and production of HFCs by 80% in the next 30 years. Developed countries are already starting the phase-out process, while developing countries will start from consumption freeze in 2024 (or 2028 for some countries) (Ozone Secretariat 2019).

The Stockholm Convention on Persistent Organic Pollutants regulates chemicals (persistent organic pollutants: POPs) that can linger in the nature for a prolonged period of time and cause harm to human health and environment. These cover some of the chemicals used in pesticide⁶ and for industrial use. Those POPs listed in the Annex A are subject to ban on use, manufacture, and trade. Those in Annex B faces restrictions on the use, manufacture, and trade (Secretariat of the Stockholm Convention 2020).

Recent addition to management of chemical substances at the global level is the Minamata Convention on Mercury⁷ This convention regulates the mining and trading of mercury, phasing out the use of mercury in certain products, and reduces the emission and release of mercury. It requires countries to phase out the mining

activities of mercury and control the export and import of mercury between countries. In addition, the year 2020 marks the year to completely phase out the manufacture, export, and import of mercury-added products listed in Part I of Annex A. Mercury is (was) used widely in our daily lives. They are used in batteries, lamps (such as compact fluorescent lamps),⁸ and non-electronic measuring devices such as thermometers, cosmetics, pesticides, and switch and relays.⁹ Mercury is also used in manufacturing processes. Part I of Annex B requires countries to phase out the use of mercury in acetaldehyde production (by 2018)¹⁰ and chlor-alkali production (by 2025). Other manufacturing processes¹¹ listed in Part II of Annex B do not have specific phase-out dates, but countries are required to reduce and restrict the use of mercury and mercury compounds in the manufacturing processes (UNEP 2019).

Another international agreement on chemicals, the “Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International

⁸ Because of the concerns for global warming, people were switching from incandescent lamps to compact fluorescent lamps since the latter is more energy efficient. In more recent years, people are switching again to more energy-efficient light-emitting diodes (LED) lamps (UNEP 2017).

⁹ Dental amalgam is the only product listed in Part II of Annex A.

¹⁰ This is one of the significant achievements of the convention, since the use of mercury in acetaldehyde production and releasing the untreated wastewater to the river was the main cause of the Minamata disease.

¹¹ They are vinyl chloride monomer production, sodium or potassium methylate or ethylate, and production of polyurethane using mercury containing catalysts (UNEP 2019).

⁶ For a complete listing of the POPs, please see Secretariat of the Stockholm Convention (2019).

⁷ This convention is named after a city in Japan, Minamata, where they suffered from mercury poisoning (the Minamata disease).

Trade”, focuses on the information exchange of hazardous chemical substances between exporters and importers, and these chemical substances need to be clearly labeled (Secretariat of the Rotterdam Convention 2020). “Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal” controls the international movement of hazardous wastes which was adopted focusing on the notification of transboundary movements of hazardous wastes, but starting in 2019, there is now a ban on exports of hazardous wastes covered in Basel Convention that are intended for final disposal, reuse, recycling, and recovery from countries listed in Annex VII (such as OECD) (Secretariat of the Basel Convention 2020).¹²

Some of these international agreements rely on quota (including ban) to achieve the sustainability goal, which naturally have impact on international trade and consumption. Others rely on notification and information exchange to make importing countries (especially developing countries) aware of the trading activities, to raise the awareness of the sustainability issue. The latter type of agreements can be considered as part of fixed costs described in Sect. 6.2.

6.3.2 Domestic Regulations

For the international agreements to have any legal weights, applicable laws corresponding to the international agreements need to be introduced in each country. When doing so, a country (or a region) may introduce additional requirements. For instance, the implementation of “Montreal Protocol on Substances that Deplete the Ozone Layer” in EU is backed by the Regulation (EC) No 1005/2009,¹³ which includes five additional ODSs that are not covered in the Montreal Protocol.¹⁴ Thus, even in the case of

international agreements, domestic implementations may differ from countries to countries.

In addition to these international agreements, countries introduce numerous laws to safeguard human health and to protect environment. In almost every country, there are food safety regulations to ensure that the agricultural goods and processed foods are safe for human consumption. Regulations may restrict maximum residue levels (MRLs)¹⁵ and require affixation of labels showing information on the manufacturer, source of inputs, ingredients, nutrition, and potential allergic substances used. Exporting firms need to comply with these regulations if they wish to export agricultural and food products to the destination. Even though they are exported, these products are subject to inspections at the point of entry to make sure that these products comply with domestic regulations. Sometime, imported products fail to meet these requirements, and they are rejected. For instance, the statistics from the UNIDO reveal that in 2013, an estimated US \$9328 million worth of agriculture and food products (all food and feeds) were rejected at the borders of four markets (Australia, EU, Japan, and USA) (UNIDO 2015). Often cited reasons for the rejections are the violations regarding residue agricultural chemicals¹⁶ and residue veterinarian drugs (IDE-JETRO and UNIDO 2013; UNIDO 2010, 2015).

These regulations are well known, yet many countries still fail to meet these requirements sufficiently, but the awareness among farmers is

¹² For a list of wastes that are covered in the Basel Convention, please see Annex VIII. Recently, plastic wastes were added and came into force in 2021 (Secretariat of the Basel Convention 2020).

¹³ See <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R1005&from=EN> for the full text of the regulation.

¹⁴ They are halon 1202, methyl chloride (MC), ethyl bromide (EB), trifluoroiodomethane (TFIM) and n-propyl bromide (n-PB) (European Environment Agency 2021).

¹⁵ Codex Alimentarius offers some base MRL and streamlining regulations to this may facilitate international trade (Li 2018; Rusch, Cameron and Hohgardt 2019) and more stringent requirements are likely to have negative impacts on international trade, especially on exports from developing countries (Otsuki, Wilson and Sewadeh 2001; Wilson and Otsuki 2004), although this is difficult since MRL in each country is set based on their dietary habits.

¹⁶ Developing countries seem to have difficult times in meeting the MRL requirements in developed countries (Xiong and Beghin 2014), mainly because the MRL requirements in developed countries are more stringent than in the developing countries (Winchester et al. 2012).

not keeping up with the regulation information and the domestic regulatory systems (Schreinemachers et al. 2015). The problem is compounded especially for the processed food industry. They need to make sure that all inputs used in each step of manufacturing process comply with the regulations. For instance, when a firm manufactures frozen shrimp, it needs to ensure that the shrimp they use do not contain excessive amount of residue chemicals (for instance, antibiotics or in some cases, antioxidants). If the shrimp they use as inputs already contained these substances above the allowed amount, then there is nothing that the manufacturers can do to correct this problem.

How can the final good manufacturers ensure that their products will comply with the requisite regulations? First, the manufacturers need to know the regulation of the destination countries. Such information is considered as a part of the fixed cost of exporting as described in the theoretical section. Second, the manufacturers need to ensure that suppliers also know these regulations and these inputs need to be checked along the supply chain, to make sure that after each stage of the supply chain, the products (or inputs) meet the requirements. This checking can be done by the buyer firms (firms located in the downstream), the seller firms (firms located in the upstream), or rely on third party (in many instances, public research institute). In the case of residue chemicals, these tests need to be done scientifically. Thus, either at firm or at the country level, there must be a sufficient scientific capabilities and facilities. In addition to this, to trace back the origin of the problems, traceability system along the supply chain is needed to make sure that only “qualified” (or checked) inputs are used in the supply chain and to quickly identify the source of the problem if arises.¹⁷

This poses a large concern on producers, especially in developing countries. Often small-scale farmers in developing countries are not

aware of regulations (domestic and/or foreign ones). Because they are unaware, they do not take the necessary steps to ensure that their products meet the regulatory requirements of importing countries such as correct applications of agricultural chemicals. From government’s point of view, there are two policy levers that they can utilize. One is the establishment of quality assurance system (including public research institutes assisting firms in scientific measurements), and the other is the information dissemination and training of farmers (IDE-JETRO and UNIDO 2013).

Manufacturing industries also face many regulations, especially on the environmental issues.¹⁸ Many countries have introduced pollution abatement regulations. Typically, these traditional types of environmental regulations have focused on the production processes of domestic entities. If a country is keen on environmental protections, their regulations on manufacturing processes tend to be stricter compared to the other countries where they are not too concerned with environmental damages. This can result in the movement of production processes from developed to developing countries through foreign direct investment.¹⁹

Gradually, there seem to be a shift in the orientation of environmental policies in many countries, notably in developed countries. Even though there have been regulations concerning product characteristics such as energy efficiency requirements or emission restrictions for automobiles, there is now an increasing tendency to do so, especially focusing on chemicals. Environmental policies now are focusing more on product-related environmental regulations (focusing on product characteristics) (PRERs) rather than traditional pollution abatement regulations. Pollution abatement regulations regulate

¹⁷ Different supply chains of agricultural and food products deal with this issue differently. See Mori, Nabeshima and Yamada (2013) for the eel industry in China. There are many studies on shrimp industry (IDE-JETRO and UNIDO 2013; Suzuki and Nam 2016; Tran et al. 2013).

¹⁸ On the survey of political factors on environment, see Hu et al. (2021).

¹⁹ This is so-called pollution haven effect. On this, please see Kellenberg (2009) and Erdogan (2014). While the traditional literature has looked at FDI and gross exports, Duan et al. (2021) focus on trade in value added and find that firms tend to relocate “dirty” processes to developing countries and forming “global pollution chain”.

domestic production activities by domestic law. The cost of regulatory compliances is borne by domestic producers. PRERs regulate the products regardless of where they are produced, resulting in a mismatch of location of production and consumption. The cost of complying of regulations is borne by domestic and foreign producers.

One such example of PRERs is the Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) (Directive 2011/65/EU), a regulation by the European Union. The regulation essentially limits the use of ten chemical substances in electronics that are known to cause harm to both human health and environment.²⁰ This directive, coupled with the regulation on waste electrical and electronic equipment (WEEE) (WEEE Directive, Directive 2012/19/EU), is used to minimize the risk to human health and environment stemming from the use, recycling, and disposal of electronic equipment. Since RoHS directive applies to electronic products sold in EU, this applies to both domestic and foreign producers. When RoHS was introduced, there were much discussion on the impacts of this on the production and exports of these products from East Asia to EU (Michida 2017). Similarly, the introduction of Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (Regulation (EC) No 1907/2006) has caused concerns among producers in East Asia. REACH requires that chemicals to be used in the product must be first registered at the European Chemical Agency. And for the registration, it requires scientific evidence (risk and hazard analysis) that chemical is safe (Humphrey 2017). A study by Honda and Otsuki (2017a) finds that firms in Malaysia and Vietnam that are able to meet these requirements actually increased their exports to the EU markets. At the same time, these firms also seem to concentrate on the EU market once they comply with these regulations. This may be because they have invested substantially to meet the

requirements, and to recoup their investments, they are now focusing more on the EU market. Other studies such as Fontagné and Orefice (2018) find that when firms are faced with technical barriers to trade (TBT), some exporter firms, especially if they export to multiple destinations, tend to focus on the market with more relaxed TBT.

Overall, if a firm belongs to global production networks, they invest in compliance requirements even if that entails additional investments (often in terms of increase in the fixed costs, but sometimes of variable costs) (Honda and Otsuki 2017b; Michida et al 2017; Ueki et al 2017). To assist firms in maintaining export activities to the regulated yet lucrative markets, governments typically provide assistance through establishments of quality assurance facilities if that were lacking as well as introducing similar regulations domestically (Michida 2017; Ramungul 2017). In fact, many countries in East Asia have introduced similar regulations concerning chemicals to reduce the information costs. This is done to reduce the export-specific fixed cost. These studies tend to focus on certain issues, and there have been relatively few studies that look at the impact of domestic regulations on international trade.²¹ We turn to this issue in the next subsection.

6.3.3 Economic Assessment of the Impact of Regulatory Differences Between Exporters and Importers

There are only limited number of studies systematically looking at the impact of domestic regulations on international trade relative to the overall international trade literature.²² This is because there was no comprehensive data on the domestic regulations. The past literature has

²⁰ They are lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE), bis (2-ethylhexyl) phthalate (DEHP), butyl benzyl phthalate (BBP), dibutyl phthalate (DBP), and diisobutyl phthalate (DIBP).

²¹ For instance, Disdier and Marette (2010) and Xiong and Beghin (2014) look at the impact of MRL. Other studies have sectoral focus (Bao 2014) or country focus (Portugal-Perez, Reyes and Wilson 2010).

²² For the review of the literature, please see UNCTAD (2018).

relied on the estimation of ad valorem equivalents (AVE) to measure the trade impacts (such as Kee et al (2009)). Some are based on the notifications to WTO (Bao and Chen 2013; Bao and Qiu 2012), but the number of notifications is much fewer in number compared to the overall domestic regulations that may have impacts on international trade. In the case of Japan, the total number of non-tariff measures (NTMs) reported to WTO is 383, while the total number of NTMs coded from domestic regulations is 1278 (Nabeshima and Obashi 2020). The effort by the United Nations Conference on Trade and Development (UNCTAD) has created a data set that can be utilized by the researchers.²³

In most studies, they take the existence of regulations in importing countries as the main indicator of interest. However, as we have seen, many countries ratify international agreements, and therefore, corresponding domestic regulations exist, which are similar across countries. In addition, governments introduce regulations to safeguard human health and environment, but they tend to introduce similar regulations. Since domestic regulations apply to domestic entities, even exporting firms need to meet domestic regulations (fixed cost, F , in subsection 6.2). In addition to this, exporting firms need to meet the requirements imposed by importing countries (F_x , in the theoretical subsection 6.2); however, there may be significant overlap between the two since countries implement similar kind of regulations. To account for this overlap, some research utilizes differences in regulations between exporting and importing countries to better identify the true fixed costs, F_x . Among many methodologies,²⁴ one methodology is the use of cosine similarity,²⁵ which is based on comparing two vectors (each vector representing a set of regulations) and measures the difference

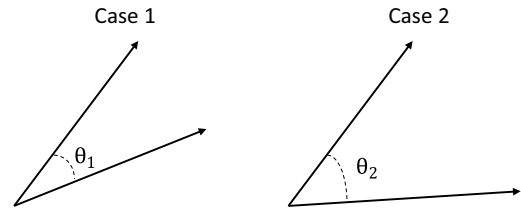


Fig. 6.5 Illustration of cosine similarity. *Source* Created by the author

in angle. Figure 6.5 illustrates this. In case 1, two vectors are facing similar directions, compared to case 2 (smaller angle in the case 1). One can utilize this information to construct the cosine similarity index.²⁶

Nabeshima and Obashi (2021) construct the additional compliance indicator (ACRI) based on cosine similarity. They find that the differences in regulations between exporting and importing countries negatively impact international trade. If the regulation changes from “completely the same” (ACRI = 0) to “completely different” (ACRI = 1), bilateral trade between two countries is reduced by 22.9% (or 14.4% when zero trade is taken into account). They also find that exports from developing countries decrease both to developed and developing countries when there are differences in regulations, while developed countries do not seem to be affected by the differences in regulations (Nabeshima and Obashi 2021). This supports the general observation that developing countries often find it difficult to comply with the regulations in developed countries. Furthermore, the so-called South–South trade (trade between developing countries) is also affected by differences in regulations. This finding points the general weakness of firms in developing countries to comply with regulations in destination countries, especially if they are different from the domestic regulations that they are familiar with.

Another study by Nabeshima et al. (2021) find that decomposes the negative impacts of differences in regulations by looking at the intensive

²³ For the details on how regulations are collected and coded, please see UNCTAD (2021).

²⁴ For other methods, please see Drogué and DeMaria (2012) and Winchester et al. (2012) using MRL data and Cadot et al. (2015) on UNCTAD NTM data.

²⁵ Cosine similarity is often used method in the patent literature to measure the similarity between patent documents (Branstetter 2006; Jaffe 1986).

²⁶ For the detail, please see Nabeshima and Obashi (2021).

and extensive margins of international trade.²⁷ Like other studies, they find that additional regulatory burden negatively affects intensive margin (less trade). When decomposing this to the price and quantity effect, they find that additional regulatory burden negatively affects quantities²⁸ and increases prices. Since the reductions in quantity outweigh the increase in price, overall, the trade decreases.

These and other studies suggest that firms in developing countries are finding it difficult to comply with regulations in destinations.

6.4 De Facto Regulation (Private Standard) Approach

The previous section has examined the impact of regulations on international trade. In general, the regulations tend to reduce international trade (sometime by design like the case in many international agreements focusing on conservation efforts). Research also points out that differences in regulations tend to discourage exports especially from developing countries. Recently, there is a widespread usage of private standards to respond to consumers' demand for sustainable products. The final product makers are keen on meeting such demand and offer products labeled as sustainable. To do so, the final product makers need to make sure that suppliers also follow certain production processes or other requirements for the final product to be called sustainable. This leads to the creation of private standards, and the final product makers require meeting this private standard as a condition for the procurement. Because of this, for the supplier

firms, private standards (even though voluntary in nature) are a mandatory requirement and perceive it the same as regulations. Even though standards are voluntary in nature, but for certain firms, they become de facto regulation.

There are many different private standards globally, but in this section, we focus on the private standard with third-party certification scheme.

6.4.1 Types of Private Standards

The main difference between regulations and standards is that regulations are mandatory, and standards are voluntary.²⁹ Standards can be created by any entity, and depending on the nature of the entity, it is called international (such as by the International Organization for Standardization: ISO), industrial (created by a group of firms in an industry), national/public, and private standards.³⁰ Standards exist to ensure consistent quality of products or process or assuring the compatibility of products. For instance, there are well-known standards for management such as ISO9001 for quality management or ISO14001 for the environment management. These specify the processes. Then, there are standards that assist in interoperability of goods. Paper size is defined in ISO216, and because of that, it is easier for the consumers to know whether certain products that use paper as inputs (such as printers) can accept the paper consumers want to use, regardless of the manufacturers of papers or printers. In this chapter, we focus on process standards.

Among the private standards, we can broadly divide them into three different categories as

²⁷ Intensive margin refers to the changes in the trade volume of the existing trading relationship. For instance, if a country exports more of the same goods, we say increase in intensive margin. Extensive margin refers to the number of products that a country exports. For instance, if a country exports ten goods in one year, and 11 in the next year, there was an increase in extensive margin.

²⁸ This is in line with the Melitz model described in the theoretical section if one assumes that a firm produces a variety. As the fixed costs of exporting increased, the number of exporting firms decreases, hence, reductions in varieties and quantity exported.

²⁹ What makes it confusing is that standards are voluntary. But if a regulation includes a standard, that becomes a mandatory standard, for instance, Japan Industrial Standard (JIS) technical specifications. If a regulation calls that certain item needs to confirm to JIS, then that particular JIS becomes a mandatory standard. EU for instance would like the charging of smartphones to follow USB-C, following their past attempts in the past with micro-USB (European Commission 2021; Fanta 2019).

³⁰ In this chapter, we do not cover the so-called de facto standards, which become "standard" (everyone uses it) in the marketplace. We focus on standards that are intentionally created by an entity to set certain rules.

Table 6.2 Differences among three types of standards

Type	Checked by	Credibility to others
Self-check	Self (first party)	Low
Supplier audit	Buyer (second party)	Medium to high
Third-party certification scheme	Certification firm (third party)	High

Source Created by the author

shown in Table 6.2. In the first case of “self-check”, checking of whether one follows the standard is done by oneself. It is a self-claim, and the credibility to the others (especially to strangers) is low. However, this is still useful in, say, dissemination of “best practices”. The second type is often utilized in the business relationships. The buyer firms require the supplier firms to follow certain rules (such as procurement rules created by the buyer firm, which may include external standards). The check (auditing) is done by the buyer firm to make sure that suppliers follow the rule. Continuation of business relationship depends on whether the supply follows the rules set by the buyer. The credibility is medium to high, typically resting on the reputation of the buyer firm. Then the final category is the third-party certification scheme. In this category, the buyer firm requires supplier firms to be certified in specified external standards. Since the buyer is not involved in the certification process, the credibility of this is high (to the extent of credibility of the certification firm).

According to UNFSS (2020), there are now more than 250 voluntary sustainability standards (VSS) globally. Fairtrade and Rainforest Alliances are examples of such VSS. In examination of VSS contributions to SDGs, many VSS contribute to Goals 12 (especially on target 12.4 on chemicals, 12.5 on recycling, and 12.6 on encouraging multinational firms to integrate sustainability information) of the SDGs since many VSS focus on the sustainability issues (UNFSS 2018). While these VSS are utilized in the business relationships between buyers and suppliers, VSS can be integrated in other aspects such as the Olympics. Since the London Olympic, the sustainability issue has been integrated in hosting of the Olympic games. This tradition is carried on by the Rio and also the Tokyo

Olympics. Table 6.3 lists the private standards with third-party certification schemes to achieve sustainable procurements for the commodities utilized in the Tokyo Olympic.³¹

6.4.2 Impacts on Developing Countries

Prevalence of private standards is challenging for the producers, especially in developing countries. For instance, agricultural food suppliers need to meet traditional regulations on the use of agricultural and veterinary chemicals, but also humane treatment of livestock and agricultural laborers (some by regulations and some by private standards), while improving the productivity of agricultural productions to achieve lower prices and more quantity produced (Saitone and Sexton 2017). To the extent that the private standards are used as the conditions for the exports, if a firm obtains necessary certificates, then a firm is well positioned to expand on their export activities. In fact, research shows that obtaining international certificates seems to have good effects in the development of coffee industry in Ethiopia (Minten et al. 2019) that obtaining organic and GlobalGAP certificate led to increase in pineapple exports from Ghana (Kleemann Abdulai and Buss 2014), and that Fairtrade certification contributed to increase in job satisfaction among pineapple workers in Ghana (Krumbiegel et al. 2018). A product carrying some indication of “desirability” (such as “organic” or “natural” labeling) seems to be able

³¹ In addition to procurement, reducing food loss was identified as one of the sustainability efforts for the Olympic. However, reducing food loss in a sufficient manner is rather difficult because food providers need to meet the food safety regulations (Kasza et al. 2019).

Table 6.3 Private standards identified in the procurement guidelines for Tokyo Olympic

Type of products	Private standards
Agriculture products	GlobalGAP, ASIAGAP, Organic
Livestock	JGAP or GlobalGAP
Fishery products	Marine Eco-Label (MEL), Aquaculture Eco-Label (AEL), Marine Stewardship Council (MSC), Aquaculture Stewardship Council (ASC)
Timber	Forest Stewardship Council (FSC), Programme for the Endorsement of Forest Certification schemes (PEFC), Sustainable Green Ecosystem Council (SEGC)
Paper	Forest Stewardship Council (FSC), Programme for the Endorsement of Forest Certification schemes (PEFC)
Palm oil	Indonesian Sustainable Palm Oil (IPO), Malaysian Sustainable Palm Oil (MPO), Roundtable on Sustainable Palm Oil (MSPO)

Source Created by the author from the sustainable procurement guidelines of Tokyo Olympics (Tokyo Organizing Committee for the Olympic and Paralympic Games 2020)

to sell at higher prices compared to more generic products (Bonanno et al. 2018).³² Because of these advantages, some governments are using the adoption of VSS as a policy tool for export promotion (UNFSS 2020).

However, adoption of VSS is not without concerns. There are at least three different concerns that come from the proliferation of VSS to producers in developing countries (UNFSS 2018). First is that these VSS are now becoming de facto regulations for producers in developing countries, since obtaining some certificate is required as a part of business transactions. Some suspect that buyer firms are using the certificate as a way of minimizing costs associated with production network. In the past, the auditing of the suppliers was done by the buyers themselves, with the cost of auditing incurred by the buyer firms (often from developed countries). However, increasingly buyer firms are requiring suppliers to obtain third-party certification in lieu of auditing by themselves. Thus, the auditing cost has been pushed to the suppliers as fees associated with obtaining certificates (see Table 6.4).

³² People tend to overstate their willingness-to-pay on sustainability issue. However, even when correcting for these biases, consumers are willing to pay more for these “sustainable” products than the generic products, although the effect is negative for organic foods (Gschwandtner and Burton 2020).

Developing countries complain that these private standards are promoted with consumers in developed countries in mind, yet the costs of ensuring health and environmental sustainability of consumption (and disposals) in developed countries are borne by producers.

Second, there are many different, yet overlapping private standards that exist, and suppliers may need to obtain several certificates if they deal with multiple buyers (often from developed countries). This can lead to several different outcomes. Firms may choose to obtain several certificates if they are sufficiently large enough. This means that they need to incur multiple costs for obtaining certifications (which are fixed costs). Or it could result in some choosing one particular standard and others choosing different standards. This could create a lock-in effect and reducing the bargaining power of the suppliers to buyers.

Third, in some areas, the governance is moving from the public to the private sector, and the reach of such rule-setting is defined not by the national boundaries but the international trade linkages (see for instance, Michida and Nabe-shima (2017)). Private standards are also mainly created by firms in developed countries, and this rule-setting is outside the jurisdictions of both national governments (as well as they are not illegal) and international organizations such as the World Trade Organization, thus lacking

Table 6.4 Cost implications for private standards

Type	Checked by	Cost to suppliers for verification	Cost to buyers for verification
Self-check	Self (first party)	Low	None
Supplier audit	Buyer (second party)	Low	High
Third-party certification scheme	Certification firm (third party)	High	None

Source Created by the author

workable dispute settlement mechanisms. In addition, unlike the case in international agreements (or domestic regulations in certain cases) where differential treatment is available for developing countries, developed and developing countries are treated equally.

Even though these concerns exist, the sustainability concerns are gaining momentum, and the use of these private standards can be an effective way to encourage responsibility consumption and production. However, one needs to be aware that these are putting significant burdens on producers in developing countries.

6.5 Conclusion

To promote sustainable consumption and production (Goal 12), there were large numbers of initiatives implemented through international agreements, domestic regulations, and through private standards. Efforts for Goal 12 have close relationships to the other goals, such as Goal 2 (target 2.4) focuses on development of sustainable agriculture; Goal 3 (target 3.9) on reducing deaths from pollution; Goal 5 (target 5.1) on gender discrimination; Goal 6 (target 6.3) on reducing water pollution; Goal 7 (target 7.2) on renewable energy; Goal 8 (target 8.4) on decoupling economic growth and environmental degradation (which is also covered in Goal 12), elimination of forced labor, and other labor issues (target 8.7 and 8.8); Goal 11 (target 11.6) on city environment; Goal 14 (target 14.4) on regulating harvesting and overfishing; Goal 15 on forest management, to name a few.

In this chapter, we have examined the impacts of regulations and standards on international

trade. A simple theoretical model was presented to show that increase in fixed costs associated with exporting negatively influences the entry decision of firms into the export market. Compliance costs associated with either regulations or obtaining third-party certification schemes can be considered as fixed costs of exporting. Hence, if a firm is facing a large number of regulations or significant different regulations from domestic ones, or if a firm needs to obtain multiple certificates, the implication from the theoretical model is that there would be less number of exporting firms. One possible solution to this is to harmonize regulations and streamline certificate requirements³³ to reduce the duplicate efforts by the producers. This can be encouraged through regional trade agreements for instance.

Research also shows that for those firms that can maintain exporting activities, they seem to obtain the benefits from meeting these requirements. However, this seems to be limited to only “capable” existing exporting firms. This is a large concern for developing countries since development of export-oriented industry is a key policy concern for developing countries. Increasingly, the entry barrier to export market is becoming much higher due to these requirements. Looking into the future, additional issues can be woven into the web of agreements, regulations, and private standards such as those on human rights and issues surrounding micro-plastics. Dissemination of the regulatory information is one way of achieving this to reduce the information cost (which are fixed costs in nature) and to assist firms considering exports.

³³ While “harmonization” itself may be difficult, governments and private sector can encourage mutual recognition.

If consumers are willing to consume in more responsible way, and if producers are to respond to such demands for sustainability, producers will need to acquire new sets of skills and supporting infrastructures are needed. Both regulations and private standards require much higher management skills for producers and require easy and affordable accessibility to various testing facilities (to certify that products/processes meet the requirements). Thus, it is critical for governments, especially in developed countries, to “support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production” (target 12.a). This kind of assistance is needed in order for producers in developing countries to participate fully in sustainable globalized world.

References

- Bao X (2014) How do technical barriers to trade affect china’s imports? *Rev Dev Econ* 18(2):286–299
- Bao X, Chen W-C (2013) The impacts of technical barriers to trade on different components of international trade. *Rev Dev Econ* 17(3):447–460
- Bao X, Qiu LD (2012) How do technical barriers to trade influence trade? *Rev Int Econ* 20(4):691–706
- Bonanno A, Bimbo F, Costanigro M, Lansink AO, Viscecchia R (2018) Credence attributes and the quest for a higher price—a hedonic stochastic frontier approach. *Eur Rev Agric Econ* 46(2):163–192
- Branstetter L (2006) Is foreign direct investment a channel of knowledge spillovers? Evidence from Japan’s FDI in the United States. *J Int Econ* 68(2):325–344
- Cadot O, Aspilla A, Gourdon J, Knebel C, Peters R (2015) Deep regional integration and non-tariff measures: a methodology for data analysis. UNCTAD policy issues in international trade and commodities research study series 69, United Nations Conference on Trade and Development, Geneva, Switzerland
- CITES (2021) The CITES Species. <https://cites.org/eng/disc/species.php>. Last accessed on 18 Dec 2021
- Disdier A-C, Marette S (2010) The combination of gravity and welfare approaches for evaluating nontariff measures. *Am J Agr Econ* 92(3):713–726
- Drogué S, DeMaria F (2012) Pesticide residues and trade, the apple of discord? *Food Policy* 37(6):641–649
- Duan Y, Ji T, Yu T (2021) Reassessing pollution haven effect in global value chains. *J Cleaner Prod* 284:124705
- Erdogan AM (2014) Foreign direct investment and environmental regulations: a survey. *J Econ Surv* 28(5):943–955
- European Commission (2021) Pulling the plug on consumer frustration and e-waste: commission proposes a common charger for electronic devices. Last accessed on 24 Dec 2021
- European Environment Agency (2021) Ozone depleting substances 2021. Copenhagen, Denmark: European Environment Agency
- Fanta A (2019) How apple lobbied eu to delay common smartphone charger. <https://euobserver.com/science/144538>. Last accessed on 24 Dec 2021
- Fontagné L, Orefice G (2018) Let’s try next door: technical barriers to trade and multi-destination firms. *Eur Econ Rev* 101:643–663
- Gschwandtner A, Burton M (2020) Comparing treatments to reduce hypothetical bias in choice experiments regarding organic food. *Eur Rev Agric Econ* 47(3):1302–1337
- Honda K, Otsuki T (2017a) Effects of chemical safety standards on export performance in Malaysia and Vietnam. In: Michida E, Humphrey J, Nabeshima K (eds) *Regulations and international trade: new sustainability challenges for East Asia*. Palgrave Macmillan, pp 131–147
- Honda K, Otsuki T (2017a) Effects of chemical safety standards on production cost in Malaysia and Vietnam. In: Michida E, Humphrey J, Nabeshima K (eds) *Regulations and international trade: new sustainability challenges for East Asia*. Palgrave Macmillan, pp 131–147
- Hu H, Chen D, Chang CP, Chu Y (2021) The political economy of environmental consequences: a review of the empirical literature. *J Econ Surv* 35(1):250–306
- Humphrey J (2017) Regulation, standards and risk management in the context of globalization. In: Michida E, Humphrey J, Nabeshima K (eds) *Regulations and international trade: new sustainability challenges for East Asia*. Palgrave Macmillan, pp 131–147
- IDE-JETRO and UNIDO (2013) Meeting standards, winning markets: regional trade standards compliance report East Asia 2013. Institute of developing economies, Japan external trade organization and United Nations industrial development organization
- Jaffe AB (1986) Technological opportunity and spillovers of R&D: evidence from firms’ patents, profits, and market value. *American Econ Rev* 76(5):984–1001
- Japan Times (2021) Japan’s Atlantic Bluefin Tuna Quota for 2022 Increases by 257 Tons. <https://www.japantimes.co.jp/news/2021/11/24/business/atlantic-bluefin-tuna-quota/>. Last accessed on 19 Dec 2021
- Kasza G, Szabó-Bódi B, Lakner Z, Izsó T (2019) Balancing the desire to decrease food waste with requirements of food safety. *Trends Food Sci Technol* 84:74–76
- Kee HL, Nicita A, Olarreaga M (2009) Estimating trade restrictiveness indices. *Econ J* 119(534):172–199

- Kellenberg DK (2009) An empirical investigation of the pollution haven effect with strategic environment and trade policy. *J Int Econ* 78(2):242–255
- Kleemann L, Abdulai A, Buss M (2014) Certification and access to export markets: adoption and return on investment of organic-certified pineapple farming in Ghana. *World Dev* 64:79–92
- Krumbiegel K, Maertens M, Wollni M (2018) The role of fairtrade certification for wages and job satisfaction of plantation workers. *World Dev* 102:195–212
- Li Z (2018) Evaluation of regulatory variation and theoretical health risk for pesticide maximum residue limits in food. *J Environ Manage* 219:153–167
- Melitz MJ (2003) The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica* 71(6):1695–1725
- Michida E (2017) Regulatory Diffusion from Europe to Asia. In: Michida E, Humphrey J, Nabeshima K (eds) *Regulations and international trade: new sustainability challenges for East Asia*. Palgrave Macmillan, pp 107–129
- Michida E, Nabeshima K (2017) Diffusion of private food standards from the European Union to Asia. In: Michida E, Humphrey J, Nabeshima K (eds) *Regulations and international trade: new sustainability challenges for East Asia*. Palgrave Macmillan, pp 107–129
- Michida E, Ueki Y, Nabeshima K (2017) A snapshot of the effects of product-related environmental regulations on firms in Vietnam, Malaysia, and Japan. In: Michida E, Humphrey J, Nabeshima K (eds) *Regulations and international trade: new sustainability challenges for East Asia*. Palgrave Macmillan, pp 151–177
- Minten B, Dereje M, Engida E, Kuma T (2019) Coffee value chains on the move: evidence in Ethiopia. *Food Policy* 83:370–383
- Mori R, Nabeshima K, Yamada N (2013) Food safety control system of chinese eel export and its challenges. IDE Discussion Paper 418, Institute of Developing Economies, Chiba, Japan
- Nabeshima K, Obashi A (2020) Non-tariff measures in Japan. In: *Non-tariff measures in Australia, China, India, Japan, New Zealand, and the Republic of Korea: Preliminary Findings*, UNCTAD (ed), Geneva, Switzerland: United Nations Conference on Trade and Development
- Nabeshima K, Obashi A (2021) Impact of regulatory burdens on international trade. *J Japanese Int Econ* 59:101120
- Nabeshima K, Obashi A, Kim K (2021) Impacts of additional compliance requirements of regulations on the margins of trade. *Jpn World Econ* 59:101088
- Otsuki T, Wilson JS, Sewadeh M (2001) Saving two in a billion: quantifying the trade effect of European food safety standards on African exports. *Food Policy* 26(5):495–514
- Ozone Secretariat (2019) Kigali amendment implementation begins. <https://ozone.unep.org/kigali-amendment-implementation-begins>, Last accessed on 19 Dec 2021
- Ozone Secretariat (2020) Handbook for the montreal protocol on substances that deplete the ozone layer (Fourteenth Edition (2020)). Nairobi, Kenya: United Nations Environment Programme
- Portugal-Perez A, Reyes JD, Wilson JS (2010) Beyond the information technology agreement: harmonisation of standards and trade in electronics. *33(12):1870–1897*
- Ramungul N (2017) Adapting to Eu chemical regulations: the experience of Thailand. In: Michida E, Humphrey J, Nabeshima K (eds) *Regulations and international trade: new sustainability challenges for East Asia*. Palgrave Macmillan, pp 131–147
- Rodrik D (2019) Putting global governance in its place. World Bank ABCDE Conference, World Bank, Washington, DC
- Rusch M, Cameron G, Hohgardt K (2019) Pesticide Mrls and Impact on Global Trade. In: Melton L, Shahidi F, Varelis P (eds) *Encyclopedia of Food Chemistry*. Academic Press, Oxford, pp 428–432
- Saitone TL, Sexton RJ (2017) Agri-food supply chain: evolution and performance with conflicting consumer and societal demands. *Eur Rev Agric Econ* 44(4):634–657
- Schreinemachers P, Afari-Sefa V, Heng CH, Dung PTM, Praneetvatakul S, Srinivasan R (2015) Safe and sustainable crop protection in Southeast Asia: status, challenges and policy options. *Environ Sci Policy* 54:357–366
- Secretariat of the Basel Convention (2020) The basel convention on the control of transboundary movements of hazardous wastes and their disposal: protocol on liability and compensation for damage resulting from transboundary movements of hazardous wastes and their disposal, texts and annexes (Revised in 2019). Geneva, Switzerland: Secretariat of the Basel Convention, United Nations Environment Programme
- Secretariat of the Rotterdam Convention (2020) Rotterdam convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade: text and annexes (Revised in 2019). Geneva, Switzerland: United Nations Environment Programme
- Secretariat of the Stockholm Convention (2019) The New POPs under the Stockholm Convention. <http://www.pops.int/TheConvention/ThePOPs/TheNewPOPs/tabid/2511/Default.aspx>. Last accessed on 18 Dec 2021
- Secretariat of the Stockholm Convention (2020) Stockholm convention on persistent organic pollutants (POPs): text and annexes (Revised in 2019). Secretariat of the Stockholm Convention, United Nations Environment Programme
- Suzuki A, Nam VH (2016) Food quality awareness: cases from shrimp producers in thailand and vegetable producers in Vietnam. IDE Discussion Paper 569, Institute of Developing Economies, Japan External Trade Organization, Chiba, Japan
- Tokyo Organizing Committee for the Olympic and Paralympic Games (2020) Jizoku Kanosei Ni Hairyo Shita Chotatsu Kodo (Sustainable Procurement

- Guidelines). Tokyo Organizing Committee for the Olympic and Paralympic Games, Tokyo
- Tran N, Bailey C, Wilson N, Phillips M (2013) Governance of global value chains in response to food safety and certification standards: the case of shrimp from Vietnam. *World Dev* 45:325–336
- Ueki Y, Michida E, Nabeshima K (2017) Transmission channels of requirements for chemicals in products to firms in Vietnam. In: Michida E, Humphrey J, Nabeshima K (eds), *Regulations and international trade: new sustainability challenges for East Asia*. Palgrave Macmillan, pp 179–199
- UNCTAD (2018) Non-tariff measures: economic assessment and policy options for development. UNCTAD/DITC/TAB/2017/2, United Nations Conference on Trade and Development, Geneva
- UNCTAD (2021) Guidelines for the collection of data on official non-tariff measures. Geneva, Switzerland: United Nations Conference on Trade and Development
- UNEP (2017) Global mercury: supply, trade and demand. Geneva, Switzerland: United Nations Environment Programme
- UNEP (2019) Minamata convention on mercury: text and annexes. Geneva, Switzerland: United Nations Environment Programme
- UNFSS (2018) Voluntary Sustainability Standards (Vss), trade and sustainable development. United Nations Forum on Sustainability Standards
- UNFSS (2020) Scaling up voluntary sustainability standards through sustainable public procurement and trade policy. United Nations Forum on Sustainability Standards
- UNIDO (2010) Meeting Standards, Winning Markets: Trade Standards Compliance. United Nations Industrial Development Organization, Vienna
- UNIDO (2015) Meeting standards, winning markets: trade standards compliance. Vienna: United Nations Industrial Development Organization
- Wilson JS, Otsuki T (2004) To spray or not to spray: pesticides, banana exports, and food safety. *Food Policy* 29(2):131–146
- Winchester N, Rau ML, Goetz C, Larue B, Otsuki T, Shutes K, Wieck C, Burnquist HL, Pinto de Souza MJ, de Faria RN (2012). The impact of regulatory heterogeneity on agri-food trade 35(8):973–993
- Xiong B, Beghin J (2014) Disentangling demand-enhancing and trade-cost effects of maximum residue regulations. *Econ Inq* 52(3):1190–1203

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

