

Case Study of the Impact of Packing Regulations and Technical Standards on Export Trade*

Xue-Fei Du^a, Hyun-Sook Cho^b

^a School of Materials Science and Engineering, Jiujiang University, China

^b Division of International Trade, Wonkwang University, Korea

Received 31 August 2021, Revised 16 September 2021, Accepted 21 September 2021

Abstract

Purpose - The purpose of this study was to examine the impact of packing regulations as a technical standard barrier on export trade.

Design/methodology/approach - This study analyzed cases related to packing in major countries such as US, EU and so on. It is also show the example of export volume changed based on PRTS.

Findings - First, the role of packaging and the reason why countries issued relevant packaging provisions were introduced. Then, the impacts of PRTS on export trade were expounded. And next, we focused on investigating some PRTS related cases in export trade and gave an example of export volume changed based on PRTS. Finally, we produced implications for business leaders to aware of the importance of PRTS in export.

Research implications or Originality - This study provide PRTS information to traders. Trade practitioners can respond to PRTS related regulations, actively develop PRTS technology, and take relevant to deal with PRTS barriers to eliminate or weaken the adverse effects of PRTS on export trade.

Keywords: Export Trade, Packaging, Technical Standards, WTO, PRTS

JEL Classifications: F13, F53, K33

I. Introduction

In international trade, the packaging of export commodities is called export packaging. Packaging is one of the four main factors (quantity, quality, specification, and packaging) of international merchandise trade. Packaging is an integral part of products in import and export trade. It is also a bridge between the production and consumption of export commodities. Exports have different packaging requirements according to different product features. Only through proper packaging, the vast majority of export commodities can enter the circulation field and achieve trade, to realize the use-value and value of commodities. Packaging contributes to trade growth. First, packaging ensures goods trade success in various ways. In international trade, an effective packaging system is a precondition for long-distance transportation and efficient logistics. Second, packaging facilitates the smooth circulation of goods between

* This work was supported by Wonkwang University in 2021. This work excerpted from Xue-fei Du's doctoral dissertation for the academic year 2020.

^a First Author, E-mail: dxlaw@163.com

^b Corresponding Author, E-mail: chs1669@wku.ac.kr

© 2021 The Institute of Management and Economy Research, All rights reserved.

different countries. As a means of exchanging goods, packaging makes trade take place across international borders. Third, packaging has important economic value because it is one of the factors that packaging can reduce global commodity costs, shorten delivery time, improve supply chain efficiency, and improve the level of competition.

As a means of exchanging goods, packaging makes trade take place across international borders. Third, packaging has important economic value because it is one of the factors that packaging can reduce global commodity costs, shorten delivery time, improve supply chain efficiency, and improve the level of competition.

More and more attention has been paid to the treatment of packaging and its important role in the export trade. So the packaging has aroused widespread concern in society, which makes the packaging problems increasingly prominent in the field of international trade. In the current situation of fierce competition in the international market, many countries have taken the improvement of packaging as one of the important means to strengthen competition and the sale of foreign commodities. So, a series of packaging regulations and technical standards (PRTS) have emerged at the historic moment and have been widely used in the trade field. However, unfortunately, some of these packaging requirements have become technical barriers to import and export commodities in international trade, which has affected the ability to export manufactured goods, especially for developing countries.

Packaging is recognized by scholars as having a significant economic and environmental impact (Palsson and Hellstrom, 2016). The previous researches studied packaging-related regulations in major countries and regions, such as the European Union (EU), the United States (USA), and so on. They believed that packaging-related regulations affect export trade. Tan (2010) introduced the legislation of the EU Packaging and Packaging Waste Directive. The author pointed out that the EU Packaging Directive is a comprehensive product environmental policy. EU member states have transformed it into national legislation following the EU Packaging Directive, which has an impact on the economy, society, environment, and the recycling rate of packaging waste. Liu (2011) believed that product packaging not only refers to packaging materials but also involves a series of actions for designing and producing containers or adhesives. In the international market, packaging materials should meet the requirements of relevant safety standards. Different commodities have different packaging requirements. There are more and more restrictions on products, especially for food and medicine packaging. Wang and Sheng (2014) made a comparative analysis of the relevant provisions of the EU, USA and China in food packaging materials laws, regulations, and standards. There exist differences in food packaging definition and the relevant provisions. Liu and Wang (2005) pointed out that common forms of packaging barriers are mainly some regulations in international trade, which are: special regulations on packaging materials, container structure, packaging labels and marks, packaging pattern, language used in packaging, provisions concerning ports, etc. For the impact of packaging barriers on export, they believed that it is mainly reflected in the obstacles and difficulties brought to the export, which increases the cost of export and decreases international competitiveness. Wang et al. (2017) compared the similarities and differences in packaging standard systems (packaging materials, packaging waste, recycling, etc.) in the EU, the United States, Japan and Korea. They pointed out that packaging-related standard systems in various countries have shown obvious convergence, however, there are differences in the packaging in terms of concepts, specific evaluation, design, supply, processing, and standards. It is more difficult to establish uniform standards that can be applied to all in the world. Zhang and Wang (2011) studied the new standards on food packaging proposed by

the EU, USA, and Japan. The paper believed that these new requirements formed packaging trade barriers, affected product competitiveness and market access. The packaging of export commodities will differ according to different commodity characteristics in international trade. Many enterprises often ignore the composition test of export packaging, so that some qualified commodities are rejected by importing countries simply because of the difference in packaging materials. Liu (2010) introduced the green packaging legislation in the EU, the United States, Germany, and the causes of green packaging hinder international trade. Developed countries have set strict green packaging standards. These measures have played a positive role in reducing domestic packaging waste, but they have also created numerous obstacles to trade exchanges. The author believed that it is necessary to formulate packaging laws to protect the environment and reduce trade frictions. According to Yang and Zhu (2005), there were many laws and regulations related to commodity packaging. They believed that legislation is a successful experience in promoting the development of the packaging industry in developed countries. The process of commodity circulation can be carried on smoothly only select the appropriate packaging materials, scientific packaging container structure, and reasonable packaging technology. Long (2019) believed that packaging waste caused great damage to the environment. The author summarized the laws, regulations and technical standards which to restrict excessive packaging in China, the EU, Korea, and Japan, and proposed to construct and improve the legal system to control over-package.

The previous literature introduced issues related to packaging provisions from different aspects. They focused on expressing the impact of packaging provisions on export trade. Unlike the previous literature, this paper focuses on analyzing major countries' cases related to packaging and the implications of the results. In other words, this paper mainly analyses the impact of PRTS on export trade, the dispute cases related to (PRTS) and the implication based on the PRTS cases.

The main purpose of this paper aims to promote the research on PRTS and exert the application value of PRTS in the development of foreign trade. It is hoped that the study can provide more information about PRTS to traders. Trade practitioners can aware of the importance PRTS and respond to PRTS related regulations, actively develop PRTS technology, and take relevant measures to deal with PRTS barriers to eliminate or weaken the adverse effects of PRTS on export trade.

II. Impact of PRTS on Export Trade

As motioned above, PRTS is recognized as having a significant export trade. In this study, it is believed that PRTS related measures will increase the cost of exports and weaken the international competitiveness of products, reduce the volume of imports and exports, shrink the market sharing of import and export or products exit market, cause trade disputes or frictions, which may also cause chain reaction and affect bilateral or multilateral trade relations, etc.

1. Increase Costs and Weaken International Competitiveness of Export Products

Countries have issued packaging policies or regulations related to product trade and put

forward packaging requirements for export packaging. The export enterprises may be confronted with great challenges of the compliance of packaging standards and regulations. The USA, EU, Canada and the United Kingdom imposed strict restrictions on untreated wood-packed goods to enter their border. In addition, products need to obtain the national or internationally accepted certifications when they entering the European or American markets, such as the ISO14000 certification, the EU's CE, and US's UL and MIL. To comply with regulatory requirements, obtain the certificate of import licence of the importing country, enterprises have to improve product designs and modify the corresponding packaging design and spend a lot of money to meet this requirement. However, the conformance costs directly increase the cost of exported products and weaken the competitiveness of products in the international market, which puts export enterprises at a disadvantage (Livingstone and Sparks, 1994). For example, the application cost for ISO14000 certification is generally CNY 200,000-300,000, which is often difficult for some Small and Medium-sized Enterprises (SMEs) to bear (Zhang, 2015). All this means that the export cost of enterprises will increase, profits will decrease, export earnings will decrease, the international competitiveness of products will weaken, and the potential desire for trade will decrease.

2. Reduce Export Volume

National regulations limit the kind and quantity of exported products by packaging requirements from a single product to the industry. According to statistics, Chinese export goods are affected by the value of 24 billion US dollars each year, because they fail to meet the packaging requirements of developed countries. Some domestic enterprises pay less attention to packaging and ignore the requirements and regulations for commodity packaging in importing countries, which resulting that products cannot enter the importing countries. In addition, if the products are subject to tariffs, the product prices will rise and the demand will decline, resulting in a decline in exports.

3. Increase Export Risk

Due to the complicated customs clearance procedures and the complex inspection and quarantine procedures at ports, products are detained and cannot be entered into the market in a timely manner, which increases certain market risks. Generally, when the products are cleared for export, the corresponding materials shall be submitted such as the product qualification certificate and the import license. However, further inspections are needed for the implemented packaging technical standards (such as inspection and quarantine standards), which will take a certain amount of time. Take the positive list system implemented in Japan as an example, before implementation, it takes about 4 days to export products, but after implementation, the customs clearance time increases to 10-20 days, which exacerbates the possibility of deterioration of products (especially fresh agricultural products, food, short-lived products) and increase the risk of export (Yang, 2014).

4. Shrink Export Market Share or Products Exits the Market

Nowadays, the trend of regionalization and grouping of the world economy is constantly strengthening. This will make it more difficult for the export of commodities to enter the interna-

tional trade market and limit the development of the foreign trade industry. Export products will not be able to enter the international market smoothly, if export enterprises ignore environmental protection standards of product packaging and relevant national laws and regulations (Chen and Lei, 2004). The scope of the export market of some enterprises will shrink, and the exporters will lose part of the market share or withdraw from the international market. For example, the packaging standard of the EU stipulated that “the recycling rate of environmental packaging products should reach more than 85%”, which had a great impact on the packaging industry in developing countries. Many products were charged high costs of packaging waste disposal when they were exported to Europe. Chinese exports were denied access to the market and bore losses of up to 200 billion US dollars every year in foreign exchange for the reason that the packaging of products did not meet the environmental protection requirements or relevant packaging standards of importing countries (Liu, 2010). China’s one-use tablewares were banned from exporting to European markets because the products did not with “green standard”, which made some companies had withdrawn from the market.

5. Cause Trade Losses and Trigger Trade Frictions

Different countries and regions implement different packaging technology standards; trade frictions related to the packaging and trade losses to exporters are occurred frequently (Qi, 2014). Some products will suffer losses in export trade, if the recycling rate of packaging waste is low and difficult to dispose of. For example, a batch of mechanical products exported from China to the EU was blocked. The reason was that the wooden packaging materials (WPM) did not meet the EU’s quarantine standards. As a result, China’s export trade was lost more than 7 billion US dollars (Wang, 2018). Ceramic products exported from China to the USA used straw as packaging material, which didn’t comply with American regulations. The products were ordered to be destroyed. The standards imposed by the USA, Canada, and Britain on the wooden packaging of export goods affected China’s export of about 30 billion US dollars. In 2016, Chinese foreign trade encountered 117 cases of trade frictions and disputes, involving a total amount of 13.98 billion US dollars.

6. Cause Chain Reaction, Affecting Bilateral or Multilateral Trade Relations

The USA, EU, Japan, Canada and China are the main trading markets and the “main battlefield” of trade friction. Due to there exist differences in the level of industrial development in different countries, trade frictions are inevitable in international economic organizations which leading to tensions in bilateral or multilateral trade relations. A problem with the packaging of one company’s products can lead to strict inspections of all goods involving such packaging in other countries, that is, a chain reaction. For example, in September 1998, the U.S. Department of Agriculture required that Chinese products should be repackaged within a deadline due to the discovery of longhorn beetles in WPM; otherwise, after December 7 of the same year, the products that use the above-mentioned WPM exported to the USA would be prohibited. The USA also signed a decree and regulated that WPM from China must be accompanied with a certificate issued by an entry-exit inspection and quarantine agency, and certifying that the WPM has been undergone heat-treated, fumigated, or treated specifically. Since then, Canada, Australia, Britain, the EU responded quickly to banning Chinese WPM that has not been fumigated from entering their borders. These regulations increase packaging

costs by 20% and affect one-third of China's total exports to the above-mentioned regions.

III. Cases Related to PRTS

In this part, we focused on investigating some PRTS related cases in export trade and gave an example of export volume changed based on PRTS. These cases involving packaging provisions in packaging labeling, packaging safety and waste, packaging materials, packaging method, packaging protection function, packaging legislation, etc. The example of export volume changed based on PRTS is related to Australia's tobacco plain packaging that has been broadly known all over the world.

1. Issues in Major Countries

1.1 Cases Related to the EU

First of all, there are cases related to packaging labeling (Craddock, 2004; Mitchell, 2003). The EU's labeling legislation¹⁾ extended to all foods and ingredients produced from genetically modified (GM), even meat suppliers who feed their animals with transgenic grain will have to be clearly labeled GM-label their products, irrespective of whether they contain detectable GM material. The effect was that North American manufacturers had soon found their corn- or soy-based foodstuffs—virtually all of which are GM derived—tagged with likened to a “skull and crossbones on the packet.” The USA industry was particularly worried by the effect of European policy on its customers in the developing world. In October 2003, Zambia refused 63,000 tons of GM corn from USA. The USA farming interests were expected to press the White House to launch an immediate protest to the WTO, to smash European barriers to GM food imports. Europe's GM food moratorium was said to be costing US corn producers \$250 million a year in lost sales.

Second, It is about packaging safety and packaging waste. The EU is a major export market, and it is also the region with the complete product safety laws and regulations in the world. The RAPEX (Rapid Alert System for Non-Food Products) and RASFF (Rapid Alert System for Food and Feed) of the EU report products that do not meet safety requirements on the EU market. When products are found that they are associated with safety hazards, the RAPEX or RASFF will rapidly issue an alert of the information, so that to protect consumers from dangerous products (Song, 2015). In recent years, the EU has successively issued a series of laws and regulations and market access systems. Products exported to the EU were affected by relevant EU regulations. Let us see some cases of export products that do not meet the EU regulations were alerted by the RAPEX and RASFF. (Table 1) shows some notifications related to packaging of the Chinese exports to the EU.

1) Labeling. Any food or feed containing, consisting of, or produced from GMOs will need to be labeled in a way that indicates it contains GMOs. For GMOs that are currently approved in the EU, 'adventitious' levels of up to 0.9% will be permitted without the need for labeling; for GMOs that have not yet been fully approved in the EU but have received a favorable safety evaluation from a Community Scientific Committee, 'adventitious' levels of up to 0.5% will be permitted without the need for labeling. GMOs that have received neither EU approval nor a favorable risk evaluation will be forbidden. The labeling requirements do not apply to food products for which the manufacturing process has commenced before April 18, 2004.

Table 1. Some Notification Related to Packaging Issued by RASFF

Issue	No	Product Name	Submitted Country	Reason	Measures
Packaging label	2016.0865	Frozen cod fillet	Italy	Incorrect product labeling	Products were withdrawn from the market
Packaging sign	2016.0841	Chocolate bar	Sweden	The packaging signs were not list all substances	Products were recalled
Package migration	2016.ALY	Vacuum stopper	Italy	Packaging (substances of vacuum stopper) was transferred into products (migration 281mg/dm ²).	The products were banned from entry and returned
Package migration	2014.1406	Heart-shaped cake tray	Germany	The migration of heavy metal lead was found in the product (migration: 4.4mg/kg-ppm).	Products were recalled
Package migration	2012.BXI	flagon	Finland	The powdery matter of flagon transferred into the food.	Products were refused to be imported The products were not been put on the market and were seized by the authorities
Packing defect	2014.BYX	Canned bamboo shoots	Czech Republic	The packing was defective	

Source: <http://www.cccfna.org.cn/article/%E5%B8%82%E5%9C%BA%E6%8C%87%E5%8D%97/30206.html> (accessed February 22, 2021)

From January to July 2017, the EU RAPEX system notified and recalled 6 batches of toy products made in China. The reason for the notifications was that the products do not comply with the Directive on Packaging and Packaging Waste or EN71-1:2014. Following the alert, the importers took measures to withdraw the toy products from the market. This affected the toy products (annual exports of more than 400 million US dollars) made in Kunshan, China.

Third, There are some cases related to Energy-related Products. According to Entry-Exit Inspection and Quarantine Bureau, Anhui, China, the Energy-related Products (ErP) directive of EU is not only technical requirements for energy-related products, but also covers (packaging and packaging design, production and processing, transportation, import, packaging waste recycling, etc.) the technical management requirements of the entire industry chain. As packaging involves the whole life cycle of the product, this requires packaging materials, packaging design, and packaging waste to be environmental-friendly. This puts great pressure on the packaging of export products. Its influence has spread to upstream and downstream industries (office equipment, refrigerators, air conditioners, audio, etc.), resulting in an increase in export costs of China's exports to Europe by more than 20%.

Lastly, there are some cases related to CE mark, an example is the improper use of CE mark. In April 2009, products that were made by 5 power connector manufacturers in Ningbo, China, were returned by Spain, and 2 of them were officially notified by Spain that the products involved converters and sockets. The investigation found that the reason why the products were notified and returned was that the CE mark on the products did not meet the requirements of CE certification, and the products needed to be affixed with CE mark that was not labeled

with CE mark. As a result, the goods were detained, or destroyed, or returned, or notified after arriving at the EU ports.

1.2 Cases Related to the USA

First of all, it is about packaging materials (straw packing). In the early 1980s, the USA Customs banned the entry of goods that used straw as packing filler. The USA Customs found that two shipments of imitation of antique porcelain exported from China to Texas of USA were wrapped in straw. Immediately, they ordered to burn the straw used in the packaging in place and repackaged it, and asked China's export company to compensate the customer for the cost of burning straw and repacking fees. The two charges accounted for about 40% of the import price of the goods.

Second, It is a case related to animal and plant epidemic prevention (wooden packaging). In 1998, the USA discovered that the wood packaging materials of goods imported from China contained "long-horned beetles" that damage trees. Then the USA Department of Agriculture signed a decree and required that stringent regulations should be inspected for all wooden packaging, the wood packaging containers must be undergoing the treatment of high temperature, fumigation or preservative, otherwise, they will be refused entry. This decision will involve approximately 1 million containers imported from China each year. The ban affected 1/3 to 1/2 of China's total exports to the US, and one-third of the exported goods (about 62 billion US dollars) were returned that year. Subsequently, Canada, Australia, etc., also imposed strict controls on the WPM used in imported goods of China, and required that they must be treated with pest control in advance. In order to facilitate the export of traded goods to the US smoothly and avoid economic losses, China issued the "Urgent Notice on Disposal of Wood Packaging and Issues Related to Improving Packaging for Goods Exported to the USA" (Xue, 2006). In recent years, the inspection of foreign wooden packaging has become increasingly strict in countries. Some export wood packaging was identified to be a problem and dealt with. Although some export wood packaging is accompanied by a fumigation certificate (or logo), it was found that the wooden packaging contained harmful pests, which causing the enterprises engaged in heat treatment (fumigation) to be black-listed by the customs of the other countries.

Third, it is about the Case related to packaging marks. The "Meat Origin Label" of the USA required that all meat sold in the USA market, including imported and processed meat products, must indicate the origin. This provision has already sparked protests from Canada and Mexico, both of which belong to the North American Free Trade Area (NAFTA), they complain that the rule challenges trade convenience. It is common knowledge that the mark of origin is a kind of packaging mark of product. The packaging mark can provide information on the origin of the product, which can be traced back. The implementation of this rule has had impact on NAFTA and Chinese meat exporters to the US. It increases the cost of exports and increases the risk of return.

Forth, it is the case related to food labelling of packaging. In 2009, the USA implemented new "Food Labeling Guide". The regulation stipulated that companies (including those that produce, pack and store food) exporting food from abroad to the US must register with the U.S. FDA every year. When U.S. FDA has reason to believe that a food is substandard, it can require a voluntary recall or issue a mandatory recall order without providing definite evidence, and the cost incurred shall be borne by the company. At the same time, as long

as the U.S. FDA has reason to believe that a certain food is adulterated or mislabeled; the food can be detained administratively for up to 60 days from 30 days. The U.S. FDA also required that most foods must be marked with the content of at least 14 nutrients, which makes a leading American manufacturer in this field will spend an extra 1,05 billion US dollars for this each year (Zhang, et al., 2011). In some countries, nutrition labeling is mandatory and voluntary by statutory regulation (Table 2).

Table 2. Nutrition Labeling in Some Countries

Mandatory	Voluntary
Australia, Brazil, Canada, Chile, China, European Union, India, Indonesia, Malaysia, Mexico, New Zealand, Korea, United States, Uruguay	Japan, Kenya, Mauritius, Nigeria, Philippines, Singapore, South Africa, Thailand, Turkey, Venezuela

Source: Koen, Blaauw and Wentzel (2016).

Lastly, another case is related to improper packaging method. In late 2017, a company in Chengdu, China, exported a batch of wash bags to the USA. What the importer requested is the “Sleeve Card Packaging”, namely, the handle of product should be placed outside of package so that the products can be hung on the shelves for sale. However, the handle was enclosed when the factory was packing, which prevented the products from being directly hung on the shelves for sale. After received the goods, the importer required that the Chengdu Company compensate them for half of the retail price as compensation for packaging errors, or return the goods (half of the retail price was twice the value of the goods; the total cost of the return was equal to the value of the goods). After 5 months of negotiations, the exporter repackaged the products and offered 25% of the transaction amount as compensation for the delayed shelves. According to statistics, the total loss due to packaging errors reached 35% of the transaction amount (about 10,000 US dollars).

1.3 Case related to other major countries

First on is a case related to Australia. The “Tobacco Plain Packaging Act 2011” came into effect in Australia in 2012. The act set out detailed regulations on the retail packaging of tobacco products (such as Physical characteristics, built-in objects, attachments, cigarette brand, specifications, company name, printing specifications, etc.). All cigarettes sold in Australia must be packaged uniformly. Brand logos are not allowed to be printed on the packaging, and the brand name can only be printed in a fixed size in a fixed position.

The act has caused a strong global response. It is claimed that Australia’s scheme for tobacco plain packaging against the WTO Agreements (such as TRIPS Agreement, TBT Agreement). Honduras, the Dominican Republic, Cuba, and Indonesia, etc., have filed lawsuits against Australia. They claimed that the act was a discriminatory treatment of tobacco marks; it was restricting the legal rights of trademark owners and has an unreasonable obstruction to the use of trademarks; the act impeded the normal use of patent rights and violated Article 2.2 of TBT Agreement and various provisions of TRIPS of Art. 1, 2, 15, 16, 20 and 27, etc. The

tobacco plain packaging act infringed trademarks and intellectual property rights and the WTO Agreements. It has created unnecessary barriers to trading activities as well as international trade.

Australia Tobacco Plain Packaging is not just about tobacco, it is also closely related to “the right to protect public health”. It could cause a conflict within the international trade boundary. Although the act was legislated on the purpose of justifiable grounds, the businesses face challenges to meet the requirements of the regulations. This is the reason that the complainants raised the issues at the WTO.

Second example is a case related to Korea. The case was related to the provisions of the packing clause (wood packaging materials do not meet regulations). In April 2005, Korea exported 8 container cargoes to Shanghai, China. The goods were packed by “HANSUN EXPORT PACKING” company. After the goods arrived at the Shanghai port, the quarantine inspectors of Shanghai Quarantine Customs found that the batch of packaging materials was mixed with several types of non-conforming materials that did not meet the provisions, although the “Non-Coniferous Packing Instructions” was included in the package. As a result, the Korean export company was charged a processing fee of CNY 120,000, but, regrettably, the packaging cost was CNY 100,000, less than the charged fee.

Another example is a case related to China. One case was related to packaging protection function (unqualified packaging leads to damage during transportation of goods). In 2011, a batch of chemical raw materials was exported to the California Chemicals Corporation by a Chinese chemical import and export company. The cargo was shipped in compliance with the stipulations, and the quality of the cargo was good. When the goods arrived at the port of destination in San Francisco, the commodity inspection agency found that some of the goods were agglomerated and caked, and the quality had changed. The reason for the agglomeration and caked was due to the poor packaging, which does not play a good protective effect in protecting the goods, so, the goods absorbed moisture during transportation and damaged. The American company filed a claim lawsuit and sued for compensation, and as a result, the Chinese company bore the loss.

Another case was related to packaging protection function (product surface damage caused by insecure packaging). In 2017, bedding that worth a value of more than 1 million CNY exported to the USA by a furniture factory in Xiamen, China, which was returned by American customers, the Chinese company had a loss of more than CNY 150,000. The reason was that the packing was not strong enough. During transportation, the outer packaging box was destroyed seriously after several times of transshipment, which resulted in the damage of the surface material of the bedding product.

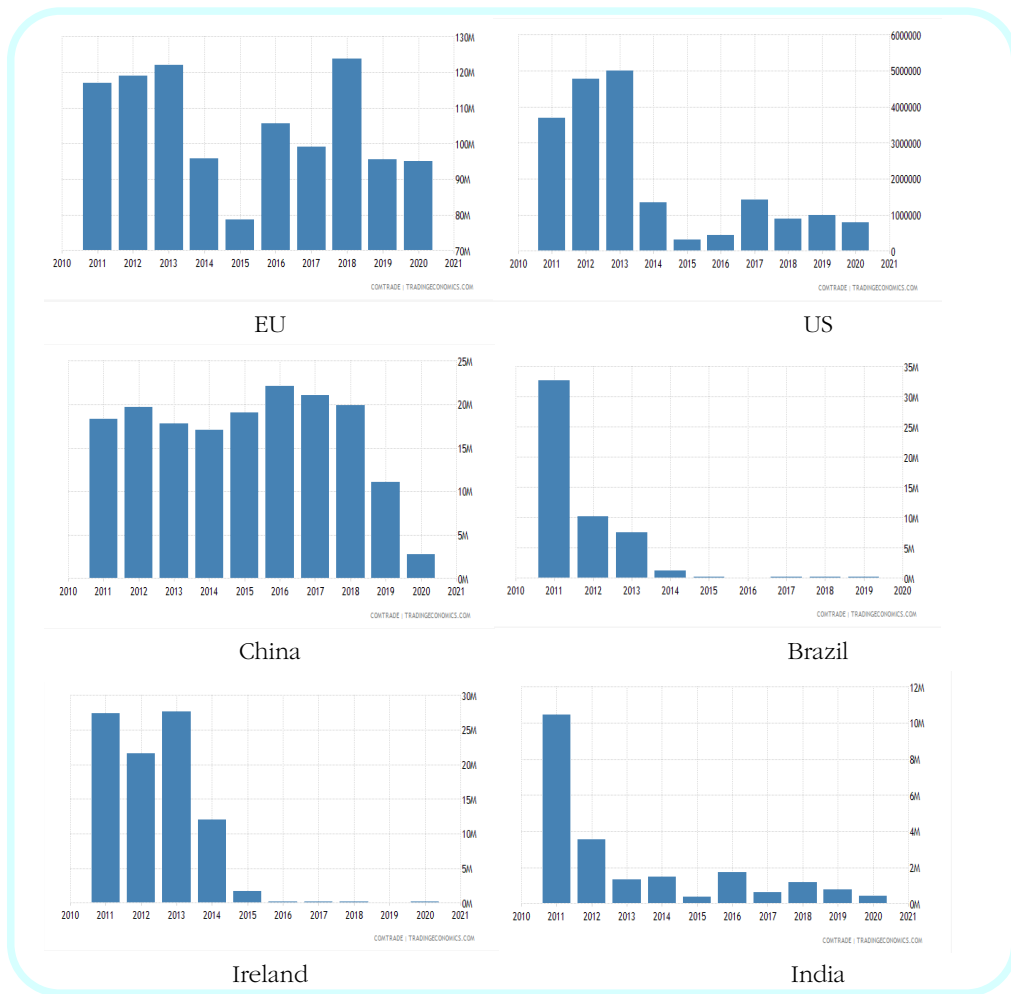
2. Example of the Variation of Export Volume Based on PRTS

PRTS measures are one of the most difficult trade barriers to describe due to PRTS as technical specification for packing involve a very wide range and shows a trend of diversification. There is no doubt that PRTS measures will have an impact on foreign trade. The clearest evidence of this is Australia's tobacco packaging. As known to all, as a typical standardized packaging regulation, Australia's tobacco packaging has been broadly discussed all over the world. For example, Buzard and Voon (2020) analyzed the trade restrictions bring by standardized packaging; they investigated the trade restrictiveness and the availability of trade-restrictive alternatives.

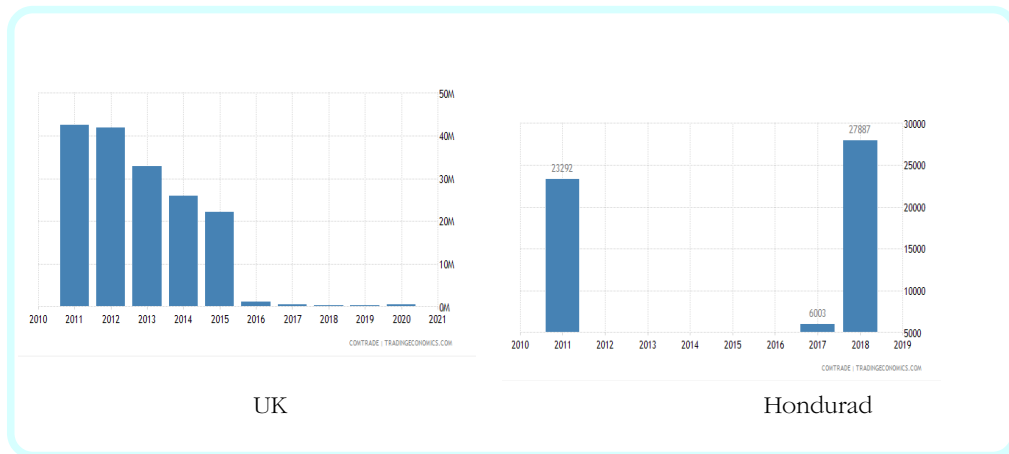
In addition, we inquired of the tobacco products exported by some major countries (EU, USA, China, Brazil, Ireland, India, United Kingdom and Honduras) to Australia from 2011 to 2020. The export values of tobacco products are shown in (Figure 1)²⁾.

We can know that there has been a decline change in tobacco exports from major countries to Australia since the introduction of tobacco packaging in Australia in 2011; especially, the export values (measured in US dollar) are fall significantly in Brazil, Ireland, India, and United Kingdom. To top them all, in the several years that followed, Honduras exports of tobacco products dropped to 0.

Fig. 1. Major Countries' Exports of Tobacco Products to Australia



2) The tobacco products include cigars, cheroots, cigarillos and cigarettes of tobacco or substitutes, other manufactured tobacco, homogenised tobacco, tobacco extract, essence, unmanufactured tobacco, tobacco refuse, etc. The export value is measured in US dollars. (Available from <https://tradingeconomics.com> accessed May 29, 2021.).



IV. Implications

From these cases, it can be known that exported goods have been detained, or destroyed, or returned, or notified by the importing country. Economic losses have happened because the packaging does not comply with the laws and regulations of the importing country or region, or because the packaging technology is not qualified, or the export goods are damaged. PRTS involves a very wide range and shows a trend of diversification. It is a complex issue that makes a comprehensive quality evaluation of the impact of PRTS during the entire life cycle assessment (LCA) of products.

First, packaging involves products in various industries in the trade field, such as agricultural, mechanical, electronic, food, daily-use products, chemical, textiles and clothing, home appliances industry, etc. The object of trading in international trade is goods, and packaging is the "coat" of goods. In import and export activities, packaging is always accompanied with products. Packaging requirements such as packaging materials, packaging technology, and shipping packaging marks are included in the trading cycle, and they will continue until the packaging wastes are disposed of. So, the packaging related issues will always be around in export trade. From this perspective, packaging has a great effect on trade, and plays an extensive and important coordinating role in international trade, especially in the context of increasing international environmental protection requirements.

Second, product packaging standards are framework clauses in international trade. Product packaging standards and technologies are one of the important contents of trade terms requirements. This is to say that packaging technology is one technical requirement of the technical trade barriers. Governments have implicit packaging restrictions on exporters when implementing trade measures. Although some developed countries do not directly impose restrictions on products, but they have set market access rules through packaging and labeling systems, technology standards systems, environmental and health quarantine systems. Packaging requirements are implied in trade terms such as environmental protection and health safety, and they have very important restrictive effect on the export of specific products. Most of these packaging requirements are technical standards that are difficult for products to meet

in a short period.

Third, in international trade, there exist differences in packaging technology levels in different countries. When the national environmental protection packaging regulations require a certain product to adopt a certain package, it often considers domestic resources, packaging materials, packaging technology, domestic producers and consumer preferences, domestic waste treatment facilities and other favorable conditions. These packaging regulations and standards provide unbroken policies and measures on packaging types, specifications, manufacturing materials, structures, shapes. Complex and diverse packaging regulations have put strict requirements for imported products. Due to the resources and technology of the exporters, the packaging materials used by exporters may be prohibited or restricted by the packaging regulations of the importing country. Diversified packaging will impose many troubles on the export trade of products from exporting countries.

Fourth, it is an effective way to avoid loss is that export products should according to the PRTS of importing country. In foreign trade, exporters should pay attention to the important role of packaging in trade, understand and grasp the relevant packaging requirements of the target country timely. Exporters should focus on the packaging quality of export goods, actively develop packaging technology, and adopt appropriate packaging methods. Especially in the process of logistics and transportation, exporters should pay special attention to the protective effect of packaging on the products, and ensure that the products are complete and intact in quantity and quality during the circulation process to avoid reputation damage and economic interest loss.

V. Conclusion

In general, PRTS are set up by developed countries with advanced technology. The importing countries formulate corresponding regulations, technical standards, and quality standards for imported goods. These have become a benchmark for assessing whether imported goods meet conformity assessment and product quality regulations. Unfortunately, some of these packaging requirements have become technical barriers to import and export commodities in international trade, which has affected the ability to export manufactured goods, especially for developing countries. The PRTS in imported countries not only require that the domestic packaging industries, packaging products should comply with relevant laws and regulations, but also require that imported packaging products should comply with the same laws and regulations, which will inevitably have an impact on international trade. So, the export environment for overseas trade will become more and more difficult.

This paper surveyed some cases related to PRTS and summarized the impact of PRTS on international trade. These cases involved in packaging material, packaging labelling and marks, animal and plant epidemic prevention, packaging method and protection function, and so on. The impacts of PRTS were mainly manifested as reducing export volume, increasing export cost and risk, triggering trade frictions, shrinking export market share or products exists the market, affecting bilateral or multilateral trade relations, etc.

PRTS of various countries constitute an incomplete standard system, and developing countries suffer from PRTS Technical Barriers to Trade (TBT) in various forms. Different countries adopted different requirements to import and export products in the form of packaging laws, regulations, and technical standards. The country-to-country differences in TBT will make prod-

ucts directly subject to import bans. If the imported goods fully meet the quality standards and comply with the regulations of the importing country, the goods can be exported to the importing country freely. On the contrary, once the quality of goods of the exporting country fails to meet the requirements of the importing country, the goods will be prohibited, and the export will be hindered. Although the products meet the standard, they will be excluded from the market due to the different ways in which the conformity assessment process is implemented. Packaging regulations may create unnecessary obstacles to trade activities, and also likely bring challenges and chances for exporting enterprises. From an environmental and energy perspective, the packaging system has a positive effect. However, there are no unified international laws and regulations; different countries have different packaging standards and requirements, packaging regulations on import and export show a difference from country to country. As a result, the PRTS will lead to conflicts within international trade boundaries, foreign trade exporters will also lose some trade opportunities, and the future trade environment will be affected.

This paper just limited on case study but statistic analysis might be necessary to quantify the impact of PRTS on exports in the future.

References

- Buzard, K. and T. Voon (2020), "How Trade-Restrictive Is Standardized Packaging? Economic and Legal Implications of the WTO Panel Reports in Australia–Tobacco Plain Packaging", *World Trade Review*, Vol. 19, No. 2, pp. 267-281.
- Chen, S.R. and Y.S. Lei (2004), "Green Packaging and China's Export Trade", *Journal of Guangdong University of Technology*, Vol. 4, No. 1, pp. 22-24.
- Craddock, N. (2004), "Flies in the Soup--European GM Labeling Legislation", *Nature Biotechnology*, Vol. 22, No. 4, pp. 383-384.
- Fernie, J. and L. Sparks (2004), *Logistics and Retail Management: Insights into Current Practice and Trends from Leading Experts* (2nd ed.), London: Kogan Page.
- Koen, N., R. Blaauw. and E. Wentzel-Viljoen (2016), "Food and Nutrition Labelling: the Past, Present and the Way Forward", *South African Journal of Clinical Nutrition*, Vol. 29, No. 1, pp. 13-21.
- Liu, J. and J.F. Wang (2005), "Discussion on How to Break through the Packaging Barrier in International Trade." *Economist*, No. 5, pp. 51-52.
- Liu, P. (2010), *Green Package in International Trade, Legal Research* (Master's Thesis), Guizhou: Guizhou University.
- Liu, T. (2011), *Study on Green Packaging of China's Agricultural Exports and Countermeasures* (Master's Thesis), Dongbei: Dongbei University of Finance and Economics.
- Livingstone, S. & L. Sparks. (1994), "The New German Packaging Laws: Effects on Firms Exporting to Germany", *International Journal of Physical Distribution & Logistics Management*, Vol. 24, No. 7, pp. 15-25.
- Long, M. (2019), *Discuss on the Legal Regulation of Excessive Packaging of Goods* (Master's Thesis), Hunan: Hunan University of Technology.
- Mitchell, P. (2003), "Europe Angers US with Strict GM Labeling", *Nature Biotechnology*, Vol. 21, pp. 6.
- Palsson, H. and D. Hellstrom (2016), "Packaging Logistics in Supply Chain Practice–Current State, Trade-Offs and Improvement Potential", *International Journal of Logistics Research and Applications*, Vol. 19, No. 5, pp. 351-368.
- Qi, Y. (2014), "Analysis of Problems Related to Goods Packaging in International Export Trade", *China*

- Business Update*, No. 6, pp. 34-35.
- Song, L. (2015), "Information Bulletin and Case Analysis of Rapid Alert System for Non-Food Products-RAPEX", *Standard Science*, No. 9, pp. 79-81.
- Tan, W. (2010), *A Study of Directive on Packaging and Packaging Waste in EU* (Doctoral Dissertation), Hunan: Hunan University.
- Wang, J., W.S, Wang, B.Y, Su. and Y.J, Li. (2017), "Comparison Between Domestic and International Standards of Green Packaging", *Packaging Engineering*, Vol. 38, No. 19, pp. 232-236.
- Wang, J.J. and J.P, Sheng (2014), "Analysis on Food Packaging Materials Laws and Regulations and Standards Between China and Some Developed Countries", *Journal of Food Safety and Quality*, Vol. 5, No. 11, pp. 3548-3552.
- Wang, Z.J. (2018), *Study on the Construction of China's Packaging Law and Regulation System* (Master's Thesis), Hunan: Hunan University of Technology.
- Xue, Y.M. (2006), *The Study on Green Packaging Strategy of China's Export Enterprises* (Master's Thesis), Tianjin: Tianjin University.
- Yang, F. (2014), *Study on Influences of Green Trade Barriers on Chinese Agricultural Product Export* (Master's Thesis), Beijing: Jiaotong University.
- Yang, Z.B. and D.D, Zhu. (2005), "Research into Law and Regulation of Commodity Package of China", *Journal of Chongqing Technology and Business University*, Vol. 22, No. 5, pp. 508-512.
- Zhang, B. (2015), *The Development of Green Logistics in Developed Countries and its Impact on China's Foreign Trade* (Doctoral Dissertation), Jilin: Jilin University.
- Zhang, X.Y. and D.H, Wang (2011), "New Trends in Food Packaging Trade Barriers and Countermeasures under Low-Carbon Economy", *Journal of Central University of Finance & Economics*, No. 12, pp. 65-69.