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Technical Barriers to Trade: A Canadian Perspective on Ecolabelling

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Abstract:
Ecolabelling is a market-based instrument and an important element of international environmental policies. In our day and age, there is a wide range of ecolabels, which may complicate the decision-making process when looking for the best outcome for consumers and producers. The International Organization for Standardization (ISO) and Global Ecolabelling Network (GEN) suggest a solution to align the various ecolabelling programs. For instance, ISO launched the ISO 14,001 framework, which includes the requirements for Environmental Management Systems (EMSs). The GEN harmonizes international ecolabelling schemes and improves exchanges of information among its country members. This article addresses how unaligned and aligned regulations impact international trade. Consequently, a database including the ISO 14,001 certifications of all countries and containing the exports from 153 countries to Canada from 2001 to 2015 as a dependent variable was created. The remaining variables will serve as independent variables, including gravity variables such as market size, market similarity, distance, and some other core variables such as GEN membership of the exporting country, WTO membership, binding in Free Trade Agreements (FTA) and Mutual Recognition Agreements (MRA) with Canada. Findings show that holding ISO 14,001 certifications has a positive impact on exports to Canada; however, these impacts are not significant enough. Therefore, there is not strong evidence that ISO 14,001 creates barriers to export to Canada. In addition, GEN membership significantly promotes exports to Canada, especially for countries binding in an FTA or MRA with Canada.

Keywords: technical barriers to trade, ecolabelling, exports, Canada
DOI: 10.1515/gej-2017-0090

1 Introduction

Growing concerns on environmentally-friendly activities have created a large demand for environmental and safety measures. The main objectives of ecolabelling are "to raise consumer awareness about the environmental effects of products, to inform consumers about the environmental characteristics of a product and to promote the adoption of more environmentally sound production methods and technologies" (UNEP 1997); however, evidence from the academic literature show that not all ecolabelling programs are consistent with these objectives.[1] The implementation of ecolabels and ecolabelling programs needs substantial investments such as training specialists, upgrading processes and purchasing equipment. Although ecolabelling is optional, it carries some characteristics of technical barriers to trade (TBT). There are some discussions among World Trade Organization (WTO) members that ecolabelling should fall into Trade-Related Environmental Measures (TREMs) and that the regulations in the WTO TBT Agreement should be applied to them. Also, welfare returns to investments in ecolabelling, and its success in terms of environmental protection depend on how firms would uptake ecolabelling certifications and consumer demands for ecolabelled products.

The growth of environmental activities over the past decades resulted in an increase in ecolabelling organizations (ELOs) engaged in environmental certifications and ecolabelling programs (Delmas, Nairn-Birch, and Balzarova 2013). The ELOs are non-governmental institutions that establish a set of standards and rules of conduct to guide companies in the application of ecolabelling and the offering of ecolabelling programs. In fact, ecolabels should get certified by third parties, either a governmental or a non-governmental organization (Dauvergne and Lister 2010); however, ELOs are not the only parties involved in conducting and operating

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ecolabelling standards. Civil society groups, industry associations, corporations and hybrid public-private organizations were also created to control ecolabelling standards (Ven 2015). Hence, this diversity and lack of universal monitoring authority may create some major problems in terms of credibility and rigor.

Ecolabelling has obtained an effective ecological role in society. It contributes to environmentally-friendly activities and promotes sustainable development (Prieto-Sandoval et al. 2016; Gutiérrez et al. 2012); however, the higher price of ecolabelled products and the lack of trust in unknown ecolabels affect the demand for ecolabelling.

Environmental concerns rose among Canadian citizens over the past few decades. Consequently, on the one hand, policymakers started regulating business activities, and on the other hand, producers and service providers started offering environmentally-friendly products or services with environmentally friendly claims. These claims include: natural, recyclable, eco-friendly, low energy, recycled content, etc., which can be defined as "ecolabels". The Global Ecolabelling Network (GEN) defines ecolabelling as follows:

> Ecolabelling is a voluntary method of environmental performance certification and labelling that is practiced around the world. An ecolabel is a label that identifies the overall, proven environmental preference of a product or service within a specific product/service category.

In the Canadian context, ECOLOGO has been successfully implemented over the past two decades. ECOLOGO certifications fall in the same category as the International Organization of Standardization ISO type 1 ecolabels. Here, we analyze the impacts of another ecolabelling certification - ISO 14,001 - as a technical barrier to trade on exports to Canada. The question is whether or not the dissimilarity between two ecolabelling programs, ECOLOGO and ISO, negatively affects exports to Canada. We also analyze the influence of ecolabelling networks such as the Global Ecolabelling Network (GEN) on the promotion of international trade. We choose imports from 153 countries to Canada over a period of 11 years, from 2003 to 2013. In terms of methodology, we design a time-series cross-section estimation, based on an augmented-gravity model (Anderson 1979; Helpman1987). Next section presents a background on Canadian ISO 14,001 certifications and GEN. Section 3 presents the literature review on trade and ecolabelling, trade agreements and environment, and ecolabelling in a global perspective. Table 1 presents a set of standards that ISO set as 14001 certification.

Table 1: ISO 14001 certification.

Designation	Title
UNI EN ISO 14,020	Environmental labels and declarations – General principles
UNI EN ISO 14,024	Environmental labels and declarations – Type I environmental labelling –Principles and procedures
UNI EN ISO 14,021	Environmental labels and declarations – Self-declared environmental claims – (Type II environmental labelling) "…sets out specific standard requisites and terms for the description; defines the assessment methodology to follow, sets out specific guidelines, confirming the manufacturer's declaration validity."
ISO/TR 14,025	Environmental labels and declarations – Type III environmental declarations "…is a non-compulsory instrument that does not express the environmental performance of a product/service, with reference to pre-defined indicators."

Source: www.iso.org
Furthermore, most ecolabelling organizations follow Type 1 ecolabels as defined by ISO 14,024.

2 Background

2.1 ISO 14,001 certification

Consumers of countries with a recognized ecolabelling program hardly trust another ecolabel. The variety of ecolabelling schemes and trust issues calls for the standardization and unification of practices. In September 1996, the International Organization for Standardization (ISO) launched ISO 14,001 to harmonize the various ecolabelling programs (Jiang and Bansal 2003). ISO 14,001 is an international standard that issues some requirements for an Environmental Management System (EMS). ISO 14,001 is very similar to ISO 9001 quality management standards. By the end of 2016, 1,644,357 ISO 14,001 certifications had been issued for organizations in 201 countries.[2] Almost 52 % of theses certifications belong to East Asian and Pacific areas versus less

than 1 % to Africa areas. In 2015, ISO reports that organizations that are ISO 14,001 certified have improved their overall environmental performances. In addition to environmental advantages, these standards also have economic advantages for organizations as listed below:

- *Cost savings*: Avoiding unnecessary usage can lead to sizeable cost savings. In 2015, ISO estimates savings of 1,000 per employee when trying to improve resource use.
- *Waste reduction*: It is easy to cut waste once you know what you actually use. Not only does this avoid the use of landfills, but further costs are saved by reducing waste disposal.
- *Competitive advantage*: In an increasingly difficult financial environment, the cachet of holding an internationally recognized standard sets you apart from the competition.
- *Win new business*: ISO 14,001 is a proven business winner, helping those bidding for local and central government projects to make the perfect bid. In the private sector, the standard is increasingly becoming a supply chain requirement.
- *Retain existing customers*: It is easier to retain existing clients than to find new ones. Showing your commitment toward reducing your environmental impact gives customers another reason to be loyal.
- *Legislative compliance*: Failure to comply with environmental legislations could result in a PR disaster, fine or further prosecution. You can stay safe with ISO 14,001.

Many countries accepted ISO 14,001 as a universal environmental certificate (Hall et al., 2015); however, the response toward this ISO was not the same in North American countries and multinational firms with multiple subsidiaries (Jiang and Bansal 2003). Jiang and Bansal (2003) conducted a survey on the application and performance of ISO 14,001 in North America. They interviewed members of the Canadian pulp and paper industry who hold the ISO 14,001 certification. They mentioned that the cost of obtaining an environmental certificate like ISO 14,001 was between $24,000 and $128,000, and that to maintain ISO 14,001 could cost between $5,000 and $10,000 (2003 cost estimates); however, if the firm already obtained the sophisticated EMS, the cost for an ISO 14,001 certification would be much less than the others with no basis. They claimed that the comparative advantage of the certificate motivates most businesses, even those with financial problems (Bansal 2002; Jiang and Bansal 2003). Furthermore, factors like "market demand", "institutional pressure," and "management control" were other indicators influencing the request for ISO 14,001 certification. This standard does not impose a specific technology but just mandates firms to have their EMS audited by the third-party. Hence, the production process should be clearly documented and conducted by experts to be appropriate for auditors for certification. Evidence shows that to achieve this, professional training and investment in documentation are required (Lim and Prakash 2014). Therefore, businesses must spend extra money to meet certification requirements. According to the data on ISO's website, some businesses with a lower income cannot afford obtaining the ISO 14,001 certification. Meanwhile, businesses in developing countries have been actively applying for the certificate in order to access the global market. Figure 1 shows the number of ISO 14,001 certifications across different countries by end of 2016.

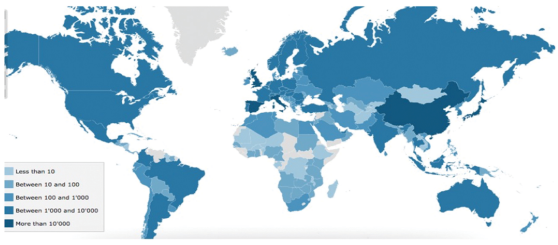

Figure 1: Number of ISO 14,001 certifications per country by the end of 2016.
Source: www.iso.org

ISO categorizes ecolabelling into three types of voluntary labels: Type I - lifecycle based, voluntary, multisectoral, environmental leadership, third-party labelling schemes Type II- self-declared claims (either lifecycle or single issue) Type III- environmental performance declarations or reports (non-selective). As Table 2 reads, ISO 14,024 contains Type I, ISO 14,021 contains Type II, and the ISO 14,025 contains Type III.

Table 2: List of GEN members (as of February 2018).

Country	Member

Australia	Good Environmental Choice Australia Ltd.
Brazil	Associacao Brasileira de Normas Tecnicas (ABNT)
China	China Environmental United Certification Center
China	China Quality Centre (CQC)
Chinese Taipei	Environment and Development Foundation
European Union	European Commission
Germany	German Federal Environmental Agency
Germany	TÜV Rheinland
Hong Kong	Green Council
India	Confederation of Indian Industry
Indonesia	Ministry of Environment
Israel	The Standards Institution of Israel (SII)
Japan	Japan Environment Association (JEA)
Kazakhstan	International Academy of Ecology of the Republic of Kazakhstan
Korea	Korea Eco-Products Institute
Malaysia	SIRIM QAS International Sdn Bhd
New Zealand	The New Zealand Ecolabelling Trust
Nordic countries	Nordic Ecolabelling Board: The Nordic Swan
North America	ECOLOGO- UL environment
North America	Green Seal Inc.
Philippines	Philippine Center For Environmental Protection and Sustainable Development,
Russia	Eco-logical Union
Singapore	Singapore Environment Council
Sweden	Swedish Society for Nature Conservation (SSNC)
Sweden	TCO Development (TCO)
Thailand	Thailand Environment Institute
Ukraine	All Ukrainian NGO Living Planet

Source: www.iso.org

2.2 Global ecolabelling network (GEN)

The Global Ecolabelling Network (GEN) is a non-profit association of third-party, environmental performance recognition, certification and labelling organizations founded in 1994 to facilitate the alignment of ecolabelling programs (Dauvergne and Lister 2010). It is an association of representatives of ecolabelling organizations, which follow Type 1 ecolabels as defined by ISO 14,024. The mission of GEN is to improve, develop and promote the ecolabelling of products and the credibility of ecolabelling programs worldwide. The GEN fosters cooperation, information exchange and harmonization among its members. The GEN does not develop criteria or certify products; instead, it supports members by developing environmental leadership standards in ecolabelling. Since the GEN is an association of labelling organizations, countries cannot become members of the GEN but are represented by the ecolabelling programs. The GEN currently has 27 members, the latest of which are listed in Table 2.

One of the activities of the GEN members is setting criteria for products and services with lower environmental burdens to provide a framework to exchange their information and cooperate among ecolabelling organizations. The GEN defines ecolabelling as the only program that is lifecycle based, voluntary, third-party, multi-sectoral and selective, according to the standards definition in ISO Type I, including 14,024 (GEN Report, 2003). Moreover, the goal is to increase the supply and demand for environmental labelling products and services; however, despite all of these efforts, the literature shows no evidence of success for the GEN in achieving its goals. This paper includes GEN membership as a factor to examine whether it eliminates uncertainty or improves the reputation of ecolabels for its member countries, especially those that are less developed. In 2003, the GEN launched the Global Ecolabelling Network's Internationally Coordinated Ecolabelling System (GENICES) process, a framework for evaluating and auditing programs operated by GEN members to obtain mutual trust and recognition among all members. The GENICES ensures that the programs are in fact reputable operating Type I ecolabelling programs in compliance with ISO 14,024. Applicants that successfully completed the GENICES sign a multilateral mutual recognition agreement (MMRA). GEN members conduct periodic reviews and update environmental criteria and categories by considering technological and marketplace development (RSMeans 2011). The ECP of Canada submitted the GENICES application in March 2006; however, later in 2010, the ECP management was transferred to Underwriters Laboratories (UL) Environment who was already a GEN member, thus also making Canada represented in the GEN. The UL Environment is a global labelling company that reinforces the credibility of sustainable product claims through their certification, validation and testing

services. The UL Environment assists companies in their development and the execution and communication of their sustainability strategies and initiatives with advisory services. The UL ECOLOGO certifies products that meet multi-attribute, lifecycle-based sustainability standards. These standards set metrics for a wide variety of criteria for products in such categories as materials, energy, manufacturing and operations, health and environment, product performance and use, and product stewardship and innovation. No literature currently analyzes the effect of Canada's participation in the GEN as well as the effect of the transfer of ECOLOGO to the UL Environment.

3 Literature Review

3.1 Trade and ecolabelling

To facilitate trade, countries frequently sign trade agreements, which eliminate tariffs and reduce non-tariff barriers to trade. Sustainable development issues, including environmental protection, are a prominent feature of many trade agreements. Increasing interest in environmental protection and conservation in sustainable development are strongly connected to the development of ecolabelling schemes. Harmonizing ecolabelling and certification, among other approaches, can achieve both goals of protecting the environment and promoting trade (Esty and Geradin 1997). In addition, eliminating tariffs frees up resources for exporting countries that can then redirect them toward adopting ecolabelling if they expect them to be profitable. For example, Rugman and Verbeke (1998), who studied international environmental policies and the behavior of firms, report that an approved ecolabelled product in the market of the importing country creates a competitive edge for exporters especially when consumers are highly motivated to buy ecolabelled products. On the other hand, there are some discussions about the need for the Canadian government to "impose increasingly demanding sustainability requirements on producers and supply chain actors to protect Canadian resources, beyond current environmental programming" (MacRae 2014). Therefore, as discussed, ecolabels are more likely to be TBT for exporters to Canada. Vranes (2011) advises against the implementation of mandatory ecolabelling and instead proposes voluntary ecolabelling, which is not discriminatory against trade; however, there is no evidence whether Canadian trade agreements eliminate the trade-impeding impacts of ecolabelling. This paper aims to explore the role of WTO, FTAs and MRAs on promoting exports to Canada. The following section discusses the WTO as a trade organization that suggests special treatment for technical barriers to trade. The TBT Agreement has been launched by the WTO to unify technical regulations across the countries and eliminate regulations that are discriminatory toward trade.

3.1.1 WTO and Ecolabelling

Following the dissatisfaction with the pre-Uruguay round treatment of trade and the environment, the WTO dedicated an official part of its agenda to trade and the environment. This resulted in the establishment of a WTO Committee on Trade and Environment (CTE). One of the CTE's missions is to examine trade measures for environmental purposes including those issued in multilateral agreements, ecolabelling and exports of domestically prohibited goods (Trebilcock and Howse 2005); however, there has been some dispute about environmental labelling regulations among WTO members. The 2001 Doha Declaration demanded that the CTE include environmental labelling in its special concerns. Meanwhile, some members suggested including ecolabelling in the TBT Agreement. Current disciplines in the TBT Agreement apply to environmental labelling (ecolabelling) since this agreement identifies rights and obligations for both mandatory and voluntary labelling programs.

According to WTO reports, more than 10 % of all notifications issued by the TBT and Sanitary and Phytosanitary Measures (SPS) were issued under the environmental protection objective. Most of these notifications touched on soil and water pollution abatement, energy conservation, planet and forestry conservation, consumer information, and protection of plants or territory from pests and diseases. Almost 20 % of trade issues discussed by the TBT Committee were about measures aimed at environmental protection. These trade issues include the control of hazardous substances, chemicals, heavy metals, and vehicle and air pollution, the energy efficiency of equipment and electrical appliances (e. g., resource management, waste, reuse and recycling of vehicles, and electrical and electronic products), and other concerns about wood, fishery and seal products.

The TBT Agreement issued the Code of Good Practice for the Preparation, Adoption and Application of Standards for voluntary environmental labelling. This code must be used by any standardizing body within the territory of WTO members. In this matter, the WTO shares the information with the ISO/IEC Information Center. The Code requests that any standardization body in the member countries that accepted or withdrew

from this Code report to the ISO/IEC Information Center in Geneva; however, we must still determine "what special characteristics of a technical regulation distinguish it from other regulations and make it subject to more detailed obligations in the TBT Agreement" (Du 2015).

Aiming at improving its members' knowledge about labelling requirements, the TBT committee organized the "Learning Event" on labelling, which covered both the implementation of the TBT Agreement and the impact of the requirements on market access. Given that some members are concerned that ecolabelling creates barriers for their exports, the TBT committee gave members the opportunity to share their perspectives on ecolabelling issues and the challenges of implementing ecolabels in their countries (Xu et al. 2012; Pérez-Ramírez and Lluch-Cota 2010).

Conformance of ecolabels with the international business rules set forth by the WTO is the focus of the research by Bartenstein and Lavallée (2003) who suggest that ecolabelling may become a "green protectionism" tool. That is, national governments could be pursuing the objective of creating or keeping the competitive advantage of their national products using ecolabelling in the name of environmental protection. This, in turn, could harm the reputation of ecolabels and undermine their true objective. Their analysis shows that ecolabels are not at serious risk of violating the relevant rules of international trade under the WTO agreements. Due to the absence of state constraints, they represent a legal and authorized commercial tool. That is, the ecolabel does not appear to be designed to distort competition through state intervention and does not constitute an unjustified restriction on trade but rather serves as a means to participate in the competition and benefit from it; however, the authors suggest that ecolabels of western countries can have a de facto discriminatory effect on developing countries. On the one hand, it is not clear whether their environmental protection priorities are the same as those of rich countries. On the other hand, developing countries do not have the same financial capacity and technological means.

The WTO has been offering technical assistance to facilitate the application of ecolabelling programs for lower-income countries. The Trade and Environment Committee pays special attention to the subject of environmental requirements and market access and its effects on developing countries. All WTO member governments acknowledge that sustainable development depends on improved market access for products from developing countries. Environmental standards applied by some countries could result in unwarranted economic and social costs for other countries. The WTO is widespread enough to ensure that environmental regulations and standards do not create barriers to trade. Therefore, to remain consistent with WTO rules, its member governments take the capability of developing countries into account. Given the WTO's efforts in helping less-developed countries own their national ecolabels, some may question whether consumers in developed countries recognize these ecolabels or require well-known third-party certifications.

3.1.2 Trade Agreement and Environment

Canada is currently involved in several trade agreements or negotiations such as the Trans-Pacific Partnership Agreement (TPPA), Canada-European Union Comprehensive Economic and Trade Agreement (CETA) and Canada-Korea Free Trade Agreement. Next, we review the recent related literature across different fields to describe each agreement in more details.

3.1.2.1 Trans-Pacific Partnership Agreement

The TPPA is one of the most important multilateral free trade and investment agreements in recent years (Zhang et al. 2017). The purpose of the TPPA is to promote economic growth, support the creation and retention of jobs, enhance innovation, productivity and competitiveness, raise living standards, reduce poverty in the signatory countries, promote transparency and good governance, and enhance labor and environmental protection. The final TPPA proposal was signed on 4th February 2016, between Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, Vietnam and the US; however, after the US withdrew on 23rd January 2017, there were concerns whether the TPPA would be implemented or not. Japanese representatives declared that the TPPA was "meaningless", even though the Australian Prime Minister refused to accept that the TPPA was indeed dead. Despite the numerous goals of the TPPA, some argue that it has not fulfilled its objective of "environmental protection". In October 2016, the Foreign Affairs, Defense, and Trade Reference Committee of the US Senate published a critical analysis of Chapter 20 of the TPPA. The report states that "a close reading of the text of the TPPA reveals that the Environment Chapter fails to provide for sufficient protection in respect of the environment across the Pacific Rim." This Committee also argued that the environmental chapter of the TPPA lacked meaningful enforcement of environmental rules and standards.

Carrey and Holmes (2017) studied the impact of the TPPA on the Canadian automotive industry. They concluded that there is an increase in Canadian import penetration by vehicles manufactured in Japan due to the

removal of tariffs by up to 6.1 %. Hence, domestic vehicle production is negatively affected by an increase in imports resulting in a negative impact on automotive production and employment in Canada. Another study on the TPPA, by Ruckert et al. (2017), showed that obligations in regional trade agreements including the TPPA may conflict with several health-related sustainable development goals. The conflicts included unhealthy commodities, threats to equitable access to essential health services, medicine and vaccines, and reduced flexibility of government regulations. Karacaovali et al. (2017) analyzed international trade relations between the US, Canada, and Mexico with TPPA countries. They evaluated the gravity model using trade data collected between 1980 and 2015. Their results indicate that existing free-trade agreements among TPPA countries and between TPPA members and non-member countries affected trade in a positive way.

The impact of the TPPA on some non-member countries has also been studied. Zhang et al. (2017) conducted a comprehensive research on the relationship between China and TPPA countries from the perspective of the virtual water trade and agricultural products. They concluded that China imports many agricultural products from TPPA countries. Meanwhile, China exports a grey water footprint to TPPA countries, which is very important from an environmental perspective.

3.1.2.2 Canada-European Union Comprehensive Economic and Trade Agreement (CETA)

The CETA is the biggest Canadian trade agreement as of 2017. It is a progressive free trade agreement that covers virtually all sectors and aspects of Canada-EU trade in order to eliminate or reduce barriers (Warin 2015). Here is a little bit of history about the CETA. In March 2004, Canada and EU leaders agreed to set up a framework for a new Canada-EU Trade and Investment Enhancement Agreement (TIEA). The CETA includes a trade and environment section, which proposes collaboration on technical regulations and standards through the TBT process. In the TIEA, ecolabelling is mentioned as an important issue in the chapter on sustainable development:

"Environment: transfers of environmentally friendly technologies, voluntary ecolabelling and certification, trade and environment technical assistance and capacity building." In addition, Canada committed to recognize the benefits of ecolabelling and environmental performance goals and standards; however, the CETA references sustainable management and development (including ecolabelling) in relation to only two sectors: forestry and fisheries. Other industries such as mining, energy and transportation have not been included in the CETA.

It has been estimated that the CETA imposes additional costs in the magnitude of CAD 80 mln–1.6 bln to the Canadian public healthcare system (Lexchin and Gagnon 2013); however, some studies support the CETA and see opportunities in this trade agreement. Warin (2015) states that, first, 98 % of the tariffs for the EU will be eliminated, and within seven years, 99 % of custom duties will have disappeared. Second, European certification can be obtained in Canada, meaning that Canadian exporters will not need to go to Europe to get European Conformity (Conformité Européenne or CE) certification. The effectiveness of including such sections in the CETA has not been studied from a Canadian perspective yet.

3.1.2.3 Canada-Korea Free Trade Agreement

The Canada-Korea Free Trade Agreement is the first FTA in the Asian region. Korea is the 11th largest economy worldwide and the 4th largest economy in Asia. The CKFTA came into force on January 2015. The Canadian-Korean agreement is limited in its scope and does not include Canadian purchasing, pricing and distribution practices. The CKFTA has applied much of the already existing WTO Agreement on Sanitary and Phytosanitary Measures (SPS Agreement) and the TBT Agreement; however, this agreement does not cover provincial, territorial or municipal procurement projects in Canada (Kukucha 2016). Bachmann (2017) suggested that the Canada-Korea FTA has small impacts on transportation gateways and is mostly concentrated in the Asia-Pacific Gateway, specifically in the Port of Vancouver, British Columbia. The Korea Ecolabel program launched by the Korea Eco-Products Institute (KEITI) in 1992 includes 150 standards and more than 10,000 awarded labels. The KEITI sets up the environmental standards, and through an evaluation system, offers eco-products and information on environmental trends to the public. The Korea Ecolabel program is a member of the GEN.

There are some discussions about the successful model of trade agreements between countries. Lake (2017) suggested a dynamic farsighted model of network development among asymmetric countries. He concluded that free trade agreements (FTAs) prevent global free trade when two larger economies (countries) border a smaller economy; however, when two small economies join a larger one, FTAs can become necessary for global free trade.

To conclude, one strategy is to pursue more clear and operational labelling rules through trade agreements to reduce trade barriers (Smyth, Kerr, and Phillips 2017). Another strategy is to influence demand for the new regulation by increasing awareness on its pros and cons. Therefore, specific programs that improve the knowledge of consumers in developing and less developed countries are recommended. The profit retained from

consumer demand of standardized products should cover the additional cost of product certification and increase international trade on a global scale.

3.2 Ecolabelling in global perspective

At the global level, ecolabelling schemes have increased throughout the last three decades (Devi Juwaheer, Thanika, and Marie Monique 2012a; Juwaheer, Thanika, and Marie Monique 2012b). Nordic Swan in Nordic countries, EU Flower in EU countries, Energy Star in the US, Eco-Mark in Japan and India, Environmental Choice in Canada and New Zealand, Green Label in Singapore and Thailand, and Environmental Label in China are some examples of such schemes (Shen 2012). At the same time, the uptaking of ecolabelling among producers has also increased. For example, in Denmark, the number of Nordic Swan ecolabelled products increased from 3,021 in 2008 to 7,173 in 2013 (Jørgensen and Moen 2015). Although the main objective of ecolabelling is environmental protection, it may also create a trade barrier in the international trade system. Changes in consumer awareness lead to changes in consumer purchasing behavior. As such, global trade will be impacted more and more each year (Lee 2016). Hence, there are concerns among trade organizations, such as the WTO, about considering ecolabelling as a significant influencer on trade.

In the background section, we discussed how the diversity of environmental labels complicates consumer purchasing decisions. The issue becomes more complex when products are not produced domestically and are labelled in such a way that consumers are unfamiliar with the label. The literature shows that the matter is more critical when the label is implemented in developing countries. Compared to developed countries, developing countries are found to be slower and less motivated to promote the ecolabelling of their products (Melser and Robertson 2005). For example, in their research on the ecolabelling of forest products in developing countries, Durst et al. (2006) suggest that only 5 % of all certified products are produced in lower-income countries (in particular, tropical countries), while the majority of certified products are produced in North American and European countries (91.8 %). Applying ecolabelling standards in some developing countries imposes additional costs and restrictions on export and trade (Basu, Chau, and Grote 2004; Durst et al. 2006). One example is the tuna/dolphin dispute between the US and Mexico, which demonstrates a critical aspect of this conflict:

> "The U.S. southern neighbor believes that the Dolphin Safe Policy is too restrictive and in 2008, it filed a multi-faceted complaint with the WTO, saying that the regulations are inconsistent, discriminatory and unnecessary. The WTO decided that the U.S. Dolphin Safe Policy does not discriminate against Mexico" (Wright 2011).

Using the Nash competition model for importing and exporting countries, Basu, Chau, and Grote (2007) show that the lack of ecolabelling has a significant pro-trade bias, especially when a rich importing country applies higher product standards. They also find that importing countries overestimate profits from ecolabelled products. The authors explain that importers choose higher labelling standards without recognizing that these standards will impose expenses on exporters. In contrast, exporters tend to choose lower labelling standards. The authors show that ecolabelling may reduce income, especially for poorer countries. In addition, they conclude that the impact of ecolabelling on trade may be even bigger when the incomes of two trading countries are sufficiently different. Pérez-Ramírez and Lluch-Cota (2010) believe that certificates (e. g., MSC) are expensive for most developing countries and suggest offering assistance to less developed countries to promote participation in standards for fisheries. Moreover, evidence from India (Thomsen and McAloone 2015) and Colombia (Gaviria 1995) illustrates difficulties in adopting environmental requirements for products and services in these countries.

Despite the slow uptake and high cost of ecolabelling, studies show that producers in developing countries benefit from ecolabelling certifications. Carlson and Palmer (2016) conducted a study on the Forest Stewardship Council (FSC) and Marine Stewardship Council (MSC) certification in developing countries. Their results indicated that ecolabelling benefited governance in developing countries, which compensated for the expenses of ecolabelling certification.

In the fishing industry, developing countries face new regulations on their exports. As the world's leading fish producer (32.5 %), followed by Japan, India, the United States and Russia, China is challenging new barriers on the country's exports to developed countries (Gulbrandsen 2005; Lackey 2005). For example, between 2006 and 2008, the US Food and Drug Administration suspended imports of some Chinese food items including seafood (which amounted to 37.5 % of the exported food). During the same period, the European Imported Alarm System reported that 16 % of seafood imported from China did not meet food-safety regulations (Xu et al. 2012). To remain competitive, the Chinese government introduced a number of seafood qualification standards known as "green labels". Latin American countries, Vietnam, Bangladesh and Indonesia, which are also large producers of tuna products, are struggling to obtain ecolabel (e. g., MSC) certifications (Pérez-Ramírez and Lluch-Cota 2010; Duggan and Kochen 2016).

4 Research Questions and Hypotheses

Ecolabels are a form of private product regulation (Castka & Corbett, 2016; 2011; 2010) and are not necessarily (and always) conducted by governmental institutions. On the contrary, with tariffs and many other non-tariff regulations that are regulated by governments to improve international trade, ecolabelling is not under government control. The creation of more than 400 ecolabels complicates consumers' selection of an appropriate ecolabel and creates competition among ecolabelling organizations. Hence, ecolabelling may have negative impacts on trade.

This study aims to explore the impacts of foreign ecolabels on export to Canada. We selected ISO environmental management standards, compared to ECOLOGO, which is practiced in Canada. Canada is the second country to have established an environmental program with its own ecolabels. As Figure 2 shows, few Canadian firms have obtained the ISO 14,001 certifications. The reason may be that companies that implemented ECOLOGO in their products or services are not motivated to apply for ISO 14,001 certificates. Hence, the assumption is that Canadian consumers know ECOLOGO as a trusted environmental program, and therefore Canadian firms are not required to add ISO to compete in the internal market.

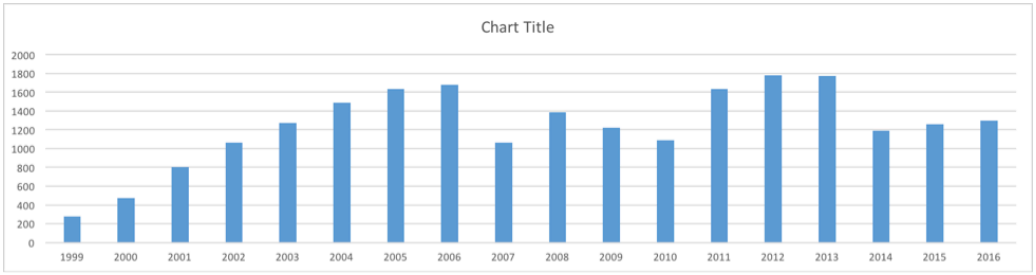

Figure 2: Number of ISO 14,001 certifications granted to Canadian firms (1999–2016).
Source: www.iso.org

The question raised here is twofold:

(1) we are interested in knowing whether or not ISO 14,001 certifications influence imports to Canada as a TBT. To figure it out, we must answer two other sub-questions: (1.1) whether ISO 14,001 certifications are recognized as ecolabels by Canadian consumers, and (1.2) whether GEN as a global ecolabelling network helped its members to export to Canada.

(2) We aim to investigate whether non-domestic ecolabels may create barriers to international trade and how the impacts change when holding trade agreements with Canada or WTO membership.

These questions are important for several reasons: first, to know whether or not ecolabelling relatively reduces exports to Canada. We can generalize the answer on exporting to any developed country that has a national ecolabelling program. Many studies tried to clarify the impacts of ecolabelling on international trade as a technical barrier or trade promoter. The question is original in that we investigate trade impacts regardless of the industries and sectors of products and services. For instance, Cohen and Vandenbergh (2012) analyzed carbon product labelling in a green economy, Pérez-Ramírez and Lluch-Cota (2010) studied the fisheries industry, Teisl, Roe, and Hicks (2002) investigated tuna products and dolphin-safe ecolabels, and Raynolds (2000) examined the agri-food industry. The focus is more on the role of ISO 14,001 as a different ecolabelling program to promote imports to Canada. Second, this question determines the reason why harmonized and universal ecolabelling schemes exist. We analyze the efficiency of participation in universal ecolabelling programs on facilitating international trade. This is why we investigate the role of this certification program in importing to Canada, a GEN member itself. This article also looks at the impacts of signing a trade agreement with Canada.

Third, it can clarify the impact of an ISO certificate on imports in terms of development. Moreover, we calculate the variability of the market size and income similarity to analyze the side effects of the level of income and development on import to Canada with respect to implying ecolabelling regulations.

Therefore, these are our hypotheses:

Hypothesis 1- Holding the ISO 14,001 certification helps to export to Canada.

Hypothesis 2- GEN membership promotes exports to Canada.

5 Data and Methodology

In terms of methodology, a time-series cross-section analysis is performed. Each cross-section has its own individual features, which may (or may not) influence the predictor variables (Eisenhart 1947). A Hausman test

is performed to see whether time-invariant characteristics are unique to the individuals (Stock and Watson 2012; Bartels 2008). And regarding the data, both fixed and random effects models are tested. As a result, the best estimation technique is a set of multilevel linear regressions. As Hox and Kreft (1994) explained: "multilevel models assume a hierarchically structured population, with random sampling of groups both groups and individuals within groups". These models are linear models with (1) fixed effects to take into consideration parameters corresponding to an entire population and (2) random effects, parameters corresponding to individual units drawn at random from a population.

Since multilevel models are selected, some underlying assumptions must be checked. [3]

The estimation technique is thus a set of multilevel models, with some temporal pseudo-replication due to the time-series cross-section (TSCS) dimension of the data. The Generalized Least Squares (GLS) technique (Parks 1967) is the method that is often used with TSCS data. However, GLS technique for TSCS may produce inaccurate standard errors and violates the Gauss-Markov assumption (Beck and Katz 1995). Indeed in our data, each country may have its own error variance (heteroscedasticity). To deal with heteroskedasticity, dummy variables are created to represent each country. Thus, each country has its own intercept. Hsiao (1986) shows that fixed effects are suitable if one wants to make inferences to the units observed.

For validity, a set of models are tested. First, to deal with heterogeneity, the random coefficients model (RCM) is used (Beck and Katz 2006; Swamy 1970). Regarding our data, the RCM as the "Random Intercepts" (Model 2) is selected to add some more validity to the analysis. [4] Second, the current random model is augmented with time as a fixed effect. Third model is calibrated with time as a predictor of trade inflows and random intercepts across countries (see column "Time RI" - Model 3). Fourth, a next model is calibrated with the effect of time being different across countries (varying slopes across countries) (see the "Time RS" column - Model 4). The fifth model introduces a term that models the covariance structures and errors (see the "Auto Regressive" column - Model 5). Finally the sixth model adds two interaction variables for each WTO, FTA, and MRA with GEN (see the "Interaction model" column).

The empirical analysis is based on a variant of the gravity model, commonly used to analyze bilateral trade flows. Since the dataset includes missing observations, the actual dataset is unbalanced.

The model is estimated using the following gravity equation and includes Hecksher-Ohlin variables (market size, income similarity) (Warin, Wunnava, and Janicki 2009):

$$\begin{aligned} EX_{ij,t} &= \alpha_o + \beta_1 G_{ij,t} + \beta_2 S_{ij,t} + \beta_3 accFirm_{j,t} + \beta_4 gen_{j,t} \\ &+\beta_5 distance_{ij} + \beta_6 comborder_{ij} + \beta_7 comlang_{ij} \\ &+\gamma_1 wto_{j,t} + \gamma_2 wtoLength_{j,t} \\ &+\gamma_3 fta_{j,t} + \gamma_4 ftaLength_{j,t} \\ &+\gamma_5 mra_{j,t} + \gamma_6 mraLength_{j,t} \end{aligned} \tag{1}$$

Both the Heckscher-Ohlin variables take the following forms:

$$G_{ij,t} = log\left(GDP_{it} + GDP_{jt}\right) \tag{2}$$

and,

$$\mathrm{S}_{ij,t} = log\left[1 - \left(\frac{GDP_{it}}{GDP_{it} + GDP_{jt}}\right)^2 - \left(\frac{GDP_{jt}}{GDP_{jt} + GDP_{it}}\right)^2\right] \tag{3}$$

$accFirm_{j,t}$ represents the sum of ISO 14,001 certifications that have been obtained up to year t by the exporter country i. The data is collected from the international organization of standarization (ISO) dataset at the country level.

G is a measure of market size and S represents the market similarity. Warin, Wunnava, and Janicki (2009) applied these indices in a gravity model to analyze bilateral FDI outflows. We use the same strategy to analyze the level of development of exporting countries. In our model, country j represents Canada, and i represents exporting countries. Hence, the greater G, the great the exporting country's GDP. Also, the higher the income similarity measurement, the closer the exporting country i is to Canada's GDP level.

Exports to Canada are collected from the Statistics Canada database in Canadian dollars. The data cover export values of all categories based on the 6-digit commodity level using the harmonized system (HS). The data for geographic distance, common border and common language are obtained from CEPII. The data regarding the FTA and MRA are collected from Global Affairs Canada and Industry Canada. Information about the year

of membership for current GEN members are available on the GEN website. Also, the data related to WTO are collected from the WTO database available online.

Variables $wto_{j,t}$, $fta_{j,t}$, $mra_{j,t}$, and $gen_{j,t}$ are binary variables. Variable $wto_{j,t}$ represents the WTO membership of country j in year t. Variables $fta_{j,t}$ and $mra_{j,t}$ represent the binding of country j respectively in a free trade agreement and mutual recognition agreement with Canada in year t. Variable $gen_{j,t}$ represents the membership of country j to a global ecolabelling network in year t. Furthermore, $wtoLength_{j,t}$ represents the number of years country j has been a WTO member. Also, $ftaLength_{j,t}$ and $mraLength_{j,t}$ are the number of the years that agreements between country j and Canada have been issued.

In model 6, two interaction variables are created. The first variable is the interaction of the length of the agreement by the WTO membership with the GEN membership, and the second variable is the interaction of the number of certifications with the binary variables WTO, FTA and MRA. After running an overall general model in eq. (1), we then break the baseline eq. (1) into three equations. In the next equation, the WTO factor and WTO-related variables are included. In a further equation, the FTA factor is included and in the third step, the MRA factor is included. The results are presented in three different tables.

6 Results

In eq. (1), we have three factors: WTO, FTA and MRA, in order to verify their (combined) impacts on exports to Canada. In eq. (4), (5) and (6), these factors are added independently from each other. The results are presented in Table 3, 4 and 5, followed by their interpretations. First, we include the WTO membership and the length of the membership as an explanatory variable. The equation is as follows:

$$\begin{aligned} EX_{ij,t} &= \alpha_o + \beta_1 accFirm_{j,t} + \beta_2 gen_{j,t} + \beta_3 G_{ij,t} + \beta_4 S_{ij,t} \\ &+\beta_5 distance_{ij} + \beta_6 comborder_{ij} + \beta_7 comlang_{ij} \\ &+\gamma_1 wto_{j,t} + \gamma_2 wtoLength_{j,t} \\ &+\delta_1 accFirm : wto_{j,t} + \delta_2 gen : wtoLength_{j,t} \end{aligned} \tag{4}$$

Table 3: Regression result- WTO.

	Dependent variable: Export Canada (log) - WTO					
	GLS	**RI**	**Time RI**	**Time RS**	**Auto Regression**	**Interaction Model**
accFirms	0.00002***	0.00001***	0.00001***	0.00001***	0.00001***	0.00000
	(0.00002, 0.00002)	(0.00001, 0.00001)	(0.00001, 0.00001)	(0.00001, 0.00001)	(0.00001, 0.00001)	(−0.00001, 0.00001)
gen	0.066	0.162	0.186	0.188*	0.120	0.078
	(−0.012, 0.145)	(−0.058, 0.382)	(−0.036, 0.409)	(−0.034, 0.411)	(−0.124, 0.365)	(−0.198, 0.354)
g	−0.092	0.112	0.091	0.092	0.394**	0.076
	(−0.244, 0.061)	(−0.236, 0.460)	(−0.258, 0.439)	(−0.257, 0.441)	(0.025, 0.763)	(−0.276, 0.428)
s	0.036	0.024	0.014	0.014	−0.078	0.026
	(−0.027, 0.099)	(−0.132, 0.179)	(−0.141, 0.170)	(−0.141, 0.170)	(−0.252, 0.095)	(−0.132, 0.183)
distance	−0.00002***	−0.00001	−0.00002	−0.00002	−0.00002	−0.00002
	(−0.00003, 0.00000)	(−0.00001, 0.00002)	(−0.0001, 0.00002)	(−0.0001, 0.00002)	(−0.0001, 0.00002)	(−0.0001, 0.00002)
comBorder	37.387***	37.501***	37.502***	37.394***	37.729***	37.498***
	(37.014, 37.760)	(36.398, 38.604)	(36.403, 38.601)	(36.295, 38.494)	(35.530, 37.929)	(36.389, 38.608)
comLang	−0.014	−0.060	−0.050	−0.050	−0.056	−0.046
	(−0.085, 0.056)	(−0.264, 0.144)	(−0.254, 0.153)	(−0.254, 0.154)	(−0.281, 0.169)	(−0.252, 0.160)
wto	0.142**	−0.018	0.002	0.002	0.004	0.010
	(0.011, 0.237)	(−0.179, 0.143)	(−0.162, 0.167)	(−0.162, 0.166)	(−0.155, 0.163)	(−0.156, 0.175)
wtoLength	−0.10**	0.007**	0.0003	0.0003	−0.0005	−0.002
	(−0.018, −0.001)	(0.0002, 0.014)	(−0.013, 0.014)	(−0.013, 0.014)	(−0.020, 0.019)	(−0.017, 0.012)
year			0.008	0.008	0.007	0.008
			(−0.005, 0.021)	(−0.005, 0.021)	(−0.013, 0.027)	(−0.006, 0.021)
accFirm:wto						0.00001
						(−0.0001, 0.0001)
gen:wtoLength						0.010
						(−0.004, 0.024)
Constant		−0.982	−16.443	−16.453	−17.791	−16.201
		(−4.868, 2.904)	(−42.305, 9.419)	(−42.359, 9.453)	(−57.472, 21.890)	(−43.464, 11.062)
Time Fixed Effects	No	No	Yes	Yes	Yes	Yes
Observations	1,595	1,595	1,595	1,595	1,595	1,595
Log Likelihood	−1,441.918	−956.591	−955.885	−955.179	−211.620	−954.927
Akaike Inf. Crit.	2,905.837	1,937.182	1,937.769	1,940.358	455.240	1,939.854
Bayesian Inf. Crit.	2,964.958	2,001.677	2,007.639	2,020.977	541.234	2,020.473

Note: *p < 0.1; **p < 0.05; ***p < 0.01
Time series estimations based on a time-series cross-section analysis, With no serial correlation, no contemporaneous correlation and no heteroscedasticity All the commands and algorithms are coded in R 3.3.2 using the plm package

Table 4: Regression result- FTA.

	Dependent variable: Export Canada (log) - FTA					
	GLS	**RI**	**Time RI**	**Time RS**	**Auto Regression**	**Interaction Model**
accFirms	0.00002***	0.00001***	0.00001***	0.00001***	0.00001***	0.000001***
	(0.00002, 0.00002)	(0.00001, 0.00001)	(0.00001, 0.00001)	(0.00001, 0.00001)	(0.00001, 0.00001)	(0.00001, 0.00001)
gen	0.155***	0.295***	0.296***	0.297***	0.239**	0.071
	(0.083, 0.228)	(0.084, 0.506)	(0.082, 0.510)	(0.083, 0.510)	(0.022, 0.456)	(−0.159, 0.302)
g	−0.097	0.034	0.031	0.033	0.294*	0.239
	(−0.235, 0.042)	(−0.277, 0.344)	(−0.296, 0.358)	(−0.295, 0.360)	(−0.258, 0.058)	(−0.050, 0.528)
s	−0.005	0.022	0.022	0.022	−0.100	0.169**
	(−0.063, 0.053)	(−0.125, 0.169)	(−0.125, 0.169)	(−0.125, 0.169)	(−0.258, 0.058)	(0.032, 0.307)
distance	−0.00001*	−0.00000	−0.00000	−0.00000	−0.00001	−0.00000
	(−0.00002, 0.00000)	(−0.00004, 0.00003)	(−0.0004, 0.00003)	(−0.0004, 0.00003)	(−0.0004, 0.00003)	(−0.0004, 0.00004)
comBorder	34.684***	33.707***	33.710***	33.604***	33.720***	25.432***
	(34.222, 35.147)	(32.561, 34.852)	(32.560, 34.859)	(32.454, 34.754)	(32.472, 34.969)	(23.946, 26.917)
comLang	−0.001	0.009	0.009	0.009	−0.019	−0.003
	(−0.065, 0.062)	(−0.185, 0.203)	(−0.186, 0.204)	(−0.186, 0.204)	(−0.214, 0.176)	(−0.215, 0.210)
fta	−0.755***	−0.662***	−0.663***	−0.663***	−0.329***	−0.813***
	(−0.986, 0.525)	(−0.847, −0.478)	(−0.847, 0.478)	(−0.848, −0.479)	(−0.522, −0.136)	(0.951, −0.675)
ftaLength	0.183***	0.238***	0.238***	0.238***	0.182***	0.047**
	(0.159, 0.208)	(0.212, 0.264)	(0.212, 0.264)	(0.212, 0.264)	(−0.012, 0.011)	(0.024, 0.070)
year			0.0002	0.0002	−0.001	−0.004
			(−0.006, 0.006)	(−0.006, 0.006)	(−0.012, 0.011)	(−0.009, 0.001)
accFirm:fta						0.0001***
						(0.0001, 0.0001)
gen:ftaLength						0.464***
						(−0.406, 0.523)
Constant		−0.306	−0.631	−0.633	−1.784	5.229
		(−3.793, 3.181)	(−12.595, 11.332)	(−12.591, 11.324)	(−24.713, 21.146)	(−3.855, 14.313)
Time Fixed Effects	No	No	Yes	Yes	Yes	Yes
Observations	1,595	1,595	1,595	1,595	1,595	1,595
Log Likelihood	−1,307.820	−808.644	−808.642	−807.764	−170.851	−361.468
Akaike Inf. Crit.	2,637.640	1,641.288	1,643.285	1,645.528	373.702	752.935
Bayesian Inf. Crit.	2,696.761	1,705.783	1,713.155	1,726.147	459.696	833.555

Note: *p < 0.1; **p < 0.05; ***p < 0.01
Time series estimations based on a time-series cross-section analysis, With no serial correlation, no contemporaneous correlation and no heteroscedasticity All the commands and algorithms are coded in R 3.3.2 using the plm package

Table 5: Regression result- MRA.

	Dependent variable: Export Canada (log) - MRA					
	GLS	**RI**	**Time RI**	**Time RS**	**Auto Regression**	**Interaction Model**
accFirms	0.00002***	0.00001***	0.00001***	0.00001***	0.00001***	0.000000**
	(0.00002, 0.00002)	(0.00001, 0.00001)	(0.00001, 0.00001)	(0.00001, 0.00001)	(0.00001, 0.00001)	(0.0000, 0.0000)
gen	0.072*	0.131	0.151	0.152	0.104	0.022
	(0.005, 0.150)	(−0.089, 0.352)	(−0.073, 0.374)	(−0.071, 0.376)	(−0.139, 0.347)	(−0.213, 0.256)
g	−0.140*	0.054	0.008	0.009	0.358*	−0.052
	(−0.292, 0.013)	(−0.287, 0.395)	(−0.345, 0.360)	(−0.343, 0.362)	(−0.013, 0.729)	(−0.401, 0.296)
s	0.029	0.031	0.021	0.021	−0.079	0.032
	(−0.034, 0.093)	(−0.127, 0.188)	(−0.138, 0.180)	(−0.138, 0.180)	(−0.255, 0.097)	(−0.125, 0.180)
distance	−0.00000	0.00002	0.00002	−0.00002	−0.00000	0.00000
	(−0.00002, 0.00001)	(−0.00002, 0.00001)	(−0.0002, 0.00001)	(−0.0002, 0.0001)	(−0.0005, 0.00004)	(−0.0004, 0.00004)
comBorder	37.425***	37.556***	37.569***	37.473***	36.753***	37.341***
	(37.052, 37.799)	(36.441, 38.671)	(36.456, 38.682)	(36.359, 38.587)	(35.549, 37.958)	(36.244, 38.438)
comLang	−0.039	−0.082	−0.089	−0.088	−0.076	−0.103
	(−0.108, 0.031)	(−0.288, 0.123)	(−0.294, 0.117)	(−0.294, 0.117)	(−0.299, 0.146)	(−0.306, 0.099)
mra	0.235***	0.207*	0.239*	0.238*	−0.021	0.259**
	(0.063, 0.406)	(−0.027, 0.441)	(−0.004, 0.481)	(−0.004, 0.480)	(−0.309, −0.268)	(0.021, 0.497)
mraLength	−0.010	0.019***	0.016*	0.016**	0.021*	−0.013*
	(−0.026, 0.007)	(0.008, 0.030)	(0.003, 0.029)	(0.003, 0.029)	(−0.002, 0.044)	(−0.028, 0.002)
year			0.004	0.004	0.001	0.009**
			(−0.004, 0.012)	(−0.004, 0.012)	(−0.013, 0.015)	(0.001, 0.016)
accFirm:mra						0.0001***
						(0.0001, 0.0001)
gen:mraLength						0.043***
						(0.023, 0.062)
Constant	1.651*	−0.708	−8.183	−8.149	−5.145	−16.653**
	(−0.050, 3.351)	(−4.520, 3.104)	(−23.400, 7.034)	(−23.361, 7.063)	(−32.876, 22.585)	(−31.736, −1.569)
Time Fixed Effects	No	No	Yes	Yes	Yes	Yes
Observations	1,584	1,584	1,584	1,584	1,584	1,584
Log Likelihood	−1,433.155	−946.883	−946.385	−945.750	−213.366	−910.282
Akaike Inf. Crit.	2,888.311	1,917.766	1,918.770	1,921.500	458.731	1,850.564
Bayesian Inf. Crit.	2,947.355	1,982.176	1,988.550	2,002.016	544.614	1,931.080

Note: *p < 0.1; **p < 0.05; ***p < 0.01
Time series estimations based on a time-series cross-section analysis, With no serial correlation, no contemporaneous correlation and no heteroscedasticity All the commands and algorithms are coded in R 3.3.2 using the plm package

In addition, two interaction variables are added to the equation above. These variables are: $accFirm : wto_{ij,t}$*representing* the interaction of the number of ISO 14,001-certified firms by the end of the corresponding year and the binary variable, which indicates if country j is a WTO member in the corresponding year or not. $gen : wtoLength_{ij,t}$ represents the interactions of two variables: the GEN membership and the length of the WTO membership of exporting country j. The impact of the number of ISO 14,001 certifications is significantly positive although it is not big enough to conclude that ISO certification is TBT. The GEN coefficient is significantly positive and is also large enough to be considered a facilitator in exporting to Canada. The GEN variable is a binary variable, which takes value 1 if the exporting country 6 has joined the GEN in the corresponding year. The coefficient of the length of WTO is not significant across all six methods; however, in the random effect model, the WTO length coefficient is significantly positive. In addition, the market size coefficient in the autoregressive model is significantly positive, therefore the level of development of the exporting countries has a positive relationship with exports to Canada.

The results show that the common border is a significant promoter for exports to Canada. This is normal since the USA is the biggest exporter to Canada. The significant negative coefficient of distance in the GLS method supports the assumption of the traditional gravity model in that distance has negative impacts on trade. The interaction method does not show any significant results for the interaction variables.

The eq. (5) includes FTA-related indicators. Similar to eq. (4), we replaced the FTA-related indicators in eq. (1). Equation (5) is as follows:

$$\begin{aligned} EX_{ij,t} &= \alpha_o + \beta_1 accFirm_{j,t} + \beta_2 gen_{j,t} + \beta_3 G_{ij,t} + \beta_4 S_{ij,t} + \\ &\beta_5 distance_{ij} + \beta_6 comborder_{ij} + \beta_7 comlang_{ij} + \\ &\gamma_3 fta_{j,t} + \gamma_4 ftaLength_{j,t} + \\ &\delta_3 accFirm : fta_{j,t} + \delta_4 gen : ftaLength_{j,t} \end{aligned} \tag{5}$$

We included two interaction variables related to FTA. Variable $accFirm : fta_{ij,t}$ represents the interaction of the number of ISO 14,001-certified firms by the end of the corresponding year and the binary variable that indicates if country j joins a FTA with Canada in the corresponding year. In addition, $gen : ftaLength_{ij,t}$ is the interaction of two variables: the GEN membership and the length of FTA for exporting country j.

The result of the FTA model supports the positive impacts of the GEN membership on exports to Canada. The $gen_{j,t}$ coefficient is more significant in the FTA model than the WTO model. The FTA coefficient is significantly negative (- 0.329) in the autoregressive model; however, the length of the FTA agreement is significantly positive. In most cases, it can be explained by the fact that the effectiveness of the trade agreement increases in the following years. Furthermore, the autoregressive method shows a positive significant relation between the size of the market and exports to Canada; however, there is no strong evidence about the relationship between the similarity of the market and exports to Canada.

The interaction model shows significant results for variables $accFirm : fta_{j,t}$ and $gen : ftaLength_{j,t}$. Countries that are GEN members and hold an FTA with Canada are more likely to export to Canada in higher volumes. Also, countries in which there are more ISO 14,001-certified firms and which hold an FTA with Canada are more likely to export to Canada. Since the coefficient is much smaller, we can conclude that the impacts of a GEN membership and the length of the FTA with Canada are greater than having ISO 14,001certified firms.

Like the WTO model, the common border of the FTA model has a significant positive coefficient; however, common language and distance do not have significant impacts on exports to Canada. The only country that shares a border with Canada is the US and it is the biggest exporting country to Canada. Therefore, we expected that the common border would be a factor that promotes exports.

The eq. (6) includes MRA-related variables.

$$\begin{aligned} EX_{ij,t} &= \alpha_o + \beta_1 accFirm_{j,t} + \beta_2 gen_{j,t} + \beta_3 G_{ij,t} + \beta_4 S_{ij,t} + \beta_5 distance_{ij} \\ &+ \beta_6 comborder_{ij} + \beta_7 comlang_{ij} + \gamma_5 mra_{j,t} + \gamma_6 mraLength_{j,t} + \delta_5 accFirm : mra_{j,t} + \\ &\delta_6 gen : mraLength_{j,t} \end{aligned} \tag{6}$$

The results show that ISO 14,001 certification has significant positive impacts on exports to Canada; however, like the previous results, this impact is not significant. In relation to MRA, the GEN does not have a significant impact on exports to Canada. In the autoregressive model, the MRA has a significant negative coefficient but the MRA length coefficient is significantly positive. Therefore, MRAs promote trade significantly during their activation year.

The coefficient of interaction variable $accFirm : mra_{j,t}$ is significantly positive. This means that the number of ISO 14,001 certifications in countries holding mutual recognition agreements with Canada is positively related to exports to Canada. Moreover, coefficient $gen : mraLength_{j,t}$ is significantly positive and relatively bigger (0.464). This means that countries that are GEN members through their ecolabelling programs and also hold

an MRA with Canada, export to Canada more than other countries. This shows the efficiency of both the MRA and the GEN in accelerating exports to Canada.

7 Conclusion

Over the last four decades, ecolabelling organizations have earned recognition as an important tool in developing sustainability and environmental protection in the production cycle of products (Prieto-Sandoval et al. 2016; Reisch 2001). Blue Angel, ECOLOGO (also known as the Environmental (11) Choice Program and EcoLogo) and Nordic ecolabelling are among the first national and supra-regional organizations. The success of these organizations, and the need to align ecolabelling practices, led to the introduction of ISO 14,001 by the International Organization for Standardization. The demand for ISO 14001 has increased among producers in different countries.

Another solution strategy to the diversity of ecolabelling programs is the GEN. It invited all ecolabelling organizations to one table to align their ecolabelling programs. The main objective of the GEN is to exchange information among national ecolabelling organizations operating "type 1" ecolabels. The GEN requires its member to exchange information and cooperate with one another to increase the supply and demand for ecolabelled products. The GEN current includes 26 ELOs from both developed and developing countries. As our results show, the GEN significantly promotes exports to Canada, especially for countries with an FTA or MRA with Canada.

Evidence from developing countries such as India, China, Mexico and Colombia show that applying ecolabelling regulations in such countries imposes costs and barriers on their exports to developed countries. Meanwhile, according to previous studies, developing countries benefits from well-known ecolabels such as the Forest Stewardship Certification and Marine Stewardship Certification. Over the last decade, China, as the leader of the fishing industry, and Latin American countries, as the largest producers of tuna products, have been having trouble exporting to developed countries. To help these countries, the WTO offered assistance to facilitate the implementation of ecolabelling programs for some developing countries; however, the result on WTO membership does not support evidence of this matter.

Acknowledgements

The authors want to thank Natalia Mishagina (CIRANO) and attendees of the International Trade & Finance Association (IT&FA) Conference in May 2015 for their useful comments. The usual caveats apply.

LIST OF SYMBOLS AND ABBREVIATIONS

TBT	Technical Barrier to Trade
WTO	World Trade Organization
FTA	Free Trade Agreement
MRA	Mutual Recognition Agreement
ISO	International Standard Organization
GEN	Global Ecolabelling Network
UNEP	United Nations Environment Programme
FSC	Forest Stewardship Council
MSC	Marine Stewardship Council
UL	Underwriters Laboratories

Notes

1 Report of the Governing Council of the United Nations Environment Programme (UNEP), supplement No. 25, April 1997
2 Data available in www.iso.org
3 There are five fundamental assumptions for multilevel models: (1) within-group errors are independent with mean zero and variance σˆ2, (2) within-group errors are independent of random effects, (3) random effects are normally distributed with mean zero and covariance matric ψ, (4) random effects are independent in different cross-sections, and (5) the covariance matrix does not depend on the cross-section.
4 The random part of the model is specified as the name of the country, which means only the intercepts vary across countries.

References

Anderson, James E. 1979. "A Theoretical Foundation for the Gravity Equation." *The American Economic Review* 69 (1):106–116.

Bachmann, Chris. 2017. "Modeling the Impacts of Free Trade Agreements on Domestic Transportation Gateways, Corridors, and Ports." In *Transportation Research Board 96th Annual Meeting*. https://trid.trb.org/view.aspx?id=1437432.

Bansal, Pratima. 2002. "The Corporate Challenges of Sustainable Development." *The Academy of Management Executive* 16 (2):122–131.

Bartels, Brandon. 2008. "Beyond 'Fixed versus Random Effects': A Framework for Improving Substantive and Statistical Analysis of Panel, Time-Series Cross-Sectional, and Multilevel Data." *The Society for Political Methodology* 9: 1–43.

Bartenstein, Kristin, and Lavallée Sophie. 2003. "L'écolabel Est-Il Un Outil Du Protectionnisme «Vert»?" *Les Cahiers De Droit* 44 (3):361–393.

Basu, Arnab K., Nancy H Chau, and Ulrike Grote. 2004. "On Export Rivalry and the Greening of Agriculture–The Role of Eco-Labels." *Agricultural Economics* 31 (2–3):135–147.

Basu, Arnab K., Nancy H Chau, and Ulrike Grote. 2007. "Eco-Labelling and Strategic Rivalry in Export Markets." In *New Frontiers in Environmental and Social Labelling*, 111–132. Physica-Verlag HD. http://link.springer.com/content/pdf/10.1007/978-3-7908-1756-0_6.pdf.

Beck, Nathaniel, and Jonathan N Katz. 1995. "What to Do (And Not to Do) with Time-Series Cross-Section Data." *American Political Science Review* 89 (3):634–647.

Beck, Nathaniel, and Jonathan N Katz. 2006. "Random Coefficient Models for Time-Series–Cross-Section Data: Monte Carlo Experiments." *Political Analysis* 15 (2):182–195.

Carlson, Anna, and Charles Palmer. 2016. "A Qualitative Meta-Synthesis of the Benefits of Eco-Labelling in Developing Countries." *Ecological Economics* 127:129–145.

Carey, Jeffrey, and John Holmes. 2017. "What Does the Trans-Pacific Partnership Agreement Portend for the Canadian Automotive Industry?" *Canadian Public Policy* 43 (S1): S30–S42.

Castka, Pavel, and Charles J Corbett. 2016. "Governance of Eco-Labels: Expert Opinion and Media Coverage." *Journal of Business Ethics* 135 (2):309–326.

Cohen, Mark A., and Michael P Vandenbergh. 2012. "The Potential Role of Carbon Labelling in a Green Economy." *Energy Economics* 34:S53–S63.

Dauvergne, Peter, and Jane Lister. 2010. "The Prospects and Limits of Eco-Consumerism: Shopping Our Way to Less Deforestation?" *Organization & Environment* 23 (2):132–154.

Delmas, Magali A., Nicholas Nairn-Birch, and Michaela Balzarova. 2013. "Choosing the Right Eco-Label for Your Product." *MIT Sloan Management Review* 54 (4):10.

Du, Ming. 2015. "What Is a Technical Regulation in the TBT Agreement? Some Reflections on EC-Seal Products." https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2579361

Duggan, Deirdre E., and Momo Kochen. 2016. "Small in Scale but Big in Potential: Opportunities and Challenges for Fisheries Certification of Indonesian Small-Scale Tuna Fisheries." *Marine Policy* 67 (May):30–39. https://doi.org/10.1016/j.marpol.2016.01.008.

Durst, P. B., P. J. McKenzie, C. L. Brown, and S. Appanah. 2006. "Challenges Facing Certification and Eco-Labelling of Forest Products in Developing Countries." *International Forestry Review* 8 (2):193–200.

Eisenhart, Churchill. 1947. "The Assumptions Underlying the Analysis of Variance." *Biometrics* 3 (1):1–21.

Esty, Daniel C., and Damien Geradin. 1997. "Market Access, Competitiveness, and Harmonization: Environmental Protection in Regional Trade Agreements." *Harv. Envtl. L. Rev.* 21:265.

Gaviria, Diana. 1995. "Introducing the Ecolabelling Concept: Experience of Colombia." In *International Trade Forum*, 8. International Trade Centre. http://search.proquest.com/openview/0b1ab8746e543484cc0ac45ee9ab6fbc/1?pq-origsite=gscholar&cbl=47429.

Gulbrandsen, Lars H. 2005. "Mark of Sustainability? Challenges for Fishery and Forestry Eco-Labelling." *Environment: Science and Policy for Sustainable Development* 47 (5):8–23.

Gutiérrez, Nicolás L., Sarah R Valencia, Trevor A Branch, David J Agnew, Julia K Baum, Patricia L Bianchi, Jorge Cornejo-Donoso, et al. 2012. "Eco-Label Conveys Reliable Information on Fish Stock Health to Seafood Consumers." *PLoS One* 7 (8):e43765.

Hall, C. Michael, Stefan Gossling, Daniel Scott, and others. 2015. *The Routledge Handbook of Tourism and Sustainability*. Routledge. https://books.google.ca/books?hl=en&id=NaygBgAAQBAJ&oi=fnd&pg=PP1&dq=hall+2015+tourism+and+sustainability&ots=E6I5e_j6i2&sig=L1trU3HqiMkclGFS1dOKT9s1qJk

Henson, Spencer. 2011. "Private Agrifood Governance: Conclusions, Observations and Provocations." *Agriculture and Human Values* 28 (3):443–451.

Hox, Joop J., and Ita GG Kreft. 1994. "Multilevel Analysis Methods." *Sociological Methods & Research* 22 (3):283–299.

Hsiao, Cheng. 1986. *Analysis of Panel Data, Econometric Society Monograph No. 11*. Cambridge: Cambridge University Press.

Jiang, Ruihua Joy, and Pratima Bansal. 2003. "Seeing the Need for ISO 14001." *Journal of Management Studies* 40 (4):1047–1067.

Jørgensen, Rikke Bramming, and Øystein Moen. 2015. "Eco Labelling from the Consumer Perspective: A Case Study of Indoor Paint Products." *Journal of Research for Consumers*, 27:1–25.

Juwaheer, Devi, Sharmila Pudaruth Thanika, and Emmanuelle Noyaux Marie Monique. 2012a. "Analysing the Impact of Green Marketing Strategies on Consumer Purchasing Patterns in Mauritius." *World Journal of Entrepreneurship, Management and Sustainable Development* 8 (1):36–59.

Juwaheer, Devi, Sharmila Pudaruth Thanika, and Emmanuelle Noyaux Marie Monique. 2012b. "Analysing the Impact of Green Marketing Strategies on Consumer Purchasing Patterns in Mauritius." *World Journal of Entrepreneurship, Management and Sustainable Development* 8 (1):36–59.

Karacaovali, Baybars, Deveraux Talagi, and others. 2017. "International Trade Effects of Trans Pacific Partnership for North America." http://www.economics.hawaii.edu/research/workingpapers/WP_17-1.pdf.

Kukucha, Christopher J. 2016. *Multilateralism and Canadian Foreign Trade Policy*, 117. Seeking Order in Anarchy: Multilateralism as State Strategy. Edmonton: University of Alberta Press.

Lackey, Robert T. 2005. "Fisheries: History, Science, and Management." *Water Encyclopedia*. http://onlinelibrary.wiley.com/doi/10.1002/047147844X.sw249/full.
Lake, James. 2017. "Free Trade Agreements as Dynamic Farsighted Networks." *Economic Inquiry* 55 (1):31–50.
Lee, Soyoung. 2016. "Compatibility of Eco-Labelling Scheme with WTO and Its Potentially Conflicting Impacts." In *Legal Issues on Climate Change and International Trade Law*, edited by D.-Y. Park, 43–65. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-29322-6_2.
Lexchin, Joel, and Marc-André Gagnon. 2013. "CETA and Intellectual Property: The Debate over Pharmaceutical Patents." *CETD Policy Briefs Series*, Http://Labs.Carleton.Ca/Canadaeurope/Wpcontent/Uploads/Sites/9/CETD-Policy-Brief_CETA-and-Pharmaceutical-patents_MG_JL.Pdf.http://labs.carleton.ca/canadaeurope/wp-content/uploads/sites/9/CETD-Policy-Brief_CETA-and-pharmaceutical-patents_MG_JL.pdf.
Lim, Sijeong, and Aseem Prakash. 2014. "Voluntary Regulations and Innovation: The Case of ISO 14001." *Public Administration Review* 74 (2):233–244.
MacRae, Rod. 2014. "Do Trade Agreements Substantially Limit Development of Local/Sustainable Food Systems in Canada?". *Canadian Food Studies/La Revue Canadienne Des Études Sur L'alimentation* 1 (1):103–125.
Melser, Daniel, and Peter E Robertson. 2005. "Eco-Labelling and the Trade-Environment Debate." *The World Economy*. 28. pp. 49–62.
Parks, Richard W. 1967. "Efficient Estimation of a System of Regression Equations When Disturbances are Both Serially and Contemporaneously Correlated." *Journal of the American Statistical Association* 62 (318):500–509.
Pérez-Ramírez, Mónica, and Salvador Lluch-Cota, and others. 2010. "Fisheries Certification in Latin America: Recent Issues and Perspectives." *Interciencia* 35 (11):855–861.
Prieto-Sandoval, Vanessa, José A Alfaro, Andrés Mejía-Villa, and Marta Ormazabal. 2016. "ECO-Labels as a Multidimensional Research Topic: Trends and Opportunities." *Journal of Cleaner Production* 135 (November):806–818. https://doi.org/10.1016/j.jclepro.2016.06.167.
Raynolds, Laura T. 2000. "Re-Embedding Global Agriculture: The International Organic and Fair Trade Movements." *Agriculture and Human Values* 17 (3):297–309.
Reisch, Lucia A. 2001. "Eco-Labelling and Sustainable Consumption in Europe: Lessons to Be Learned from the Introduction of a National Label for Organic Food." *Consumer Interest Annual* 47:1–6.
RSMeans. 2011. *Green Building: Project Planning and Cost Estimating*. Kingston, MA: R.S. Means Company, Inc.
Ruckert, Arne, Ashley Schram, Ronald Labonté, Sharon Friel, Deborah Gleeson, and Anne-Marie Thow. 2017. "Policy Coherence, Health and the Sustainable Development Goals: A Health Impact Assessment of the Trans-Pacific Partnership." *Critical Public Health* 27 (1):86–96.
Rugman, Alan M., and Alain Verbeke. 1998. "Corporate Strategies and Environmental Regulations: An Organizing Framework." *Strategic Management Journal* 19 (4): 363–75.
Shen, Junyi. 2012. "Understanding the Determinants of Consumers' Willingness to Pay for Eco-Labeled Products: An Empirical Analysis of the China Environmental Label." *Journal of Service Science and Management*, 5 (March), 87–94. http://file.scirp.org/Html/11-9201422_18237.htm.
Smith, Timothy M., and Miriam Fischlein. 2010. "Rival Private Governance Networks: Competing to Define the Rules of Sustainability Performance." *Global Environmental Change* 20 (3):511–522.
Smyth, Stuart J., William A Kerr, and Peter WB Phillips. 2017. "Labelling and Preferential Trade Deals." *Biotechnology Regulation and Trade*, 235–250. Springer. http://link.springer.com/chapter/10.1007/978-3-319-53295-0_12.
Stock, James H., and Mark W. Watson. 2012. *Introduction to Econometrics: Global Edition. Boston, MA*: Pearson Education.
Swamy, Paravastu AVB. 1970. "Efficient Inference in a Random Coefficient Regression Model." *Econometrica: Journal of the Econometric Society* 38: 311–323.
Teisl, M. F., B. Roe, and R. L. Hicks. 2002. "Can Eco-Labels Tune a Market? Evidence from Dolphin-Safe Labelling." *Journal of Environmental Economics and Management* 43 (3):339–359. https://doi.org/10.1006/jeem.2000.1186.
Thomsen, Jakob, and Tim C McAloone. 2015. "Does the Ecomark Label Promote Environmentally Improved Products in India and What Experiences Can Be Drawn from the Nordic Ecolabel?" *ICoRD'15–Research into Design across Boundaries Volume 2*, 125–135. New Delhi: Springer. http://link.springer.com/chapter/10.1007/978-81-322-2229-3_11.
Trebilcock, Michael J., and Robert Howse. 2005. *The Regulation of International Trade*. London and New York: Routledge, Taylor & Francis Group.
UNEP. 1997. Report of the Governing Council of the United Nations Environment Programme (UNEP), Supplement No. 25, April 1997.
Ven, Hamish. 2015. "Correlates of Rigorous and Credible Transnational Governance: A Cross-Sectoral Analysis of Best Practice Compliance in Eco-Labelling." *Regulation & Governance* 9 (3):276–293.
Vranes, Erich. 2011. "Climate Labelling and the WTO: The 2010 EU Ecolabelling Programme as a Test Case under WTO Law." In *European Yearbook of International Economic Law 2011*, 205–237. Berlin: Springer. http://link.springer.com/10.1007%2F978-3-642-14432-5_9.
Warin, Thierry. 2015. "Libre-Échange Entre l'Union Européenne et Le Canada: Quelles Sont Les Opportunités À Saisir". *Harvard Business Review* (France), September 17.
Warin, Thierry, Phanindra V Wunnava, and Hubert P Janicki. 2009. "Testing Mundell's Intuition of Endogenous OCA Theory." *Review of International Economics* 17 (1):74–86.
Wright, J. 2011. "U.S. Defends Its Dolphin Safe Tuna Policy against Criticism of Mexico." *WTO Rulling, SeaFood Business* 30 (12).
Xu, Pei, Yinchu Zeng, Quentin Fong, Todd Lone, and Yuanyuan Liu. 2012. "Chinese Consumers' Willingness to Pay for Green-And Eco-Labeled Seafood." *Food Control* 28 (1):74–82.
Zhang, Yu, Jinhe Zhang, Chang Wang, Jingjing Cao, Zehua Liu, and Lachun Wang. 2017. "China and Trans-Pacific Partnership Agreement Countries: Estimation of the Virtual Water Trade of Agricultural Products." *Journal of Cleaner Production* 140:1493–1503.