

Paving the Road to Global Markets: How Increasing Participation in International Standards Development Can Boost Exports From Small and Medium Enterprises

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ABSTRACT

While tariff barriers have drastically reduced around the world, non-tariff barriers, including demonstrating compliance with technical regulations, standards, and conformity assessment procedures, remain a significant obstacle to trade and could be particularly daunting for small and medium enterprises (SMEs). International standards have been recognized as an effective way to reduce technical barriers to trade (TBT). This research examines the impact of Canada's participation in international standards development (measured by technical committee/subcommittee participation) on SMEs' likelihood to export. Drawing on a national SME survey, results of the analysis showed that, after controlling for potentially confounding firm and owner attributes, Canada's participation in international standards development has a positive impact on Canada's exports and is associated with engaging more SMEs in international trade.

KEYWORDS

Harmonization, International Standards, Small Medium Enterprises (SMEs), Technical Barriers to Trade (TBT), Trade

INTRODUCTION

The COVID pandemic has posed unprecedented challenges to many aspects of society, including international trade. Canada's exports of goods and services dropped by 12.3% in 2020, equivalent to a 74 billion Canadian dollars (CAD) decrease, compared to the previous year (Export Development Canada, 2021). The pandemic impacted small and medium enterprise (SME) ¹ exporters less severely, with a decline of 6.3% in the value of their exports, which was less than half of the decline larger exporters reported in 2020 (15.1%) (Statistics Canada, 2021a).

While large enterprises constitute a critical force in Canada's exports, the importance of SME exporters should not be overlooked. Canadian SMEs represented over 99% of "employer businesses" (i.e., establishments with at least one employee, excluding the business owner) and 98% of goods exporters (equivalent to 43% of total export values in goods), in 2020. Yet, amongst the over 1.2 million "employer SMEs" in Canada, only 42,543 (i.e., less than 4%) exported goods in 2020 (Statistics

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Canada, 2021a, 2021b). As the backbone of Canada's economy, SMEs make a significant contribution to job creation and advancing inclusive economic growth. While proportionately SMEs are less likely to export, eight out of 10 new Canadian exporters are SMEs. The vast number of SMEs in Canada represents "an untapped source of exporters" that can help the Canadian government reach its goal of increasing exports by 50% in 2025 (Global Affairs Canada, 2019).

Technological advancements and economic globalization offer SMEs the opportunity to insert themselves into global value chains. However, selling to foreign markets can be challenging, especially for SMEs. While tariff barriers have drastically reduced around the world, nontariff barriers such as technical regulations, product standards, and certification requirements have emerged as the dominant components of trade barriers imposing significant costs to businesses (Ruckteschler et al., 2022). These standards-related barriers, known as technical barriers to trade (TBT), play an increasing role in shaping the flow of international trade. A report linking standards and regulations to trade demonstrated that technical regulations impacted up to 93% of goods exported globally in 2015 (Okun-Kozlowicki, 2016). These standards-related barriers can pose a particular challenge for SMEs, as they may be more likely to have limited resources to comply with standards or technical regulations (United States Trade Representative [USTR], 2012).

Standardization has a critical role in international trade, and SMEs' contribution to Canada's exports is significant, but disproportionate. Thus, it is important to understand how Canada can encourage more SMEs to participate in global value chains. In this study, the authors hypothesized that, by actively participating in international standards development, a country can more effectively address TBT, thereby helping to pave the road to the global market for SMEs. Subsequently, the authors tested this assumption by examining the association between Canada's participation in international standards development and SMEs' likelihood to export.

The remainder of the paper is organized in the following five sections: The first section offers a review of the literature explaining why TBT disproportionately impacts SMEs and the role of international standards in harmonizing technical requirements and reducing TBT; the second section provides the research question, an overview of the methodology, and the data the authors used; The third section presents data analysis and findings from this study; the fourth section consists in the discussion of the implications and practical impacts deriving from the research findings; the last section concludes the paper.

LITERATURE REVIEW

Standardization can help organizations optimize internal processes, improve operational efficiency, and reduce transaction costs, thus enabling them to become more competitive and profitable (Gerundino et al., 2014). They also provide an effective means of spreading and applying technical knowledge to a broad group of institutions, which, in turn, creates benefits for the wider economy by improving efficiency, interoperability, and productivity, thereby ensuring sustainable economic growth in the long run (Blind et al., 2022; Grimsby, 2018).

Technical Barriers to Trade Disproportionately Impact Small and Medium Enterprises

Thanks to advances in information technologies, improved transportation, and reduced tariffs, SMEs now have more potential to grow in export markets and be part of global value chains (World Trade Organization [WTO], 2016). However, such opportunities are not cost-free. Businesses must ensure that their products and/or services can be sold in diverse markets. This could require complying with technical regulations, standards, and conformity assessment procedures that may not be harmonized across the world. These standards-related measures are important tools to ensure that imported products or services comply with domestic requirements. They also play a critical role in overcoming

market failures and protecting the health and safety of consumers, as well as the environment of the importing country (Blind et al., 2022; Grundke & Moser, 2019).

Nevertheless, these standards-related measures can become trade barriers if unnecessary duplication in standards requirements exists. There are concerns that technical requirements can needlessly restrict trade if they are overly burdensome, discriminatory or outdated (USTR, 2010). According to the Agreement on Technical Barriers to Trade (referred to as “TBT Agreement”), there are three types of TBT measures:

- **Technical Regulations:** They are documents imposed by national regulators that lay down mandatory requirements on “product characteristics or their related processes and production methods” (WTO, n.d.a, p. 17).
- **Standards:** They are voluntary documents approved by a recognized body that provide “common and repeated use, rules, guidelines or characteristics for products or related processes and production methods” (WTO, n.d.a, p. 71).

Both technical regulations and standards may “include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method” (WTO, n.d.a, p. 71). While compliance to technical regulations is mandatory, standards are generally voluntary in nature, unless they are referenced in regulations.

- **Conformity Assessment Procedures:** They are processes or procedures used “to determine that relevant requirements in technical regulations or standards are fulfilled,” such as “procedures for sampling, testing, and inspection; evaluation, verification, and assurance of conformity; registration, accreditation, and approval, as well as their combinations” (WTO, n.d.a, p. 72).

Demonstrating compliance with technical regulations, standards, and conformity assessment procedures in export markets can be a significant barrier to trade. This is especially the case for SMEs. Compared to their large counterparts, SMEs, with limited resources and capacity, face more challenges in accessing information about, and complying with diverse and rapidly evolving technical requirements, which may impede their growth in the global market (Ruckteschler et al., 2022; USTR, 2013).

TBT related to product and testing requirements have been documented worldwide and remain one of the major obstacles hampering SMEs’ opportunities to grow through international trade. According to an OECD report (Lloyd-Reason et al., 2009), meeting export product standards or specifications ranked as one of the top ten barriers SMEs face in global markets. In an OECD/WTO survey (WTO, 2015), 79.2% of respondents indicated that nontariff measures (including standards) were one of the most important sources of trade costs when exporting. In the United States, the lack of mutual recognition of different product standards across borders was more likely to be cited as an export barrier for SMEs than for large enterprises (United States International Trade Commission [USITC], 2010). Standard related barriers were also the most cross-cutting trade-related barrier cited by SMEs in the U.S., in terms of inhibiting their exports to the European market (USITC, 2014).

In Canada, simplifying compliance requirements and harmonizing Canadian regulations were reported among the top five regulatory changes that can bring the most benefit to Canadian manufacturers and exporters (Arcand, 2020). Moreover, a survey conducted in the Niagara Region of Canada reported that export assistance in products standards was more useful for smaller firms than larger enterprises (Yannopoulos, 2010).

As previously noted, TBT can be prohibitively expensive and may impede SMEs from engaging in exporting activities (WTO, 2016). Compliance with technical requirements can be complex for firms exporting to multiple countries and may be particularly daunting for SMEs (Lesser, 2007).

Exporters are forced to make costly investments to comply with distinct technical requirements in various export markets, such as different packaging and labelling requirements, multiple certification processes or even changing the production processes (Cusmano & Koreen, 2017). Costs related to TBT affect SMEs disproportionately because these costs (e.g., additional testing, labeling, and packaging) are fixed regardless of the size, revenue or export value of a firm (Cernat et al., 2014; Ghodsi, 2023; USITC, 2014). Unlike large enterprises, most SMEs do not possess in-house experts with technical knowhow in conformity assessment or people who know how to efficiently overcome relevant trade costs (Fliess & Busquets, 2006; WTO, 2015). Larger firms are better positioned to absorb these costs due to higher market shares and economies of scale (USITC, 2019). By contrast, fixed compliance costs account for a larger proportion of SMEs' export sales, making them more burdensome (Jansen, 2016). As a result, SMEs are more likely to lose export potential or exit foreign markets due to costs related to TBT (USITC, 2019). This not only applies to SMEs exporters, but also affects SMEs that are indirectly involved in global value chains through subcontracting or supplying products to exporters (Ferro et al., 2013).

The Role of International Standards in Reducing Technical Barriers to Trade

It has been a global effort to reduce TBT through better alignment of technical regulations, standards, and conformity assessment procedures. To date, the TBT Agreement is the most horizontal collaboration attempting to address this issue, with 164 participating members and 25 observing members across the world (WTO, n.d.b). One of its critical components is harmonization. The agreement encourages member countries to harmonize standards, technical regulations, and conformity assessment procedures “to the maximum extent possible, with the standards, guidelines, and recommendations established by the relevant international standard-setting bodies” (WTO, 2021, para. 2).

Compared to domestic standards, international standards have a stronger effect on enhancing trade in the global landscape (Blind et al., 2022; Mangelsdorf et al., 2012; Swann, 2010). Harmonization based on international standards such as International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) can effectively reduce TBT. Under the Global Relevance Policy, international standards developed by ISO and IEC should be able to be implemented in any country or region to support global trade (USTR, 2010). Harmonization based on international standards relies on a common set of technical requirements. This is considered more effective than harmonization of standards at the regional level, since they may still divert from international efforts and result in fragmented requirements in the global space. International standards can help reduce language barriers, overcome information asymmetries, and increase transparency and compatibility, thus reducing trade barriers to cross-border trade (Blind & von Laer, 2022; Wakke et al., 2016). This is important in today's interconnected economies, where manufacturing of products could take place in the global landscape (Blind et al., 2018). By facilitating the exchange of technical information and knowledge, international standards allow a country to connect to global value chains and promote economic development in times of globalization (Blind et al., 2018; Blind et al., 2022; Gereffi et al., 2005; Nadvi, 2008). This is not only necessary for the connection and compatibility of products, but also increases consumer welfare by providing quality assurance and offering “wide and economically attractive choice of products” as a result of competition (WTO, n.d.c, para. 1).

In line with the WTO agreement, harmonization of international standards is widely recognized and supported (WTO, 2016). Yanase and Kurata's (2022) recent study demonstrated that free trade agreements are more favorable for trade if standards are harmonized across these agreements. The majority of regional trade agreements also encourage the use of international standards, guides, and conformity assessment procedures for setting technical regulations; this is intended as a collective effort by regional economies to achieve the end-goal of “one standard, one test, accepted everywhere” (Lesser, 2007, p. 21). Regional trade negotiations such as Canada-United States-Mexico Agreement and Comprehensive Economic and Trade Agreement are a few examples of such regional collaborations (Finbow, 2019; Global Affairs Canada, 2020; Wallach, 2001).

Research has demonstrated that harmonization of standards can enhance trade by increasing the volume of sales and enabling entry to an increased number of foreign markets for existing exporters. Schmidt and Steingress's (2022) empirical study showed that harmonization of standards increased product-level trade flows by 0.67%, equivalent to a tariff reduction of 2.1 percentage point. A U.S.-based study also reported that international harmonization of product standards could increase exports to Europe, mostly coming from new firms entering the European Union (EU) market. Notably, these firms were usually smaller and less productive than firms already exporting to the EU market (Reyes, 2011). This is not surprising, considering the high level of convergence between European standards and international standards. Both the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC) standards are heavily aligned with ISO and IEC standards. As of 2015, 31% of CEN standards and 72% of CENELEC standards were identical to ISO and IEC standards, respectively (CEN & CENELEC, 2015).

Harmonization of international standards is trending in the global space. It allows producers to provide the same or similar products to foreign markets despite the differences in regulatory frameworks. Firms can also save costs by sourcing low-cost inputs, achieving economies of scales, and avoiding expenses associated with different technical requirements across jurisdictions and markets (CEN & CENELEC, 2015). Blind et al. (2022) called for policy makers in EU countries to further invest in a harmonized standardization system not just within the European level, but at the international level as well. Harmonization based on international standards is not only favoured in EU, but also encouraged in Asian and Pacific region, especially in trade agreements with remote countries (Lesser, 2007). Both the Asia-Pacific Economic Cooperation (APEC) and the Association of Southeast Asian Nations (ASEAN) encourage their member countries to draw on international standards in writing their own technical regulations and standards (APEC, 2011; ASEAN, 2014).

Development and Adoption of International Standards

Worldwide use of international standards can reduce TBT and encourage more SMEs to take advantage of global markets. This is impeded when domestic regulations and standards are not in line with international standards or guidelines. When domestic requirements conflict with international standards, it is more challenging for SMEs to comply with both (USITC, 2019). By contrast, the adoption of the same set of international standards by the importing country and the exporting country can reduce the information asymmetry SMEs faced in the foreign markets and save costs in searching for and complying with various technical requirements. The adoption of international standards can be a full adoption or a partial adoption with modification to meet local needs (ISO, 2005). Whether or not the adoption is identical, the baseline is that it is built on a common set of standards. This allows easier adaptation and integration in the manufacturing of components and the end products sold to foreign markets (USTR, 2013).

To facilitate the adoption of international standards in the domestic market, it is important to ensure that international standards adequately reflect the country's interest. It is only when the development of international standards takes into consideration domestic needs and requirements that the adoption of international standards becomes possible. As Blind and von Laer (2022) pointed out, "[s]tandards are never neutral. They reflect the strengths and innovations of those who develop them. Therefore, nonparticipation in standardization hands decision making over to the competition" (ISO, 2012, as cited in Blind & von Laer, 2022, pp. 2-3). By strategically participating in international standards development, a country can potentially influence standards according to their needs. For example, to move the economy away from low-value-added manufacturing, China proactively sought out leadership roles at ISO in sectors with heavy R&D investment that are considered strategically important to the country (Blind & von Laer, 2022). China's growing footprint at ISO provides a good example of how a country can gain economic and political influence by taking a strategic and planned approach to international standards development that aligns with the country's interest (Rühlig, 2023).

Development and incorporation of standards into regulations can be slow (Lesser, 2007). According to the ISO (n.d.), it takes about three years to develop a standard from first proposal to final publication. The different cycles between standards development and the update of regulations further impedes the process of incorporating and updating standards in regulations (Standards Council of Canada, 2018). Thus, it is important to make sure that a country's voice is heard at the early stages of international standards development. This is the critical first step that can lead to a decrease of TBT and enable more SMEs to access global markets down the road. By strategically engaging in international standards development, a country can facilitate reductions in trade barriers that could ultimately bring more SMEs into global value chains.

RESEARCH QUESTIONS AND METHODOLOGY

Hypothesis

Given the critical role standards play in expanding national productivity through international trade, and the significant but disproportionate contribution of SMEs to the export markets, it is essential to understand the link between international standards development and SMEs' exports. However, research in this area is limited, particularly in Canada. To the best of the authors' knowledge, most studies have focused on specific sectors or geographic areas. To date, there is a lack of nation-wide data on how standards affect Canadian businesses' export performance. This research attempted to address this gap by studying how participation in international standards development connects Canadian SMEs to global value chains.

One key activity to influence the development of international standards is through participation in technical committees and subcommittees (TCs/SCs), where groups of experts and stakeholders develop the technical content of standards for particular issues (Liao, 2021). Each TC/SC is responsible for the development of standards within a defined scope. As of 2020, there have been close to 1,000 ISO and IEC TCs/SCs covering the development of international standards on diverse subject areas (IEC, n.d.; ISO, 2021). In this study, the authors used the number of ISO and IEC TCs/SCs in which Canada participates to quantify the country's level of involvement in international standards development. By taking part in TCs/SCs, a country has the opportunity to provide input and edit standards at the early stages. This enables faster and easier adoption of the international standards in the domestic market and should help avoid unnecessary trade barriers in international markets that also use the same set of standards. The authors assumed that the more international TCs/SCs a country participates in, the more power it has in shaping the content of standards to its own benefits, and thus the easier for SMEs from that country to comply with international standards and enter the export markets. Accordingly, the authors' hypothesis in this study is as follows:

Hypothesis: Participation in international standards development through TCs/SCs is positively associated with SMEs' likelihood to export.

To avoid exogenous influences, it is important to control for confounding variables that could potentially have an impact on SMEs' likelihood to export. Extant literature has widely documented factors associated with SMEs' export propensity. They are divided into two categories, namely firm-level attributes and owner-level attributes.

Firm-Level Attributes

Firm-level attributes include sectors, size of firm, age of firm, and innovation, as detailed below:

- **Sectors:** SMEs' export propensity is related to the sectors in which they operate. According to Orser and Carrington's (2006) research, across all industries, firms in the manufacturing

sector, whether SMEs or large enterprises, are most likely to export. SME exporters are also more likely to be involved in wholesale, retail, and the service sector, due to the lower initial investment required (Halabisky et al., 2005; Innovation, Science, and Economic Development Canada [ISED], 2020).

- **Size of Firm:** Empirical research has found mixed evidence with respect to the relationship between firm size and export propensity. Cavusgil (1984) reported no significant relationship between firm size and export propensity. Yet, many studies have demonstrated that firm size, both in terms of the size of employment and financial measures, such as revenues and assets, was positively correlated with, or represented a threshold of, exporting (Calof, 1994; Halabisky et al., 2005; Julien et al., 1993; Orser & Carrington, 2006; Simpson & Kujawa, 1974).
- **Age of Firm:** Similar to firm size, empirical findings for firm age and export propensity are inconclusive (Johanson & Vahlne, 1990; Sapienza et al., 2006). While traditional internationalization theory suggests that firm age is positively correlated with international expansion, Orser et al.'s (2008) study of 8,112 Canadian SMEs showed no significant statistical differences in firm age between exporters and non-exporters.
- **Innovation:** Innovation may increase SMEs' adaptability to the changing market and complex international environment, thus impacting their capability to export (Lumpkin & Dess, 1996). In the global context, innovative SMEs with positive attitudes towards novelty are more likely to adopt new markets and creative practices to serve diverse preferences from foreign customers. In Orser et al.'s (2008) study, innovative SMEs were more than twice as likely to export as their counterparts.

Owner-Level Attributes

Owner-level attributes include age of owner, educational, management experience, immigration and growth intention, as detailed below:

- **Age of Owner:** For firms with relatively smaller size, the characteristics and attitudes of SME owners play a critical role in driving exporting strategy (Crick & Spence, 2005; Reid, 1981). Liao (2015) reported that the age of the business owner was positively associated with SMEs' likelihood of exporting. It is assumed that an older age is associated with more resources, thus a higher degree of risk-tolerance, resulting in more positive attitudes towards exporting (Cavusgil, 1984).
- **Educational Level:** Evidence shows that college and university education is positively associated with export propensity by increasing SME owners' expectations of profit, decreasing their perceptions of risk, and generating a positive response to unsolicited orders from foreign customers (Crick & Spence, 2005; Dimitratos & Plakoyiannaki, 2003; Reid, 1981; Simpson & Kujawa, 1974).
- **Management Experience:** Accumulated experiential knowledge in management and in international markets has been reported to have a positive association with the propensity to obtain foreign sales (Reuber & Fischer, 1997; Spence et al., 2011). SMEs' management experience (including owners' pre-firm experience) and international acumen are suggested as factors that explain firms' differences in export propensity (Orser & Carrington, 2006; Orser et al., 2008; Wiedersheim-Paul et al., 1978).
- **Immigration:** Bilkey (1978) suggested that firms tend to start their exporting businesses in countries that are psychologically closer to their own before expanding into countries that are psychologically more distant. This explains why immigrant-owned firms are found to have a higher tendency to export as a result of their international acumen in immigrant networks, foreign language competencies, and cultural familiarity (Spence et al., 2011).
- **Growth Intention:** Growth intention could be a positive indicator of business owners' attitudes towards export and has been reported to have a positive association with export propensity (Orser

& Carrington, 2006). In Orser et al.'s (2008) study, owners with growth intentions are twice as likely to export as those who did not intend to grow even after controlling for firm size and sector.

Research Methodology and Data

This study drew on data from the Survey on Financing and Growth of Small and Medium Enterprises (SFGSME) conducted by ISED and Statistics Canada.² The researchers collected data between February and June 2018, but the reference period was for the 2017 calendar year. This survey targeted private sector SMEs that employed between 1 and 499 employees and that generated annual gross revenue of \$30,000 or more. To ensure data representativeness, Statistics Canada stratified survey sample by geographic locations, sectors, age and size of businesses. With 9,115 respondents across the country and a response rate of 53%, this survey provides a good source of nation-wide data to help better understand the impact of Canada's participation in international standards development (measured by the number of TCs/SCs Canada participated) on SMEs' likelihood to export.

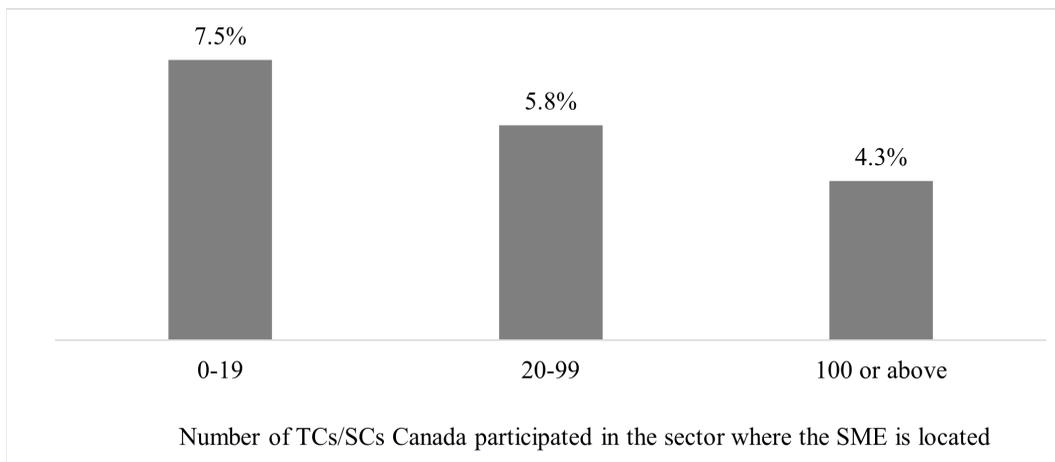
The survey asked SME exporters whether administrative obstacles outside of Canada such as product standards, technology requirements, and foreign customer requirements were major obstacles in exporting. Taking a sectoral approach, the respondents showed a negative association between the number of TCs/SCs in which Canada participated (i.e., in sectors where SMEs were located) and the tendency for SMEs to report standards-related obstacles in exporting (Figure 1). This indicates a positive impact of TCs/SCs participation on SMEs' exporting experience.

To account for potentially confounding variables, the authors adopted the same model as in Orser et al.'s (2008) and Spence et al.'s (2011) work, namely, multivariate logistic regression, to control for systemic firm and owner differences to investigate the association between Canada's participation in international TCs/SCs and SMEs' likelihood to export. Whether or not the SME reported any export sales is the dependent variable in the logistic regression. The model is expressed as follows:

$$\ln \left(\frac{f(x_i)}{1 - f(x_i)} \right) = \alpha + \beta_a T + \sum_{i=1}^n \gamma_i C_i + \tilde{\epsilon} \quad (1)$$

where:

Figure 1. Percentage of SME Exporters that Reported Standards-Related Obstacles



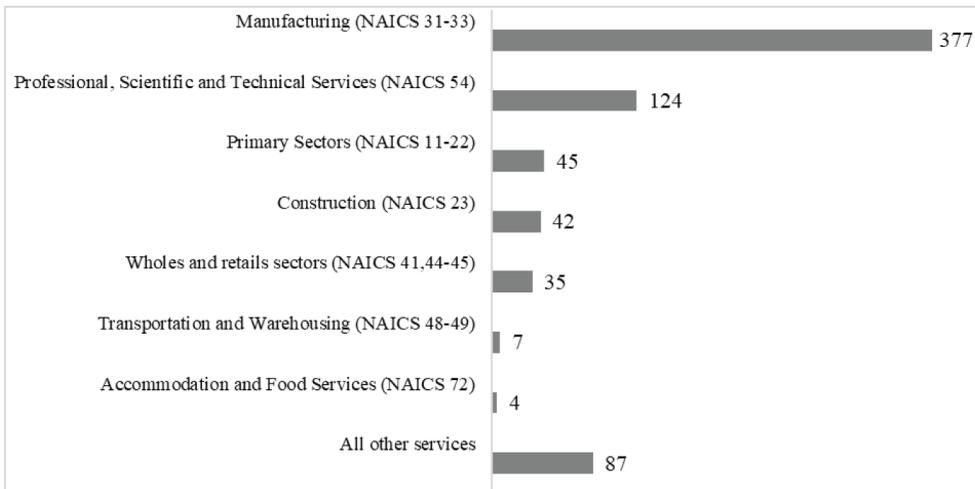
- $\ln \left(\frac{f(x_i)}{1 - f(x_i)} \right)$ is the dependent variable; it denotes the natural logarithm of $f(x_i)$ and represents the probability that an SME exported in 2017.
- T indicates the number of international TCs/SCs in which Canada participated aligning to the SME’s sector in the year 2015, taking into consideration a lagging effect of TCs/SCs participation on export. The authors completed this step by manually mapping each TC/SC in which Canada participated in 2015 to the NAICS code. Figure 2 shows the result of the mapping (i.e., the number of TCs/SCs in which Canada participated in each sector). The authors introduced the lag to account for the fact that complying with standards and acquiring certifications is a time-consuming process that is necessary before a product or service can be exported.
- $\sum_{i=1}^n \gamma_i C_i$ represents a group of control variables that the authors had previously found to influence SMEs’ likelihood to export. Specifically, control variables that the authors considered in this study include:
 - **Firm-Level Characteristics:** Sectors, size of firm, age of firm, and innovation.
 - **Owner-Level Characteristics:** Age of owner, educational level, management experience, immigration, and growth intention.
- $\tilde{\varepsilon}$ are vectors of error terms assumed to obey the statistical assumptions of the model being estimated.

Table 1 provides a more detailed description of the variables the authors included in the regression model.

Before proceeding to the regression, the authors applied analysis weights to ensure that the results were representative of the underlying population of Canadian “employer SMEs.”

The authors carried out the logistic regression in two steps. They entered control variables, including salient firm and owner attributes, in the first step. Then, in the second step, they entered the number of international TCs/SCs in which Canada participated, to assess whether it significantly improved the model’s ability to predict SME’s propensity to export. Since the authors mapped the

Figure 2. Number of International TCs/SCs in Which Canada Participated by Sectors



Note: Since one TC/SC can be mapped to more than one NAICS code, the total count of TCs/SCs here is greater than the actual number of TCs/SCs in which Canada participated in 2015.

Table 1. Summary of All Variables in the Regression Model

Variables	Descriptions
Dependent variable	Whether the SME reported export sales in 2017.
Independent variable	The number of ISO and IEC TCs/SCs in which Canada participated, by the sector where the SME was located, in the year 2015.
Control variables	<ul style="list-style-type: none"> • Sectors: Defined by the 2-digit NAICS code. • Size of Firm: Number of employees the SME employed (excluding the business owner) in 2017. Since the data on firm size were not normally distributed, the authors transferred it into Ln(size of firm) to normalize this variable in the analysis of logistic regression. • Age of Firm: Number of years since the SME had been first established at the time of the survey. • Innovation: Whether the SME reported at least one of the following innovations between 2015 and 2017, namely, production innovation, process innovation, organizational innovation and/or marketing innovation. • Age of Owner: Age of the primary decision maker at the time of the survey. • Educational Level: Level of education of the business owner defined by four levels: <ul style="list-style-type: none"> ◦ High school education or less. ◦ A college/diploma. ◦ A bachelor's degree. ◦ A master's degree or above. • Management Experience: Years of experience the primary decision maker has in owning or managing a business. • Immigration: Whether the primary decision maker was born outside of Canada. • Growth Intention: The expected growth of annual sales over the next three years at the time of the survey (referred to 2018, 2019, and 2020).

independent variable (i.e., number of TCs/SCs in which Canada participated) based on NACIS code, they checked the variance inflation factor of the second regression to rule out the possibility of multicollinearity.

RESULTS AND ANALYSIS

Table 2 reports the results of the logistic regression. For both step one and step two, the p-value was less than 0.000, an indication that the model was statistically significant. The increase in the pseudo R-squared in step two also signified that adding Canada's participation in TCs/SCs to the model was meaningful and improved the explainability of the model. Unlike R-square in ordinary least squares regression, pseudo R-squared in logistic regression does not reflect the proportion of variance in the dependent variables explained by the predictors. It only has meaning when compared to another pseudo R-squared of the same type, on the same data, and predicting the same outcome. In this situation, the higher pseudo R-squared indicates that the model in step two better predicts the outcome.

The coefficient is less straightforward in the interpretation of logistic regression. To better understand how Canada's participation in TCs/SCs is associated with SME's likelihood of exporting, the authors used odds-ratio, instead (as presented in Table 2). An odds-ratio of higher than one means that the independent variable is positively associated with the dependent variable. On the contrary, an odds-ratio of lower than one indicates a negative association between the independent variable and the dependent variable.

Results of the regression showed that, after controlling for potentially confounding firm and owner attributes, Canada's participation in TCs/SCs was significantly and positively associated with SMEs' likelihood to export. The hypothesis of this study was supported. Specifically, an odds-ratio of 1.002681 indicated that one-unit increase in TCs/SCs (i.e., participating in one more TC/SC) was

Table 2. Date Output of the Regression

Variables	Step One		Step Two	
Sectors	Odds-Ratio		Odds-Ratio	
Construction (NAICS 23)	0.2928256	***	0.2708773	***
Manufacturing (NAICS 31-33)	4.449462	***	2.789699	***
Wholesale and Retail Sectors (NAICS 41,44-45)	1.665462	***	1.667554	***
Transportation and Warehousing (NAICS 48-49)	3.855588	***	3.933472	***
Professional, Scientific and Technical Services (NAICS 54)	2.758542	***	2.05108	***
Accommodation and Food Services (NAICS 72)	ns		ns	
All Other Services	ns		ns	
Size of firm	1.242033	***	1.243249	***
Age of firm	1.006582	**	1.00634	**
Age of owner	ns		ns	
Educational Level				
College/Diploma	ns		ns	
Bachelor's degree	1.718217	***	1.708913	***
Master's degree or above	1.856077	***	1.847544	***
Management experience	ns		ns	
Immigrant	1.283751	**	1.281512	**
Growth intention	1.355895	***	1.361602	***
Innovation	2.153831	***	2.150333	***
Participation in TCs/SCs			1.002681	***
Constant	0.0114444	***	0.0109972	***
Number of observations	7545		7545	
Pseudo R2	0.1550		0.1564	
P-value (Prob > chi2)	0.0000		0.0000	

Note: * denotes the significance level, where *** corresponds to 99% (p-value \leq 0.01) and ** corresponds to 95% (p-value \leq 0.05); ns indicates that the independent variable is not significantly associated with the dependent variable. Restricted by the Information and Privacy Breach Protocol at Statistics Canada, analysis based on survey data should not reveal any confidential information and all results need to be vetted before publication. In this analysis, the authors did not report odd ratios of insignificant variables as they are omitted in the vetting process.

associated with a 0.2681% increase in the probability of an SME in exporting (i.e., the likelihood of an SME to participate in international trade). By inserting this odds-ratio as well as the number of exporters and non-exporters back to the regression, the authors were able to calculate the increased number of SME exporters associated with one-unit increase in TCs/SCs, which was 203. In other words, participating in one more TC/SC was associated with a potential increase of 203 SMEs entering the export market. Among all SME exporters, 40.7% exported goods only and 12.4% exported both goods and services in 2017. Thus, increased participation in one more TC/SC would be associated with an increase of 108 SMEs exporting goods to the foreign markets. At the time of the study, the average export value of SME goods exporters was CAD 4.78 million (Statistics Canada, 2021a). Assuming that new SME goods exporters had a similar average export value as their counterparts, participating in one more TC/SC would be associated with an increase of approximately 516 million CAD.

Data output also indicated that, consistent with previous literature, SMEs' likelihood to export was sector specific (Halabisky et al., 2005; Spence et al., 2011). Compared to SMEs in the primary

industries (i.e., NAICS 11 - Agriculture, Forestry, Fishing and Hunting and NAICS 21 - Mining and Oil and Gas Extraction, which was the referenced category in the logistic regression), SMEs in Manufacturing (NAICS 31-33), Wholesale and Retail Sectors (NAICS 41,44-45), Transportation and Warehousing (NAICS 48-49) and Professional, Scientific and Technical Services (NAICS 54) were more likely to export.

Holding all other variables constant, both firm size and firm age were significantly and positively associated with SMEs' likelihood to export. This is consistent with the underlying theories in traditional internationalization, which assumes that the fundamental goal for a firm is long-term survival, thus it progresses to internationalization in a relatively orderly manner in accordance with the accumulation of market knowledge and experience (McDougall et al., 1994; Oviatt & McDougall, 1994; Sapienza et al., 2006).

Consistent with previous research, innovation, growth intention, and business owners that were immigrants and with a bachelor's degree or higher were also significantly and positively associated with SMEs' likelihood to export (Crick & Spence, 2005; Lumpkin & Dess, 1996; Orser et al., 2008; Parsley, 2004). Surprisingly, neither age nor management experience of the business owners were significantly associated with SMEs' export propensity in this study. Age is connected to people's aspiration, creativity, and openness. While younger SME owners might be more internationally minded but lack of resources to enter the export markets, older SME owners with more experience might be more conservative in taking risks in international markets when they may be starting to consider retirement. Thus, it is possible that the relationship between age/experience of the business owners and the likelihood to export would emerge as an inverted U-shape, that is, age and experience of the SME owners might be positively associated with the likelihood to export until it reaches the turning point when the association become negative. Further analysis is required to examine this assumption.

DISCUSSION

This research builds on previous SME studies on export propensity, adding a standards perspective by linking the propensity to export to participation in international TCs/SCs. To the best of the authors' knowledge, this is the first nation-wide study trying to link standards with Canadian businesses' export performance. It addressed the research gap by studying how participation in international standards development connects Canadian SMEs to global value chains. Results of this study indicate that, holding other confounding factors constant, Canada's participation in international standards development through TCs/SCs is positively associated with SMEs' likelihood to export. In addition, in this study, the authors tested firm and owner attributes that they had previously found to be associated with SMEs' export propensity in the Canadian context.

Like all empirical studies, this research is not without limitations. The use of country specific data means that care should be taken when extrapolating the results. However, given that the export trends of Canadian SMEs may be similar in other countries, additional research could be conducted to test the applicability of our findings. Additionally, to link SMEs with Canada's participation in international standards development, the authors mapped the NAICS codes to international TCs/SCs in which Canada participated. While the NAICS code is designed to reflect the classification of economic activities, TCs/SCs are categorized to reflect the content of standards and technologies covered by the committees. Unlike the NAICS, standards sectors are not exhaustive nor mutually exclusive. Consequently, the mapping from TCs/SCs to NAICS code is not an exclusive one-to-one relationship, that is, one TC/SC is often mapped to multiple sectors in NAICS. In addition, restricted by the data privacy policy from Statistic Canada, the mapping of TCs/SCs can only be done in the two-digit level.³ This limits the authors' ability to perform interaction analysis between TCs/SCs and sectors and the possibility to explore sector specific challenges. Targeted research is needed to further elaborate sectoral trends.

Finally, when estimating the increased export value from increased TC/SC participation, the authors assumed that new SME goods exporters had a similar average export value with their counterparts. This is unlikely the case. Given that we did not have sufficient data to warrant an accurate estimate for all types of increase (i.e., export in both goods and/or services sectors, increased sales from existing exporters and new exporters), we opted to be conservative when estimating the economic benefits associated with the increased participation in international standards development through TCs/SCs. Hereto additional research is needed to disentangle the impacts on export sales from different types of exporters.

While the results highlight the important role of standards participation in driving SMEs to export, it is important to keep in mind that engaging in international standards development does not act alone to boost domestic exports. Increases in Canada's participation in international TCs/SCs is necessary, but not sufficient, to connect Canadian SMEs to the global market. Harmonization based on international standards should be a global effort that is recognized and adopted internationally to foster greater technical alignment in trade. Meanwhile, in alignment with WTO principles, it is also important for the Canadian government to consider international standards in domestic regulations when they can adequately meet the needs and requirements of the domestic market. This is an area that may require further exploration. In 2021, less than 15% of references to standards in Canada's federal, provincial and territorial regulations were for international standards or adoptions of international standards. By comparison, U.S. standards are more predominantly referenced in Canadian regulations. More than one-third of references to standards in Canadian regulations are to U.S. standards. Given that the U.S. account for more than 70% of Canadian exports, it is not surprising that Canadian regulators seek to align with U.S. However, as Canada seeks to diversify trade, it will be important to consider the balance of which standards (i.e., regional or international) are referenced in regulations to maximize trade. Results of this research indicate that international standards do play an important role in facilitating trade and encouraging more SMEs to capitalize on global value chains.

Notably, mutual recognition of conformity assessment procedures is as important as harmonization of international standards to enable seamless trade. If the importing country does not recognize the certification from the exporting country, exporters will still face duplicative costs in acquiring multiple certifications and potential delays in entering foreign markets. Only when harmonization towards international standards and mutual recognition on the conformity assessment procedures work in parallel will TBTs be reduced or eliminated to the maximum extent possible (Correia de Brito et al., 2016; Horton, 1998; Nicolaodis, 1997; Pelkmans, 2007; Schmidt, 2007).

CONCLUSION

International trade is crucial for the prosperity of Canadian economy. As the authors noted previously, the vast majority of Canadian exports are destined for the U.S. market. As Canada is increasingly looking for opportunities to diversify, the importance of diversification is clear given the unprecedented global uncertainty as well as the rising tension on the trade policy between Canada and the U.S.

Results of this study indicate that Canada's participation in international standards development through TCs/SCs is positively associated with SMEs' likelihood to export. Specifically, participating in one more TC/SC could potentially be associated with 203 SMEs entering export markets, among which 108 could be exporters of goods with a potential to increase good exports by 516 million CAD. By proactively and strategically engaging in international standards development through TCs/SCs, Canada can have an influential voice at the table and achieve better alignment between domestic technical regulations/standards and international standards. This is a critical first step if Canada is

to expand and diversify trade in the global landscape. This will help Canadian SMEs pave the road to global markets and capitalize on export opportunities by providing them with more predictable access to over seven billion customers around the world.

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ENDNOTES

- ¹ In Canada, an SMEs is defined as a business establishment with 1 to 499 paid employees.
- ² For the purpose of this survey, non-profitable organizations, cooperatives, financing, and leasing companies, joint ventures, multiple/federal government, subsidiaries, as well as other enterprises in specific industries are not included in the sampling population.
- ³ According to the Information and Privacy Breach Protocol at Statistics Canada, the cross-tabulation between any independent variable and the dependent variable should reach a minimum frequency to guarantee that it will not reveal any confidential information. Dividing NAICS code into three-digit level or more will violate this rule, thus is not allowed.

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