

Superstar Search: Studying the Current and Potential Populations of Canadian Exporters and Foreign Direct Investors Abroad

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L'étude réalisée porte sur l'analyse du potentiel d'amélioration des exportations canadiennes et des investissements directs canadiens à l'étranger. Pour effectuer cette analyse, nous avons constitué un ensemble exclusif de données administratives regroupant des informations détaillées au sujet de millions d'entreprises ayant exercé leurs activités au Canada entre 2010 et 2015. Ainsi avons-nous pu, dans un premier temps, étudier la population canadienne *actuelle* d'exportateurs et d'investisseurs directs à l'étranger. À l'aide d'un modèle probit et de l'appariement des coefficients de propension, nous en avons déduit, dans un second temps, la population *potentielle* de ces entreprises et avons examiné leurs caractéristiques observables. Nos estimations semblent indiquer que le potentiel inexploité de croissance des activités canadiennes internationales outre-frontières est considérable, des milliers d'entreprises ayant été recensées comme exportateurs ou investisseurs directs à l'étranger présentant un fort potentiel. Les possibles candidates, prises individuellement, sont susceptibles d'avoir au départ un volume d'activités beaucoup plus modeste sur les marchés internationaux, car elles tendent à être exploitées à plus petite échelle que les entreprises dont les activités ont déjà une envergure internationale — dans le cas des exportateurs, moins de la moitié et dans le cas des investisseurs à l'étranger, moins du dixième.

Mots clés : caractéristiques des entreprises, exportations, investissements directs canadiens à l'étranger, politique commerciale, taille et distribution du marché

In this article, we analyze the potential to increase Canada's exports and foreign direct investment abroad. To do so, we construct a unique administrative dataset containing detailed information for millions of companies that operated in Canada between 2010 and 2015. This allows us first to study the current population of Canada's exporters and foreign direct investors abroad. Then, using probit modelling and propensity score matching, we infer the potential populations of these firms and examine their observable characteristics. Our estimates suggest there is considerable untapped potential to grow Canada's outward international activity, with thousands of firms identified as high-potential exporters or foreign direct investors abroad. On a per-firm basis, the initial international activity of potential entrants is likely to be considerably lower because they tend to operate at a smaller scale than companies that are already internationally active—for exporters, less than half the scale, and for outward investors, less than one-tenth the scale.

Keywords: Canadian foreign direct investment abroad, exports, firm characteristics, market size and distribution, trade policy

Introduction

Given Canada's small domestic market, which accounts for only 2 percent of global gross domestic product, expanding and strengthening trade and investment links with the rest of the world is critical to fostering an innovative economy that can sustainably improve its long-run living standards. As such, it is a perennial government objective to promote exporting, including increasing the number of exporters and supporting foreign direct investment (FDI), in order to develop the country's commercial capabilities and links to global supply chains.

The coronavirus disease 2019 (COVID-19) global pandemic puts a premium on this long-standing desire. Between February and April 2020, during the first wave of government containment measures in various countries, the value of total Canadian exports suffered a massive decline of one-third. Initial estimates suggest the number of goods exporters dropped by almost 4,100 firms, or 20 percent (Statistics Canada 2020b). A key question is how many of these exporter exits will be permanent and how many will be temporary. Elevated household debt levels in Canada may restrain future consumer spending, and with weak private-sector investment intentions in the oil and gas sector, the economic recovery will likely require a sizable contribution from international trade.

Fortunately, despite the ongoing pandemic and elevated worries about global protectionism, existing exporters' reported interest in new and diversified cross-border activities has spiked. It appears that companies are trying to ensure business survival by seeking out new customers wherever they are located around the world. *Export Development Canada's (2020)* biannual survey of Canadian exporters, conducted in May 2020 as the initial COVID-19 containment measures were beginning to ease, finds that the share of respondents exporting to new international markets rose to its highest level on record (50 percent), and the number of those planning to export to new markets was also higher than ever (69 percent). At the same time, the share of respondents with investments outside of Canada also increased to reach a record high (20 percent).

Such surveys capture recent actions and intentions reported by current exporters who are already in international markets; however, if we want to develop future trade, it is critically important to learn more about potential entrant firms—a task that has thus far proven elusive. In recent decades, the firm-level approach to international trade research has greatly improved the understanding of how trade is created. This literature consistently finds that, after episodes of trade policy liberalization, the majority of trade growth comes from the extensive margin—that is, the entry of new trading firms, the creation of newly traded products, and engagement with new international markets—as opposed to the intensive margin, whereby existing traders scale up existing trade patterns (Baier, Bergstrand,

and Feng 2014; Dutt, Mihov, and Zandt 2013; Tapp, Van Assche, and Wolfe 2017; Timothy and Kim 2013).¹

Expanding Canada's exporter community and supporting the economic recovery, therefore, requires identifying high-potential companies currently focused on the domestic market that could become the next successful exporters and foreign direct investors. Unfortunately, in practice little is known about these firms. As such, it is challenging for trade promotion authorities to recognize the best candidates that are capable of moving into foreign markets and to distinguish them from those that are content to continue serving only domestic customers.

This goal of this article is to inform Canadian trade policy and strategic business planning by identifying the observable characteristics of these potential entrants, quantifying the overall size of this population, and estimating the potential benefits if they were to become exporters or outward foreign direct investors. We accomplish this by first examining the attributes of current exporters and outward foreign direct investors. We then apply propensity score matching techniques to infer and analyze potential exporters and outward foreign direct investors—identified as firms that share similar attributes but have not yet moved into global markets.

We make two main contributions to the literature. First, we provide a rich picture of the longer-run trends in outward international trade and investment activities of firms operating in Canada. By adopting a broad concept of international activities, we go beyond the typical focus on direct merchandise exports from Canada to examine commercial services exports, export sales to foreign markets made by Canadian foreign affiliates operating abroad, and Canadian direct investment abroad (CDIA). In addition to these activities, we examine other important dimensions, such as importing, foreign ownership in Canada, and employing immigrants. We achieve this by constructing a unique and comprehensive database that links information on the universe of millions of businesses that operated in Canada between 2010 and 2015.

Our second and more novel contribution is to provide longer-run estimates of the potential pool of exporters and outward foreign direct investors. Rather than indirectly inferring this information by asking firms through surveys, we take a more sophisticated approach to improve our understanding of the underlying characteristics of firms that have the highest potential to become active in global markets. In addition to estimating the number of potential exporters, our approach allows us to estimate the value, intensity, and other attributes of these firms, such as various distributional characteristics. In doing so, we demonstrate how analyzing large, linked administrative databases can inform trade policy-makers and support corporate strategic planning in Canada.

A preview of our main findings is as follows:

- Canada's exports are increasingly being complemented by a growing, on-the-ground presence of Canadian companies working via affiliates operating in foreign markets.
- Canadian export value is highly concentrated among superstar global firms. These are large, highly capital-intensive businesses that employ immigrants and simultaneously import and export.
- CDIA makes an outsized contribution to economic activity, and it is growing quickly, particularly for debt-financed investments.
- Few Canadian exporters engage in CDIA (only 3 percent), but most CDIA firms (74 percent) are exporters.
- There are plenty of potential entrant firms that look as though they could become exporters and outward investors, but they are likely to do significantly less international business than the established firms, at least initially.
- Potential exporters are typically not investing abroad; are small, Canadian-owned, non-frontier

productivity firms; have been operating for less than 20 years; are importers; employ immigrants; are highly capital intensive; and have low debt.

- Potential foreign direct investors abroad are typically highly capital intensive, employers of immigrants, importers, exporters, small or medium sized, firms with more than 10 years of operating experience, and domestically controlled and have low debt-to-asset ratios.

The article is organized as follows: in the next section, we outline the analytical framework and methodology and review the relevant literature. We then describe the data and present the results. The final section concludes.

Analytical Framework and Methodology

Among the population of firms operating in Canada, we focus on two segments (see Figure 1). The first is the currently active market, which includes enterprises that are currently investing abroad or exporting goods and services to foreign markets directly from Canadian facilities

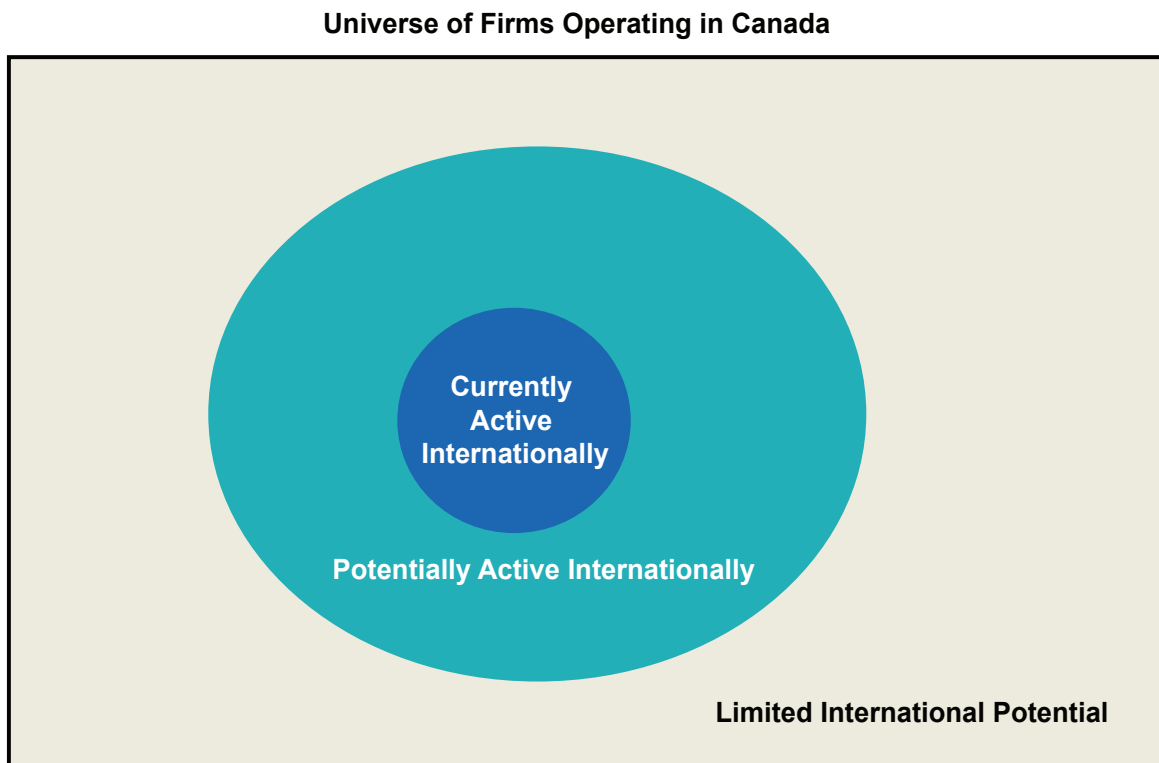


Figure 1: Conceptual Approach to Distinguishing Firms' Potential to Be Internationally Active

Notes: Currently active = enterprises in Canada that currently export or are foreign direct investors abroad; Potentially active = enterprises in Canada that currently do not export or invest abroad but have similar observable characteristics as current exporters or foreign investors abroad; Limited international potential = enterprises in Canada that currently do not export or invest abroad and do not have similar observable characteristics as current exporters or foreign investors abroad.

Source: Authors.

or from foreign affiliate facilities. The second segment is the potentially active market, which includes enterprises that are not currently exporting or investing abroad but that have similar observable characteristics as current exporters or foreign investors.²

Attributes of Current Exporters and Canadian Foreign Direct Investors

Before estimating the potential pool of exporters and Canadian foreign direct investors abroad, we first investigate the observable firm characteristics associated with exporting and outward investing. In addition to well-known firm attributes such as age, size, and productivity, we also consider firms' multi-dimensional global linkages.³ This is because recent research finds that the best-performing "superstars," or so-called global firms, typically engage in different global activities simultaneously along several dimensions, such as exporting, importing, investing abroad, and employing immigrant workers (Bernard et al. 2018; Freund and Pierola 2015). Therefore, we analyze how these different dimensions of global linkages are associated with firms' decisions to export or invest abroad.

Decisions to enter export markets have long been explicitly considered in heterogeneous firm-based models of international trade, where entering international markets involves incurring fixed costs (Bernard et al. 2003; Melitz 2003). In these models, firms only enter export markets if the present value of their expected profits from exporting exceeds the fixed entry costs. This implies that only some firms export and that these exporters are generally more productive. These empirical patterns are found in previous studies across many countries, consistent with the theoretical prediction that high-productivity firms self-select into export markets (see Bernard et al. 2012 and Wagner 2007 for a survey of the literature, and Baldwin and Yan 2015 for a summary of Canadian evidence).

Helpman, Melitz, and Yeaple (2004) generalize the Melitz (2003) model on exports to horizontal FDI. The model shows that if the fixed costs of FDI are sufficiently high relative to the fixed cost of exporting, then the most productive firms will serve foreign markets through FDI, firms in the intermediate productivity range will choose to export, and the least productive firms will choose to serve only the domestic market. Yeaple (2009) provides supportive evidence on heterogeneous firms and FDI.

Recent work further considers the interplay of a firm's other international activity on its export or investment decisions. Bernard et al. (2018) demonstrate the interdependencies and complementarities between various modes of firms' international participation, and Kasahara and Lapham (2013) and Baldwin and Yan (2020) provide some of the first empirical evidence in this area. Kasahara and Lapham (2013, 305) find that complementarities between the fixed costs of importing and exporting allow a firm to "save between 7 and 26 percent of the per-period

fixed costs and sunk costs." Baldwin and Yan (2020) find that a firm's export decision and subsequent performance is related to its prior global engagement as an importer.

To identify key observable firm characteristics typically associated with firms' exporting or foreign investment decisions, we model a firm's probability of being an exporter or foreign direct investor as a function of a set of observable characteristics, as follows:

$$\text{Prob}(d) = \Phi(Z), \quad (1)$$

where d is an indicator variable that equals 1 if the firm is an exporter or a foreign direct investor and 0 otherwise. Z is a set of observable firm characteristics, which includes labour productivity, size (sales or total assets), age, research and development, capital intensity, financial structure (leverage), industry, province and international activities (exporting, importing, CDIA, foreign ownership in Canada, and proportion of immigrant workers employed by the firm). Industry, province, and foreign ownership in Canada are discrete dummy variables. All other variables are continuous.

Potential Exporters and Outward Canadian Foreign Direct Investors

Propensity Score Matching

The key challenge is that potential exporters or Canadian foreign direct investors abroad are not directly observable. However, they can be inferred using propensity score matching.⁴ This approach essentially creates a control group (i.e., potential exporters or foreign direct investors) from the non-treated pool (i.e., the universe of non-exporters or non-foreign direct investors), in which the distribution of observed firm characteristics is as similar as possible to the distribution of the treated group (i.e., currently active exporters or foreign direct investors).

Two steps are involved. First, we identify the key observable firm characteristics typically associated with firms' exporting and foreign investment decisions. A probit model based on Equation (1) distills the numerous observable characteristics into an estimated propensity score (i.e., the probability that a given firm in Canada, operating in industry i , at time t , is an exporter or foreign direct investor), conditional on a detailed set of observable characteristics, Z .

In the second step, we use the estimated propensity scores to match each current exporter or foreign direct investor with one or more similar firms, whose propensity scores and observable characteristics are not statistically significantly different. The matched firms are the potential pool of exporters and investors who share the same characteristics as the current ones but who have not yet become internationally active.⁵

There are two main methods of matching: (a) nearest neighbour and (b) kernel-based matching, which uses

distributional weights proportional to the closeness of the treated and the non-treated units. This study uses the nearest neighbour approach. In nearest neighbour matching, each treated unit is matched to one or more non-treated units to minimize the difference in the propensity scores that summarize the multi-dimensional characteristics.⁶ To ensure comparability of the matched samples, matching is done for each year, and within each North American Industry Classification System (NAICS) three-digit industry (which represents 99 district industries). We use one-to-one matching and one-to-five matching.

Conceptually, the propensity score is a conditional probability based on observed characteristics. The technique can balance observed covariates between the control and treated groups, but it cannot control for unobserved covariates that could make one group systematically different from the other. This is especially important if one uses the technique to infer a causal relationship between an intervention and an outcome. This limitation of unobserved confounders is less relevant in our case because we are not inferring causality but are simply identifying firms that share the same observable characteristics as the current exporters or foreign direct investors but that have not yet exported or invested abroad. One must look beyond the observed characteristics identified in this article for explanations for why the identified pool of potential exporters and investors has not yet moved into international markets.

Estimating the Value of the Potential Market

After establishing the pool of potential exporters and foreign investors, we estimate the latent value of international activities of the potentially active market by assuming that the value of exports or foreign investment is proportional to one of the characteristics, such as total sales of goods and services in the case of exports or total assets in the case of foreign investment (A_{it}). Moreover, we assume the intensity of exports or FDI abroad is similar between the matched pair of treated and control units. The estimated value of exports or FDI for the control unit i at time t (\hat{v}_{it}) equals its total sales or total assets (A_{it}) times the average intensity of its neighbours of the matched treated units

$$\hat{v}_{it} = A_{it} * \frac{\sum_{j \in \text{matched treated units}} (v/A)_{ijt}}{n} \quad (2)$$

Data

The dataset mainly draws from Statistics Canada's National Accounts Longitudinal Microdata File (NALMF), which contains detailed information on firm characteristics in productivity, capital intensity, size, age, financial leverage, industry, and geographic location.⁷ Labour

productivity is measured as value-added output divided by total employment. Value-added output is computed as the sum of profits (net income before tax)⁸ and labour costs (payroll from tax T4 slips issued by enterprises). Labour productivity is deflated by industry-level deflators taken from the Canadian Productivity Accounts. Capital intensity is calculated as total tangible and intangible assets divided by total employment. Size can be captured by a few measures, such as employment, total revenue, total sales of goods and services, and total assets. Financial leverage is measured by the total liabilities relative to total asset ratios, which indicates the share of total assets financed by trade creditors, banks, and other lenders that result in a firm's liabilities and debt.

We link NALMF at the enterprise level to the following micro databases from Statistics Canada to obtain additional information on firms' linkages to global markets: imports, exports, foreign ownership, CDIA, and the proportion of immigrant workers. The trade and FDI data are from the following databases: Trade by Exporter Characteristics, Trade by Importer Characteristics, Canada's International Transactions in Commercial Services, and CDIA. Information on country of control is based on ownership information from the Business Register that represents direct and indirect foreign control (defined as having more than 50 percent voting shares in a Canadian enterprise). Information on the number and payroll of immigrant workers for each firm is from the Canadian Employer Employee Dynamics Database (Statistics Canada 2020a). All variables are available for 2010–2015, except CDIA results, which are only available for 2012–2015.

Firm Groupings

Table 1 summarizes the firm groupings. Global linkages have five dimensions: imports (goods and services), exports (goods and services), foreign ownership, FDI abroad, and immigrant workers. Firms with positive values are classified as importers, exporters, foreign investors, or firms with immigrant workers. The remaining are non-importers, non-exporters, non-foreign investors, or firms with no immigrant workers. Firms are also grouped into Canadian-, US-, and other foreign-controlled firms.

To facilitate presentation of summary statistics, we classify firms, within each NAICS three-digit industry, into groups by their productivity level, capital intensity, liability-to-asset leverage ratio, age, and size. "Frontier firms" are defined as those in the top 10th percentile of the labour productivity distribution in the industry; the remaining are classified as "non-frontier firms." Firms whose capital intensity and leverage ratios are greater than the median industry values are classified as "highly capital-intensive or highly leveraged firms," and those with below-median values are classified as "low capital-intensive" or "low-leverage firms." Other subgroups such

Table 1: Groupings by Firm Characteristics

Firm Characteristics	Groupings	Definition
Productivity	Frontier vs. non-frontier firms	Labour productivity = value-added output in constant dollars/total employment 1 = frontier firms (top 10th percentile firms in terms of labour productivity in a year and NAICS 3-digit industry); 0 = firms with labour productivity lower than top 10 percentile; . = zero or missing
Global linkages		
Exporting	Exporters vs. non-exporters	1 = exporters if total exports of goods and services > 0; 0 = non-exporters
Importing	Importers vs. non-importers	1 = importers if total imports of goods and services > 0; 0 = non-importers
Foreign direct investment abroad	CDIA investors vs. non-investors	1 = CDIA investors; 0 = non-CDIA investors
Foreign-control	Canadian vs. United States vs. other foreign controlled	1 = Canadian; 2 = United States; 3 = other foreign controlled
Immigrant workers	With vs. without immigrant workers	1 = proportion of immigrant workers > 0; 0 = no immigrant workers
Capital intensity (total assets per worker)	High vs. low	1 = if capital intensity > the median for each year and NAICS 3-digit industry; 0 = if capital intensity < the median for each year and NAICS 3-digit industry; . = zero or missing
Firm size	1: large 2: medium 3: small 4: missing	Total employment ≥ 500 100 £ total employment £ 500 0 < total employment < 100 0 or missing
Age, y	1: 0–10 2: 11–20 3: ≥ 21 4: missing	0 < age ≤ 10 11 < age < 20 Age ≥ 21 Missing
Leverage ratio: total liability to total asset ratio	High vs. low	1 = if leverage ratio greater than the median for each year and NAICS 3-digit industry; 0 = if leverage ratio < the median for each year and NAICS 3-digit industry; = zero or missing

Notes: NAICS = North American Industry Classification System; CDIA = Canadian direct investment abroad.

Source: Authors.

as size and age are defined as follows. There are three groups by age: 0–10 years, 11–20 years, and 21 or more years of operations. There are also three size groups: small firms (with fewer than 100 employees), medium-sized firms (with more than 100 but less than 500 employees), and large firms (with more than 500 employees).

This study focuses on active commercial businesses operating in Canada. The commercial business sector here includes 21 NAICS two-digit industries but excludes the following sectors that are generally much less engaged internationally: utilities (NAICS 22), education (NAICS 61), health care and social assistance (NAICS 62), and other services such as professional services (NAICS 813) and public administration (NAICS 91). Businesses with no employment or revenues are excluded. In our sample, there are on average 2.4 million enterprises in Canada each year, but only 0.7 million are considered active Canadian commercial businesses in this study.

Results

Current Exporters and Foreign Direct Investors

Activities of Current Exporters and Investors

Canadian firms serve foreign markets by exporting directly from Canada and by selling from foreign affiliates operating abroad. It is not widely appreciated that total sales from these two channels are similar in magnitude (Table 2). Between 2010 and 2015, the annual value of exports was \$570 billion, whereas annual foreign affiliate sales were \$541 billion. Moreover, foreign affiliate sales grew faster than exports (8.5 percent per year vs. 6.1 percent). Therefore, Canada's exports are increasingly being complemented by a growing, on-the-ground, value-creating presence of Canadian companies operating in foreign markets.

Table 2: Canadian Exports and Canadian Foreign Affiliate Sales, 2010–2015

Variables	No. of Firms		Export Value	
	Share, %	Average Annual Growth, %	Average Value, \$ billions	Average Annual Growth, %
Exports	4.8	0.7	570	6.1
Goods	4.4	0.4	476	5.9
Services	0.8	7.2	95	6.8
Foreign affiliate sales	0.1	−0.9	541	8.5

Sources: Authors' calculations using linked databases (no. of firms); Statistics Canada Tables 12-10-0011-01, 36-10-0007-01, and 36-10-0470-01 (export value); and foreign affiliate sales for 2011–2015.

Services firms are less export intensive than goods exporters, but their numbers have grown much faster. Between 2010 and 2015, on average only 0.8 percent of Canadian firms exported commercial services compared with the 4.4 percent of firms that exported goods. The number of commercial service exporters grew at an annual average rate of 7.2 percent, compared with only 0.4 percent for the number of goods exporters.

Our results also reveal that outward FDI makes an outsized contribution to economic activity and is also growing quickly (Table 3). The book value of Canadian FDI abroad averaged \$843 billion annually between 2012 and 2015. Although such investors account for only 0.2 percent of Canadian firms in our sample, they generate 26 percent of total sales and 17 percent of total employment. The vast majority (\$785 billion, or 93 percent) of the total value of this direct investment abroad is financed by equity, growing at an impressive average annual rate of 14 percent. Debt financing accounts for only 7 percent of direct investment abroad, but it grew faster than all other categories considered, at an astounding 56 percent per year.

Table 3: Canadian Foreign Direct Investment Abroad, 2012–2015

CDIA	Average	Average Annual Growth, %
Total book value of CDIA (\$billions)	843	16
Total book value of equity	785	14
Total book value of debt	58	56
Contribution, % of total		
No. of firms	0.2	NA
Total sales	26	NA
Total employment	17	NA

Notes: CDIA data are only available from 2012–2015.

CDIA = Canadian direct investment abroad; NA = not applicable.

Source: Authors' calculations using linked databases and Statistics Canada Table 36-10-0008-01.

Distributional Attributes of Current Exporters and Foreign Direct Investors Abroad

Current exporters and foreign direct investors abroad are distributed unevenly among firms (Table 4). Most of these firms, in terms of both the number of exporters and export value, are highly capital-intensive firms that have operated for more than 10 years. Exporting firms are often importers that also employ immigrants. Indeed, export value is even more highly concentrated among large, highly capital-intensive firms that employ immigrants and engage in two-way trade (i.e., simultaneously importing and exporting). These are the so-called superstar exporters.

The number of exporters and the value of exports can differ greatly. For example, large firms account for only 3 percent of all exporters but contribute 63 percent of all exports. Similarly, foreign-owned firms account for 10 percent of all exporters but 57 percent of all exports.

Although few exporters engage in CDIA (only 3 percent), it turns out that most CDIA firms (74 percent) are exporters. Given the significant fixed costs involved in investing abroad, it is not surprising that Canadian foreign direct investors abroad are even more likely than exporters to be large, capital-intensive firms. Outward investing firms are also more likely than exporters to operate at the productivity frontier and to be foreign owned. There are interesting complementarities at play within firms, because firms that perform well in one international activity are often able to leverage their capital, know-how, and profits to engage in other international activities.

Probit Model

To summarize the attributes associated with exporters and foreign direct investors abroad, we estimate the probit model in Equation (1). The results in Table 5 reinforce what we have established – namely, that exporters or foreign direct investors abroad tend to be larger, more productive, older, foreign-controlled multinationals; to be importers; and to employ immigrants. In addition, exporters tend to have higher capital intensity than non-exporters. All differences are statistically significant at the 1 percent level.

Table 4: Distribution of Current Exporters and Foreign Direct Investors Abroad by Firm Attributes, Percentage of Totals, Averaged over 2010–2015

Firm Characteristics	Exporters		Foreign Direct Investors Abroad	
	No.	Value	No.	Book Value
Productivity				
Non-frontier firms	82	49	63	43
Frontier firms	18	51	37	57
Size (employment)				
Large	3	63	29	81
Medium	10	21	30	7
Small	88	16	41	12
Age, y				
1: 0–10	27	14	14	3
2: 11–20	45	39	52	57
3: ≥ 21	29	47	33	40
Capital intensity				
Low	31	5	4	1
High	69	95	96	99
Debt-to-asset ratio				
Low	58	51	68	45
High	42	49	32	55
Importer status				
Non-importer	22	3	21	4
Importer	78	97	79	96
Exporter status				
Non-exporter			26	9
Exporter			74	91
CDIA investor status				
Non-CDIA investor	97	56	26	9
CDIA investor	3	44	74	91
Immigrant workforce status				
Without immigrant workers	27	3	10	3
With immigrant workers	73	97	90	97
Foreign controlled				
Canadian controlled	90	43	59	83
US controlled	6	29	24	8
Other foreign controlled	4	28	17	9

Note: CDIA = Canadian direct investment abroad.

Source: Authors' calculations using linked databases.

Potentially Active Market for Exporters

Propensity Score Matching

Using the estimated propensity score from the probit model of Equation (1), we construct the treated (current exporters or foreign direct investors) and the control (potential non-exporters or non-investors) groups—where again, the latter have similar observable characteristics

Table 5: Probit Model of Exporters and Canadian Foreign Direct Investors Abroad

Variables	Marginal Probit	
	Exporters	Foreign Direct Investors Abroad
Log (value-added per worker)	0.0006*	0.0002*
Log (sales)	0.0162*	
Log (total assets)	—	0.0012*
Age, years	0.0003*	0.0000*
Log (tangible capital per worker)	0.0016*	−0.0001*
Exporter dummy	—	0.0011*
Importer dummy	0.0555*	0.0000
Foreign-control dummy	0.0286*	0.0005*
Immigrant worker dummy	0.0147*	0.0002*
CDIA investor dummy	0.0484*	—
Debt-to-asset ratio	0.0000	0.0000*
Other controls	Province	Province
	Industry	Industry
	Year	Year
No. of observations	3,295,676	2,410,962

Note: CDIA = Canadian direct investment abroad.

* $p < 0.01$.

Source: Authors' calculations using linked databases and probit model of Equation (1).

as the former but have not yet become exporters or international investors.

Figure 2 provides a graphical example of the machinery manufacturing industry in 2012. It plots the density distribution of the estimated propensity scores for the treated (all current exporters, the gray upper bars [red online]) and the untreated (all non-exporters, the black lower bars [blue online]). This shows that most current exporters are concentrated on the right side, not surprisingly having a high predicted probability of exporting, whereas most non-exporters are concentrated on the left side, having a low predicted probability of exporting. In this example, there is not a lot of “low-hanging fruit” in that, among the firms that have a high predicted probability of exporting, most are already doing so. Nonetheless, there are numerous high-potential firms that are not currently exporting but that the model predicts could export given their observable characteristics. These firms are the hidden gems that trade promotion agencies would like to identify and whose international expansion they would like to support.

The adequacy of the propensity score model can be checked by evaluating the balance of the propensity score as well as all observable characteristics across the treated and control groups, such that the differences in firm characteristics and the predicted probabilities are not statistically significantly different between the two groups. In

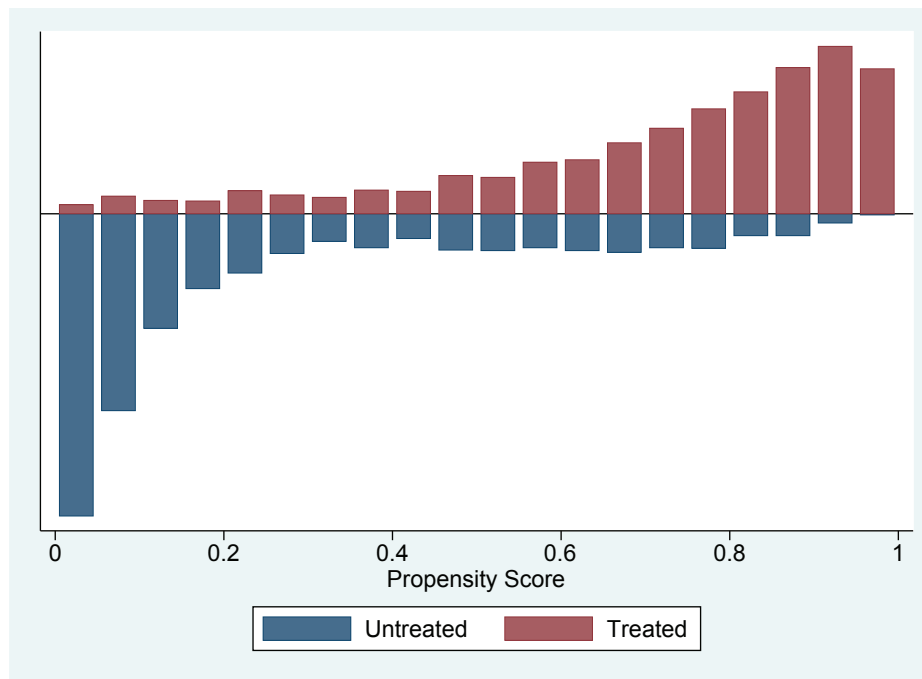


Figure 2: Illustrative Propensity Score Matching Results for Machinery Manufacturing (North American Industry Classification System 333), in 2012

Source: Authors' calculations using linked databases.

our machinery manufacturing industry example, the differences in observable characteristics between the matched treated and control samples are statistically insignificant after propensity score matching (Table 6).

Estimates of Potential Exporters and Investors

Table 7 compares our estimates of current and potential exporters. The results depend on the matching approach used. Estimates based on the one-to-one matching are 18,000 potential exporters with potential export value of \$79 billion annually. The one-to-five matching method produces a larger potential number of exporters (55,000) and a potential export value of \$310 billion. In both cases, there is much larger growth potential for the number of exporters (55–157 percent) than for the value of exports (19–75 percent). This is because a typical potential exporter is predicted to generate far less export value than a current exporter (only \$4.5–\$5.6 million annually for potential exporters, or less than half of the \$11.8 million for current exporters).

This finding is consistent with the positive selection effects into exporting documented earlier. If a specific firm has several key attributes associated with exporting (i.e., the firm is large, capital intensive, an importer), then that firm is already likely to export. Thus, as a group, even high-potential non-exporters, with similar attributes as exporters, offer less export value potential. Note that these are static estimates. Over time, learning-by-exporting effects would likely increase firm-level productivity and further increase the potential export gains.

The estimates for CDIA show the same general pattern, but the value differentials between the current and potential groups are significantly larger (Table 8). The estimates of potential foreign direct investors abroad range from 738 to 3,021 (representing growth of 52–213 percent, respectively, over the active investor population). The potential investment book value is less impressive, with growth potential of \$29–\$81 billion annually (representing an increase of only 3–10 percent). Once again, this result is due to the much smaller estimated activity for potential investors. In sum, plenty of potential firms look as though they could become exporters and outward investors, but they are likely to do significantly less international business than the established firms, at least initially.

Distributional Attributes of Potential Exporters and Foreign Direct Investors Abroad

Table 9 reports the observable characteristics of potential exporters. These firms are not investing abroad (almost 100 percent of potential exporters), are small (96 percent have fewer than 100 workers), Canadian owned (96 percent), and non-frontier (85 percent); have been operating for 20 years or less (72 percent); are importers (70 percent); employ immigrants (66 percent); are highly capital intensive (61 percent); and have a low debt-to-asset ratio (60 percent).

Potential foreign direct investors abroad are characterized as firms that are highly capital intensive (90 percent), employ immigrants (89 percent), importers (81 percent),

Table 6: Example of a Balance Test on Firm Attributes: Unmatched versus Matched Samples, Machinery Manufacturing (NAICS 333), 2012

Variables	t-test: $p > t $	
	Unmatched	Matched
Log (value added per worker)	0.0	0.2
Log (sales)	0.0	0.5
Age	0.0	0.3
Log (tangible capital per worker)	0.0	0.5
Importer dummy	0.0	0.3
Foreign-control dummy	0.0	0.7
Immigrant worker dummy	0.0	0.3
Debt-to-asset ratio	0.0	0.9
Propensity score model ($p > c^2$)	0.0	0.6

Note: NAICS = North American Industry Classification System.

Source: Authors' calculations using linked databases.

Table 7: Current and Potential Exporters, Averages 2010–2015

Exporter Estimates	No. of Exporters (thousands)	Value of Exports (\$billion)	Average Exports per Exporter (\$million)
Treated (current exporters)	35	415	11.8
Controlled (potential exporters)			
1-to-1 matching	18	79	4.5
1-to-5 matching	55	310	5.6

Source: Authors' calculations using linked databases.

Table 8: Current and Potential Canadian Foreign Direct Investors Aboard, Averages 2012–2015

CDIA Estimates	No. of Investors Abroad	Book Value of CDIA (\$billions)	Average Book Value per Investor (\$millions)
Treated (current CDIA)	1,418	843	594
Controlled (potential CDIA)			
1-to-1 matching	738	29	39
1-to-5 matching	3,021	81	27

Note: Survey weights were used. CDIA = Canadian direct investment abroad.

Source: Authors' calculations using linked databases.

exporters (71 percent), small or medium sized (85 percent employ fewer than 500 employees), firms with more than 10 years of operating experience (84 percent), generally Canadian controlled (61 percent), and with a low debt-to-asset ratio (58 percent).

Table 9: Distribution of Potential Exporters and Foreign Direct Investors Abroad by Firm Attributes, Percentage of Totals

Firm Characteristics	Potential Exporters, Average, 2010–2015		Potential Foreign Direct Investors Abroad Average, 2012–2015	
	No.	Value	No.	Book Value
Productivity				
Non-frontier firms	85	83	62	58
Frontier firms	15	17	38	42
Size (employment)				
Large	1	9	16	69
Medium	4	9	33	9
Small	96	82	52	22
Age, y				
1: 0–10	30	42	15	16
2: 11–20	42	32	40	43
3: ≥ 21	28	26	44	41
Capital intensity				
Low	39	34	10	8
High	61	66	90	92
Debt-to-asset ratio				
Low	60	30	58	33
High	40	70	42	67
Importer status				
Non-importer	30	62	19	9
Importer	70	38	81	91
Exporter status				
Non-exporter			29	7
Exporter			71	93
CDIA investor status				
Non-CDIA investor	100	98		
CDIA investor	0	2		
Immigrant workforce status				
Without immigrant workers	34	42	11	1
With immigrant workers	66	58	89	99
Foreign controlled				
Canadian controlled	96	94	61	60
US controlled	2	3	18	21
Other foreign controlled	2	3	21	19

Note: CDIA = Canadian direct investment abroad.

Source: Authors' calculations using linked databases.

Conclusion

The article constructs a unique, large administrative dataset with millions of firm-level observations to inform Canadian trade policy and strategic business planning by analyzing the size and distributional characteristics of current and potential exporters and Canadian foreign direct investors abroad. Using propensity score matching, we identify the observable characteristics of potential

international entrants and quantify the potential benefits of their international market entry.

The good news is that our estimates suggest there is considerable potential to grow Canada's exports and outward FDI, coming from the many firms operating in Canada that we identify as potential exporters (18,000–55,000) as well as potential foreign direct investors abroad (738–3,021). However, because these firms tend to operate at a smaller scale, their potential contribution to the economy on a per-firm basis is likely to be considerably lower than the existing populations of exporters and investors abroad—for exporters, less than half, and for outward investors, less than one-tenth.

Our estimates are static, not dynamic. They identify potential exporters or outward foreign direct investors at a moment in time. In reality, firms' experiences are dynamic. Some firms grow and thrive, and others struggle and exit. As this article demonstrates, superstar firms that are simultaneously active in several dimensions of international activities contribute disproportionately to the total value of Canada's exports and FDI abroad.

Important questions for future research remain: Why are the high-potential firms we identify not currently exporting or making direct investments abroad? What are the specific obstacles to their international growth? What interventions, if any, would best support their transition into international markets and help them become superstar global firms? The answers to these important questions would help policy-makers better understand whether, or how, they might support Canadian companies to successfully expand their international business operations.

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Notes

- 1 For example, [Dutt et al. \(2013\)](#) show that countries that become World Trade Organization members trade more of products that they have previously not traded (extensive) and less of products that they have already traded before (intensive). The link between total trade growth and extensive margin becomes stronger over longer time horizons among North American Free Trade Agreement countries ([Timothy and Kim 2013](#)) or more generally among countries with economic integration agreements ([Baier et al. 2014](#)).
- 2 Conceptually, there is a third segment of firms, which we do not explore further in this article, that are not currently

active and have limited potential to engage internationally, given their observable characteristics.

- 3 [Sui and Yu \(2012\)](#), [Acharya \(2016\)](#), and [Rao and Zhang \(2019\)](#) document Canadian exporters' attributes. [Baldwin and Yan \(2015\)](#) provide a summary of Canadian empirical studies on trade and productivity.
- 4 Propensity score matching is often used to evaluate causal treatment effects, applied in diverse fields such as medical and pharmaceutical research; economic policies; and the effect of an individual's or a firm's decision on its subsequent performances ([Rosenbaum and Rubin 1983](#)).
- 5 The adequacy of the propensity score model can be checked by evaluating the balance of the propensity score as well as all observable characteristics across the treatment and control groups, such that the differences in firm characteristics and the predicted probability are not statistically significantly different between the treatment and control groups.
- 6 In addition, we impose a caliper range, a trim, and a common support restriction to reduce bias. A caliper specifies the maximum tolerated distance between the treated and the control units. A treated unit is left unmatched if none of the non-treated units is within the caliper range. The common support further specifies that treated units are left unmatched if their propensity scores are larger than the maximum or less than the minimum propensity score in the non-treated pool. The trim imposes common support by dropping a certain percentage of the treated observations at which the propensity score density of the control observations is the lowest. We use one-to-one and one-to-five nearest neighbour matching with replacement (where some control units are matched to more than one treated unit), a 1 percent trim, a 0.2 caliper, and common support that pairs treated with one or many comparable non-treated units.
- 7 The total value of exports and FDI reported in the article is based on the authors' calculations. It is not directly comparable to the official statistical publications from Statistics Canada for the following two main reasons: (a) All the trade and foreign investment data are linked to NALMF tax data, and the linkage rates range from 80 percent to 100 percent depending on the trade databases, and (b) we focus on the active commercial business sector. Businesses with no employment or revenue are therefore excluded. The commercial business sector here includes 21 NAICS two-digit industries, excluding sectors that are much less engaged in international transactions: utilities (NAICS 22), insurance (NAICS 524), education (NAICS 61), health care and social assistance (NAICS 62), and other services such as professional services (NAICS 813) and public administration (NAICS 91).
- 8 The results are not sensitive to whether we include capital cost allowance as part of the profit.

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