Innovation, Science and Economic Development Canada
Innovation, Sciences et Développement économique Canada

INSIGHTS

2017, VOLUME 2 // STRATEGY AND INNOVATION POLICY SECTOR

Makerspaces, Internal Trade Flows, Corporate Profits

Canada

FEATURE ARTICLES:

IN EVERY ISSUE:

RECENT DEVELOPMENTS OF INTEREST TO ISED

THE BANK OF CANADA RELEASED ITS LATEST *MONETARY POLICY REPORT*

- The October 2017 edition of the Bank of Canada's *Monetary Policy Report* expects global economic growth to average 3.5% per year over the 2017 – 2019 period, which is largely in line with its July forecasts.
- The US is projected to post growth of 2.2% in both 2017 and 2018, as solid expansions in business investment and consumption are expected to outpace a drag from net exports.
- Chinese growth is expected to gradually decline from 6.8% in 2017 to 6.3% in 2019 on account of earlier measures targeting the housing and financial sectors and a reduction in fiscal policy support.
- Canadian real GDP is forecast to increase 3.1% in 2017, an upward revision over its July forecast, as economic growth has been very strong and widespread in the first half of the year on account of robust growth in consumer spending, a broad-based expansion in business investment, and a surge in energy exports. Growth is expected to moderate to 2.1% in 2018.

THE INTERNATIONAL CHAMBER OF COMMERCE PUBLISHED ITS LATEST *OPEN MARKETS INDEX, 2017*

- Canada ranked 17th out of 75 countries on the International Chamber of Commerce's Open Markets Index, which assess and ranks economies on their openness to trade based on: observed openness to trade; trade policy settings; foreign direct investment (FDI) openness; and, trade-enabling infrastructure.
- Canada ranked ahead of all its G20 counterparts on the basis of strong performances in trade policy, trade enabling infrastructure, and FDI openness, while trade openness was identified as an area with sufficient room for improvement.
- In 2017, only three economies attained "most open" status: Singapore (5.6), Hong Kong (5.5), and Luxembourg (5.0). The top-five was rounded out by the Netherlands and Ireland, which were categorized as "above average openness" economies, like Canada.
- To help countries improve their openness to trade and FDI, the report recommends implementing the WTO Trade Facilitation Agreement, facilitating better access to trade finance, and encouraging the global growth of e-commerce over the short-term, in addition to liberalizing trade in services and encouraging investment facilitation over the longer-term.

THE WORLD ECONOMIC FORUM PUBLISHED ITS *GLOBAL HUMAN CAPITAL REPORT, 2017*

- Canada ranked 14th out of 130 countries on the World Economic Forum's *Global Human Capital Report*, which assesses how well countries develop their human capital based on their performance in the four thematic dimensions of capacity, development, deployment, and know-how, in five distinct age groups.
- Canada's performed well in a number of indicators across the four main sub-indexes, including: literacy and numeracy and the primary education attainment rate for 15 – 24 year olds; the tertiary education attainment rate for the 25 – 54, 55 – 64, and 65 and older age groups; the underemployment rate for the 25-54 and 55 – 64 age groups; and, the skill diversity of graduates for 15 – 24 year olds.
- The top-five was comprised of Norway, which ranked first on the overall index despite not ranking higher than 6th in any of the four sub-indexes, Finland, Switzerland, the United States and Denmark.
- Countries that rank well on the index are generally described as economies with a longstanding commitment to the educational attainment of its citizens and that have deployed a broad share of their workforce in skill-intensive occupations across a broad range of sectors.

Makerspaces: an inclusive response to the challenges posed by technological progress

HIGHLIGHTS

- Makerspaces are part of a global trend where anyone can access facilities and services to actively create goods and new ideas, conditions that promote an inclusive economy.
- Libraries, which are transitioning from book lenders to inclusive creation and innovation spaces, offer an environment that is compatible with makerspaces and are at the centre of the proliferation of these facilities.
- There are at least 200 makerspaces in different organizations across Canada.

BACKGROUND

Technological advancement has a huge impact on the digitization of the economy. Today, the structure and nature of work are undergoing tremendous transformations, while applications and wireless devices are becoming more prominent within industry. New skills and tools become necessary in gaining and maintaining a competitive edge. Given these realities, how then do we ensure that innovation promotes economic inclusion instead of economic exclusion?

The Innovation and Skills Plan from Budget 2017 focuses on people, by taking the changing nature of the economy into account to ensure that Canadians have access to the tools and resources they will need to succeed. In this context, this article deals with an innovative way of tackling this challenge: makerspaces. These spaces provide an environment for accessible learning and collaboration that stimulates the development of skills, innovation and creativity, all of which are conditions that promote an inclusive economy. This article examines the factors that foster the creation of these makerspaces; and it provides a brief overview of some makerspaces across the country.

Makerspaces[1] are part of a global trend, the maker movement[2], where anyone can actively take part in creating goods and new ideas. They are collaborative spaces that allow users to work on personal, academic or commercial projects at a low cost. These spaces also promote collaboration among people with diverse profiles (e.g., expertise, experience, age,

[1] The terms *fab labs* and *hackerspaces* are sometimes used to talk about *makerspaces*.
[2] The maker movement is also the origin of the living lab concept.

economic status, etc.), where everyone is given an opportunity to learn at their own pace. Computer-controlled machines and tools like 3D printers, laser or vinyl cutters, and milling machines are made available, as are a range of services such as training, coaching, activities and advice. Makerspaces have been established in a variety of locations and institutions, including businesses, incubators, universities and. libraries[3,4,5].

TRANSITION TO A NEW APPROACH

The transition of libraries from book lenders to inclusive spaces that stimulate creation and innovation reflects adjustments to technological change. This adaptation is not limited to space allocation, service delivery or the presence of cutting-edge technology, it also signifies a paradigm shift.

In recent decades, technological advancements have already altered the traditional role of libraries as conservationists and conveyers of knowledge and culture, following a significant expansion in access to knowledge. As a result, these establishments were forced to set themselves apart by taking measures to become spaces where people can get together and interact (e.g., opening cafés and shared work areas).

New technologies come with new challenges. Makerspaces represent the most recent response to these new challenges for a number of reasons. First, makerspaces operate in a way that is consistent with the mission of libraries, which is to facilitate open access to relevant learning tools (e.g. books and computers) and the transmission of knowledge and skills. Second, their approach of sharing tools and encouraging ideas helps users create and innovate. They also play a key role in the creative process by acting as mediators between people and technology (see box 1). It is expected that it will take some time to adjust to this new approach to work that places considerably emphasis on frequent interaction and collaboration; nevertheless, makerspaces have the advantage of making a huge contribution to the emergence of new ideas.

Libraries are not the only institutions that encourage the growth of makerspaces. Making the necessary adjustments to technological progress compels all organizations to review their approaches to creation and innovation. As a result, businesses such as Microsoft,[6] Renault[7] and Dassault Systèmes[8] have already set up makerspaces within their organizations to stimulate innovation.

[3] Miller, A (2015). *What is a Makerspace?*, Makerspaces.com : https://www.makerspaces.com/what-is-a-makerspace/
[4] Sleigh, A et al. (2015). *Open dataset of UK Makerspaces: a user's guide*, Nesta: http://www.nesta.org.uk/publications/open-dataset-uk-makerspaces-users-guide/
[5] Direction générale des entreprises (2014). *État des lieux et typologie des ateliers de fabrication numérique*, Ministère de l'Économie de l'Industrie et du Numérique de France: http://www.entreprises.gouv.fr/files/files/directions_services/etudes-et-statistiques/etudes/numerique/etat-des-lieux-fablabs-2014.pdf/
[6] https://www.microsoft.com/en-us/garage/
[7] http://www.le-square.paris
[8] https://3dexperiencelab.3ds.com/fr/projets/fablab/3ds-fablab

A PAN-CANADIAN TREND

There are at least 200 makerspaces in Canada. To gain a better understanding of recent trends in the growth and development of such facilities, four regional offices of the Strategy and Innovation Policy Sector have examined makerspaces in their provinces and regions.

Box 1: Benny Library

BennyFab is a makerspace that opened at the Benny public library in Montreal in August 2016. At the Benny library, people can use a variety of digital tools, such as 3D printers, vinyl cutters and programming applications, to build and experiment. Recognizing the importance of acquiring digital skills, the library regularly organizes activities to teach people how to use the available tools, and facilitators are always on hand to provide help. Users also share ideas and learn among themselves. For these reasons, BennyFab users described the space as an incubator of ideas and innovation. Through workshops, a number of youths have become more interested in science and engineering while, at the same time, strengthening their scientific foundations.

This example illustrates the adjustments that technological changes have imposed on a wide variety of organizations. BennyFab reflects the needs of the community by serving a diverse clientele ranging from school groups to enthusiasts and families. In 2011, 76% of local residents were first- or second-generation immigrants.

The initial idea to set up makerspaces in Montreal came from success stories of similar initiatives in other cities (e.g., the Digital Innovation Hub at the Toronto public library) and the opinions expressed by people at public consultations. Proponents of the project argue that a library would have a difficult time thriving in the 21st century without a makerspace. In fact, since digital technology occupies an increasingly prominent role in people's lives, individuals need to acquire the skills to fully integrate into the economy of tomorrow.

Although BennyFab opened only one year ago, the City of Montreal already considers it to be a major success. Consequently, the city wants to open at least nine additional makerspaces instead of the four that were initially planned.

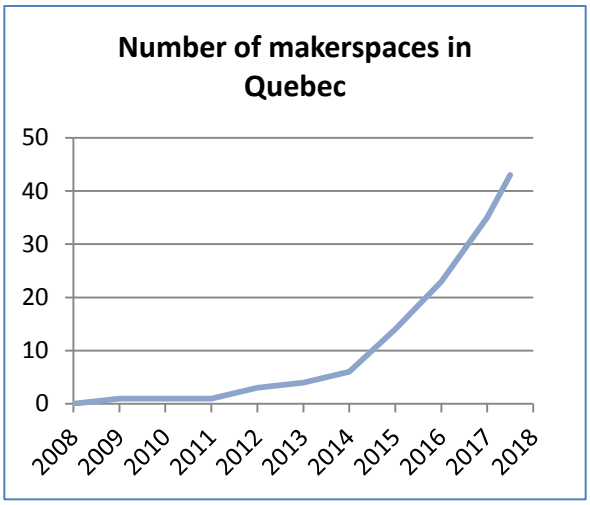
The Prairie provinces are not to be outdone, as Winnipeg is home to the North Forge Fabrication Lab (shown above), the largest makerspace in Canada. It is operated by the North Forge Technology Exchange, a local organization that promotes economic development based on innovation.

In **British Columbia**, makerspaces started appearing in the late 2000s. Today, at least 21 makerspaces are in operation within the province. They include WePress, which is intended for a marginalized clientele, and MakerLabs, which provides digital design and manufacturing services for businesses, covers an area of over 2,400 m² (26,000 ft²), and has more than 200 members. The province also hosts the Vancouver Mini Maker Faire, an annual event where craft makers share and exchange information about the latest technologies, science, engineering and the arts.

Although the exact number of makerspaces in **Ontario** is unknown, they are largely concentrated in Toronto. Among the largest facilities in the province are Kwartzlab in Kitchener, UnLondon in London, HackLab.TO in Toronto, Diyode in Guelph, think|haus in Hamilton and SimColab in Barrie. Public libraries also factored prominently in the operation of makerspaces in Ontario, as a survey of public libraries in the province conducted in late 2015 revealed that about a third of respondents

(106 libraries in total) were hosting makerspaces[9] on their premises. For example, the Lambton library in Sarnia is equipped with a makerspace that offers a wide variety of tools including a laser cutter, sewing machines, a 3D printer, a vinyl cutter and a robotics workshop. The success of this program, which is funded by the provincial government, can be partially attributed to some of the activities it provides for both children and adults, including workshops on how to use the various tools that are made available. In January 2017, this library also launched a mobile makerspace.

The number of makerspaces in **Quebec** has been rising rapidly since 2014, and there are now more than 43 such facilities across the province. They are concentrated in major cities (80% of them are in Montreal and Quebec City), and are largely operated by primary and secondary schools (12 spaces), non-profit organizations (9 spaces) and libraries (9 spaces). One example of a makerspace in the province is *Espace Fabrique*, a cooperative that provides local businesses and residents with access to industrial-grade machine tools. Like in Ontario, public libraries are gradually increasing in prominence in the Quebec makerspace ecosystem, with at least 12 projects in the works. Moreover, the Quebec government will invest $17 million to convert the former Saint-Sulpice library in Montreal into a large makerspace. This establishment, slated to reopen in 2018, will become part of Bibliothèque et Archives nationales du Québec, a government agency that is also responsible for the largest public library in the province.



There are an increasing number of makerspaces located in **Atlantic Canada;** included among them are libraries equipped with such facilities in all four provinces. For instance, the new Inspire Learning Centre, which is part of the Rotary regional library in Summerside, Prince Edward Island, received over 30,000 visitors in its first four months of operation. Although this makerspace does not yet have a large number of digital tools, it has dedicated spaces and activities that encourage creation. In New Brunswick, the Moncton public library has a workshop with a variety of digital equipment, from a 3D printer to programmable nano-computers. However, there have been some setbacks in the Atlantic regions, including the Halifax Central Library, which was designed to offer a new approach to traditional library services and was supposed to include a makerspace. Despite the success of its new direction, as evidenced by the 1.9 million visitors it received during its first year of operation, the library is still looking for the funding needed to open the makerspace that was originally planned.

Furthermore, a number of impressive initiatives planned for rural regions in Nova Scotia, including a mobile 3D printer, were abandoned due to the difficult economic climate.

IMPLICATIONS FOR ISED

In the last decade, the number of makerspaces has increased dramatically in various organizations around the world. They provide an inclusive response to the challenges posed by technological progress. As demonstrated in this article, Canada is no exception to this trend, as a number of makerspaces have benefited from the Youth Internship Program, while some academic institutions are funding the creation of makerspaces by taking advantage of the Post-Secondary Institutions Strategic Investment Fund. It remains to be seen whether these funding sources will be sufficient to support continued growth in the number of makerspaces across the country.

[9] http://fopl.ca/news/makerspaces-interesting-numbers-from-the-2015-ontario-data-collection/

Ultimately, makerspaces are relatively recent initiatives that play a growing role as vectors of digital literacy. They drum up interest in careers in science and engineering and serve as incubators of ideas, among other benefits. However, further analysis and research is required to better estimate their numbers and identify locations across the country, measure their funding needs, assess whether the public is sufficiently informed about them, evaluate their performance in terms of advancing digital skills, and understand their economic impacts.

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The State of Canada's Aerospace Industry, 2017

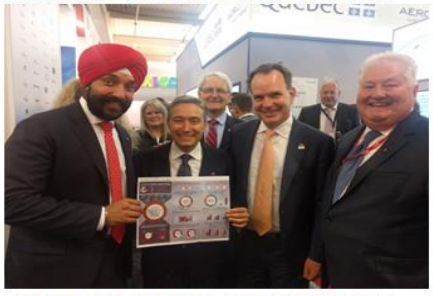
HIGHLIGHTS

- Innovation, Science and Economic Development Canada (ISED) and the Aerospace Industries Association of Canada (AIAC) recently collaborated on the publication of the 2017 edition of the annual *State of Canada's Aerospace Industry* report.
- Canada is a world leader in aerospace, possessing a highly innovative industry that makes significant contributions to the national economy. It is comprised of a combination of large and small Canadian and foreign-owned companies that factor prominently in the global aerospace value chain.
- This report demonstrates that strategic partnerships and collaborative efforts between industry and government can generate relevant, timely, and quality information that can inform evidence-based decision making.

BACKGROUND

On June 13, 2017, Innovation, Science and Economic Development Canada (ISED) and the Aerospace Industries Association of Canada (AIAC) jointly released the 2017 *State of Canada's Aerospace Industry* report. This annual report, now in its fifth edition, aims to provide an overview of Canada's aerospace sector with relevant, timely, and quality information that can inform evidence-based decision making by industry executives and policy-makers in the aerospace community. The report was conceived following the 2012 Emerson Review of Aerospace and Space Programs and Policies[10], which used data from multiple sources because a comprehensive data source on the sector did not exist at the time. Each year, the report is released prior to a major international air show that takes place alternately in Paris, France on odd years and Farnborough, UK on even years.

FIGURE 1. Minister Bains showcasing the 2017 State of Canada's Aerospace Industry report at the International Paris Air Show in June 2017



Pictured left to right: Minister Bains, Minister François-Philippe Champagne, Parliamentary Secretary Steven MacKinnon, and Jim Quick, President of the AIAC.

Last June, Minister Bains attended the International Paris Air Show, where he shared a summary of the 2017 report with members of the Canadian delegation (Figure 1), which included: the Honourable François-Philippe Champagne, Minister of International Trade; the Honourable Marc Garneau, Minister of Transport; and, Steven MacKinnon, Parliamentary Secretary to the Minister of Public Services and Procurement.

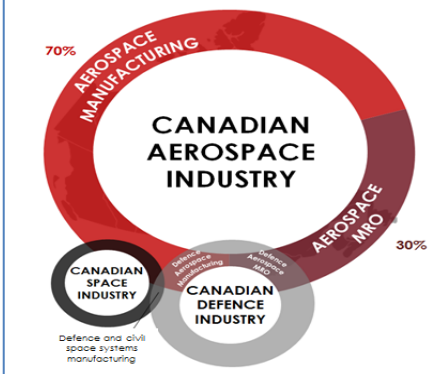
[10] Produced by the Honourable David Emerson, the report "Beyond the Horizon: Canada's Interest and Future in Aerospace" is the product of an official Aerospace Review mandated by the Government of Canada in February 2012.

The report itself was produced by the Industrial Technological Benefits Branch (ITBB) and the Aerospace, Defence and Marine Branch (ADMB), which used the latest socioeconomic data from Statistics Canada and a number of global independent research organizations to develop detailed economic models, statistics, analysis and visualization tools. It highlights the aerospace industry's contributions to Canada's gross domestic product (GDP), employment, exports, and research and development (R&D). Meanwhile, the AIAC consulted its network to validate research findings on business drivers, issues and trends. The dialogue resulting from this collaboration is helpful in interpreting the data to inform aerospace policy development and industry decision making. The continued success of this report demonstrates how government and industry can work together to achieve positive results. The *State of Canada's Aerospace Industry* report represents one of a relatively small number of documents that are produced using this unique collaborative model.[11]

STRUCTURE AND ECONOMIC CONTRIBUTIONS

The Canadian aerospace ecosystem is interlinked with Canada's space and defence industries (figure 2). The aerospace industry, which includes both civil and defence activities, is comprised of two main activities: manufacturing (70% of aerospace GDP), and maintenance, repair and overhaul services (MRO, 30% of aerospace GDP). Beyond the manufacture of space systems, the space industry also includes satellite operations, value-added applications and space based broadcasting. Meanwhile, defence sales in the air and space sectors were dominated by military aircraft MRO, comprising almost half of total sales. Aircraft structures and components made up less than a quarter of total defence sales, whereas the remainder were related to avionics, mission systems[12], simulation, and space systems.

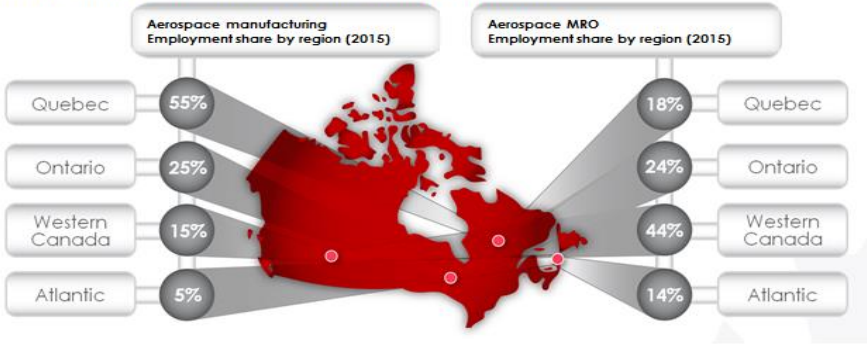
FIGURE 2: The Canadian aerospace industry is made up of manufacturing and maintenance, repair and overhaul, and is interlinked with the space and defence industries



Source: 2014 GDP ISED economic model estimates are based on data from Statistics Canada, the Canada Revenue Agency, the Canadian Space Agency and enterprise-level observations, 2017

The aerospace industry is an important part of the Canadian economy, contributing close to $28 billion in GDP and 208,000 jobs in 2016. Aerospace activities are conducted throughout the country, with the majority of aerospace manufacturing activity taking place in Central Canada, while Western and Atlantic Canada capture close to 60% of aerospace MRO activities (figure 3).

FIGURE 3: The Canadian aerospace industry is national



Source: ISED's economic model estimates are based on data from Statistics Canada, the Canada Revenue Agency and enterprise-level observations, 2017

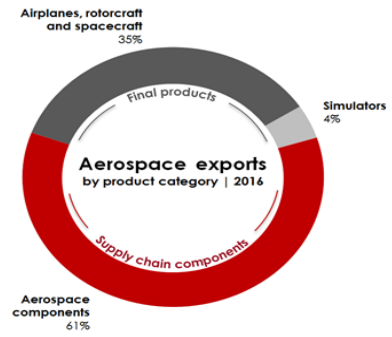
[11] Another example would be the bi-annual *State of Canada's Defence Industry* report developed by ISED in cooperation with the Canadian Association of Defence and Security Industries (CADSI).

[12] Mission systems include electro-optical, radar, sonar and other sensor/information collection systems; fire control, warning and countermeasures Systems; and related components.

Although Canada's aerospace industry is best-known for a number of prominent original equipment manufacturers (OEMs)[13], such as Bombardier and Bell Helicopter, it actually includes many players in the global aerospace value chain. In fact, over 60% of Canadian aerospace product exports are supply chain related, with engines, avionics and landing gears accounting for the bulk of them (figure 4). Furthermore, the combined export share of these components has risen by more than 20% over the past 15 years.

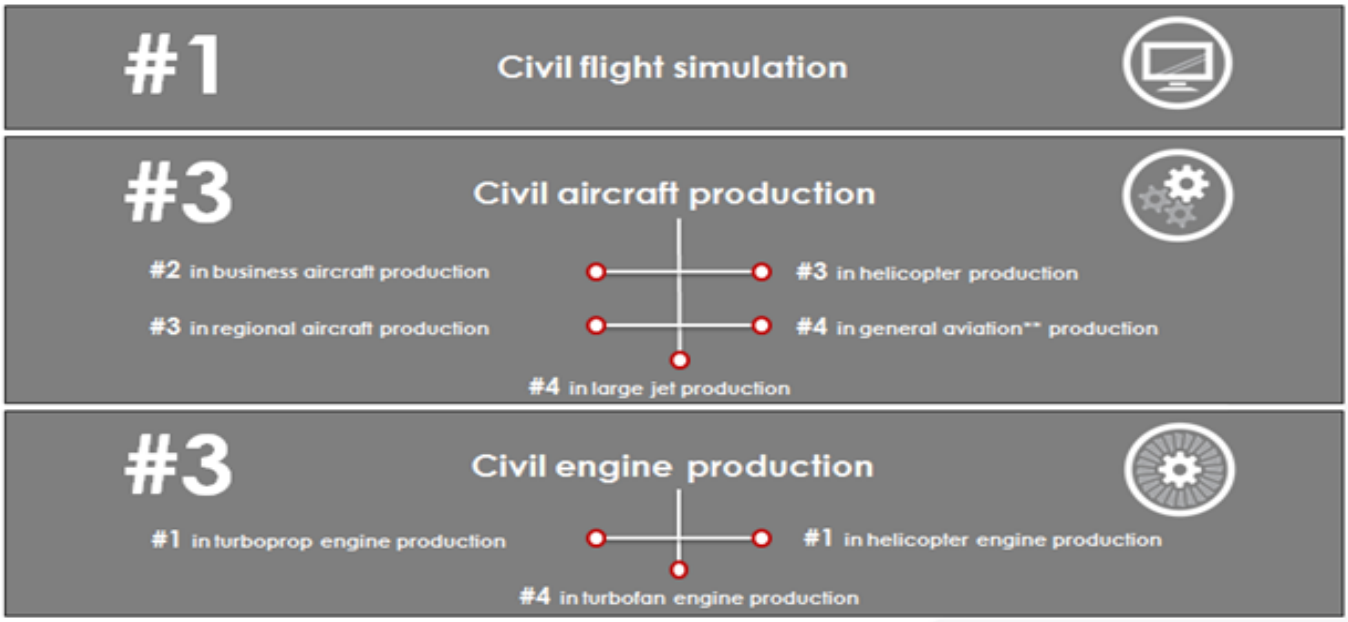
The Canadian aerospace industry is an important player on the world stage, ranking first in the production of civil flight simulators, and third in the production of civil aircraft and engines, respectively (figure 5).

FIGURE 4: Supply chain components make up over 60% of aerospace product exports



Source: Global Trade Atlas (2016), 2017

FIGURE 5: Canada is a global leader in civil flight simulation, aircraft and engine production



Source: Flight simulation: Frost & Sullivan, Commercial Flight Training and Simulation Market (2016); Aircraft production: average of Forecast International and Teal Group data (2017); Engine production: Forecast International (2017), 2017

INNOVATION AND R&D

This year's edition of the report features a special section on innovation, drawing on recently released Statistics Canada data on business innovation practices. It aligns with the Innovation and Skills Plan to showcase the aerospace manufacturing industry's leadership position in innovation collaboration, the integration of advanced technologies, advanced manufacturing, supply chain management innovation, and the hiring of innovative skilled workers.

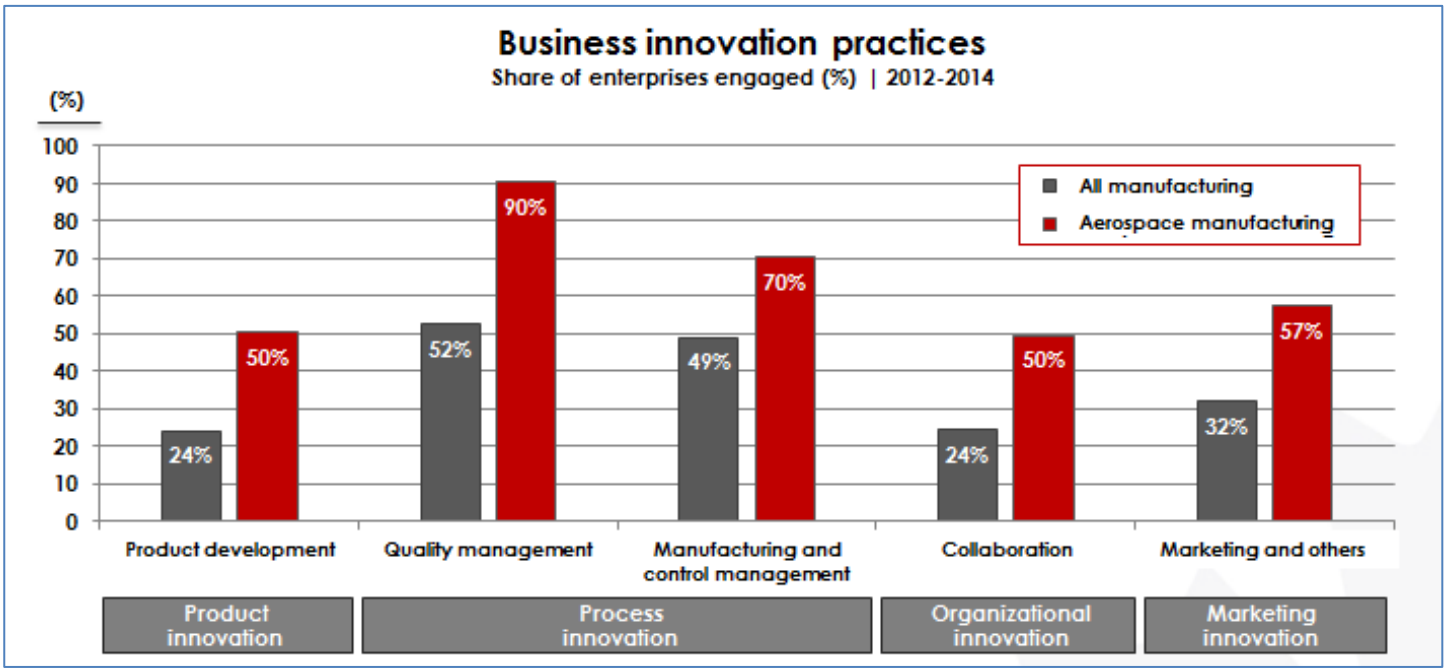
Aerospace manufacturing is Canada's top R&D player among all Canadian manufacturing industries, as evidenced by its R&D intensity of 18%, which is six times higher than the sector average. Furthermore, Statistics Canada's Survey of

[13] Manufacturers that perform final assembly of aircraft or large components such as engines.

Advanced Technology reveals that aerospace manufacturers demonstrated innovation leadership in all four categories of business innovation practices, as defined by the OECD's Oslo Manual: product, process, organizational and marketing innovation.

Figure 6 shows that, during 2012 – 2014, aerospace enterprises significantly outpaced the manufacturing sector in all categories of business innovation practices, by more than double in some cases. A more detailed examination of the data reveals that twice as many aerospace manufacturers developed new advanced technologies relative to the manufacturing average. Also, aerospace firms were 50% more likely to customize or modify existing technologies and have adopted advanced manufacturing technologies at a higher rate than their manufacturing sector counterparts.

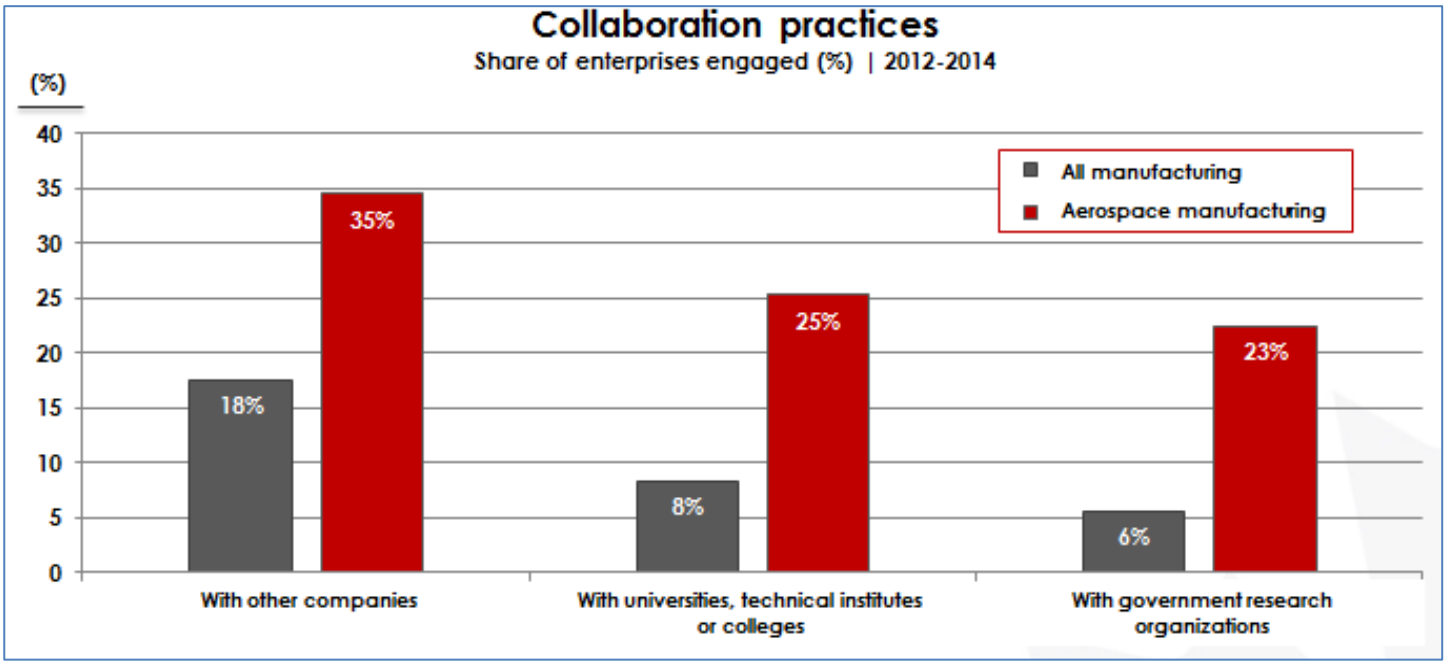
FIGURE 6: Aerospace manufacturers outpaced the average in use of all types of innovation practices



Source: Statistics Canada Survey of Advanced Technology (2014), 2016

The technical and specialized nature of the work performed in aerospace manufacturing means that firms in this industry require highly skilled workers. Aerospace manufacturers of all sizes outperformed their Canadian manufacturing sector counterparts in terms of increasing their employment of skilled workers to facilitate innovation. In addition to hiring innovative and skilled workers, significantly more aerospace manufacturers utilized outside expertise by collaborating with other companies, academia, and government research organizations at a higher rate than the Canadian manufacturing average (figure 7). Of note, small Canadian aerospace manufacturers collaborated three times more often with academia and four times more often with government research organizations compared to other small Canadian manufacturing enterprises.

FIGURE 7: Collaboration practices are higher among aerospace manufacturers than all manufacturers



Source: Statistics Canada Survey of Advanced Technology (2014), 2016

WHAT DOES IT MEAN FOR ISED?

The *State of Canada's Aerospace Industry* report showcases the value of an effective win-win strategic partnership between industry and government. By leveraging their respective expertise, networks and resources, ISED and the AIAC have developed a relevant, timely and quality report to support the needs of both industry executives and policy-makers in the aerospace community. The report clearly shows that, in addition to being an important contributor to the Canadian economy, the aerospace industry is in a class of its own when it comes to innovative activity. As a major R&D spender, collaborator and employer of high-skilled, innovation-related workers, the Canadian aerospace industry provides an example for others to emulate.

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CORPORATE PROFITS:
Comparability and interpretation

HIGHLIGHTS

- Firm-level corporate profits are regarded as a measure of business success, while aggregate corporate profits as a share of GDP is sometimes used to assess a business' incentive to innovate.
- With the proper data adjustments at the country level, Canadian aggregate corporate profit as a share of GDP has been mostly lower than the US over the 1998 to 2014 period.
- However, caution needs to be exercised when interpreting and comparing corporate profits between countries to assess the competitive or innovative environment given that several factors need to be taken into account.

BACKGROUND

Corporate profits are among the most closely followed economic indicators, as profitability is widely-regarded as a summary measure of corporate success, making it an essential gauge of economic performance[14]. Profits are important for a number of reasons. For example, they constitute a source of retained earnings, which provide much of the funding for investments that can raise a firm's productive capacity. Profits are also frequently used to measure the rate of return on investment and evaluate the impacts of changes in policy and economic conditions on corporations. They also generate dividends that contribute to personal incomes, retirement pension plans, and individual savings. On a more aggregate level, corporate profits often represent an important component of a country's national income[15]. This versatility means that corporate profits are utilized by a number of economic actors, including investors for evaluating corporate financial health, industry analysts for tracking industry financial health, macroeconomic forecasters for projecting plant investments, and government policy makers for projecting tax receipts.

Canadian corporate profit figures could be measured against those of other countries to assess the relative competitiveness of Canada's business environment. However, it is necessary to take steps to ensure that the variables and measures used in such analyses are comparable and accurately reflect trends between countries if a useful contribution to evidence-based policy-making is to be obtained.

[14] US Dept. of Commerce (2002) and Myers (2015).
[15] US Dept. of Commerce (2002) and Marcuss (2004).

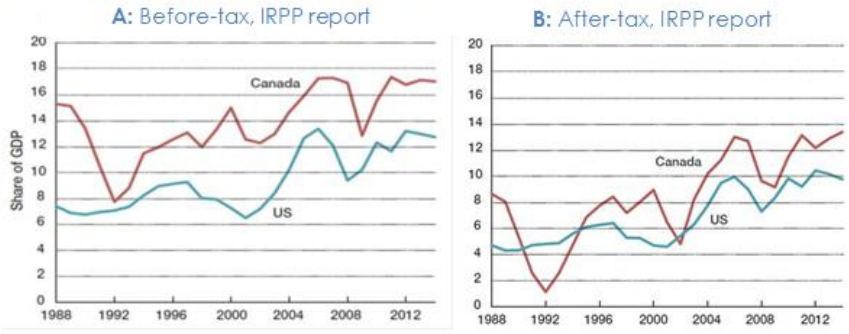
ISSUES OF COMPARABILITY

A recent paper by the Institute for Research on Public Policy (IRPP), *Canada's Innovation Conundrum: Five Years after the Jenkins Report*[16], determined that Canada's before-tax corporate profits as a share of GDP were higher than those of the US in every year from 1988 to 2014 (Figure 1A). During that period, Canada averaged 13.9% compared to just 9.4% in the US. The report also states that Canadian companies outperformed their US counterparts in after-tax corporate profits as a share of GDP (Figure 1B), though the gap was smaller.

Based on these results, the IRPP report argues that "Canadian businesses have had less competitive pressure to stimulate innovative responses", suggesting that Canadian firms lack incentives to adopt innovation-based strategies. The Canadian Council of Academies also used before-tax corporate profits to show that the Canadian environment was not conducive to risk-taking, innovation-focused business strategies[17]. In other words, Canadian businesses appear to have achieved prosperity without having to resort to riskier strategies involving the development of new products or the adoption of innovative processes.

Figure 1: Corporate Profits as a Share of GDP, Canada and the US, 1988 – 2014

Canadian data calculated according to business accounting standards



Source: Institute for Research on Public Policy (IRPP) entitled *Canada's Innovation Conundrum: Five Years after the Jenkins Report*, June 2016.

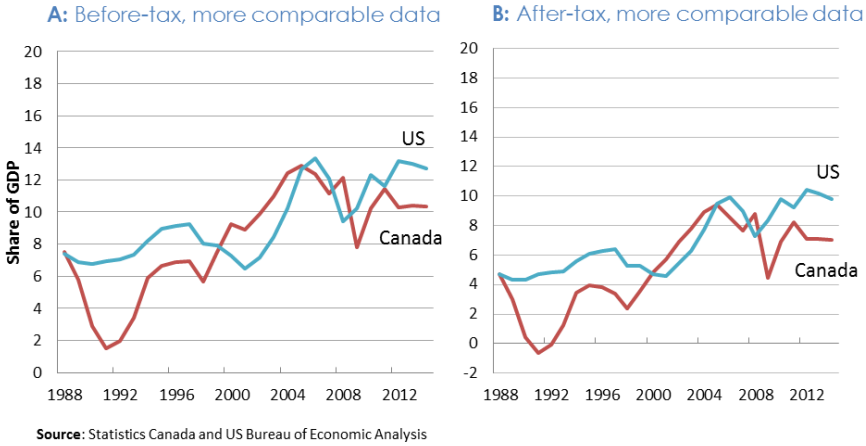
Unfortunately, upon closer examination of the methodology used to produce the Canadian and US figures, it was determined that the report relied on data that were not adequately comparable to conduct a robust examination of relative trends in corporate profits between the two countries. To be more precise, the Canadian corporate profit figures were calculated according to business accounting standards, whereas the US numbers were based on national accounting standards, which ultimately differ in their treatment of receipts and expenditures (see Box 1).

Results with more comparable data

To perform a more meaningful comparison, Statistics Canada was consulted to adjust the Canadian corporate profit data to better align with national accounting standards, making them more comparable with the US figures. Note that the national accounts method is built to allow international comparison, which makes it the natural choice for comparing Canada and US corporate profits. The end result (Figures 2A and 2B) dramatically altered the conclusions presented in the IRPP report. Specifically, the revised data reveal that before-tax corporate profits actually

Figure 2: Corporate Profits as a Share of GDP, Canada and the US, 1988 – 2014

Canadian data calculated according to national accounting standards



Source: Statistics Canada and US Bureau of Economic Analysis

[16] Sulzenko (2016).
[17] Council of Canadian Academies (2009, 2013).

averaged 8.3% in Canada during the 1988 - 2014 period, below the 9.4% averaged in the US. Additionally, Canadian after-tax corporate profits averaged 5.1% during that same period, also trailing the US result of 6.8% (Table 1). The adjusted figures demonstrate that Canadian corporate profits are not as high as the numbers presented in the IRPP report.

Table 1: Comparison of Corporate Profits between Canada and the US, IRPP Report vs. Statistics Canada Adjustments

	Before tax			After tax		
	Canada	**US**	**Difference**	**Canada**	**US**	**Difference**
IRPP report	13.9%	9.4%	4.5 pp	8.5%	6.8%	1.7 pp
Adjusted data	8.3%	9.4%	-1.1 pp	5.1%	6.8%	-1.7 pp

The next section provides a short discussion on whether aggregate corporate profits as a share of GDP is an appropriate measure for evaluating the competitive or innovative environments of an economy, given the numerous factors that can impact its value and trends.

Box 1: Two different approaches to measuring corporate profits

Businesses in Canada provide financial information on either a business accounting or tax accounting basis. Both approaches define overall net income as revenues less expenses, but they differ in terms of how some revenues and expenses are defined, the timing of recognition for some of these revenues and expenses, and their specific audiences.

For instance, the **business accounting** approach is prepared according to applicable accounting standards (i.e. the Generally Accepted Accounting Principles (GAAP), Private GAAP, or International Financial Reporting Standards) and is meant for shareholders or regulatory bodies, while the **national accounting** method is a GDP-based approach that measures the income earned by corporations from current production in order to produce a descriptive set of internationally-comparable macroeconomic accounts.

The national accounting approach differs from the business accounting approach in its treatment of depreciation and inventory, and its exclusion of capital gains/losses, depletion, bad debts, charitable donations, and dividends. Many corporations will actually prepare two sets of profit information to satisfy the requirements of separate clients, namely, the public to inform investors and tax agencies to report income for tax purposes.

ARE CORPORATE PROFITS THE BEST INDICATOR OF THE INNOVATIVE ENVIRONMENT?

Using the IRPP argument that profits are inversely related to competition and innovation, this would imply that Canadian firms face more competition and would operate in a more risk-taking innovative environment than their American counterparts. However, this is not necessarily the case, particularly in light of the persistent productivity gap between the two countries, which is well documented in the literature – an aggregate outcome influenced by firm-level innovation.[18] More importantly, the link between the aggregate corporate profit shares of an economy and the innovative environment is not straightforward, as there are many factors at play that are hard to disentangle at the national level.

[18] Baldwin et al. (2014), Baldwin and Gu (2009), Tang (2016)

Basic economic theory tells us that profits depend on the degree of competition faced by firms, where higher competition in a market is associated with lower profits. However, even though the US market is seen as being highly competitive, recent research reveals a growing trend of higher mark-ups in the US[19]. Mark-ups can be an indication of market power, which would suggest lower competition, because they reflect the additional marginal revenue that a firm is able to accrue above costs.

Taking the argument one step further, technological change allows firms to maintain mark-ups and preserve positions of market power, at least in the short-run. In other words, corporate profits can themselves be innovation-induced. Innovation can keep firms ahead of their competition within a particular industry (through patents, industrial secrets, or lead time), thereby generating increased market share and profits. Recent evidence reveals that the US is transitioning to a more Intellectual Property (IP), capital-intensive economy, as shares in IP capital are rising (relative to labour and traditional capital shares of GDP)[20].This is also in line with recent research showing that industries in the US are becoming more concentrated, often consisting of just a few high-profit, low-labour share firms. These tend to be "superstar" firms with superior products or productivity[21].

In sum, aggregate corporate profits mask heterogeneity at the firm or industry level – levels at which profit may be linked to the lack of competitiveness (e.g., protected sectors) or inversely to benefit from innovation. Therefore, caution is needed when using aggregate corporate profits as a share of GDP to evaluate the innovative environment of a country without getting a better sense of the drivers at the industry or firm levels.

WHAT DOES IT MEAN FOR ISED?

The treatment of corporate profits in the IRPP report illustrates the importance of exercising caution when engaging in cross-country analysis or comparisons using different data sources, as data sets for the same indicator (corporate profits in this case) are not necessarily comparable between statistical agencies. We argue that more in-depth analysis at the firm and industry levels would be needed to better understand he drivers of trends in corporate profits and to devise sound policy advice.

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[19] Barkai (2016), De Loecker and Eeckhout (2017)
[20] Koh et al. (2016)
[21] Autor et al. (2017)

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Internal Trade Flows in Canada

HIGHLIGHTS

- To strengthen the evidence base on internal trade flows, the Department worked with Statistics Canada to jointly develop more detailed inter-provincial trade data.
- The largest trade flows within Canada occur along the Quebec City – Southwestern Ontario corridor.
- The nature of internal trade differs across cities, with some trading more with neighbouring provinces, while others have trade ties spanning long distances.

BACKGROUND

The newly-implemented Canadian Free Trade Agreement (CFTA) aims to reduce barriers hindering the movement of goods and people across provincial borders. To better inform the policy debate on trade flows, ISED worked with Statistics Canada to jointly develop trade data at a finer regional scale and strengthen the evidence base on the patterns of internal trade flows within and across provinces in Canada. These efforts resulted in the creation of the Surface Transportation File (STF), a new database that measures flows of goods moved by truck and rail between 30 greater economic regions (GERs) from 2004 to 2012 (see Annex for more details on the database).

CANADA'S INTERNAL TRADE

Figure 1 shows the major flows of goods between GERs across Canada by utilizing an edge-bundling map, a common technique used to identify broad patterns implied by multiple overlapping relationships. In this case, the map highlights the major trading corridors across GERs within and between provinces, with a darker blue line indicating a larger volume of flows relative to a lighter line.

The map shows that Canada's two-way trade largely flows along the corridor spanning Quebec City to Southwestern Ontario, which has an estimated value in excess of $13 billion. There are also strong ties to the Western provinces, represented by another thick blue line starting in Toronto and fading as it separates into the major cities along the route to Vancouver. Other inter- and intra-provincial flows between GERs are depicted with fainter lines representing smaller values.

Figure 1: Main internal trade corridors, Canada 2012

Source: http://www.statcan.gc.ca/pub/11-627-m/2016005/m-c02-eng.htm

Although Figure 1 demonstrates strong trade ties across provinces, trade largely remains intra-provincial. Table 1 shows total provincial trade flows (Atlantic Provinces are grouped) and the magnitude of inter-provincial trade in 2012. At $124.2 billion, inter-provincial exports accounted for 30 percent of goods moved by truck or rail within Canada. Therefore, the remaining 70 percent moves either within the regions themselves, or between regions within provinces.

Table 1: Internal trade, Canada 2012

	Inter-provincial flows		Total flows		Share of inter-provincial flows	
	Exports	Imports	Exports	Imports	Exports	Imports
	millions ($)				%	
Atlantic Canada	8,383	8,892	21,923	22,432	38.2	39.6
Quebec	35,201	23,759	98,869	87,428	35.6	27.2
Ontario	38,094	36,382	166,313	164,601	22.9	22.1
Manitoba	7,366	8,793	14,284	15,711	51.6	56.0
Saskatchewan	6,373	7,604	13,799	15,030	46.2	50.6
Alberta	18,553	22,008	61,181	64,636	30.3	34.0
British Columbia	10,237	16,769	31,425	37,956	32.6	44.2
Total	**124,207**	**124,207**	**407,795**	**407,795**	**30.5**	**30.5**

Note: Numbers represent the value of merchandise goods trade within Canada, including constructions but excluding goods traveling by pipeling (oil and natural gas), marine and air. See Annex for details.

Source: Statistics Canada's Surface Transportation File, 2016, and ISED's calculations

REGIONAL EXPORTS AND IMPORTS

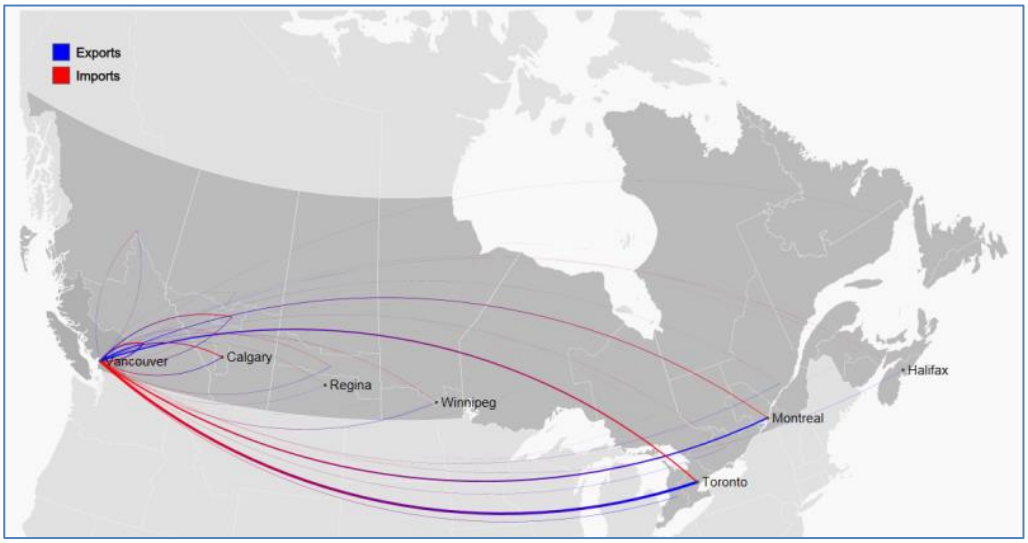
The inter- and intra-provincial flows depicted in Figure 1 can be disaggregated by region and the direction of the flow (e.g., exports and imports). For this article, we focused the analysis on three major GERs, namely the Vancouver Region,

Edmonton, and the Greater Toronto and Hamilton area. Note that the flows are represented by a blue line as they leave their origins as exports and transition into a red line as they reach their destinations as imports. Also, as mentioned earlier, thicker lines represent flows of greater value. Each figure is accompanied by a table showing the relative magnitudes of the inter-regional trade flows within and across provinces for each of the three GERs.

Vancouver Region (Lower Mainland – Lower Coast – Vancouver Island)

Figure 2 and Table 2 show the trading relationships for the Lower Mainland – Lower Coast – Vancouver Island region within Canada.

Figure 2: Regional exports and imports for Lower Mainland – Lower Coast, Vancouver Island, 2012



Source: http://www.statcan.gc.ca/pub/11-627-m/2016005/m-c01-eng.htm

Table 2: Regional trade for Lower Mainland – Lower Coast – Vancouver Island, 2012

Partner (Greater Economic Region)	Exports	Imports	Exports	Imports
	millions ($)		share	
Intra-provincial partners				
Lower Mainland-Lower Coast-Vancouver Island, BC	12,457	12,457	56.6%	50.0%
Interior British Columbia, BC	1,890	1,581	8.6%	6.4%
Northern British Columbia, BC	274	265	1.2%	1.1%
Total intra-provincial trade	**14,621**	**14,303**	**66.4%**	**57.4%**
Major inter-provincial trading partners				
Central / Greater Toronto and Hamilton Area, ON	1,984	4,059	9.0%	16.3%
Greater Montreal, QC	911	2,243	4.1%	9.0%
Calgary, AB	1,286	916	5.8%	3.7%
Edmonton, AB	1,155	725	5.2%	2.9%
Central Saskatchewan, SK	315	326	1.4%	1.3%
Total inter-provincial trade	**7,385**	**10,594**	**33.6%**	**42.6%**
Total internal trade flows	**22,006**	**24,897**	**100.0%**	**100.0%**

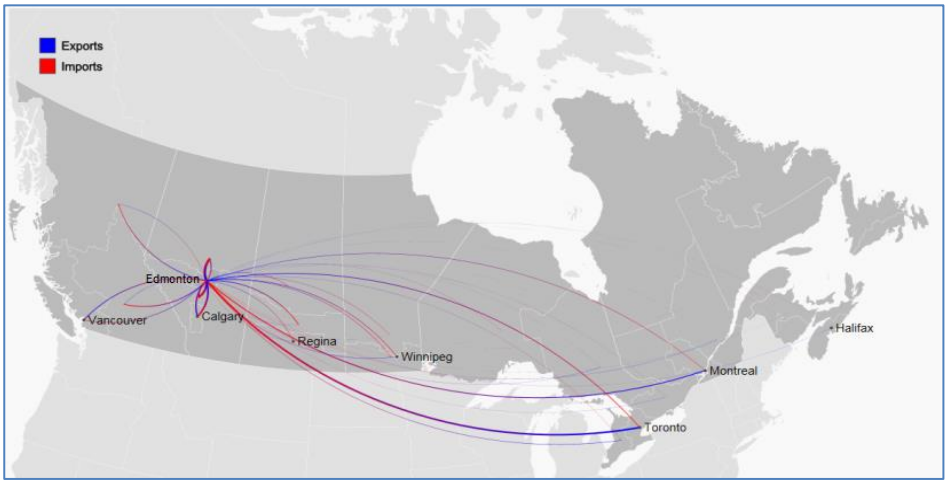
Source: Statistics Canada's CANSIM table 386-0004 and ISED's calculations

The first interesting finding is that around half of all domestic trade within the region remains in the area (i.e., local trade). Outside of local trade, the region's main trading partners within Canada are the Central Ontario/Greater Toronto and Hamilton area and Greater Montreal, particularly in terms of imports. However, it also has prominent relationships with nearby regions including the BC interior within the province, and Edmonton and Calgary (mainly on the export side) in neighbouring Alberta. Its trade connections with other parts of the country are less significant, based on dollar values, as indicated by the fainter lines on the map.

Edmonton

Figure 3 shows that the value of Edmonton's trade is on par with that of the lower mainland in BC (Vancouver), but with some notable differences. Edmonton has strong non-oil and gas export relationships with the rest of the Prairies, while a significant share of its imports come from Toronto and Montreal. It also has strong flows with northern Alberta and BC, perhaps reflecting its historical role as the "Gateway to the North". In fact, a comparison of Figures 2 and 3 suggests that Edmonton's links to Northern BC are actually stronger than those of Vancouver, while its relationship to the BC interior is of a similar magnitude. Like the previous example, Edmonton's most prominent two-way relationships are local and within the province, as Calgary, and Central and Northern Alberta account for the majority of Edmonton's imports and exports.

Figure 3: Regional exports and imports for Edmonton, 2012



Source: http://www.statcan.gc.ca/pub/11-627-m/2016005/m-c01-eng.htm

Table 3: Regional trade for Edmonton, 2012

Partner (Greater Economic Region)	Exports	Imports	Exports	Imports
	millions ($)		share	
Intra-provincial partners				
Edmonton, AB	8,759	8,759	31.4%	39.5%
Northern Alberta, AB	3,898	1,292	14.0%	5.8%
Central Alberta, AB	3,350	1,540	12.0%	6.9%
Calgary, AB	2,752	2,144	9.9%	9.7%
Total intra-provincial trade	**18,759**	**13,735**	**67.2%**	**61.9%**
Major inter-provincial trading partners				
Central / Greater Toronto and Hamilton Area, ON	1,070	2,803	3.8%	12.6%
Greater Montreal, QC	574	1,456	2.1%	6.6%
Lower Mainland-Lower Coast-Vancouver Island, BC	725	1,155	2.6%	5.2%
Interior British Columbia, BC	1,214	350	4.3%	1.6%
Northern British Columbia, BC	990	318	3.5%	1.4%
Total inter-provincial trade	**9,152**	**8,442**	**32.8%**	**38.1%**
Total internal trade flows	**27,911**	**22,177**	**100.0%**	**100.0%**

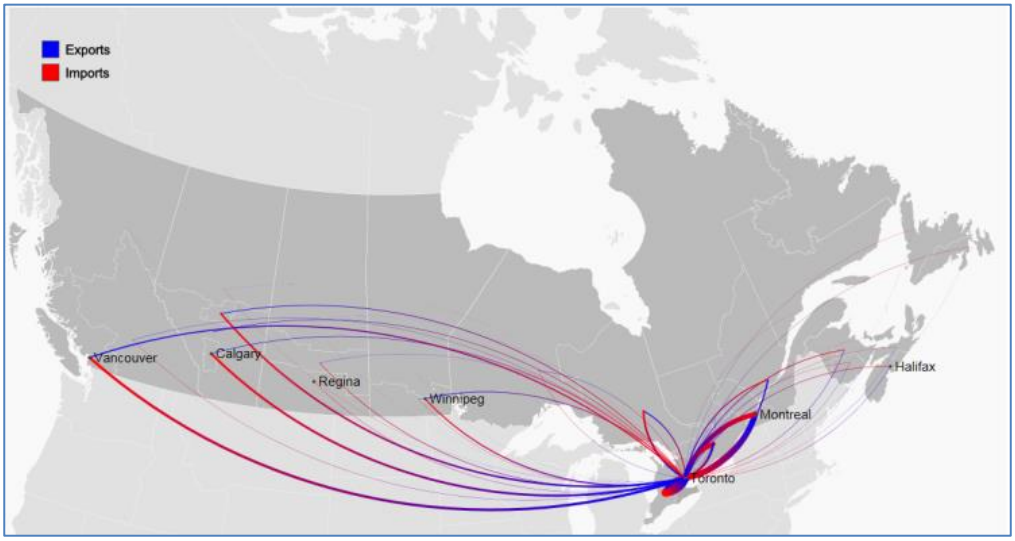
Source: Statistics Canada's CANSIM table 386-0004 and ISED's calculations.

It should be noted that these findings must be treated with caution because the data do not include the province's prominent oil and gas exports, on account of the fact that they are primarily transported via pipeline. Therefore, the extent of Edmonton's inter-provincial trade is likely underestimated (see Annex for details regarding the database).

Central Ontario, Greater Toronto and Hamilton area

Figure 4 and the corresponding table show that the Central Ontario, Greater Toronto and Hamilton area has strong relationships with both the western and eastern regions of Canada. Its inter-regional relationships, which are generally stronger on the export side, are particularly large with the other regions within Ontario (intra-provincial trade), as well as the adjacent region of Greater Montreal in Quebec. However, it also has relatively large flows of goods to Vancouver, Edmonton, Calgary and Winnipeg. Note finally that more than half of this GER's total trade is within the region, as local trade flows are valued at approximately $63 billion.

Figure 4: Regional exports and imports for Central Ontario, Greater Toronto and Hamilton area, 2012



Source: http://www.statcan.gc.ca/pub/11-627-m/2016005/m-c01-eng.htm

Table 4: Regional trade for Central Ontario, Greater Toronto and Hamilton Area, 2012

Partner (Greater Economic Region)	Exports	Imports	Exports	Imports
	millions ($)		share	
Intra-provincial partners				
Central / Greater Toronto and Hamilton Area, ON	63,340	63,340	55.7%	64.1%
Southwestern Ontario, ON	12,477	9,899	11.0%	10.0%
Eastern Ontario, ON	7,117	3,530	6.3%	3.6%
Northeastern Ontario, ON	3,028	1,631	2.7%	1.7%
Northwestern Ontario, ON	388	448	0.3%	0.5%
Total intra-provincial trade	**86,350**	**78,848**	**76.0%**	**79.8%**
Major inter-provincial trading partners				
Greater Montreal, QC	7,512	8,845	6.6%	9.0%
Lower Mainland-Lower Coast-Vancouver Island, BC	4,059	1,984	3.6%	2.0%
Calgary, AB	3,385	846	3.0%	0.9%
Québec City region-Saguenay-Beauce-Estrie, QC	1,734	2,204	1.5%	2.2%
Edmonton, AB	2,803	1,070	2.5%	1.1%
Total inter-provincial trade	**27,279**	**19,916**	**24.0%**	**20.2%**
Total internal trade flows	**113,629**	**98,764**	**100.0%**	**100.0%**

Source: Statistics Canada's CANSIM table 386-0004 and ISED's calculations

Other regions

Other regions across Canada also exhibit patterns that are somewhat similar to those described in the three GERs highlighted in the previous examples, but with notable differences.

For example, Montreal's internal trade is largely concentrated within the region itself and with those that are nearby such as Québec City, Greater Toronto and Eastern Ontario in Ontario, and Northern and Eastern New Brunswick. However, the region also has large export and import activity across the country, including with the Vancouver area and Edmonton. Meanwhile, trade flows for Halifax-Southern Nova Scotia-Annapolis Valley are also highly-concentrated within the province or with nearby regions in New Brunswick and Quebec; few flows associated with this region travel further west than the Greater Toronto region.

WHAT DOES IT MEAN FOR ISED?

In summary, this article utilizes new data from the Surface Transportation File (STF), a database jointly developed by ISED and Statistics Canada, to show that strong national trade ties exist within Canada, especially between major cities. It also demonstrates the diverse nature of different regional ties across the country.

This article also provides context to the newly announced Canadian Free Trade Agreement (CFTA) by presenting an analysis of the STF data to better represent domestic trade at a finer regional scale. Furthermore, it offers a useful benchmark to assess how the implementation of this agreement will bolster inter-provincial trade.

ANNEX

The data analyzed in this paper come from Statistics Canada's Surface Transportation File (STF) and covers almost all internal merchandise trade, excluding commodities that are primarily moved by pipeline (conventional and synthetic crude oil, natural gas, natural gas liquids and related products, crude and diluted bitumen) and, to preserve the confidentiality of the supply-use tables, coal products.

Inter-regional trade is measured using a three-year moving average within and between 30 Greater Economic Regions, or GERs, that are aggregated from a set of 73 provincial Economic Regions (ERs) and coincide with the 2011 Standard Geographical Classification (SGC). This aggregate version of the STF is publicly available in CANSIM table 386-0004. The territories are not included, because their trade is primarily moved by water and air.

To use this database interactively to see inter-regional trade flows for specific regions, please go to http://www.statcan.gc.ca/pub/11-627-m/11-627-m2016005-eng.htm.

For more details go to http://www.statcan.gc.ca/daily-quotidien/160922/dq160922b-eng.htm.

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INSIGHTS DATA TABLE

Monthly Economic Indicators

		Month-over-month growth (at monthly rates)			Q-o-q growth	Year-over-year growth	
	Reference Period	Latest month	Prev. month	2 Months before	2017Q2	2016	2015
Mfg sales (current $)	Jul '17	-2.6	-1.9	1.4	1.6	1.2	-1.6
Mfg sales (constant $)	Jul '17	-1.4	-1.1	1.3	0.7	1.6	-1.1
Retail trade (current $)	Jul '17	0.4	0.0	0.6	1.5	5.1	2.6
Retail trade (chained $)	Jul '17	-0.2	0.4	1.1	2.1	4.0	2.3
Real GDP	Jul '17	0.0	0.3	0.6	1.2	1.3	0.9
-Services	Jul '17	0.2	0.2	0.2	0.9	2.1	2.1
-Manufacturing	Jul '17	-0.4	0.5	0.9	1.3	1.0	0.2
Exports (bop) (current $)	Jul '17	-4.9	-5.0	3.0	2.9	-0.7	-0.7
Imports (bop) (current $)	Jul '17	-6.0	0.5	2.9	5.6	-0.1	4.5
All-items CPI	Aug '17	0.1	0.0	-0.1	0.6	1.4	1.1
All-Items CPI excluding food and energy	Aug '17	0.0	0.0	0.1	0.5	1.9	1.8
LFS employment (Δ in 000s)	Aug '17	22.2	10.9	45.3	103.0	229.0	152.4
Unemployment rate (%)	Aug '17	6.2	6.3	6.5	6.5	7.0	6.9
US employment (Δ in 000s) (CPS)	Aug'17	-74.0	345.0	245.0	168.0	2,081.0	2,509.0
US unemployment rate (%)	Aug'17	4.4	4.3	4.4	4.4	4.9	5.3

Financial Indicators

			Monthly average			Annual average	
	Reference period	Current value	Latest full month	Prev. month	2 Months before	2016	2015
Bank rate (%)	Sep 26 '17	1.00	1.00	0.75	0.75	0.75	0.88
Exchange rate	Sep 26 '17	123.7	126.0	126.9	133.0	132.6	127.9

Quarterly Economic Indicators

		Quarter-over-quarter growth (at annual rates)			Year-over-year growth	
	Reference period	Latest quarter	Prev. quarter	2 Quarters before	2016	2015
Real GDP	2017Q2	4.5	3.7	2.7	1.5	0.9
Final consumption expenditure	2017Q2	4.0	3.7	2.5	2.2	1.8
Gross fixed capital formation	2017Q2	1.9	10.5	-7.8	-3.1	-4.6
-Machinery & equipment	2017Q2	3.6	28.9	-3.2	-5.3	-3.3
Exports	2017Q2	9.6	1.5	0.8	1.0	3.4
Imports	2017Q2	7.4	15.6	-11.3	-0.9	0.3
Final domestic demand	2017Q2	3.5	5.1	0.1	1.0	0.3
Labour productivity	2017Q2	-0.3	5.3	1.5	0.7	-0.5
Unit labour cost	2017Q2	-3.1	-1.2	1.5	0.8	2.2
Industrial capacity utilization (%)	2017Q2	85.0	83.2	81.7	80.6	80.8
Real US GDP	2017Q2	3.1	1.2	1.8	1.5	2.9