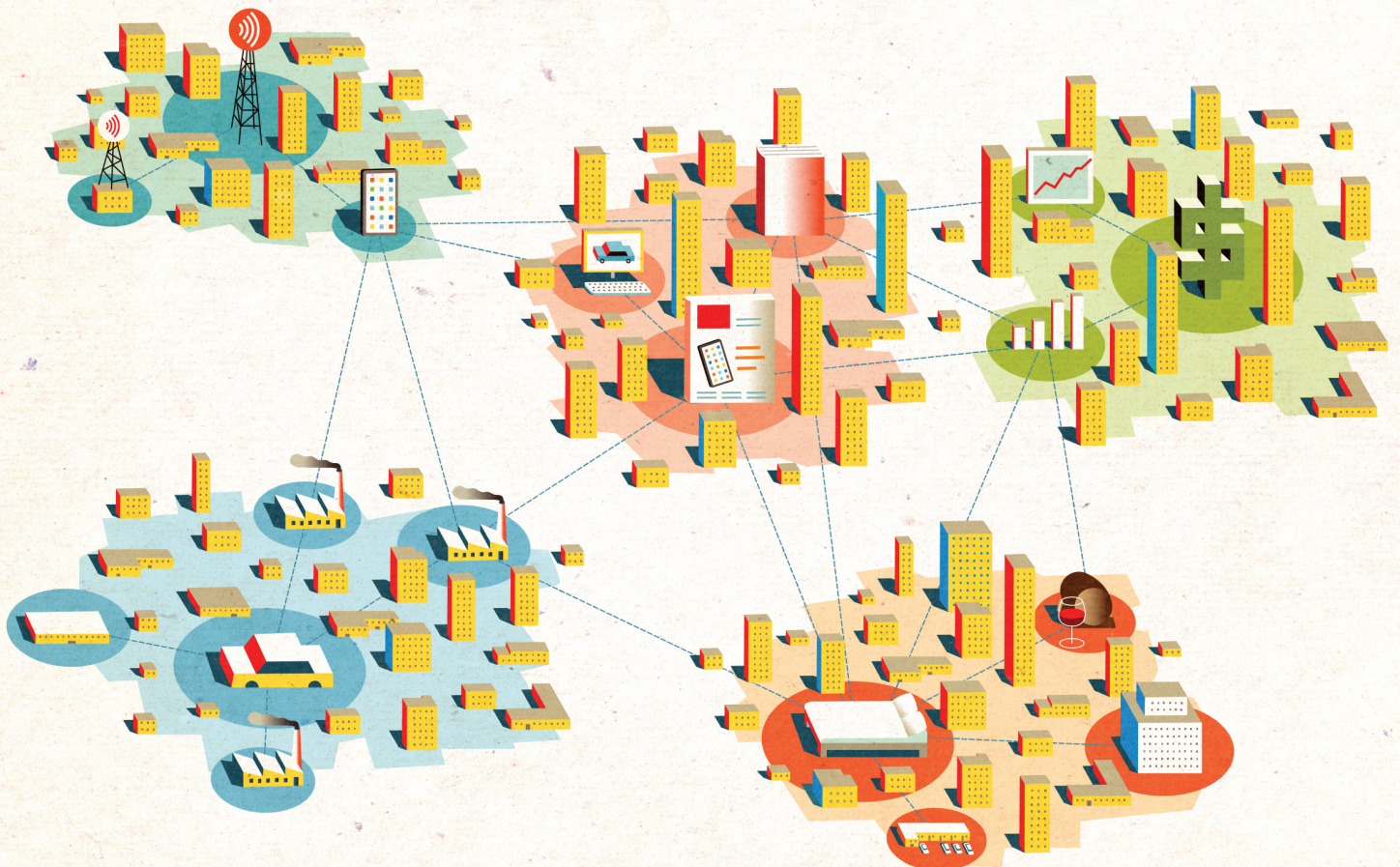


CLUSTERS IN ONTARIO

Creating an ecosystem for prosperity





The Institute for Competitiveness & Prosperity is an independent not-for-profit organization that deepens public understanding of macro and microeconomic factors behind Ontario's economic progress. Research by the Institute is intended to raise public awareness and stimulate debate on a range of issues related to competitiveness and prosperity. It is the aspiration of the Institute to have a significant influence in increasing Ontario and Canada's competitiveness, productivity, and capacity for innovation. We believe this will help ensure continued success in creating good jobs, increasing prosperity, and building a higher quality of life. We seek breakthrough findings from our research and propose significant innovations in public policy to stimulate businesses, governments, and educational institutions to take action.

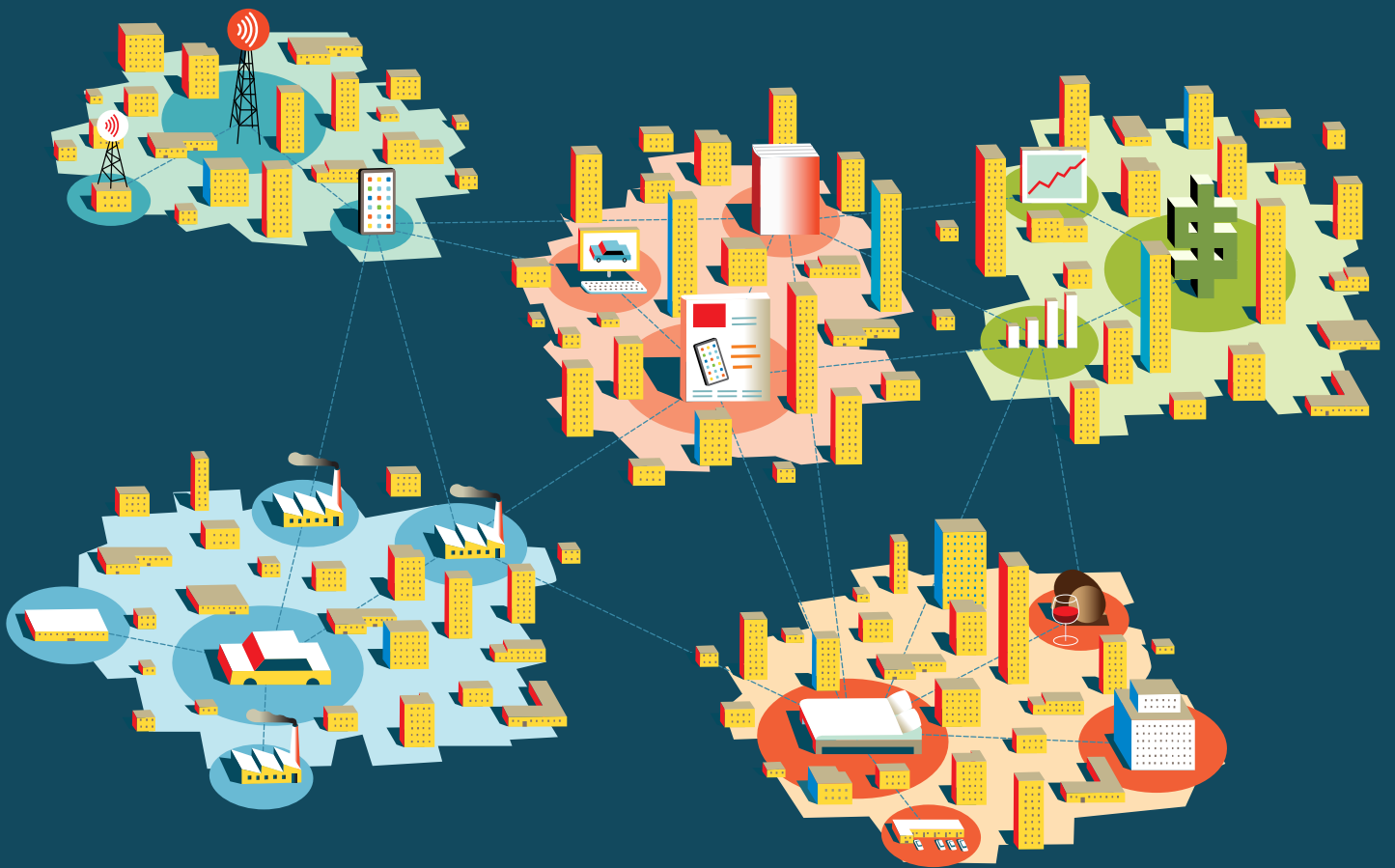
The Institute was formerly the research arm of the Task Force on Competitiveness, Productivity and Economic Progress established in 2001 by the Ontario Premier, and led by Roger L. Martin. The Task Force completed its work at the end of 2014. The Institute is now advised by Ontario's Panel for Economic Growth & Prosperity, led by Tiff Macklem.

Comments on this report are welcome and should be directed to the Institute for Competitiveness & Prosperity. The Institute is funded by the Government of Ontario through the Ministry of Economic Development and Growth.

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CLUSTERS IN ONTARIO

Creating an ecosystem for prosperity



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Strong clusters raise productivity



Tiff Macklem

Chair, Ontario's Panel on Economic Growth & Prosperity

Dean, Joseph L. Rotman School of Management

I AM PLEASED to present Working Paper 26 of the Institute for Competitiveness & Prosperity. This Working Paper examines how cluster growth could increase the prosperity of our province using five examples of strong clusters in Ontario, and proposes recommendations on how to improve the ecosystem that fosters successful clusters. Clusters are found in small geographical areas where interconnected firms, organizations, and service providers are concentrated. Ontario is home to a number of vibrant clusters that we should be proud of, including Communications & Equipment Services in Kitchener-Cambridge-Waterloo, Automotive in Windsor, and Financial Services in Toronto.

Within each cluster, firms, academic/research organizations, venture capitalists, and governments are located in close proximity to each other, and hence are more likely to interact. As elaborated in the Porter Diamond model, there are four critical interactive elements to clusters: inputs that firms draw upon and use, supporting and related industries that firms rely on, sophisticated customers who demand innovative and high quality products, and the specific local context that informs how firms compete and behave. Interactions between firms, academic/research organizations, venture capitalists, and governments and the elements of the Porter Diamond create a unique ecosystem that allows actors to share knowledge and expertise, form relationships and partnerships, and to investment in each other's success.

The Institute has written extensively about clusters in the past. Clusters energize the economy because they foster the creation of new companies that support the cluster, attract and build talent, and draw suppliers and related industries to locate in the same area. Not only does this pool together talent and related firms, it also creates the necessary competitive environment to spur innovation in goods and services. As a result, clusters register higher wages, innovation output, and entrepreneurial activity. This virtuous cycle helps the region become more competitive, and a more competitive region is more prosperous. Indeed, stronger clusters are crucial to closing the prosperity gap between Ontario and its North American peers.

In this Working Paper, we use Harvard Business School Professor Michael E. Porter's cluster definitions and identify five strong clusters that Ontario should support and market: Automotive; Financial Services; Marketing, Design & Publishing; Hospitality & Tourism; and Communications Equipment & Services.

Clusters energize the economy because they foster the creation of new companies that support the cluster, attract and build talent, and draw suppliers and related industries to locate in the same area.

Clusters should be market led and supported by government policy. Clusters cannot be replicated and governments should not try to create them. Growth should occur from the ground up, with firms leading the way. But government has an important role to play in fostering a healthy business environment and a supportive ecosystem for Ontario's high potential clusters. The recent announcements of the Canadian Cluster Mapping Portal by the federal government and the new *Partnerships for Jobs and Growth Act* by the provincial government are steps in the right direction.

Nonetheless, there is more that could and should be done. Our recommendations emphasize the importance of focusing limited public resources on supporting the clusters with the largest export and growth potential, on the critical role of attracting and developing leading talent as a driver of cluster success, the importance of aligning infrastructure investment with the needs of high-potential clusters, and the potential for a more open and transparent foreign direct investment regime to provide greater opportunities to scale our most successful clusters.

The Institute gratefully acknowledges the ongoing funding support from the Ontario Ministry of Economic Development and Growth. We look forward to sharing and discussing our work and welcome your comments and suggestions.



WHAT ARE CLUSTERS?

Geographically proximate groups of interconnected companies, suppliers, service providers, and associated institutions.

ONTARIO HAS MANY STRONG, TRADED CLUSTERS FIVE YOU MAY RECOGNIZE



AUTOMOTIVE
WINDSOR



FINANCIAL SERVICES
TORONTO



MARKETING, DESIGN & PUBLISHING
TORONTO



HOSPITALITY & TOURISM
ST. CATHARINES



COMMUNICATIONS EQUIPMENT & SERVICES
KITCHENER-CAMBRIDGE-WATERLOO

There are two types of clusters



CLUSTER GROWTH REQUIRES A HEALTHY ECOSYSTEM TO FOSTER INTERACTIONS BETWEEN CLUSTER ACTORS AND THE ELEMENTS OF THE PORTER DIAMOND.

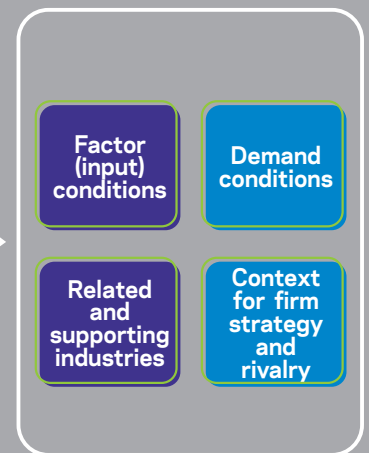
EACH ELEMENT WORKS THROUGH AND WITH EACH OTHER TO DRIVE INNOVATION, PRODUCTIVITY, COMPETITIVENESS, AND PROSPERITY.



Cluster Actors



Porter Diamond Elements



INTERACTIONS PRODUCE:

LABOUR MARKET POOLING
LARGER POOL OF SPECIALIZED WORKERS

SUPPLIER SPECIALIZATION
FIRMS SPECIALIZE IN PRODUCING INPUTS

KNOWLEDGE SPILLOVERS
INFORMATION SHARING



AS A RESULT, A REGION EXPERIENCES:

- ↑ INNOVATION
- ↑ PRODUCTIVITY
- ↑ COMPETITIVENESS
- ↑ PROSPERITY

HOW DO WE CREATE A CLUSTER ECOSYSTEM THAT DRIVES PROSPERITY?

- 1.** Develop a clear and integrated cluster strategy to boost economic development
- 2.** Improve regional data to support decision-making
- 3.** Implement the recommendations under 'How Ontario can improve':

	How Ontario fares	How Ontario can improve
Factor (input) conditions	<ul style="list-style-type: none"> ▪ Lowest infrastructure stock per worker ▪ Managerial talent is strong ▪ Limited venture capital investment, particularly at later stages ▪ Stagnant business R&D investment 	<ul style="list-style-type: none"> ▪ Increase productivity-enhancing infrastructure ▪ Support advanced degree attainment ▪ Reconsider venture capital policy ▪ Strengthen entrepreneurial culture
Related and supporting industries	<ul style="list-style-type: none"> ▪ Multitude of cluster organizations but few cluster initiatives 	<ul style="list-style-type: none"> ▪ Encourage inter- and intra-cluster collaboration
Demand conditions	<ul style="list-style-type: none"> ▪ Customer sophistication level remains behind the US ▪ Many trade opportunities within Great Lakes Region and internationally 	<ul style="list-style-type: none"> ▪ Expand trade commissioners program ▪ Work with macro-regions such as the Great Lakes to grow macro-clusters
Context for firm strategy and rivalry	<ul style="list-style-type: none"> ▪ Greenfield FDI is strong but restricted 	<ul style="list-style-type: none"> ▪ Loosen restrictions on foreign direct investment

CLUSTERS CAN HELP CLOSE THE PROSPERITY GAP BETWEEN ONTARIO AND ITS NORTH AMERICAN PEERS.

CLUSTER DEVELOPMENT CAN INCREASE ONTARIO'S PROSPERITY

Government intervention to facilitate economic growth has oscillated between subsidizing businesses and attempting to replicate other regions' clusters. Although both initiatives intend to attract larger firms and increase competitiveness, their ineffectiveness has garnered criticism. As such, provincial and federal governments are taking a new approach by establishing a cluster policy.

Cluster policy can be used to drive competitiveness

As of 2015, the prosperity gap, measured by Gross Domestic Product (GDP), between Ontario and its North American peers stood at \$12,500 per capita.¹ This prosperity gap reflects lagging productivity. It means that the average worker in Ontario produces less output (goods or services) than his or her North American counterparts. If Ontario wants to close its prosperity gap and become more competitive, it must address its greatest challenge: increasing productivity.

Traditionally, public policy has focused on incentivizing large firms to relocate in order to increase a region's competitiveness. The assumption is that large firms employ more people and are more productive. This has led to a "race to the bottom" in which governments bid against each other to attract large firms. In the case of Shell, Pennsylvania outbid West Virginia and Ohio on a production facility with a \$1.6 billion tax credit over 25 years.² However there was no guarantee that Shell would bring the expected employment opportunities. In many cases, the public cost of the jobs created was exorbitant. In the US in 2013, \$80.4 billion was spent by local governments on corporate incentives, with the hope of generating local employment opportunities. However, there is currently no record of how many jobs were actually created by the investment.³ As a result, this "bidding-for-business" approach has been criticized for being costly and ineffective.⁴

In addition to these top-down approaches to driving competitiveness, governments are now using policies which directly target cluster development. There are many definitions and classifications of clusters. The Institute uses the methodology developed by Harvard Business School Professor Michael E. Porter, who coined the term 'clusters' and applied specific definitions and classifications to study their importance to regional competitiveness.

Porter argues that unlike industries or sectors, clusters are not just a group of firms that produce similar products or services. Instead, *clusters* are geographically proximate groups of interconnected companies, suppliers, service providers, and associated institutions.⁵ They involve an extensive web of complementary linkages between companies and related actors, such as universities and colleges, research organizations, and sources of financing. Clusters can be found in geographic areas as constrained as New York's Wall Street or as sprawling as California's Silicon Valley.

Clusters are not new phenomena. The grouping together of individuals, suppliers, and organizations can be traced throughout history, to art in Florence or the Bordeaux wine region in France. But governments are now attempting to

create clusters as a means to drive economic growth. For example, in 2005, the Malaysian government built the BioValley biotechnology complex in an attempt to create a place to house a biotech cluster, but it remains largely unoccupied.⁶

Clusters cannot be replicated or created. While the actors and elements that make up a cluster ecosystem are the same, their interactions are unique. The German automotive cluster is not found anywhere else in the world for this reason. This cluster leverages the country's proximity to the rest of Europe, government policy including taxation policy, dual education system, and venture capital (VC) conferences, among other elements.⁷ These cluster elements and actors interact with one another in a way that is specific to the German culture, economy, and people.

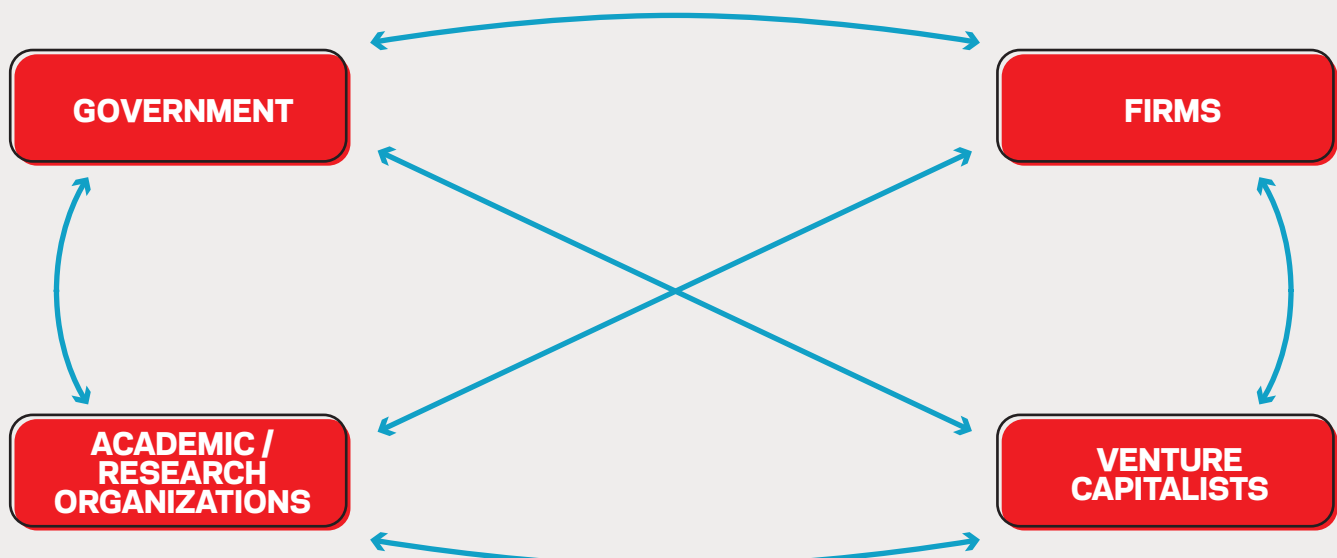
Cluster actors and their interactions

When different actors are situated in close proximity to one another, the transaction costs of interacting decreases, naturally leading to more opportunities to share knowledge, form relationships, and develop partnerships. These actors interact with the elements of the Porter Diamond and these interactions are pivotal to the development of clusters.

There are four main types of cluster actors (Exhibit 1):

- **Firms** are the main cluster actor as they are the leading economic driver within the cluster environment. But they depend on the other three actors. They are regulated and supported by government, receive advice and expertise from research and academic organizations, and obtain funding from venture capitalists. The firm, in return, offers employment, tax revenues and profit, sponsorships and information, and shares or equity of the company.
- **Academic/research organizations** use research and data to inform and consult governments and businesses in their decision-making. They may also receive financial support from the other three actors to conduct research. Most importantly, academic institutions such as universities educate the future and existing labour force, teaching them the methods and knowledge that enable firms' productivity.
- **Venture capitalists** are a type of investor that provides capital or support (e.g., expertise) to small companies looking to expand but do not have access to the equities market. Venture capitalists can also include other types of investors (e.g., pension funds, angel investors) and can also work with incubators that are government funded or at universities.

EXHIBIT 1 There are four main types of cluster actors



Source: Institute for Competitiveness & Prosperity based on research of Professor Michael E. Porter.

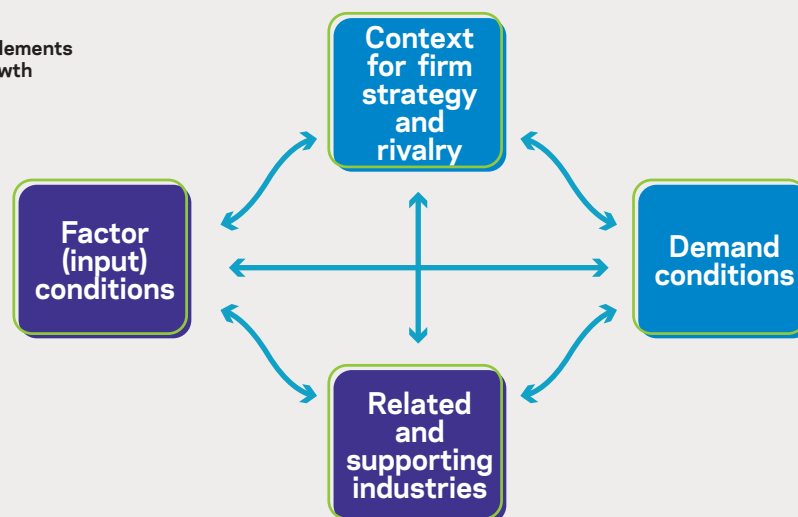
- **Government** supplements the work of the other actors, particularly where firms cannot. The government also has a strong convening role, bringing together the other three actors while directly influencing the elements of the Porter Diamond. For example, government can create the policies that facilitate a strong cluster environment, balancing the incentives and disincentives that are found within its policies to ensure firms act not just for their own best interests, but also for the greater economy. Knowing how to design optimal policies requires frequent interaction with firms as well as venture capitalists and research organizations. In doing so, the overall business environment can improve, which generates benefits that are not exclusive to specific clusters. While the recommendations in this Working Paper are primarily aimed at the provincial government, the federal and municipal governments also have a responsibility to aid the provincial government in its goal of creating a healthy cluster ecosystem.
- **Factor (input) conditions** can form specialized support to help clusters grow. To become more productive and innovative, businesses must draw upon, and use effectively, a sufficient cache of factors of production such as natural resources, pools of specialized labour, and physical and scientific infrastructure. Governments can improve these factors by training labour and investing in the existing infrastructure of the region, among other initiatives.
- **Related and supporting industries** supply the necessary inputs to production for firms within a cluster. Firms in clusters enjoy more cost-effective and innovative inputs when their suppliers or other related industries are more competitive, as they create more productive supply chains. These industries form part of the specialized support that encourages innovation and creates spin-off companies through interactions with cluster actors.

The elements of the Porter Diamond

Porter has identified four elements that interact to form a region's or country's competitiveness, and has conceptualized this in a diagram known as the Porter Diamond (Exhibit 2).⁸ These elements are present within the general business environment, but Porter identifies them as the building blocks of the cluster ecosystem. These elements can help businesses and government understand the importance of leveraging the region's existing strengths in these elements and overcoming its shortfalls to increase competitiveness and hence prosperity for a region.

- **Demand conditions** include sophisticated consumers who are more likely to ask for better products and services, putting pressure on firms to meet local demands for fear of falling behind. A classic example is Japan, where the local demand for innovative technologies spurs companies to create products that will not only satisfy local but also international customers.
- **Context for firm strategy and rivalry** refers to the specific local context of each jurisdiction that impacts firm behaviour, government regulation, and intensity of rivalry. Canadian

EXHIBIT 2 The Porter Diamond can help or hinder business development



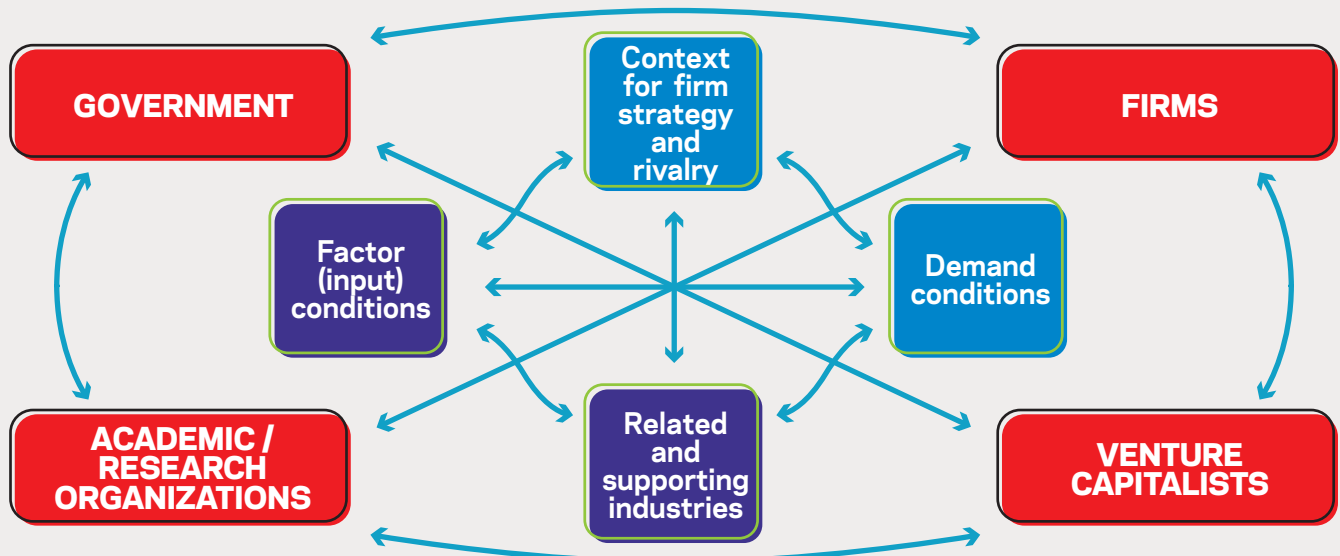
Note: Purple squares represent specialized support; Blue squares represent competitive pressure.
 Source: Porter, M. E. 2000. "Location, Competition, and Economic Development: Local Clusters In A Global Economy." *Economic Development Quarterly* 14 (1): 15-34.

business leaders are often said to be more risk averse than their US counterparts, which may be related to the extent of government regulation and physical displacement between firms.⁹ Under such conditions, firms may lack the impetus to compete, and this lowers productivity and innovation, reducing prosperity. For example, the high levels of regulation in the telecommunications industry may decrease the ability of firms to take on calculated risk, which may lower innovation and hamper the introduction of new products and services.

Porter argues that a nation can create new advanced factor endowments (skilled labour, strong capital in the form of technology and knowledge, government support, and culture) to become more competitive. This was based on the finding that a company’s efficiency is driven by the competitive forces it faces. These competitive forces are different depending on the region, thereby creating unique ecosystems for each cluster. Nonetheless, the types of actors remain the same and interact with the elements of the Porter Diamond. The co-location of the four actors and elements of the Porter Diamond make up a cluster ecosystem and create formal and informal interactions. These repeated interactions spur collaboration, innovation, and productivity (Exhibit 3).

The co-location of the four actors and elements of the Porter Diamond make up a cluster ecosystem and create formal and informal interactions.

EXHIBIT 3 A cluster ecosystem fosters interactions between elements and actors



Source: Institute for Competitiveness & Prosperity based on research of Professor Michael E. Porter.

The Porter Diamond creates specialized support and competitive pressures

The elements of the Porter Diamond form specialized support and competitive pressures that can propel firms to become more innovative and productive. However, too much support without the necessary competitive pressures creates inefficiencies. An excess of competitive pressures causes firms to exit a region or fail altogether. A lack of competitive pressure can generate health and safety risks due to unregulated or low-quality products.

The Porter Diamond buttresses traditional policies designed to boost regional competitiveness by emphasizing foundational elements that underpin a competitive business ecosystem. Factor conditions and related and supporting industries provide firms with the inputs, suppliers, and business environment that can drive growth. Competitive pressures spur innovation based on the local context as well as the level of sophisticated customer demand.

Clusters can drive economic growth

Clusters foster interactions that can energize the regional economy in three specific ways:

- **Labour market pooling** – Skilled labour is integral to any business, as they act as important factor input conditions in a cluster environment. The pooling of interrelated firms in the same geographical area attracts potential workers and new firms to relocate to the region. For example, marketing and design companies are more likely to set up shop in a city like Toronto where there are a multitude of graphic design graduates from institutions such as OCAD, Sheridan College, and Ryerson University. This creates a cycle of higher demand for skilled labour, which drives up wages, and in turn, attracts more skilled talent. The pooling of labour and businesses also drives innovation by creating a competitive environment where firms must differentiate themselves from one another.
- **Knowledge spillovers** – Increased face-to-face interaction between workers organically leads to information sharing. New employees bring institutional knowledge from the previous workplaces, which is facilitated by the competitive marketplace and labour pool. Technology spills over, as R&D knowledge is passed between firms, through employee conversations, labour movement, and proximal observations.
- **Supplier specialization** – Firms rely on suppliers to produce goods and services. In a healthy cluster, businesses within the supply chain specialize in inputs that feed into the end product or service. These companies create competitive pressures, and energize one another. But they also help one another through symbiotic relationships that result in greater innovation. In the Hospitality & Tourism cluster, hotels rely on their suppliers to create innovative and sustainable products to please guests. These features make the region more attractive to global leaders to relocate and develop local entrepreneurship.

A healthy economic ecosystem is self-reinforcing

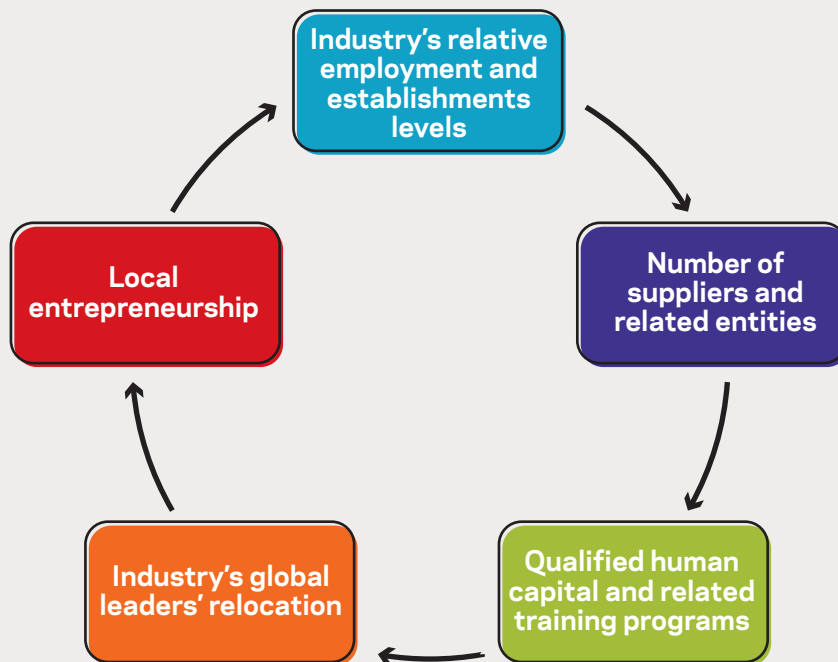
By creating an ecosystem that helps firms start and scale up, clusters spur a virtuous cycle of continued economic growth and prosperity (Exhibit 4). When a group of firms locate in the same region, other related entities and suppliers are more likely to locate there, creating a larger pool of specialized and capable workers. Their close proximity to one another lowers the cost of interaction and knowledge spillovers abound.¹⁰

As a result, the cluster environment stimulates local entrepreneurship and attracts global leaders to the region. When firms can access or are located in the same region as a strong cluster, there is a higher propensity for start-ups to form, grow, and survive.¹¹ This is due to the presence of specialized talent and expertise available for entrepreneurs, the support of government policies, funders who are able to provide the capital to help businesses scale up, and the competitive pressures

that demand innovation. It is not to say that businesses cannot succeed in the absence of a well-established cluster, but a healthy cluster environment enables firm entry and growth more readily.

The key features of clusters – labour market pooling, knowledge spillovers, and supplier specialization – all emphasize geographic proximity and clustering together. These firms will reap the benefits of lower costs, creating the virtuous cycle that generates positive economic gains through lower costs to production and increases in employment, entrepreneurship, and business investment.

EXHIBIT 4 A naturally-formed cluster attracts global leaders and fosters entrepreneurship



Source: Institute for Competitiveness & Prosperity analysis.

Clusters are on the federal and provincial governments' agendas

The success of clusters, like Silicon Valley and Boston's Route 128 Corridor, provide an alternative approach to drive economic development. Many governments, including those of Ontario and Canada, recognize their significant role in creating an ecosystem that can foster cluster growth. They have in turn begun shifting public policy toward seeding clusters and fostering entrepreneurship.

Ontario passed its first piece of comprehensive cluster legislation in 2014. The *Partnerships for Jobs and Growth Act* (hereafter, the *Act*) is designed to support emerging or established clusters in their development and planning activities.¹²

In January 2016, Ontario began to implement the *Act* by introducing its Cluster Development Seed Fund to fuel cluster growth. Administered by the Ontario Chamber of Commerce, the fund grants eligible businesses up to \$100,000 to support networking activities and research and feasibility studies.¹³ In turn, the provincial government benefits from increased information about clusters to inform policy decisions.

The federal government is also interested in building on clusters in its economic policy. Budget 2016 announced the creation of a Canadian Cluster Mapping Portal, which will be developed with provinces and territories, research institutions, and other stakeholders. This Portal will supply governments and businesses with cluster data to inform decision-making as well as guide the design and delivery of government programs and strategies.¹⁴ It will also allow cluster actors to compare Canada's cluster data and performance with that of the US.¹⁵

The Institute applauds this cluster-led or bottom-up approach to invigorating competitiveness as it allows businesses and cluster organizations to lead the charge on cluster policy and development. It is an

encouraging shift away from the traditional top-down approach to industry growth (i.e., subsidies to firms).

This Working Paper intends to identify and evaluate the performance of strong clusters in the province, as well as provide policy recommendations on how to best continue their development. In the following chapter, the Institute highlights five strong clusters that are well-known to most Ontarians to demonstrate how strong clusters are measured, where they are located, and the dynamics within each cluster. In chapter three, the Institute analyzes each element of the Porter Diamond to diagnose the state of the cluster ecosystem, drawing examples from the five strong clusters. Finally, the Institute proposes recommendations on how best to address the gaps found in each element of the Porter Diamond.

Capitalizing on Ontario's strong clusters can bolster the province's economy and help close the prosperity gap. By understanding the features and benefits of clusters, the provincial government can identify existing vibrant clusters and create an ecosystem to accelerate their development and growth.

ASSESSING STRONG CLUSTERS IN ONTARIO

Many of Ontario's recognizable industries are in strong clusters. However, not all clusters are positioned to grow or drive competitiveness and prosperity in the province. Making this distinction is integral to the marketing and development of public policy. The Institute evaluates five of Ontario's most renowned clusters as model examples of how clusters can grow.

Classifying clusters

Porter classifies clusters based on how geographically dispersed they are. He identifies two types:

- **Local clusters** produce goods and services for the local population and are therefore present in most geographic areas. There are 16 local clusters in any given jurisdiction according to Porter's definitions. Examples of establishments within local clusters include restaurants, grocery stores, and clothing retailers. In 2014, 61.5 percent of Ontarians worked in local clusters.
- **Traded clusters** produce goods (e.g., vehicles) and services (e.g., cellphone services) in a particular locale, and then distribute them across regional, national, and international boundaries. Hence these clusters do not need to be located in all geographic areas and can be concentrated in a handful of regions. There are a total of 51 traded clusters identified by Porter.¹⁶ (For a list of all traded cluster definitions, see the Appendix.)

Both local and traded clusters are important to the competitiveness of a region because they rely on each other to produce goods and services. Additionally, some traded clusters have local counterparts. The Local Financial Services cluster is made up of banks, credit unions, insurance companies, and other financial companies that serve the local population. On the other hand, companies in the traded Financial Services cluster provide national and international services such as securities trading.

While every economy needs both local and traded clusters, the prevalence of traded clusters tends to increase a region's overall wages.¹⁷ This is because traded clusters engage in import and export activities, opening up larger markets and global supply chains that enable greater productivity. Accessing international markets also allows companies to generate income that the domestic market does not provide. Canadian companies such as Linamar and Magna International must be more productive in order to compete domestically and internationally. The result of Ontario's parts manufacturers' productivity is shown in the \$18.2 billion worth of automotive parts exported to other countries.¹⁸

The Institute focuses its analysis on traded clusters since they are the main drivers of innovation activity, productivity growth, wealth creation, and export activity compared to local clusters.¹⁹

In 2013, 38.4 percent of Ontarians worked in a traded cluster. This is similar to the US peer state average at 37.9 percent (Exhibit 5). However, this was not always the case. In fact, in 2001 Ontario had a 3.9 percentage point lead over US peers. While its US peers' share remained relatively steady, Ontario's share of traded cluster employment continued to fall until 2009.

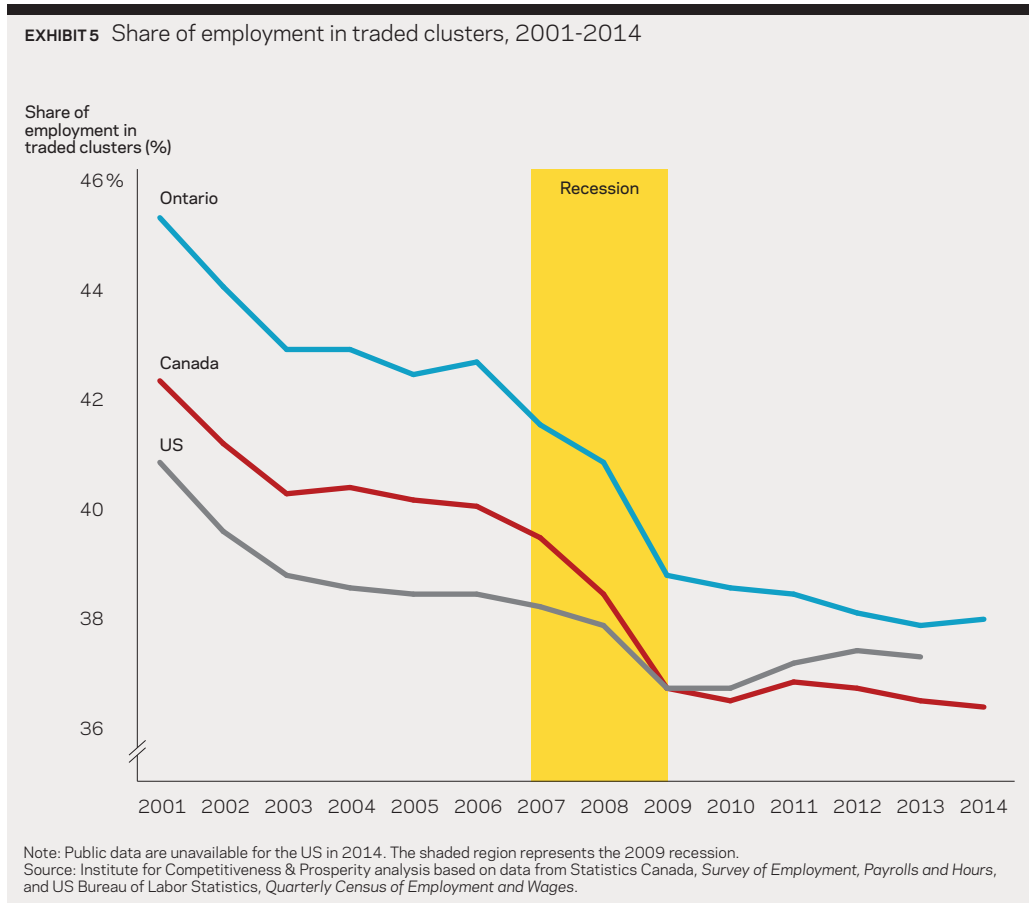
Identifying strong clusters

The 51 traded and 16 local clusters are made up of sub-clusters, which Porter defines using the North American Industrial Classification System (NAICS). These NAICS codes classify each business into a particular industry. Porter examined where industries were located, and used locational correlation statistical methods and input-output tables to identify which industries make up the various traded clusters.

Clusters are most often observed in smaller geographic regions. Therefore, the Institute uses a regional lens to analyze clusters and identifies these regions according to the Census Metropolitan Area (CMA) definition used by Statistics Canada. For US peers, the Metropolitan Statistical Areas (MSAs) definition is used.²⁰

A *location quotient* (LQ) measures the concentration of employment in a particular region compared to larger jurisdictions. This concentration is known as the *specialization* of a cluster. For this Working Paper, the percentage of a cluster's employment in the CMA is compared to its share of North American employment. A more concentrated cluster has a higher LQ.

$$LQ = \frac{\text{Cluster's share of regional (CMA/MSA) employment}}{\text{Cluster's share of North American employment}}$$



Strong clusters within Ontario

While all clusters can generate positive economic benefits for a region, some are able to offer greater levels of employment and business establishments than others, and, as a result, more innovation outputs and higher wages. Measuring the strength of clusters therefore helps identify which clusters have more potential to drive productivity (from increased innovation) and prosperity (from higher wages).²¹

The Institute defines a *strong cluster* as having a relative advantage compared to the rest of North America and has three characteristics:

- *LQ greater than 1* - This indicates that there is a high concentration of workers in the CMA relative to the North American average.
- *LQ in the 75th percentile or higher compared to all other CMAs and MSAs with the cluster present* - This indicates that the concentration of workers is highest amongst other CMAs and MSAs.
- *Number of establishments are in the 25th percentile or above compared to all other*

CMAs and MSAs with this cluster present - This prevents the presence of a few large firms being misinterpreted as a cluster.²²

While there are many strong clusters in Ontario, the Institute focuses its analysis on five that are recognizable to most Ontarians, meet the strong cluster criteria, and are also major contributors to the province's labour force and economy by demonstrating (Exhibit 6):

- High levels of employment relative to other strong clusters
- High annual wages relative to other strong clusters
- A composition of mainly private companies

The Institute examines each of the five strong traded clusters, the contributors to their growth, and compares them to the largest strong clusters in the US.

EXHIBIT 6 Evaluation of strong clusters against criteria, 2013

Cluster	Ontario CMA	Strong cluster criteria		
		LQ>1	LQ percentile >75%	Establishment percentile >25%
Automotive	Windsor	12.5	97	91
	Guelph	9.1	95	87
	Kitchener-Cambridge-Waterloo	5.2	90	88
Communications equipment & services	Kitchener-Cambridge-Waterloo	2.1	91	48
	Toronto	1.3	79	96
Financial services	Toronto	3.4	98	98
	Ottawa	1.3	87	82
Hospitality & tourism	St. Catharines-Niagara	2.5	92	59
Marketing, design & publishing	Toronto	2.1	95	98

Note: Requirements for strong clusters is based on methodology developed by Mercedes Delgado, Michael Porter, and Scott Stern.
Source: Institute for Competitiveness & Prosperity analysis based on data from *Canadian Business Patterns* and *Survey of Employment, Payrolls and Hours (SEPH)*, Statistics Canada.



AUTOMOTIVE CLUSTER

ONTARIO PARTICIPATES IN:
Automotive Parts
Gasoline Engines & Engine Parts
Metal Mills and Foundries
Motor Vehicles

SUBCLUSTERS ONTARIO DOES NOT PARTICIPATE IN:
Military Vehicles and Tanks; Small Vehicles



Ontario CMA	Employment	Establishments	LQ
Windsor	11,500	50	12.5
Kitchener-Cambridge-Waterloo	8,400	35	5.2
Guelph	4,500	34	9.1
US MSA	Employment	Establishments	LQ
Detroit, MI	88,100	512	8.9
Nashville, TN	14,600	76	3.3
Grand Rapids, MI	13,800	90	5.1



The Automotive cluster in Ontario is composed of four sub-clusters: Automotive Parts, Gasoline Engines & Engine Parts, Motor Vehicles, and Metal Mills & Foundries.²³ Ontario's Automotive cluster is most densely represented in the Windsor, Guelph, and Kitchener-Cambridge-Waterloo CMAs. Combined, these three clusters employ almost 25,000 people. Both Windsor (12.5) and Guelph (9.1) have higher location quotients than their strongest US competitor, Detroit (8.9).²⁴ This greater level of specialization has driven Ontario's success in the Automotive industry.

Both the Guelph and Kitchener-Cambridge-Waterloo CMAs benefit from housing manufacturing plants of global automotive companies. Guelph is home to Linamar, which is a global leader in vehicle parts manufacturing and Toyota Motor Manufacturing Canada Inc. is headquartered in Cambridge. These anchor firms employ the majority of people working directly in the cluster and also draw supporting companies into the area.

One reason for Windsor's high level of specialization is its proximity to the US border. Bordering Detroit, the US' largest strong Automotive MSA, produces mutual benefits. Windsor can easily source inputs to production and benefits from knowledge spillovers. In addition, the close proximity to the US allows for the cost-effective exporting of assembled parts and vehicles.



COMMUNICATIONS EQUIPMENT & SERVICES CLUSTER

ONTARIO PARTICIPATES IN:
 Communications Equipment
 Communications Services

SUBCLUSTERS ONTARIO DOES NOT PARTICIPATE IN:
 Communications Equipment Components



Ontario CMA	Employment	Establishments	LQ
Toronto	12,600	216	1.3
Kitchener-Cambridge-Waterloo	1,800	11	2.1
US MSA	Employment	Establishments	LQ
Los Angeles, CA	48,500	903	3.0
New York, NY	43,700	1,181	1.8
Atlanta, GA	38,600	423	5.8



The Communications Equipment & Services cluster in Ontario is composed of the Communications Services and Communications Equipment sub-clusters. This cluster is focused around all forms of communications made possible through radio, cable, wireless, and satellite technologies. Unsurprisingly, Kitchener-Cambridge-Waterloo and Toronto have the greatest levels of specialization as they have large pools of highly skilled labour, which is one of the drivers of success in this knowledge-intensive cluster. These two areas are home to strong universities that drive highly skilled labour and innovation. Kitchener-Cambridge-Waterloo is home to the University of Waterloo, and Toronto to the University of Toronto, York University, and Ryerson University. Not only are graduates from these universities trained to successfully enter the local market, but the ongoing interaction between firms and academia leads to higher levels of innovative activity.

Of Ontario’s two strongest Communications Equipment and Services clusters, Toronto employs the largest number of people. Over 12,600 people are employed in Toronto compared to 1,800 in Kitchener-Cambridge-Waterloo. Despite Toronto’s large employment base, however, it has a lower level of specialization because its employment is not as densely concentrated in that cluster.

Looking at MSAs in the US, Los Angeles (3.0) and New York (1.8) are as specialized as Kitchener-Cambridge-Waterloo (2.1).



FINANCIAL SERVICES CLUSTER

ONTARIO PARTICIPATES IN:

- Credit Bureaus
- Credit Intermediation
- Financial Investment Activities
- Monetary Authorities – Central Bank
- Securities Brokers, Dealers, and Exchanges



Ontario CMA	Employment	Establishments	LQ
Toronto	145,300	4,008	3.4
Ottawa	13,000	407	1.3
US MSA	Employment	Establishments	LQ
New York, NY	283,100	14,964	2.6
Los Angeles, CA	92,500	8,991	1.3
Chicago, IL	86,600	7,004	1.5



The Financial Services cluster includes Financial Investment Activities, Credit Intermediation, Credit Bureaus, Monetary Authorities – Central Bank, and Securities Brokers, Dealers & Exchanges sub-clusters.

The Financial Services cluster is only strong in two Ontario CMA regions: Toronto and Ottawa. Compared to the Financial Services clusters in the US, Toronto and Ottawa have similar location quotients, representing a similar level of specialization. Toronto and Ottawa have LQs of 3.4 and 1.3, respectively, while New York, Los Angeles, and Chicago have LQs of 2.6, 1.3, and 1.5, respectively.

Toronto is home to over 4,000 companies in the Financial Services cluster, which employ more than 145,300 workers. At the centre of the cluster is the Toronto Stock Exchange (TSX), which facilitates much of the cluster’s activity. Within the last five years, \$267 billion has been raised through equity financing to bring the total market cap of the TSX to \$2.3 trillion.²⁵ This enormous amount of capital has drawn companies of all types together to provide the services required by a financial hub.

Toronto is also home to the headquarters of all five big Canadian banks. Each has branches across Canada and operate internationally, but they have all chosen to locate their headquarters near the largest and most developed financial talent pool. They act as strong anchors for smaller and more specialized financial firms, which provide services that complement the offerings of the major players.

Ottawa’s Financial Services cluster is composed of 400 establishments and employs 13,000 people. This CMA is also home to the Bank of Canada, Canada Deposit Insurance Corporation, Office of the Superintendent of Financial Institutions, the Canadian Mortgage and Housing Corporation, and Export Development Canada, bringing other financial firms to the region. The close proximity between these institutions lends itself to skills and knowledge transfers through labour market movement. In addition, the proximity to policymakers enables firms to efficiently navigate complex regulatory frameworks or successfully lobby government in their favour.



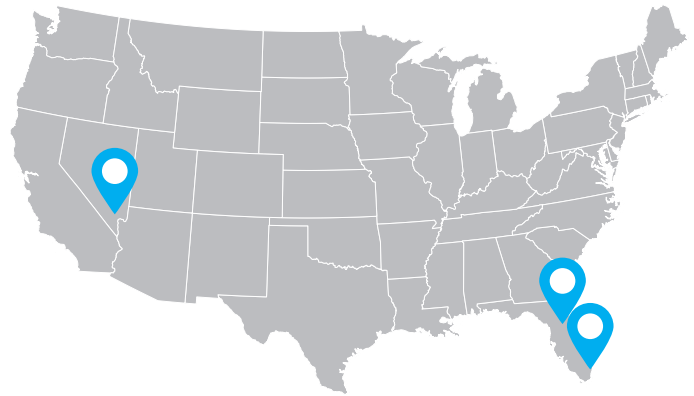
HOSPITALITY & TOURISM CLUSTER

ONTARIO PARTICIPATES IN:

- Accommodations and Related Services
- Amusement Parks and Arcades
- Cultural and Educational Entertainment
- Gambling Facilities
- Other Tourism Attractions
- Spectator Sports
- Tourism Related Services



Ontario CMA	Employment	Establishments	LQ
St. Catharines - Niagara	10,800	135	2.5
US MSA	Employment	Establishments	LQ
Las Vegas, NV	183,300	951	10.9
Orlando, FL	109,100	1,222	5.4
Miami, FL	95,600	3,303	2.2



Ontario's Hospitality & Tourism cluster encompasses the accommodation, entertainment, sporting events, and tourism services and attractions sub-clusters. These sub-clusters all depend on the region's ability to draw in visitors. For this reason, the Hospitality & Tourism cluster is most tightly linked to the Marketing, Design & Publishing cluster.

The St. Catharines-Niagara CMA is one of the top destinations for tourism in Ontario. The region is famous for its vineyards, seasonal festivals, pristine lakefront, and Niagara Falls. It is also brimming with tourist accommodations (such as bed and breakfasts, and hotels) and boasts a wide range of entertainment and tourist attractions. Overall, the region has successfully brought together players within the cluster to create a unified brand. Importantly, this brand has a strong draw despite no single company being responsible for attracting tourism.

Many large cities do not boast strong Hospitality & Tourism clusters because their employment tend to be less dominant relative to other clusters. This is why MSAs such as Las Vegas, Orlando, and Miami are strong in this cluster. The Las Vegas economy relies on its hotel and gambling specialty, while Orlando and Miami both generate a proportionately large share of economic activity from tourism.



MARKETING, DESIGN & PUBLISHING CLUSTER

ONTARIO PARTICIPATES IN:
Advertising Related Services
Design Services
Other Marketing Related Services
Publishing

Ontario CMA	Employment	Establishments	LQ
Toronto	58,000	3,666	2.1
US MSA	Employment	Establishments	LQ
New York, NY	201,300	14,993	2.9
Los Angeles, CA	80,200	9,046	1.7
Chicago, IL	73,400	6,029	2.0



The Marketing, Design & Publishing cluster is composed of Advertising Related Services, Design Services, Other Marketing Related Services, and Publishing sub-clusters. Firms within Toronto are evenly spread between these four sub-clusters. Toronto has an LQ of 2.1 in this cluster because of the demand created by a wide variety of industries. The number of firms requiring advertising and design services is most concentrated in Canada's largest business hubs, as is the case in the US. Firms exert demand pressures on local marketing companies, driving creative solutions and innovation. Toronto is also home to many graphic design students from OCAD and Ryerson University. Additionally, with many marketing activities now conducted digitally, companies from areas such as New York, Chicago, and Los Angeles further pressure the Marketing, Design & Publishing clusters in Ontario to increase productivity and efficiency in order to remain competitive.



The Institute has long advocated for Ontario to improve the productivity of its clusters. While Ontario maintains a higher share of traded clusters compared to its US peers, the province needs to capitalize on its existing strengths and invest in its cluster ecosystem. This can drive innovation and productivity growth within strong clusters to be more competitive, raise productivity, and enhance prosperity overall.

EXAMINING ONTARIO'S CLUSTER ECOSYSTEM

Cluster growth is one way to address Ontario's prosperity gap. To do this, companies within Ontario's five strong traded clusters must leverage their access to foundational elements such as infrastructure and trade, many of which are under the jurisdiction of the provincial government. These elements contribute to fostering a healthy cluster ecosystem, which should be firm led and government supported.

Traditional industrial policies of subsidizing businesses or replicating clusters are not effective ways of increasing competitiveness. Clusters can generate positive economic benefits, but they grow best when there is strong grassroots, or bottom-up activity, in which the firm leads and government supports by creating a healthy cluster ecosystem. Government can most effectively foster cluster growth by focusing on the foundational elements that are found within the Porter Diamond, such as physical infrastructure or training productive workers. Doing so enables increased interaction between cluster actors and the elements of the Porter Diamond. There are many foundational elements that contribute to the growth and productivity of clusters, such as tax policy and market regulation. Instead, the Institute evaluates the elements found in the Porter Diamond and cluster actor interactions to identify some potential opportunities for growth.

Evaluating Ontario's cluster ecosystem reveals potential investment areas

A healthy cluster ecosystem provides the specialized support and competitive pressures integral to firm development and enables interactions between the elements of the Porter Diamond and cluster actors. Factor inputs and supporting industries provide specialized support, while firm rivalry and consumer demand place competitive pressures on firms. In the absence of support, a high level of regional pressure can cause an industry to collapse. Yet high levels of support only carry firms so far. To balance these realities, government and businesses need to work together. Canada's strict regulatory regime is lauded as a primary reason why the country was able to weather the 2009 recession, but it can also restrict corporate investment and innovation. Balance between support and pressure is required in a cluster ecosystem to ensure growth and success.

Factor (input) conditions

Factor input conditions are made up of the labour and capital that contribute to a firm's output. Each organization combines a unique ratio of human and physical capital in order to generate their salable good or service. As the cluster develops and individuals acquire experience, their knowledge is continually passed around firms through labour movements and proximal observations. The Institute examines the factor conditions of infrastructure, human capital, access to capital, and innovation investment.

Infrastructure: A long overdue challenge for Ontario's cluster growth. Infrastructure serves the broad business environment in which clusters operate.²⁶ Transportation networks help move goods and people, and are especially important to the Automotive cluster, where parts from surrounding regions are shipped by rail freight, road, and waterways to a single assembly plant. Health care and educational institutions ensure that the labour force operates efficiently and effectively.

Ontario's overall infrastructure stock as a percentage of GDP fell in the 1980s and 1990s, levelled off in the early 2000s, and only recently started to show signs of growth (Exhibit 7).²⁷ Yet Ontario has the lowest infrastructure stock per worker (\$34,300) among select Canadian provinces (\$74,500 average).²⁸

Overcoming this infrastructure deficit will increase the productivity of the strong clusters in Ontario. Yet not all infrastructure investment yields equal benefits. The Institute considers productivity-reducing infrastructure to be buildings and institutions that, once built, offer employment opportunities that are low-paying. The province recently invested in administrative buildings such as post offices, and courthouses, which are productivity-reducing, even though they may provide other benefits.²⁹ Investments should instead be made in high-return assets such as marine and health care infrastructure.³⁰ The Institute hopes that Ontario's ten-year, \$137 billion infrastructure investment in areas such as health care and educational institutions, which are also input conditions to clusters, will help close the gap.³¹

Human capital: Manager education gap slowly closing.

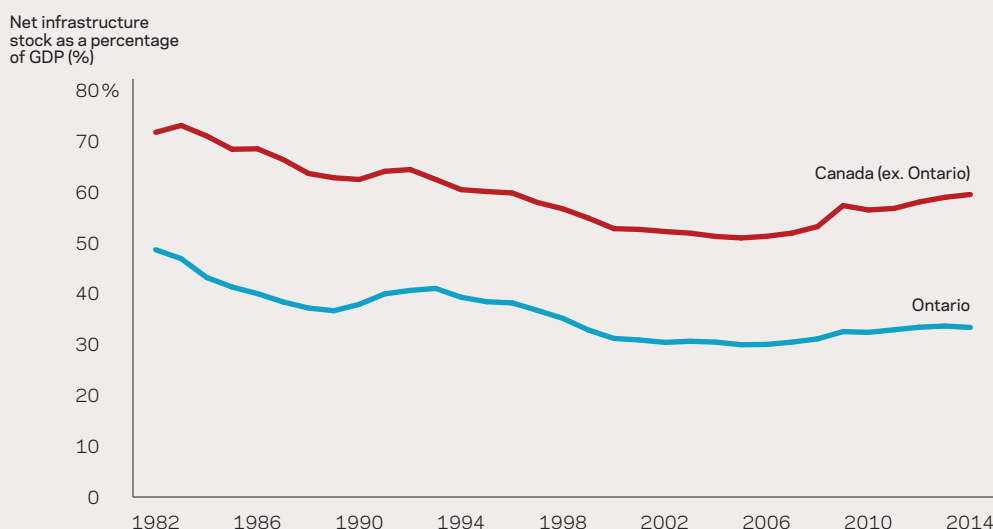
Postsecondary education fosters innovation, which is necessary for firms in a cluster to compete. This is particularly important in managers, since they are often tasked with implementing innovation. Moreover, the gap between Ontario and its US peers' manager education levels is slowly closing. This may translate into more managers deploying sophisticated techniques to drive innovation, increasing productivity in the clusters they lead. Ontarians in managerial occupations are well-educated, with 29.3 percent of them holding a bachelor's degree and 21.3 percent having an advanced degree in 2015 (Exhibit 8). But they must apply this knowledge in their business practices, which Canadian managers are less likely to do despite having the same access as their US counterparts to academic publications.

Access to capital: Improving significantly with government support.

Venture capital plays a crucial role in helping clusters scale up by providing the necessary funding for increased R&D. Firms use the R&D outputs to provide the goods and services to meet the demands of sophisticated consumers. Within a cluster environment, being in the same region makes it easier for firms to access a large pool of venture capitalists looking to invest in companies from the same cluster. Silicon Valley is a well-known technology cluster but it is also recognized as the place to go for VC funding.

Ontario's VC investment as a percentage of GDP between 1995 and 2014 has remained in line with the US peer median

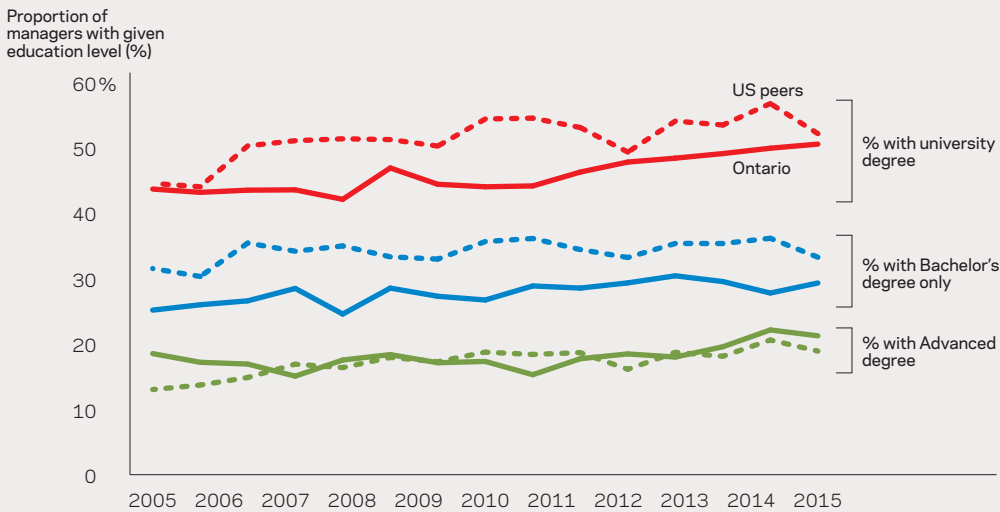
EXHIBIT 7 Infrastructure stock as a percentage of GDP, 1982-2014



Note: Stocks are per effective worker, in 2007 chained Canadian dollars, and net of geometric depreciation. Source: Institute for Competitiveness & Prosperity analysis based on data from Statistics Canada.

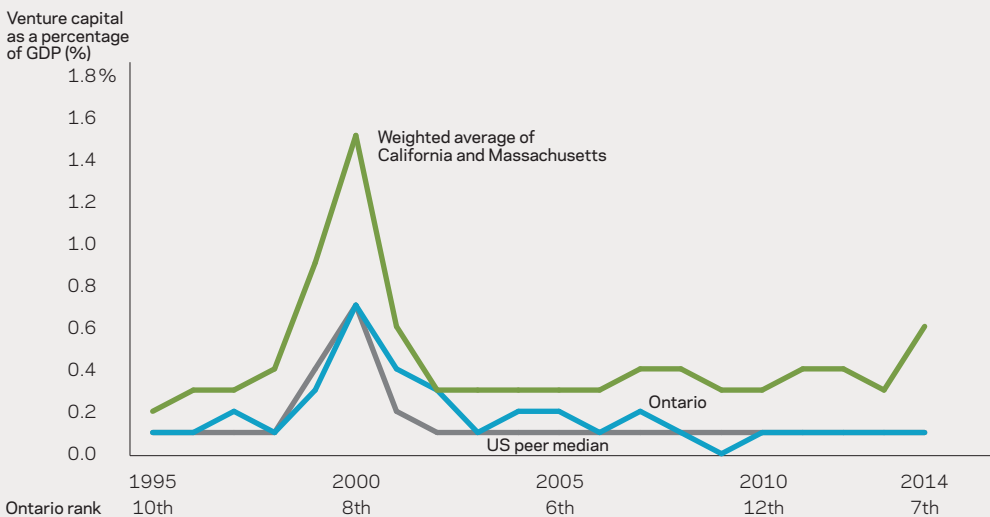
(Exhibit 9). In 2014, Ontario's VC investment was at 0.1 percent of GDP – the same as in 1995. Following the 2000 dot-com bust, Ontario's VC investment was higher than the US peer median until 2006. Ontario's VC position is enviable as the strong performance of the US peers is driven primarily by California and Massachusetts, which has experienced investment positions well above the US peer median between 1995 and 2014.

EXHIBIT 8 Managers with university degrees, 2005-2015



Note: Manager education is observed for individuals 25 years and older.
 Source: Institute for Competitiveness & Prosperity analysis based on data from Statistics Canada, Labour Force Survey and US Bureau of Labor Statistics, Current Population Survey.

EXHIBIT 9 Venture capital investment as a percentage of GDP, 1995-2014



Note: Weighted average of California and Massachusetts based on 2011 US Census population estimates.
 Source: Institute for Competitiveness & Prosperity analysis based on data from the National Venture Capital Association; Canada's Venture Capital & Private Equity Association; Macdonald & Associates; PriceWaterhouseCooper's MoneyTree Survey Report; and Thomson Reuters.

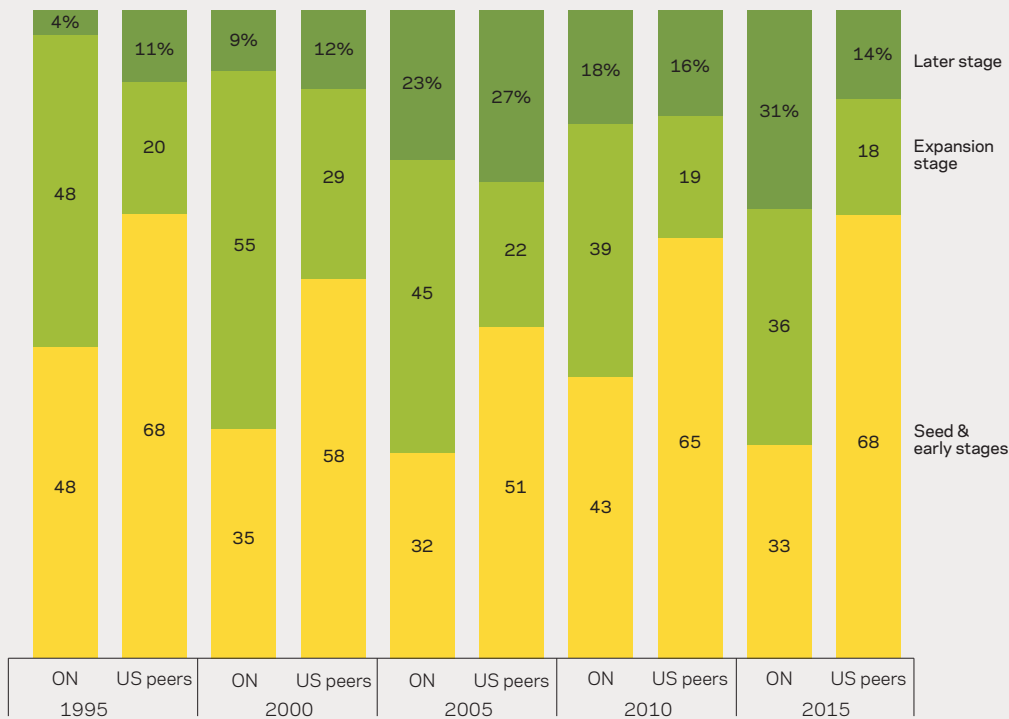
Despite the recovery in VC, analyzing the stage at which VC is invested reveals more important trends. Venture capital investment can be split into four stages:

- **Seed stage** – Company has existed for less than 18 months; product or concept development stage.
- **Early stage** – Company is one to three years in age; product or service may still be piloted or already on the market with possible revenue generation.
- **Expansion stage** – Company is more than three years old; product or service is being produced and sold, generating significant revenue growth with possible profit.
- **Later stage** – Product or service is widely available and generating stable revenue with possible profit; there may be spin-off firms.³²

Compared to its US peers, Ontario's VC investment by stage has significantly changed. Later-stage funding was 4 percent of total VC investment in 1995, increasing to 31 percent in 2015 (Exhibit 10). The greater share of later-stage VC investment may be indicative of Ontario – and Canada – favouring a more conservative approach, preferring to invest in more mature and stable companies.

It should also be noted that with the boom and subsequent bust of the tech bubble in 2000, Canada's VC environment has experienced an influx of US investment. In 2014, the US contributed approximately 30 percent of total Canadian VC investment.³³ The majority of the VC investment lands in Ontario, giving the province more access to capital, which is particularly helpful for making later-stage deals that often require significantly more capital for larger companies to scale up their operations.

EXHIBIT 10 Share of venture capital investment by stage of development, 1995-2015



Source: Institute for Competitiveness & Prosperity Analysis based on data from Thomson Reuters and PricewaterhouseCoopers/National Venture Capital Association MoneyTree Report.

Even though the latest VC data reveal a rise in expansion and later-stage funding, many business leaders argue there is a shortage. When firms – especially tech companies within the Communications Equipment & Services cluster – reach a particular threshold, they face a ‘capital cliff’ in which the pool of domestic investors willing to invest more than \$10 million becomes very small. This is the amount typically required to jumpstart major growth. Under this scenario, investors often turn to the US.³⁴ In Ontario, between 1995 and 2015, the average later-stage financing deal size was \$5.1 million. It was only in 2007 and 2013 that the average size of later-stage financing deals were near \$10 million. After 1998, the average size of US peer later-stage financing deals remained above \$10 million, with the largest deals being reached during the dot-com bubble in 2000 at \$22.8 million. As a result, between 1995 and 2015, the average deal size amongst US peers was \$11.4 million, dwarfing Ontario’s average.

The shortage of later-stage financing also leads to a reduction in seed financing because venture capitalists only profit when they exit their positions. If the exiting channels are limited, the risk to fund companies becomes unnecessarily large. Consequently, venture capitalists choose to invest in low-risk start-ups, or firms with proven cash flows and those companies that replicate successful business models. This vicious cycle discourages the development of so-called ‘unicorn’ companies that could be the next Facebook or Google in Canada.³⁵

While VC investment in Ontario is comparable to the US peer median, the fundraising phase, which occurs before the VC is disseminated, raises some concern. Of the \$1.2 billion of VC raised in Canada in 2014, \$832 million (or two-thirds) were sourced or supported by government agencies. Government involvement in venture capital activities is shown to increase the likelihood of a firm reaching the size where investors can be rewarded through third party acquisition or an initial public offerings.³⁶

Government should still be cognizant that there are diminishing returns to their involvement and significant levels of government VC can actually damage a firm’s prospects.³⁷ When over two-thirds of VC is sourced from government agencies, this may crowd out private VC firms, affecting overall levels of VC investment. The potential over-involvement of the Ontario government in the VC space, combined with the shortage of expansion and later-stage financing, may be hampering the growth of clusters in the province.

Innovation investment: Ontario’s business R&D lags behind its US peers. A cluster’s strength is augmented by innovation. When innovation occurs, new ideas and technologies spread rapidly among firms in clusters and lead to an overall improvement in the region’s productivity. Innovative activities can lead to specialized processes or products being created that benefit the entire cluster. Although there are many types of innovation, the Institute uses Research & Development (R&D) expenditures as a way to quantify innovation activity.

Innovation is primarily conducted by three of the four cluster actors: higher educational institutions (HERD), government (GOVERD), and businesses (BERD). HERD may fund basic research that businesses can use to make certain communications equipment smaller and more effective. Businesses can also leverage government spending on improving communications infrastructure to deliver goods and services in ways that meet the demands of sophisticated customers.

R&D output by one actor, such as higher educational institutions, may become the input to other pieces of research. For example, within the Communications Equipment & Services cluster, a university lab’s results on new or improved materials may be used by a corporation to research ways of making their mobile phones less susceptible to physical damage.

Ontario ranks above average among US peers in total R&D expenditure as a percent of GDP

(also known as Gross Domestic Expenditures on R&D or GERD), which includes HERD, BERD, and GOVERD. The major driver of Ontario's overall positive R&D investment performance is HERD, in which Ontario consistently ranks above its US peers, and GOVERD, where Ontario's ranking fell from second to fifth place between 2002 and 2012 (Exhibit 11).

Prior to 2004, Ontario and the US peers had the same BERD as a percentage of GDP. However, since then, this ratio has steadily fallen. BERD is an important indicator of a firm's commitment to innovation. A multi-country study by the OECD found that a 0.1 percentage point increase in the BERD-to-GDP ratio increases GDP per capita by 1.2 percent, with all other factors being equal.³⁸ The lower level of BERD weakens cluster development as it slows technological and knowledge advancement, which negatively impacts the region and individual firms.

Related and supporting industries

Clusters rely on other industries. Firms in the Education & Knowledge Creation cluster train and upgrade workers, while the Marketing, Design & Publishing cluster publicizes the products offered by financial firms. These related and supporting industries are part of the specialized support that helps clusters grow.

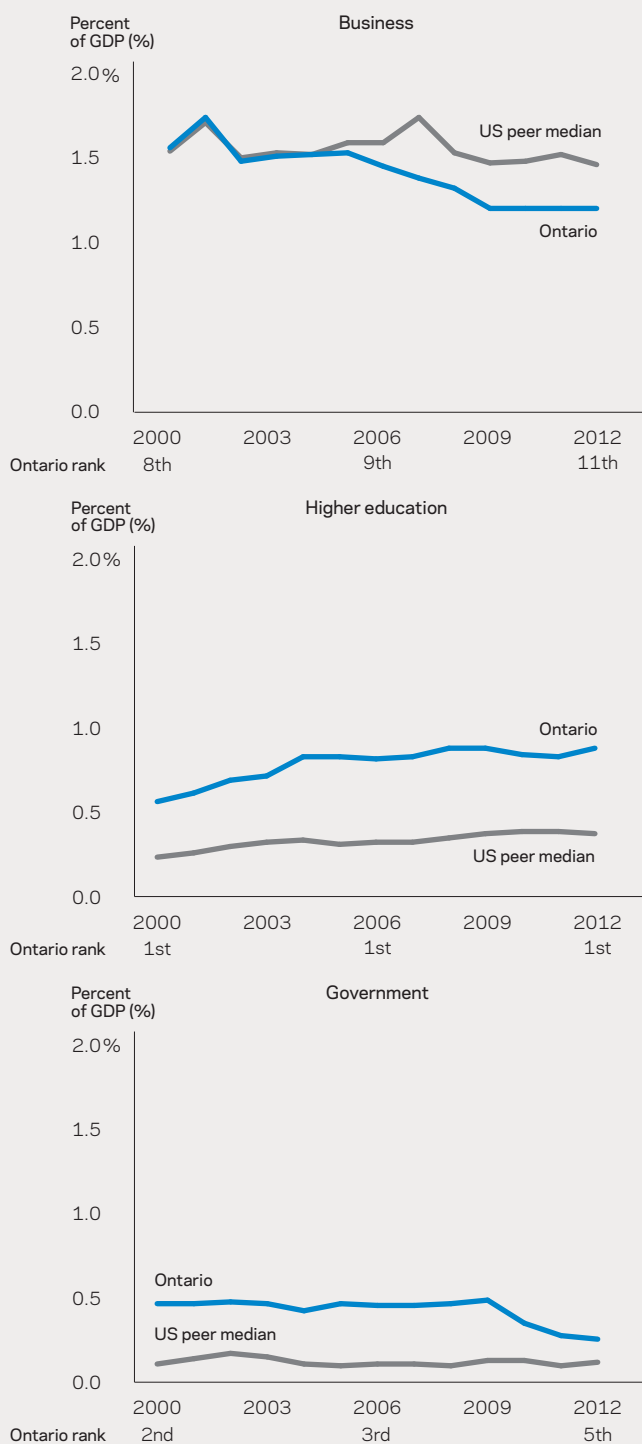
A related clusters methodology has been developed and applied to the US to quantify how closely related industries and clusters are to each other.³⁹ This not only helps to show the clusters' reliance on each other, but also how the financial performance of one affects another. As this methodology has yet to be quantitatively applied to the Canadian context, the Institute qualitatively analyzes how well clusters interact with one another in the form of cluster initiatives.

Cluster initiatives: Collaboration among clusters and regions is developing. Formal and informal interactions between businesses, research and educational organizations, venture capitalists, and government within clusters can foster innovation which, in turn, drives productivity and competitiveness.⁴⁰

Yet enabling these interactions and fostering the free flow of ideas, knowledge, and expertise cannot be done haphazardly, especially as clusters grow. That is, while informal interactions are welcomed and can be beneficial, clusters also benefit from strategic interactions that meet specific objectives. Cluster organizations are created for this reason, and provide the space for interactions to flourish. Their cluster initiatives are vital to creating specialized support.

Ontario has set up a variety of associations to facilitate collaboration within each cluster. Toronto Financial Services Alliance (TFSA), established in 2001, links all three levels of

EXHIBIT 11 R&D expenditures by business, higher education, and government as a percentage of GDP, 2000-2012



Note: Ontario's rank is for 2000, 2006, and 2012. Source: Institute for Competitiveness & Prosperity analysis based on data from Statistics Canada and National Science Foundation.

government, the financial services sector, and academic institutions. Similarly, the Information Technology Association of Canada connects and advocates for its members through events, committees, and forums, with the goal of helping the country become a leader in the sector.⁴¹

Demand conditions

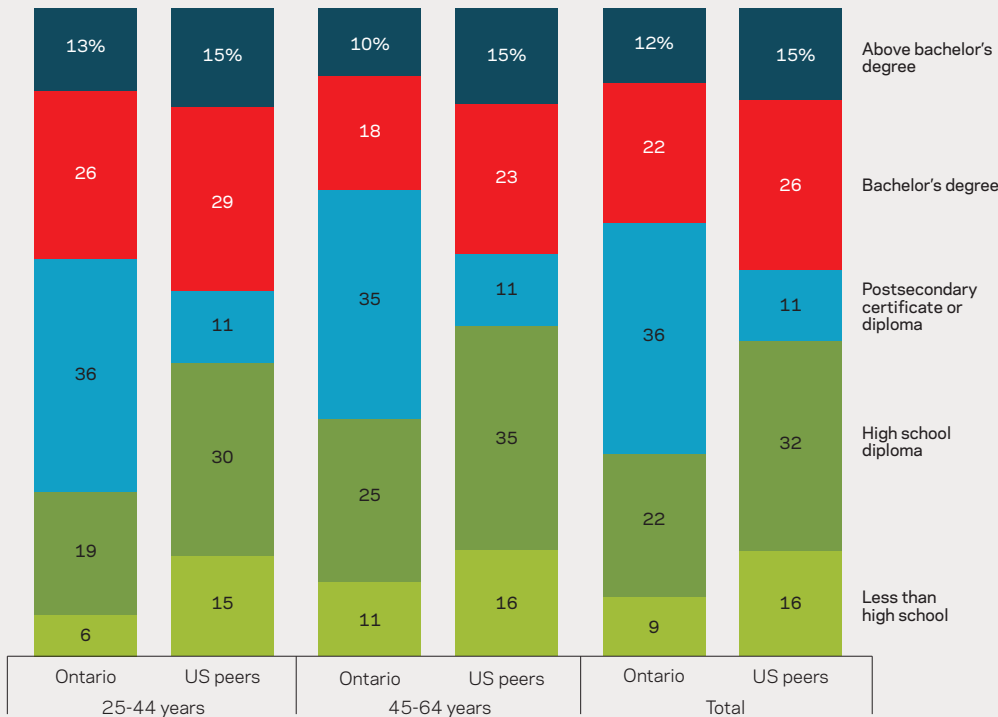
Demand conditions are the competitive pressures that can either encourage cluster innovation, collaboration, and growth, or cause firms that cannot survive under stiff competition to exit. This competitive environment is driven by sophisticated consumers who demand high quality, innovative products.

Ontario’s highly educated workforce drives sophisticated demand conditions. There are currently no surveys or quantitative data on the sophistication level of customers in

Canada. As a proxy for customer sophistication, the Institute uses the educational attainment of Ontarians. This assumes that highly educated people are likely to have more disposable income, and a desire for more effective and innovative products to meet their daily needs and lifestyles.

Ontario’s educational system is arguably one of the strongest in the world. In fact, the province is able to generate proportionally more bachelor and college degree holders than its US peers (Exhibit 12). While Ontario has a greater share of individuals with post-secondary certificates or diplomas, a gap still remains between the province and its US peers when it comes to individuals holding strictly post-secondary degrees. When the level of sophistication is lower, firms have less incentive to create high quality, innovative products to meet the needs of local customers.

EXHIBIT 12 Educational attainment by age group, 2014



Source: Institute for Competitiveness & Prosperity analysis based on data from Statistics Canada, Labour Force Survey, and US Census Bureau, American Community Survey.

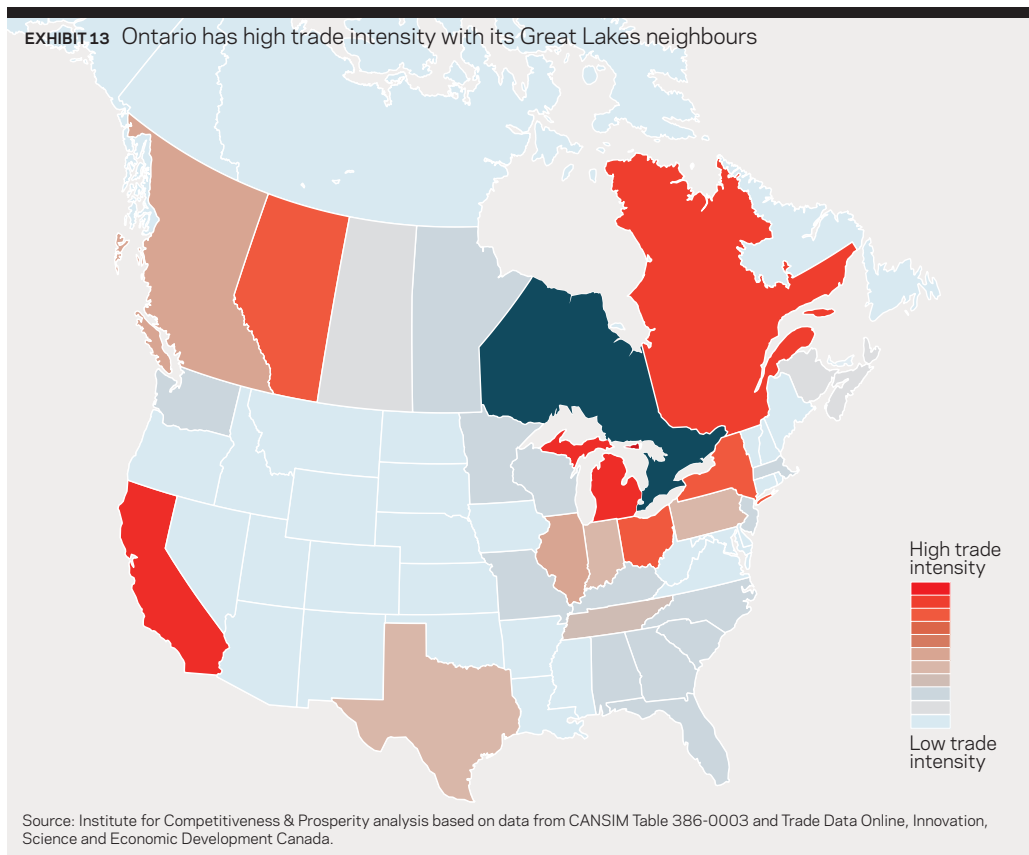
This lag in local demand not only limits the productivity drive of clusters, it also leaves clusters ill-prepared to compete effectively in a global marketplace.

Trade: Ontario needs to diversify into more international markets. Trade is undoubtedly part of the operations of firms in traded clusters. Opening up trade across jurisdictional boundaries, even between CMAs, enables greater access to new markets to increase revenue and help clusters grow.

International trade, in particular, brings opportunities and new competitive threats. Most recently, Canada has continued to pursue the Trans-Pacific Partnership (TPP), a trade deal that opens up nine other markets besides the US and Mexico: Chile, Peru, Australia, New Zealand, Japan, Singapore, Malaysia, Vietnam, and Brunei Darussalam. The TPP potentially connects Canada to a market of almost 800 million people, with an aggregate GDP of \$28.1 trillion dollars or approximately 40 percent of the global economy.⁴² Global markets open the doors to more sophisticated customers, and free trade can further reduce barriers to trade, and harmonize rules for investment, intellectual property, and labour.

As trade liberalizes, industries in which Ontario has a competitive advantage will further benefit due to continued specialization and foreign demand. However, businesses lacking sufficient specialization will face increased foreign competitive pressures. The province must work alongside the federal government to address and mitigate these concerns.

Currently, 80.1 percent of Ontario's exports are destined for the US, while only 5.9 percent are sent to emerging markets – the lowest of any province.⁴³ California and Texas are two of Ontario's biggest trading partners for manufactured products. The Automotive cluster in Ontario benefits from trade relations with California as 39.1 percent of the total export value of motor vehicles assembled in the province are exported to the state.⁴⁴ Texas, on the other hand, imports a mix of Ontario's manufactured goods, including vehicles. Close trade ties with these two states may also spur cluster collaboration between California's Silicon Valley and the Toronto-Kitchener-Cambridge-Waterloo tech corridor, or between Texas' Oil and Gas Production and Transportation cluster and regions in Ontario with a plethora of natural gas reserves (Exhibit 13).



Ontario is part of the Great Lakes region, which includes jurisdictions on both sides of the Canada-US border that share close economic ties. Of Ontario's top 10 US import and export destinations, eight overlap. Six of these top trading partners are in the Great Lakes region (Exhibit 14).⁴⁵

These trade ties have intertwined Ontario's economy with those of its Great Lake peers. The province shares many of its strong clusters with its neighbours along the Great Lakes. This demonstrates the significant advantages of proximal location. Neighbouring regions can more easily share consumer markets, inputs to production, knowledge spillovers, and conduct communal marketing exercises.

The Great Lakes region has seen cluster development that extends across national boundaries. The connection among these jurisdictions may have started with inexpensive waterway transportation but it has flourished into interdependent cluster groupings. In addition, these interconnected markets boost demand for products and services, and allow supply chains to simultaneously supply multiple regions. Businesses rely on global value and supply chains to grow, attracting suppliers and customers in the same region.

Context for firm strategy and rivalry

Firm strategy and rivalry is the level of competition faced by a firm in a cluster from other enterprises in the region. The presence of competition drives a culture of innovation in order to outperform others. This translates into highly productive and efficient firms that employ unique production and operational processes. In turn, the openness of markets can either promote or impede firm innovation.

EXHIBIT 14 Ontario's biggest trading states, 2015

Rank	Top 10 US states by total Ontario export value, 2015	Top 10 US states by total Ontario import value, 2015
1	Michigan	Michigan
2	California	Ohio
3	New York	New York
4	Ohio	Illinois
5	Texas	Indiana
6	Illinois	Pennsylvania
7	Indiana	Texas
8	Pennsylvania	Tennessee
9	New Jersey	California
10	Massachusetts	Kentucky

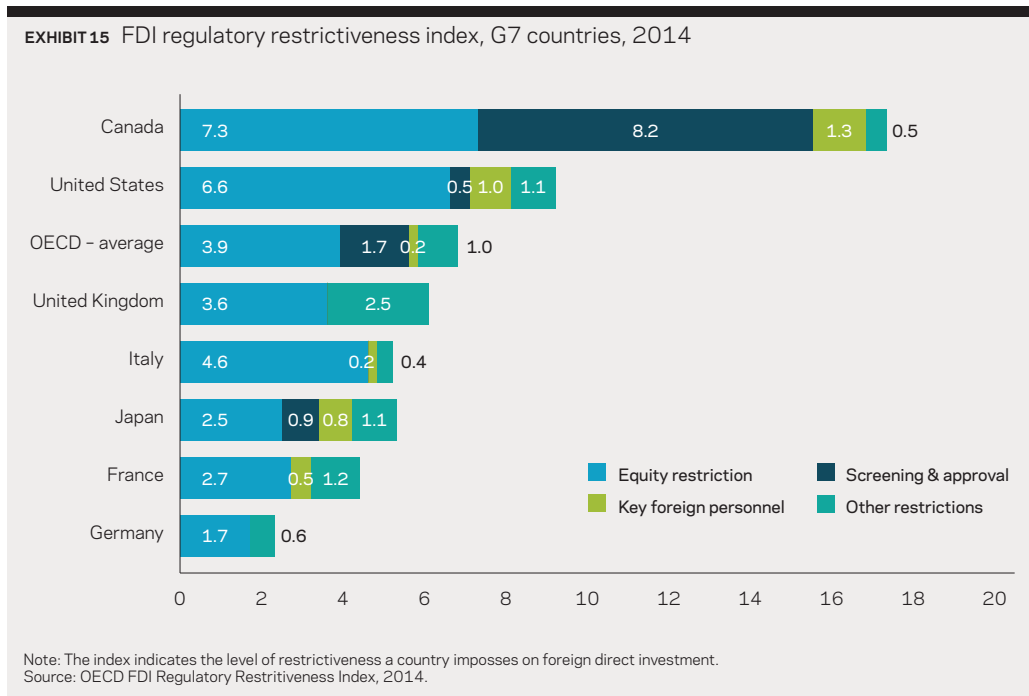
Note: Blue highlights Great Lakes states with high importing and exporting activity with Ontario. Yellow highlights non-Great Lakes states with high importing and exporting activity with Ontario.
 Source: Institute for Competitiveness & Prosperity analysis based on data from Trade Data Online, Innovation, Science and Economic Development Canada.

Market openness: Barriers restrict foreign direct investment growth. Foreign direct investment (FDI) can increase firm rivalry when greenfield investment takes place where a foreign company opens a new plant outside of its country of origin. Attracting greenfield FDI into Ontario can help the province's strong clusters become more competitive and grow because it generates new economic activity. In addition, the introduction of either a new competitor or one with expanded capacity puts pressure on existing firms to improve their performance in order to stay afloat. This drives innovation and, ultimately, improvements in the productivity of that cluster.

Although Ontario consistently ranks high in attracting greenfield FDI – placing in the top five compared to its North American peers, when expressed as a percentage of its GDP – Ontario attracts less than the average North American jurisdiction.⁴⁶ This is partially due to the fact that approximately 30 percent of FDI flows into the resource and mining sectors, yet Ontario's resource and mining sector only accounts for about 1 to 2 percent of provincial GDP.⁴⁷ The remainder of greenfield FDI flows into the manufacturing, management of

companies and enterprises, as well as finance and insurance industries.⁴⁸ These types of FDI can help Ontario develop its strong Automotive and Financial Services clusters.

One reason FDI as a percentage share of GDP is so low is that Canada's barriers remain the third highest among OECD countries, and the highest among G-7 countries (Exhibit 15). Canada performed particularly poorly at equity restrictions, along with approval and screening. The protection offered by this restrictive policy is a double-edged sword that eliminates international rivalry and stifles appetite for innovation. Both are needed to create the competitive pressures conducive to a healthy cluster environment.





While Ontario has many outstanding foundational elements on which clusters can mature and grow, there are still many opportunities for continued improvement. The province must leverage its strengths to overcome the challenges that stem from intense international competition, along with ever-changing business and economic conditions.

CULTIVATING A CLUSTER ECOSYSTEM

Clusters are the manifestation of a thriving economy. When all the elements work well and grow in parallel, the cluster becomes stronger and boosts a region's prosperity. After evaluating the general elements of the cluster environment in Ontario, several obstacles were identified. The Institute offers recommendations on how to overcome these challenges.

The Institute recommends that the Ontario government facilitate the growth of strong clusters - rather than replicate them - through investment in the foundational elements that form a healthy cluster. The following recommendations not only help the strong clusters in the province grow, they can also create a healthy ecosystem for all clusters to thrive.

Develop a clear and integrated cluster strategy to boost economic development

The success of clusters is predicated on a clear and integrated cluster strategy that identifies and leverages regional strengths. Both the federal and provincial governments are developing tools to spur cluster development as an alternative to traditional industrial policy, yet there needs to be a more concerted effort. The Ontario government offers expertise, data, and coordination on the development of cluster plans and offers groups of actors within any cluster an opportunity to tap into public resources to develop, implement, and review the cluster plan. This is a good start, but an overall cluster strategy is still necessary, one that is overarching, multifaceted, clear, and integrated. This strategy should also include individual strategies for each of the five strong traded clusters.

There should also be cooperation and collaboration across and within the three levels of government, as clusters often span across multiple local jurisdictions. There are many policy areas that are within the purview of municipalities, whose participation is critical to successful implementation. Furthermore, there needs to be internal capacity within each level of government to oversee cluster strategy implementation, as well as to support and coordinate efforts across ministries.

Finally, the strategy should include a large scale marketing and branding exercise to promote the strong clusters in Ontario. Marketing and branding are some of the most important aspects of cluster development. Recognition of where a cluster is located is vital because it helps attract workers, firms, and venture capitalists. The branding of strong clusters in Ontario should also be incorporated into future trade missions. Premier Kathleen Wynne has led two trade missions to China and India, which yielded some tangible results: over 100 agreements and memoranda of understanding valued at over \$2.5 billion with China and \$0.2 billion with India.⁴⁹ The purpose of these trade missions was to identify and capitalize on new export opportunities, while encouraging FDI inflows, but future trade missions should prioritize the development of strong clusters in Ontario.



Improve regional data to support decision-making

A comprehensive cluster strategy is incomplete without robust data. Since clusters occur at the regional or local level, CMA data on businesses, employment, and wages by six-digit NAICS are required. For example, Statistics Canada's *Canadian Business Patterns* should collect CMA-level wage data at the six-digit NAICS level alongside current survey data. The Canadian Cluster Mapping Portal may eventually be the platform for this data to be gathered, and the reinstatement of the mandatory, long-form Census is also helpful. However, more public resources should be allocated to Statistics Canada, alongside open data initiatives, to enable cluster analysis and decision-making. The availability of this data would have allowed the Institute to conduct a more robust analysis on the state of clusters in Ontario.

Invest in inputs, especially physical infrastructure, to strengthen clusters

Inputs are arguably the most important aspect of the Porter Diamond model. Firms require talented individuals, particularly those educated at quality institutions, to manage their production processes. Employees also need access to health care facilities and transportation networks to work productively. Clusters have a much better chance of developing and thriving when desirable inputs abound. While businesses need to leverage the existing talent and infrastructure in the province, the Ontario government also has a role to play in supporting these aspects to attract new firms while helping existing players thrive.

Increase productivity-enhancing infrastructure

Ontario should continue to invest in productivity-enhancing infrastructure, including health care facilities, waterworks, communications engineering, and marine infrastructure.⁵⁰ Investing in productivity-enhancing infrastructure does not necessarily mean building *new* assets. The Auditor General of Ontario in its 2015 Annual Report recommended that the maintenance of the existing stock of provincial assets is equally important. The federal and municipal governments' roles in the funding and building of infrastructure should also not be downplayed.

Many types of infrastructure investment can be funded directly through user fees instead of the public purse. This would transfer the cost to those who benefit the most from the investment, and can help reduce congestion from overuse given infrastructure's free nature.

Support advanced degree attainment

Human capital underpins the success of all firms and clusters. Ontario is home to many world-renowned universities and colleges, providing the workforce with the knowledge and skills that firms demand.

Despite the prevalence of universities and colleges, however, the province is facing a challenge in providing employers with educated and qualified employees, especially managers. This comes at a time when the makeup of the provincial economy



is shifting away from goods-producing industries in favour of service-producing industries.⁵¹ In order for the province to stay competitive, it needs a well-educated cadre of managers who are able to advance innovation and produce quality products.

The general lack of advanced degree holders in the province compared to its US peers may be due to structural issues within academia and the labour market, such as poor career development, limited career prospects, or sparse use of suitable graduate professional skills. The Ontario government should work to rectify these issues so that educational institutions are properly preparing graduates for the workplace. Providing opportunities to acquire real work experience through cooperative education and developing soft skills through seminars and coaching would go a long way to closing the divide between Ontario's most educated and the firms that need them. Likewise, firms should recognize the value of employing individuals with advanced degrees and engaging them to help scale up their businesses.

Another way to provide talent of this kind to Ontario's firms is by attracting and retaining international students.⁵² In 2010, international students contributed an estimated \$8 billion to the Canadian economy through tuition payments, housing, and discretionary spending.⁵³ Their presence can meet the needs of Ontario's firms, especially in highly skilled jobs. These students offer unique knowledge exchange opportunities to Canadian students and can assist with understanding foreign markets, increasing the export potential of Canadian goods and services.

Attracting top talent requires a competitive scholarship environment. Although Canada has invested substantially in graduate and post-doctoral scholarships, many of the awards funded under the Canada Graduate Scholarships Program are not open to international students. In addition, only 25 percent of the Vanier Canada Graduate Scholarships (Vanier CGS) and 31 percent of the Banting Postdoctoral Fellowships were awarded to international students in 2011–2012. An evaluation of the Vanier CGS concluded that the program has not yet met its goal of attracting world-class scholars largely due to the difficulty of finding an eligible Canadian institution to

nominate potential applicants.⁵⁴ Conversely, both Australia and the US increased their graduate scholarships that are open to international students to 10,000 and 100,000, respectively.⁵⁵ At the very least, Ontario needs to revise its eligibility requirements to overcome the lack of connections foreign students have with eligible academic institutions.

Reconsider venture capital policy

The Ontario government currently sources over two-thirds of VC funding available to firms.⁵⁶ Ontario should consider gradually reducing its participation in the VC market to open up the market for specialized private firms that have a greater ability to select firms with the best prospects. This ensures that venture capitalists can assist companies in their growth initiatives such as exporting to new markets.

The role of government in the VC market is still important, albeit for different reasons. Research has shown that government-backed VC can help spur patenting activity – less than that of institutional and private VC, but well above corporate, retail or even banking VC.⁵⁷ Innovation is pivotal to the competitiveness of clusters and therefore a more optimal balance between government and non-government sources of funding will improve the innovation and growth prospects of Ontario's cluster firms.

Strengthen entrepreneurial culture

A weak entrepreneurial culture – or minimal drive to establish and grow a business – is a key reason for relatively weak levels of private sector innovation.⁵⁸ Research suggests that Ontario's industry leaders are concerned about entrepreneurs' lack of experience, knowledge to expand to international markets, and ability to acquire funds for R&D. This stifles an entrepreneurial culture.⁵⁹

Educational programming for youth and businesses can help address these concerns. The I-Think Initiative, which introduces integrative thinking into elementary and secondary school classrooms, is a leading example yet to be fully implemented across Ontario.⁶⁰ The province further supports youth entrepreneurship through the Ontario Network of Entrepreneurs, which provides advisory services related to



business development and public programs.⁶¹ However, many of these supports are duplicative and uncoordinated with other public programs.⁶² Expanding the I-Think Initiative, along with streamlining existing business supports, are two ways Ontario can strengthen its entrepreneurial culture through educational programming.

Building entrepreneurial education into Ontario's skills retraining programs is a second way to strengthen the province's entrepreneurial culture. Currently, programs offered through the Employment Ontario suite do not offer training on how to be or think like an entrepreneur. Given the precarious labour market, entrepreneurship may be a viable option for those looking to change their career path or supplement their income.

Lastly, Ontario's businesses should better integrate entrepreneurial supports into their everyday operations. Encouraging and incentivizing employees to innovate by taking risks and adopting alternative approaches is one way to do this. Adobe's Kickbox – which provides tools to help innovators define, refine, validate, and evolve new ideas – shows that this is possible.⁶³

Cluster initiatives and strategic marketing can foster development

One of the most effective ways to strengthen ties with supporting and related industries is through cluster initiatives.

Encourage cluster collaboration to further economic development

Communication and collaboration are pivotal in cutting business transaction costs as well as sharing industry knowledge. Yet more cluster initiatives are needed across the province. The Institute recommends that government play a convening role in business collaboration within and between clusters. This should happen across regions, provinces, and borders. One way to do this is through an annual cluster conference to allow business leaders to network and develop partnerships. A conference would also be an excellent venue for the government to provide updates that affect each cluster and demonstrate support for the work of the private sector.

The experience of Europe's cluster initiatives offer many best practices. Most cluster organizations are membership driven and create a space for actors to converge and interact. The Institute recommends that cluster organizations or associations, led by industry leaders, have clear and specific objectives for their cluster initiatives. European survey data reveal that there is statistically significant innovation performance improvement when the objectives of the cluster initiatives are to increase exports, innovation, and R&D, followed closely by the goals of developing a strategy and vision, and growth and investment.⁶⁴



Leverage partnerships with other regions

Trade opens up clusters in Ontario to more sophisticated customers in global markets. The province should work on improving trade relations with its Great Lakes region peers and international trading partners.

Expand the trade commissioners program

Ontario's trade commissioners program is a cost-effective method to improve trade relations with other jurisdictions. The Government of Canada administers a Trade Commissioner Service (TCS) to provide businesses with advice on exporting to and within various regions.⁶⁵ Trade commissioners act like a consultation service. They become familiar with a business, its target market, and industry realities. Commissioners then work with companies to develop a strategy for breaking into international markets. The Institute supports this work because using the program can lead to higher levels of export activity.⁶⁶

Work with macro-regions, such as the Great Lakes, in order to grow macro-clusters

Ontario shares similar characteristics in industry composition, climate, supply chain, and even market with its neighbouring states and provinces. The majority of Ontario's trading partners in the US are found in the Great Lakes region. The existing waterway and supply chains along the region facilitate these trade relationships. The Institute recommends that Ontario continue to collaborate with its neighbouring states within the Great Lakes region for continued economic growth.

In addition, there is considerable support for an innovation 'supercluster' along the Kitchener-Cambridge-Waterloo to Toronto corridor. A supercluster is one that includes multiple clusters in close geographical proximity to one another. Interactions between clusters are important and can generate positive economic benefits and knowledge spillovers. Marketing this area as a supercluster ensures that the province can compete globally with other known superclusters, such as the one found in Boston (known for its technology and biomedical clusters), as all the strong clusters in the area are included and promoted as one cohesive supercluster.

Loosen restrictions on foreign direct investment

FDI restrictions disincentivize appropriate risk taking, global expansion, R&D investment, and other innovative activities. This is why the Ontario government must work with the federal government to revise FDI restrictions and other regulations that prevent cluster growth. Moreover, policy should facilitate continued greenfield FDI to spur the success of Ontario's traded clusters.

Canada currently ranks as the most restrictive amongst G7 countries in terms of FDI, especially on approval and screening, and accessing equity. Research has found that lowering Canada's restrictiveness index to the OECD average would increase labour productivity by 0.8 percent and create an additional 137,400 jobs. This would result in an average annual wage increase of \$648 per worker, translating to \$4.5 billion for the Ontario economy.⁶⁷

The province needs to step up its efforts to work with the federal government to reduce these barriers, while maintaining adequate protection to domestic businesses and consumers. These restrictions are one of the main reasons why the amount of FDI entering strong clusters in Ontario is not growing as fast as other sectors.⁶⁸ As such, the Institute recommends the province work with the federal government to attract more FDI to its strong clusters.

TRADED CLUSTER DEFINITIONS



Aerospace Vehicles and Defense

Aircraft; Missiles and Space Vehicles; Search and Navigation Equipment



Agricultural Inputs and Services

Agricultural Services; Farm Management and Labour Services; Fertilizers



Apparel

Accessories and Specialty Apparel; Apparel Contractors; Men's Clothing; Women's Clothing



Automotive

Automotive Parts; Gasoline Engines and Engine Parts; Metal Mills and Foundries; Military Vehicles and Tanks; Motor Vehicles; Small Vehicles



Biopharmaceuticals

Biological Products; Biopharmaceutical Products; Diagnostic Substances



Business Services

Architectural and Drafting Services; Business Support Services; Computer Services; Consulting Services; Corporate Headquarters; Employment Placement Services; Engineering Services; Ground Passenger Transportation



Coal Mining

Coal Mining



Communications Equipment and Services

Communications Equipment; Communications Equipment Components; Communications Services



Construction Products and Services

Construction; Construction Components; Construction Materials; Construction Products; Water, Sewage, and Other Systems



Distribution and Electronic Commerce

Electronic and Catalog Shopping; Rental and Leasing; Support Services; Warehousing and Storage; Wholesale of Apparel and Accessories; Wholesale of Books, Periodicals, and Newspapers; Wholesale of Chemical and Allied Products; Wholesale of Construction and Mining Machinery and Equipment; Wholesale of Drugs and Druggists' Sundries; Wholesale of Electrical and Electronic Goods; Wholesale of Farm and Garden Machinery and Equipment; Wholesale of Farm Products and Supplies; Wholesale of Food Products; Wholesale of Furniture and Home Furnishing; Wholesale of Industrial Machinery, Equipment, and Supplies; Wholesale of Jewelry, Watches, Precious Stones, and Precious Metals; Wholesale of Metals and Minerals (except Petroleum);

Wholesale of Other Merchandise; Wholesale of Paper and Paper Products; Wholesale of Petroleum and Petroleum Products; Wholesale of Professional and Commercial Equipment and Supplies; Wholesale of Service Establishment Equipment, and Supplies; Wholesale of Sporting and Recreational Goods and Supplies; Wholesale of Toy and Hobby Goods and Supplies; Wholesale of Transportation Equipment and Suppliers (except Motor Vehicles); Wholesale of Trade Agents and Brokers



Downstream Chemical Products

Dyes, Pigments and Coating; Explosives; Lubricating Oils and Greases; Personal Care and Cleaning Products; Processed Chemical Products



Downstream Metal Products

Ammunition; Fabricated Metal Structures; Metal Containers; Metal Products



Education and Knowledge Creation

Colleges, Universities, and Professional Schools; Educational Support Services; Professional Organizations; Research Organizations; Training Programs



Electric Power Generation and Transmission

Alternative Electric Power; Electric Power Transmission; Fossil Fuel Electric Power



Environmental Services

Other Waste Management Services; Waste Collection; Waste Processing



Financial Services

Credit Bureaus; Credit Intermediation; Financial Investment Activities; Monetary Authorities - Central Bank; Securities Brokers, Dealers, and Exchanges



Fishing and Fishing Products

Fishing and Fishing Products



Food Processing and Manufacturing

Animal Foods, Baked Goods, Candy and Chocolate; Coffee and Tea; Dairy Products; Distilleries; Farm Wholesalers; Glass Containers; Malt Beverages; Milling and Refining of Cereals and Oilseeds; Milling and Refining of Sugar; Packaged Fruit and Vegetables; Soft Drinks and Ice; Specialty Foods and Ingredients; Wineries



Footwear

Footwear; Footwear Components



Forestry

Forestry



Furniture

Household Furniture; Institutional Furniture; Mobile Homes; Office Furniture; Wood Cabinets and Woodwork



Hospitality and Tourism

Accommodations and Related Services; Amusement Parks and Arcades; Cultural and Educational Entertainment; Gambling Facilities; Other Tourism Attractions; Spectator Sports; Tourism Related Services



Information Technology and Analytical Instruments

Audio and Video Equipment; Computers and Peripherals; Electronic Components; Medical Apparatus; Process and Laboratory Instruments; Semiconductors; Software Publishers; Software Reproducing



Insurance Services

Insurance Carriers; Insurance Related Services; Reinsurance Carriers




Jewelry and Precious Metals

Jewelry and Precious Metal Products





Leather and Related Products

Personal Leather Goods and Luggage; Textile Bags and Canvas Products; Women's Handbags and Purses


 **Lighting and Electrical Equipment**
Electrical Components; Electrical Equipment; Lighting Fixtures and Parts; Storage Batteries

 **Livestock Processing**
Livestock Merchant Wholesalers; Meat Processing

 **Marketing, Design, and Publishing**
Advertising Related Services; Design Services; Other Marketing Related Services; Publishing


 **Medical Devices**
Optical Instruments and Ophthalmic Goods; Surgical and Dental Instruments and Supplies

 **Metal Mining**
Metal Mining

 **Metalworking Technology**
Fasteners; Hand Tools; Machine Tools and Accessories; Metal Processing; Metalworking Machinery


 **Music and Sound Recording**
Music and Sound Recording


 **Nonmetal Mining**
Nonmetal Mining

 **Oil and Gas Production and Transportation**
Drilling Wells; Oil and Gas Extraction; Oil and Gas Machinery; Petroleum Processing; Pipeline Transportation; Support Activities for Oil and Gas Operations


 **Paper and Packaging**
Packaging; Paper Mills; Paper Products


 **Performing Arts**
Performing Artists; Promoters and Managers

 **Plastics**
Plastic Materials and Resins; Plastic Products


 **Printing Services**
Greeting Card Printing and Publishing; Printing Inputs; Printing Services; Support Activities for Printing


 **Production Technology and Heavy Machinery**
Agricultural and Construction Machinery and Components; Air Handling Equipment; Commercial and Service Industry Machinery; Industrial Machinery; Moving and Material Handling Equipment; Process Equipment and Components


 **Recreational and Small Electric Goods**
Electric Housewares; Games, Toys, and Children's Vehicles; Motorcycles and Bicycles; Office Supplies; Recreational and Decorative Goods; Sporting and Athletic Goods

 **Textile Manufacturing**
Fabric Mills; Fibers; Household Textile Products; Knitting Mills; Other Textile Products; Textile and Fabric Finishing; Yarn and Thread Mills

 **Tobacco**
Tobacco

 **Trailers, Motor Homes, and Appliances**
Burial Caskets; Household Appliances; Trailers and Motor Homes

 **Transportation and Logistics**
Air Transportation; Bus Transportation; Ground Transportation Support Activities; Specialty Air Transportation; Trucking

 **Upstream Chemical Products**
Agricultural Chemicals; Industrial Gas; Inorganic Chemicals; Organic Chemicals



Upstream Metal Manufacturing

Iron and Steel Mills and Forging; Metal Processing; Metal Products; Wires and Springs



Video Production and Distribution

Video Production and Distribution



Vulcanized and Fired Materials

Clay Products and Refractories; Glass Products; Rubber Products



Water Transportation

Boat Building and Repairing; Marine Transportation Services; Water Passenger Transportation



Wood Products

Prefabricated Wood Building; Wood Components and Products; Wood Processing

Bottom-up approach to economic development – Industry or firm led approach to economic development that is supported by the government. This is seen as a more effective way of economic growth, particularly in the context of clusters.

Census Metropolitan Area (CMA) - Used by Statistics Canada in its analysis and is defined as an area that has a population of at least 100,000, of which at least half reside in the “core” or the centre of the region.

Cluster actors – The main actors that operate within a cluster and include: the firm, venture capitalist, government, and academic/research organizations. The close proximity of these actors within a cluster fosters interactions.

Cluster ecosystem – The ecosystem in which the four cluster actors and elements of the Porter Diamond interact from co-existing in the same geographic area. Each cluster’s ecosystem is unique because the interactions and outputs are different, but the actors and Porter Diamond elements remain the same.

Cluster initiatives – Events organized by cluster organizations that can foster interactions between cluster actors. Each initiative should have specific objectives (e.g., increasing innovation) behind them.

Clusters – Geographically proximate groups of interconnected companies, suppliers, service providers, and associated institutions. They involve an extensive web of complementary linkages between companies and related actors, such as universities and colleges, research organizations, and sources of financing.

Competitive pressures – Part of the Porter Diamond that includes demand conditions and context for firm strategy and rivalry. They create an environment that places pressures on firms to innovate in order to succeed within the specific jurisdiction’s business environment.

Context for firm strategy and rivalry – The specific local context of each jurisdiction that impacts firm behaviour, government regulation, and intensity of rivalry.

Demand conditions – The primary measure includes sophisticated consumers who are more likely to ask for better products and services, putting pressure on firms to meet local demands for fear of falling behind. A classic example is Japan, where the local demand for innovative technologies spurs companies to create products that will not only satisfy local but also international customers.

Factor (input) conditions – The factors of production, such as natural resources, pools of specialized labour, and physical and scientific infrastructure, that businesses draw upon and use effectively. They are part of the specialized support within the Porter Diamond.

Knowledge spillovers – Increased face-to-face interaction between workers organically leads to information sharing. Technology spills over in a similar manner as R&D knowledge is passed between firms, through employee conversations, labour movement, and proximal observations.

Labour market pooling – The pooling of interrelated firms in the same geographical area attracts potential workers and new firms to relocate to the region. This creates a cycle of higher demand for skilled labour, which drives up wages, and in turn, attracts more skilled talent. On the other hand, the pooling of labour and businesses creates a competitive environment that can drive innovation in order for firms to differentiate between one another.

Local clusters – Produce goods and services for the local population and are therefore present in most geographic areas. There are 16 local clusters in any given jurisdiction according to Porter’s definitions. Examples of establishments within local clusters include restaurants, grocery stores, and clothing retailers.

Location Quotient – Measures the concentration of employment in a particular region compared to larger jurisdictions. In this Working Paper, the LQ is calculated as:

$$LQ = \frac{\text{Cluster's share of regional (CMA/MSA) employment}}{\text{Cluster's share of North American employment}}$$

Metropolitan Statistical Area (MSA) – Used by US statistical agencies and is defined as an urbanized area with a core of at least 50,000 in population.

North American Industrial Classification System (NAICS) – A numerical classification system of industries, used by Canadian, US, and Mexican statistical agencies. Michael E. Porter’s cluster definitions use six-digit level NAICS.

Porter Diamond – Building blocks of the cluster ecosystem that interact to either help or hinder a country’s competitiveness. These include: Factor (input) conditions, related and supporting industries, demand conditions, and context for firm strategy and rivalry.

Prosperity gap – Difference in Gross Domestic Product (GDP) per capita between Ontario and its North American peers.

Related and supporting industries – Provide inputs that firms in clusters rely upon for their products or services. These industries therefore part of the specialized support within the Porter Diamond that encourages innovation and creates spin-off companies through interactions with cluster actors.

Specialized support – Part of the Porter Diamond that includes factor (input) conditions and related and supporting industries. Together, these support firms in helping their businesses innovate and grow.

Strong cluster – A traded cluster that has a relative advantage compared to the rest of North America and has three characteristics:

- *LQ greater than 1* – This indicates that there is a high concentration of workers in the CMA relative to the North American average.
- *LQ in the 75th percentile or higher compared to all other CMAs and MSAs with the cluster present* – This indicates that the concentration of workers is highest amongst other CMAs and MSAs.
- *Number of establishments are in the 25th percentile or above compared to all other CMAs and MSAs with this cluster present* – This prevents the presence of a few large firms to be misinterpreted as a cluster.

Supplier specialization – Firms rely on suppliers to produce goods and services. In a healthy cluster, businesses within the supply chain specialize in feeding inputs into the end product or service. These companies create competitive pressures, energizing one another. But they also help one another through symbiotic relationships that result in higher innovation.

Top-down approach to economic development – Government led approaches such as giving subsidies directly to firms as a means of economic development, particularly in the form of employment. This has led to “bidding for business” tactics that are seen as ineffective and wasteful.

Traded clusters – Produce goods (e.g., vehicles) and services (e.g., cellphone services) in a particular locale, and then distribute them across regional, national, and international boundaries. Hence these clusters do not need to be located in all geographic areas and can be concentrated in a handful of regions. There are a total of 51 traded clusters identified by Porter.

- 1 Ontario's Canadian peer provinces include Alberta, British Columbia, and Québec. Ontario's US peer states are California, Florida, Georgia, Illinois, Indiana, Massachusetts, Michigan, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Texas, Virginia, and Washington.
- 2 Story, Louise. 2012. "As Companies Seek Tax Deals, Governments Pay High Price." *The New York Times*.
- 3 *Ibid.*
- 4 Institute for Competitiveness & Prosperity. 2015. *Open for Business: Strategies for improving Ontario's business attractiveness*. Working Paper 21.
- 5 Note: Since 2014, the previous natural resource clusters are reclassified into traded clusters.
- 6 Lerner, Joshua. 2009. *Boulevard of Broken Dreams*. Princeton: Princeton University Press, as cited in Economist Intelligence Unit. 2011. *Fostering Innovation-Led Clusters: A Review of Leading Global Practices*. The Economist.
- 7 Germany Trade & Invest. 2015. *Industry Overview: The Automotive Industry in Germany, Issue 2015/2016*.
- 8 Porter, Michael E. 1990. *The Competitive Advantage of Nations*. New York: Free Press.
- 9 Task Force on Competitiveness, Productivity and Economic Progress. 2013. *Course Correction: Charting a new road map for Ontario*. Twelfth Annual Report.
- 10 Ketels, Christian H.M. and Olga Memedovic. 2008. "From Clusters To Cluster-Based Economic Development." *International Journal of Technological Learning, Innovation and Development* 1 (3): 375. doi:10.1504/ijtliid.2008.019979.
- 11 These findings have controlled for convergence in start-up activity at the region-industry level. Source: Delgado, Mercedes, Michael E. Porter, and Scott Stern. "Clusters And Entrepreneurship." *SSRN Electronic Journal*. doi:10.2139/ssrn.1689084.
- 12 Ontario Ministry of Economic Development, Employment and Infrastructure. "Partnerships for Jobs and Economic Growth." 2016. <https://www.ontario.ca/page/partnerships-jobs-and-economic-growth>.
- 13 Ontario Ministry of Economic Development, Employment and Infrastructure. 2016. *Ontario Launching New Fund to Develop Globally Competitive Clusters*.
- 14 Canadian Ministry of Finance. 2016. *Growing the Middle Class: Budget 2016*.
- 15 Canadian data will be comparable to the US Cluster Mapping Portal, <http://www.clustermapping.us/>.
- 16 The Institute previously identified three cluster classifications: traded industries, dispersed industries, and natural resource-based industries. The classification names have since been updated from industries to clusters, from dispersed to local, and exclude natural resource-based industries as the other clusters make up the majority of the economy. Source: Delgado, Mercedes, Michael E. Porter, and Scott Stern. 2015. "Defining Clusters of Related Industries." *J Econ Geogr* 16 (1): 1-38. doi:10.1093/jeg/lbv017.
- 17 Institute for Competitiveness & Prosperity. 2004. *Strengthening Structures: Upgrading specialized support and competitive pressure*. Working Paper 5.
- 18 Trade data was obtained from Trade Data Online, Innovation, Science and Economic Development Canada.
- 19 Institute for Competitiveness & Prosperity. 2002. *A View of Ontario: Ontario's Clusters of Innovation*. Working Paper 1; *idem*. 2004. *Strengthening Structures: Upgrading specialized support and competitive pressure*. Working Paper 5; Task Force for Competitiveness, Productivity and Economic Progress. 2014. *Finding Its Own Way: Ontario needs to take a new tack*. Annual Report 13.
- 20 A Census Metropolitan Area (CMA) is used by Statistics Canada in its analysis and is defined as an area that has a population of at least 100,000, of which at least half reside in the "core" or the centre of the region. Source: "Census Metropolitan Area (CMA) and Census Agglomeration (CA) - Census Dictionary." 2015. *Statistics Canada*. <https://www12.statcan.gc.ca/census-recensement/2011/ref/dict/geo009-eng.cfm>. Similarly, a Metropolitan Statistical Area (MSA) is used by US statistical agencies and is defined as an urbanized area with a core of at least 50,000 in population. Source: "Metropolitan and Micropolitan - Glossary of Metropolitan-Related Terms - People and Households - U.S. Census Bureau." 2016. *United States Census Bureau*. <http://www.census.gov/population/metro/data/glossary.html>.
- 21 Delgado, Mercedes, Michael E. Porter, and Scott Stern. "Clusters, Convergence, and Economic Performance." *SSRN Electronic Journal*. doi:10.2139/ssrn.1695011.
- 22 The criteria for a strong cluster is based on the one used in Delgado, Mercedes, Michael E. Porter, and Scott Stern. 2015. "Defining Clusters of Related Industries." *J Econ Geogr* 16 (1): 1-38. doi:10.1093/jeg/lbv017.
- 23 Ontario does not have any firms currently operating in the remaining two sub-clusters: Small Vehicles or Military Vehicles and Tanks. The Institute recognizes that military vehicles may make up a significant portion of some regions' manufacturing sectors and the spillover from significant government investment in new technologies and engineering could be extremely valuable.
- 24 Country-specific LQs are not directly comparable to one another.
- 25 Equity financing is the act of raising funds through the sale of a portion of the firm. Source: Toronto Stock Exchange, 2016. *A Capital Opportunity: A Global Market for Real Estate Companies*. Accessed May 28, 2016.
- 26 The definition of infrastructure aligns with the one in Institute for Competitiveness & Prosperity, 2015. *Better Foundations: The return on infrastructure investment in Ontario*. Working Paper 22.
- 27 *Ibid.*
- 28 *Ibid.* \$74,500 per worker is the average of the seven other provinces excluding Ontario in 2007 chained Canadian dollars.
- 29 *Ibid.*
- 30 *Ibid.*
- 31 Ontario Ministry of Finance. 2016. *Jobs for Today and Tomorrow: 2016 Ontario Budget*.
- 32 "MoneyTree definitions." 2016. *PricewaterhouseCoopers*. <https://www.pwcmoneytree.com/Definitions/Definitions#Stage>.
- 33 Industry Canada. 2015. *Venture Capital Monitor Q4 2014*.
- 34 Dingman, Shane. 2015. "As Canadian Startups Grow, Local Venture Capital Funding Dries Up." *The Globe And Mail*.
- 35 A unicorn firm is a start-up company with a value in excess of \$1 billion.
- 36 Brander, J. A., Q. Du, and T. Hellmann. 2014. "The Effects of Government-Sponsored Venture Capital: International Evidence." *Review of Finance* 19 (2): 571-618. doi:10.1093/rof/rfu009.
- 37 *Ibid.*
- 38 Scarpetta, Stefano. 2003. *The Sources of Economic Growth in OECD Countries*. Paris, France: Organisation for Economic Co-operation and Development.
- 39 See Delgado, Mercedes, Michael E. Porter, and Scott Stern. 2015. "Defining Clusters of Related Industries." *J Econ Geogr* 16 (1): 1-38. doi:10.1093/jeg/lbv017.
- 40 Lindqvist, Goran, Christian Ketels, and Örjan Sölvell. 2013. *The Cluster Initiative Greenbook 2.0*.

- 41 "Information Technology Association Of Canada – The Voice of Canada's Information and Communication Technology Community." 2016. *Information Technology Association Of Canada*. <http://itac.ca/>.
- 42 "Trans-Pacific Partnership (TPP) Free Trade Negotiations." 2014. *International Global Affairs Canada*. <http://www.international.gc.ca/trade-agreements-ac-cords-commerciaux/agr-acc/tpp-ptp/101.aspx?lang=eng>.
- 43 Hall, Peter. 2016. *Global Export Forecast, Spring 2016*. Export Development Canada.
- 44 This is a 2015 figure. Source: Government of Canada, Trade Data Online database.
- 45 The Great Lakes region includes Ontario, Michigan, Illinois, Indiana, Pennsylvania, Ohio, Minnesota, New York, and Wisconsin.
- 46 Ontario's FDI rankings are found in the fDi Intelligence annual fDi reports; "Inward Greenfield Foreign Direct Investment (FDI) Performance Index." 2016. *Conference Board of Canada*. <http://www.conferenceboard.ca/hcp/provincial/economy/inward-fdi.aspx>.
- 47 fDi Intelligence. 2016. *The fDi Report 2016*, and Statistics Canada, CANSIM Table 379-0030.
- 48 fDi Intelligence. 2016. *The fDi Report 2016*.
- 49 Ontario Office of the Premier. 2016. *Premier Concludes Successful Trade Mission to India*; Ontario Office of the Premier. 2015. *Premier's China Mission Generates \$2.5 Billion in Agreements*.
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