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# Assessing the Strength of the Toronto Biopharmaceutical Cluster

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## Executive Summary

The Institute for Competitiveness & Prosperity has identified the importance of clusters of traded industries to closing Ontario's prosperity gap with its peer group of North American jurisdictions and to strengthening innovation and commercialization results. Industry clusters are proximate groups of firms competing in the same tradable goods or services market (e.g., Detroit and Southern Ontario's automotive cluster or Northern California's wine cluster). Clusters have been shown to achieve greater productivity and innovation. The Institute's research has shown that Ontario has a good mix of traded clusters; its challenge is to strengthen the effectiveness of its clusters.

One of Ontario's significant assets is Toronto's biopharmaceutical cluster. The industry has excellent human and capital resources available to it and in employment terms it has become the eighth largest in North America. Nevertheless, the cluster represents untapped potential for Ontario's competitiveness and prosperity. Despite its impressive factor conditions the cluster has not produced many world leading companies, wages are well below levels achieved in comparable US clusters, patent output is lower than its "fair share", and per capita research and development in the industry is well below levels achieved in many other developed countries.

To determine the cause of this untapped potential, this report summarizes a detailed study of the Toronto biopharmaceutical cluster in comparison to Boston, one of the leading US clusters. Using a template developed by Michaels Porter's Institute for Strategy and Competitiveness, we compared the two clusters across 120 variables that spanned Porter's four factors of cluster strength – sophisticated demand, intense rivalry, availability of critical factors, and the presence of related and supporting industries.

The analysis concludes that Toronto's cluster is negatively affected by the presence of dominant players in the purchasing decisions, the federal and provincial governments. With their significant impact on all buyers of biopharmaceuticals and focus on price, the government reduces opportunities for innovation in the cluster and indirectly prevents the development of a healthy supplier infrastructure that can provide the specialized support, for example in the area of venture financing.

The report concludes by identifying some opportunities for strengthening the cluster within the constraint of Ontario's and Canada's current public policy approach to drug purchasing.

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In its assessment of Ontario's competitiveness against a peer group of US states, the Institute for Competitiveness & Prosperity concluded that clusters of traded industries are important contributors to local and provincial prosperity. While Ontario has an excellent mix of traded industries, it does not benefit fully from them; their performance falls short of the same clusters in its peer states. This report analyzes the key strengths and weaknesses of the Toronto region's biopharmaceutical cluster. It concludes that Toronto's biopharmaceutical cluster has a solid base of human resource and other factor strengths, but suffers from the impact of unsophisticated buyers – namely the federal and provincial governments.

In this report we:

- Identify some of the key overall strengths and weaknesses of the biopharmaceutical cluster in Toronto
- Review the Porter framework for assessing clusters
- Assess Toronto's biopharmaceutical cluster against this framework
- Suggest implications of our analysis for public policy makers

## I. The untapped potential of Canada's biopharmaceutical cluster

The biopharmaceutical industry represents a missed opportunity for Canada's competitiveness and innovation agenda. It is a critical part of our health care system, a key to Canada's social and economic policy, and a part of the nation's identity. It is also a significant innovator dedicating research and development resources that upgrade Canada's scientific base. Yet, our analysis of results from the industry, indicates that it is not delivering its full potential in economic and innovation terms. We review the industry's importance in Toronto<sup>1</sup> relative to the cluster in Boston where data are available.<sup>2</sup>

### **The importance of the biopharmaceutical industry in Canada.**

The biopharmaceutical industry is a very important part of Canada's economy and its social policy setting. Many Canadians point with pride to our health care system. It accounts for 10.0 percent<sup>3</sup> of our Gross Domestic Product in 2003 and 18.7 percent<sup>4</sup> of total government expenditures. We have a sophisticated network of health care providers and institutions. We invest significantly in health research. In Canada, health sciences draw the largest percentage of venture capital funds at 26 percent of total venture capital (VC) investment. The next largest sectors are computer related at 18 percent and communications at 13 percent.<sup>5</sup>

Within health care, biopharmaceutical products are critical drivers of innovation and competitiveness. Pharmaceutical products account for a significant proportion of Ontario's research and development. According to Statistics Canada, the biopharmaceutical industry was the second largest funder of research and development among Canada's manufacturers in 2004, behind only communications equipment, with R&D expenditure growing at 58 percent over the period of 2000-2004<sup>6</sup>.

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<sup>1</sup> In this discussion, we use Census Metropolitan Areas as regions; the US counterpart is Metropolitan Statistical Areas or MSAs.

<sup>2</sup> Where necessary, we draw on provincial or national data for our analysis. This is especially true for analysis of the regulatory climate.

<sup>3</sup> Statistics Canada, CANSIM II database - Tables 3800002 & 3800034.

<sup>4</sup> Statistics Canada, CANSIM II database - Table 3800034.

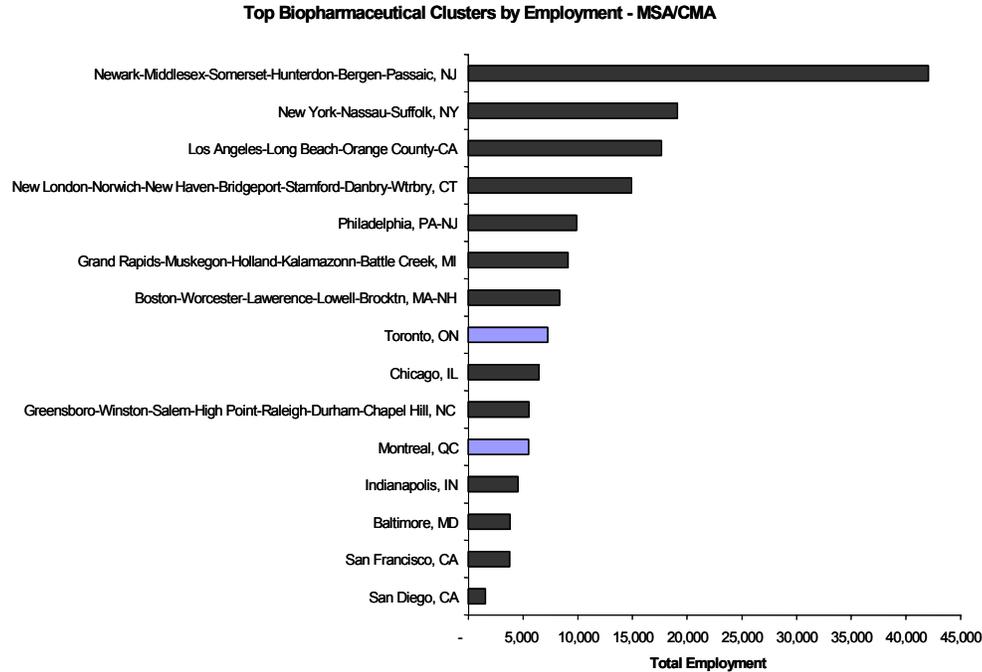
<sup>5</sup> Canadian Venture Capital Association [online] Available from: [http://www.cvca.ca/statistical\\_review/table\\_3x2003.html](http://www.cvca.ca/statistical_review/table_3x2003.html)

<sup>6</sup> Statistics Canada, "The Daily Statistics" (August 5, 2004) Catalogue no. 11-001 XIE [online] Available from: <http://www.statcan.ca/Daily/English/040805/d040805.pdf>

## The untapped potential of biopharmaceuticals.

Toronto is the 8<sup>th</sup> largest cluster by employment in North America.<sup>7</sup> (Exhibit 1)

### Exhibit 1: Toronto ranks 8th versus leading jurisdictions



Note: Neighbouring MSAs combined

Source: Institute for Strategy – Cluster Mapping Project & Competitiveness, Institute for Competitiveness & Prosperity

Yet on many factors related to innovation and global competitiveness, Canada's biopharmaceutical industry's performance has significant room for improvement.

- We produce a very small number of pharmaceutical and biotechnology inventions relative to the US; through 1998-2003 Canada produced 974 and 637 respectively (0.03 and 0.02 per thousand population) vs. 15,758 and 11,495 respectively (0.06 and 0.04 per thousand population).<sup>8</sup>
- Per capita investment in research and development in pharmaceuticals is one of the lowest among the developed countries on a per capita (\$30) and per dollar of industry revenue basis with Canada ranking 11<sup>th</sup> out of 14 industrial countries. When changes were made to the Patent Act in 1987, Canada's Research Based Pharmaceutical Companies (Rx&D) made a public

<sup>7</sup> See Institute for Competitiveness & Prosperity online at: [www.competeproser.ca](http://www.competeproser.ca) and Institute for Strategy and Competitiveness online at: <http://www.isc.hbs.edu>

<sup>8</sup> CHI Country Patent Profiles for Canada and the US, CHI Research, Inc., Haddon Heights, NJ, 2004

commitment that the industry's annual R&D expenditures as a percentage of sales would be 10%.

- While pharmaceutical R&D investment grew at an impressive 13.5 percent annual rate between 1990 and 2002<sup>9</sup>, it grew at more than twice that rate (32.5 percent) in the US over the same period. In addition, according to the July PMPRB Newsletter, pharmaceutical R&D expenditures in Canada declined by 0.5 percent from 2002 to 2003.
- Canada accounts for a small share of global drug sales – against the US, we generate one 25<sup>th</sup> the sales dollars with one tenth the population and one thirteenth the spending on health care in total
- Canada is a net importer of pharmaceutical products – importing three to five times as much as we export, depending on the year<sup>10</sup>
- Canada has produced only four global leaders, (i.e., companies with greater than \$100 million in annual sales and who are in the top five of their niche globally) in biopharmaceuticals. These include three companies based in Toronto: MDS Inc. (contract research organizations and medical isotopes niches), Patheon Inc. (drug development and manufacturing services niches), and TLC Vision (laser vision correction niche) and one in Montréal, Axcan Pharma Inc (competing in gastrointestinal products niche).<sup>11</sup>
- Average wages in Ontario's biopharmaceutical cluster are 38 percent lower than in the largest US states that compete with Ontario.<sup>12</sup>
- In comparison to the Boston life science cluster, Toronto's cluster is less broad and deep when individual sub-clusters<sup>13</sup> are evaluated. Of the eleven narrow and broad sub-clusters that make up the 'life science' cluster, the Toronto CMA has six that are top five in North America in employment terms while the Boston MSA has ten.<sup>14</sup>

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<sup>9</sup> Source: Rx&D "Profile of the pharmaceutical industry in Ontario," [online] Available from:

[http://www.canadapharma.org/Industry\\_Publications/Fact\\_Sheets/PFS\\_e/ON\\_Fact\\_Sheet\\_e.pdf](http://www.canadapharma.org/Industry_Publications/Fact_Sheets/PFS_e/ON_Fact_Sheet_e.pdf)

<sup>10</sup> Industry Canada

<sup>11</sup> Institute for Competitiveness & Prosperity, *Strengthening Structures: Upgrading specialized support and competitive pressure*, pp. 34-38.

<sup>12</sup> *ibid.*, p. 29.

<sup>13</sup> Each cluster, consists of broad and narrow sub-clusters. Narrow sub-clusters are uniquely associated with clusters. In the biopharmaceutical cluster, there are three sub-clusters, biopharmaceutical products, health and beauty products and containers. Broad sub-clusters are associated with more than one cluster. There are eight of these in the biopharmaceutical cluster (e.g. biological products, diagnostic substances and medical equipment). See Institute for Competitiveness & Prosperity, *Strengthening structures: Upgrading specialized support and competitive pressure* p 24 for more details on sub-clusters.

<sup>14</sup> Institute for Strategy and Competitiveness (2001), "One London Speech" and Institute for Competitiveness & Prosperity analysis

In summary, the biopharmaceutical industry has a strong foundation of science and technology, reliance on innovation, and a dependence on knowledge workers. It is a critical component of our health care system which is a defining feature of Canada. One would expect it to be a true Canadian success in the world setting – a critical contributor to our innovation agenda. Yet the industry appears to fall short of its potential in these areas. Our analysis indicates that the competitive environment in which the industry operates is the reason for this untapped potential. In the balance of this paper, we analyze the strengths and weaknesses of the competitive environment in which Toronto’s biopharmaceutical cluster operates. First, we set out the cluster framework for analyzing the industry’s competitive structure.

## II. Strong clusters require pressure and support

In his groundbreaking book, *The Competitive Advantage of Nations*<sup>15</sup>, Michael Porter set out the importance of clusters as drivers of a region’s economic development. Economists, geographers, and business strategists generally agree on the importance of the clustering of specific industries in specific geographical areas. The theory of clusters provides a useful analytical framework to assess the features of an industry structure and environment and determine why or why not it produces globally competitive firms. In this section, we review the research behind clusters concluding that strong clusters require both pressure and support in order to grow and prosper.

### **The importance of clusters for innovation and economic progress.**

Clustering – or agglomeration - refers to the tendency of some industries to mass together in specific locales. While every town above a certain size has a corner store or a law office, steel mills or movie studios are only found in a limited number of areas. Much of this is the result of scale requirements. But scale is not the only reason that clustering occurs. Historically, natural factors, such as forests and mineral reserves, led to resource industries in particular locations. Deep water ports and rivers created the conditions for certain types of industries to flourish in other locations. And the presence of highly skilled workers was a driving force for the growth of financial services in London or the fashion industry in Paris. These skills became more and more specialized as the industry cluster developed. Clusters also flourished as firms were driven to improve because of the demands of highly sophisticated customers. London evolved as a world-class insurance centre in no small part because of the significant risk management needs of merchants trading goods throughout the British Empire. Clusters also developed because very capable firms were competing aggressively

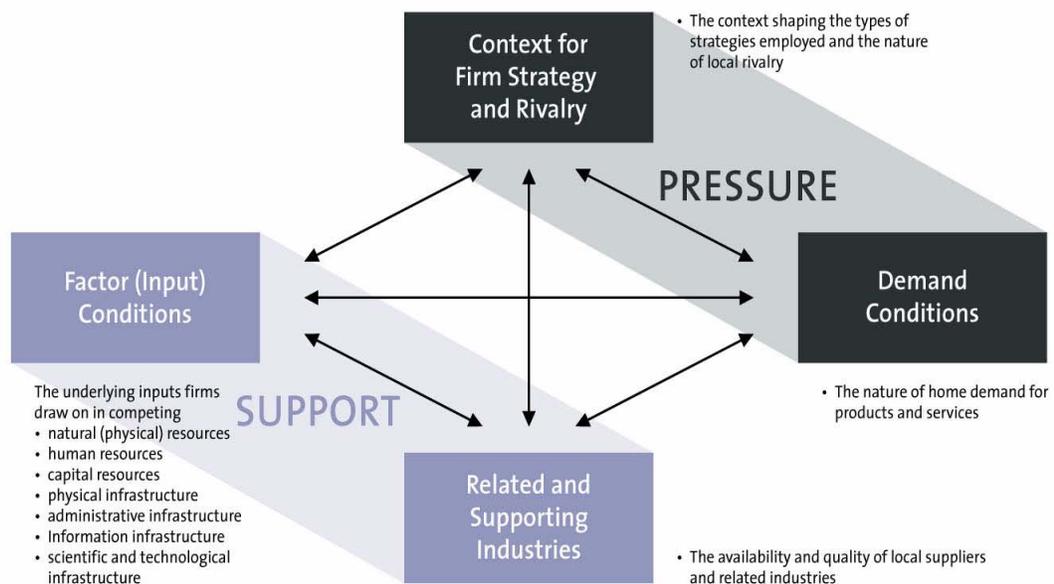
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<sup>15</sup> Porter, Michael E. (1990) *Competitive Advantage of Nations*, New York: The Free Press.

with one another. As clusters developed, technical innovation has been almost continuous, as capable rivals try to outdo one another<sup>16</sup>.

As we look at cluster performance, we see that specialization exists in a limited number of highly related industrial regions and that clusters get stronger as they develop unassailable advantages. We see the importance of two complementary structural factors - specialized support and competitive pressure. Favourable market structures create pressure for firms continuously to upgrade the source and sophistication of their advantage; at the same time they support the upgrading process with the appropriate factor inputs and supporting institutions. The combination of pressure and support is created by the interaction of the four features illustrated in Porter's diamond (Exhibit 2). The four features of Porter's diamond work together in a self-reinforcing dynamic to drive the clustering of industries. Clusters drive productivity and innovation. Average wages in traded clusters are \$44,404 vs. \$30,000<sup>17</sup> in local industries; US data indicate that traded clusters patent at a rate of 15 times that of local industries.<sup>18</sup>

**Exhibit 2: Cluster strength is the result of four inter-related factors**



Source: Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

<sup>16</sup> See *Strengthening structures :Upgrading specialized support and competitive pressure*, pp. 17-19 for a summary of research on clusters

<sup>17</sup> All data is in Canadian dollars and Purchasing Power Parity adjusted where appropriate

<sup>18</sup> Institute for Competitiveness & Prosperity analysis and Institute for Strategy And Competitiveness, Cluster Mapping Project

## **Strong clusters require the specialized support provided by bountiful factor conditions and supporting industries**

Two of Porter's factors refer to specialized support – factor conditions and related and supporting industries.

Support for innovation and upgrading is provided by an abundant supply of *factor (input) conditions*, including basic factors such as natural resources and capital resources, as well as advanced and specialized factors such as scientific infrastructure and pools of specialized labour. Important factor conditions have evolved over time from the presence of raw materials or deep water ports to more advanced and knowledge-based factors. As countries become more advanced, the quality of support is increasingly influenced by advanced (e.g., workers with graduate degrees) and specialized (e.g., research universities) rather than basic factors (e.g., transportation infrastructure) because basic factors can be purchased from abroad or easily replicated.

High quality **related and supporting industries** provide important support for upgrading. Examples of these include suppliers of inputs such as venture capital funds in clusters requiring ingoing investments or specialized goods like high quality steel for automotive manufacturers. These related or supporting industries may be complementary to the firms in the cluster rather than suppliers. An example for computer hardware firms would be specialized software producers, such as value added resellers or VARs who sell in conjunction with them thereby helping them meet customer needs. Highly capable and specialized related and supporting industries help firms in clusters innovate and create unique ways of meeting customer needs without needing to make all the investments themselves.

In addition to Porter, other researchers point to a wide variety of supporting structures and processes, such as labour market pools of highly specialized labour, knowledge spillovers between suppliers and customers, risk sharing and minimization, and the availability of information.<sup>19</sup>

## **Strong clusters require competitive pressure which emerges from sophisticated demand and intense rivalry**

Complementing the support from factor conditions and suppliers is the pressure to innovate and upgrade that comes from sophisticated customers and capable rivals.

Sophisticated customers create **demand conditions** that anticipate the nature of demand in the world. Porter has identified the importance of both attributes - demanding and sophisticated. Customers who are not easily satisfied

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<sup>19</sup> see page 18 *Strengthening structures: Upgrading specialized support and competitive pressure* for more detail

relentlessly pressure their suppliers to improve their product and service offerings. But demanding customers are not enough. Customers need to be sophisticated in their understanding of nuances of product and service improvements. If customers are simply aggressively demanding, focused on driving down price without regard to quality or innovation, they do not contribute to competitive clusters. Examples of sophisticated customers are the Japanese in consumer electronics, the French in wine, and Americans in movies. In these examples, local customers set world standards; suppliers in these home markets find it relatively easy to serve foreign markets. It is helpful to have many customers with varying needs and who are vying with each other to gain advantage. A single buyer can become overly demanding without being very sophisticated.

Pressure is also provided from intense **rivalry**. If many firms are competing vigorously for the same customers, they will be forced to innovate and upgrade. Firms operating in the same geographical area all benefit from similar factor conditions and suppliers and related industries. Consequently, they must differentiate themselves on a continuous basis with innovative products and services.

### **The combination of these four factors inside pressure and support drive cluster competitiveness**

In summary, the research by Porter and others strongly reinforces the reality that an environment of support and pressure is most beneficial in nurturing and growing globally competitive clusters. While the various researchers point to somewhat different elements of support, specialized human resources, and infrastructure figure broadly in their analysis.<sup>20</sup> The presence of such powerful elements of support tends to attract multiple competitors, which helps create an important element of pressure, which is the rivalry of co-located firms. Rivalry among alternative firms helps customers become more demanding and sophisticated which in turn helps drive the firms towards innovative activities. The presence of rival, innovating firms then produces a benefit that loops back into better support. Social networks get created across the competing firms, their customers, and their suppliers and this creates a rich environment of knowledge spillovers. Both of these features enhance the supportiveness of the environment for all firms – which serves to attract more firms still, which produces more pressure and more knowledge spillovers, and so on. No one factor drives cluster success by itself – and all factors must be present.

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<sup>20</sup> Research done by Strange (2003), Wolfe and Gertler (2004), Beschi and Malerba (2001), Jacobs (1969), Voh Hippel (1994), Rosenthal and Strange (2003), Feldman (1994), Saxenian (1994) and Maskell (2001) conclude that specialized support create strong, innovative clusters. Maskell's (2001) research concludes that pressure for upgrading is supplied by sophisticated and demanding customers. For a more complete analysis of research and specific references, refer to *Strengthening structures: upgrading specialized support and competitive pressure*, pp. 18-19.

The Hollywood movie production industry is an excellent example of this dynamic. The major US movie studios dominate world exports of motion pictures. These movie studios are under intense competitive pressure from sophisticated consumers and very capable rivals. Numerous movie studios compete vigorously against one another in southern California creating intense competitive pressure. The US movie customer, who watches more movies per capita than in any other market in the world, spurs the studios to spend ever more in innovative ways to produce more appealing movies. The studios are supported in this upgrading by the availability of specialized labour including actors, directors, and producers, and the proximity of two leading worldwide film schools (UCLA and USC) which the industry supports generously. The world's greatest concentration of related and supporting motion picture industries, including special effects firms and film camera equipment firms are based in California. Together, the features of the California diamond produce an environment for business that has driven the companies to develop ever more sophisticated strategies featuring relentless upgrading and innovation for continued global leadership. All four factors in Porter's diamond are working effectively to provide the environment and structure for global leadership.

We now turn to assessing how well Toronto's biopharmaceutical cluster performs in these areas. The analysis will help explain the cluster's untapped potential.

### III. Toronto's biopharmaceuticals cluster

As we discussed earlier, the Toronto biopharmaceutical cluster has many elements that should be driving success in a global setting. However, we also showed that in many areas the cluster is not delivering on this potential. Using Porter's cluster work as a lens on the industry's competitiveness, we show the main reason for the cluster's untapped potential is the lack of sophisticated demand.

To assess the strengths and weaknesses for individual clusters, Michael Porter's Institute for Strategy and Competitiveness at Harvard Business School has assembled a set of standardized descriptions of more than 800 industry clusters in 52 countries<sup>21</sup>, ranging from watches in Hong Kong, tufted carpets in Southwest Flanders, and wine in Napa Valley. Each profile measures a cluster in up to 120 dimensions including:

- basic descriptive data such as a cluster's name, location and employment
- statistics covering cluster competitiveness such as world export share, growth, and measures of innovative capacity

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<sup>21</sup> See Institute for Strategy and Competitiveness at: [www.isc.hbs.edu](http://www.isc.hbs.edu)

- complex qualitative information concerning the reasons behind the cluster's competitiveness, its rise, and sometimes also its decline.

These profiles have been culled from a large body of literature on clusters that has been created in recent years by cluster practitioners and academic researchers alike.

We used this profile to assemble data on the Toronto biopharmaceutical cluster. The cluster as determined by US analysis done by Michael Porter and adapted for use in Canada by the Institute for Competitiveness & Prosperity includes the manufacture of pharmaceuticals and health and beauty aids as well as pharmaceutical packaging. Our definition of Toronto in the analysis was typically the Census Metropolitan Area as defined by Statistics Canada. Where possible, to assist in the analysis we compared Toronto's cluster with that of Boston's – one of the leading biopharmaceutical clusters in the US.<sup>22</sup>

In the balance of this section we review the results of the cluster analysis

In summary, our research shows that the industry is being subjected to the wrong kind of competitive pressure by a dominant buyer. Unsophisticated demand is causing an excessive focus on price and not on value and innovation. Concerns about health care budget items mean that innovative products are slow to reach the market. In the area of support, the industry has impressive factor conditions but because of the focus on prices and the reduced acceptance of innovative new products the industry has not attracted the specialized related and supporting industries such as venture capital to help the industry flourish.

We discuss the four factors in turn concluding that:

- Toronto has impressive **factor** conditions
- The cluster benefits from some degree of **rivalry**
- The industry in Ontario suffers from unsophisticated **demand conditions**
- The cluster has a broad, but not deep, base of **suppliers and related industries**.

### **Toronto has impressive factor conditions**

As we evaluate Toronto's general factor conditions – transportation infrastructure, economic stability, market size, etc. we conclude that these are important world-class strengths which provide a solid foundation for any cluster.

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<sup>22</sup> The completed template and a summary presentation are available online from the Institute for Competitiveness & Prosperity at: <http://www.competeprosper.ca/clusters/Cluster-biopharma.pdf>

Toronto also has some significant strengths in specialized factors. There are world-class research hospitals, University of Toronto being the largest medical school in North America, with high levels of research funding from governments and industry. The region produces a large number of medically trained professionals and in fact boasts more graduates on a per capita basis than most US states.<sup>23</sup>

There are a wide variety of specialized health talent being trained in Toronto and Ontario:

- 17 universities graduating more than 17,000 students annually in health professions, science, mathematics, and engineering
- the University of Toronto and its affiliated research institutions comprise the fourth largest medical R&D community in North America
- technical programs at Seneca, Durham, and other colleges of applied arts and technology
- 30 renowned research institutes, including the Hospital for Sick Children Research Institute.<sup>24</sup>

The cluster has developed a highly specialized scientific infrastructure conducting leading edge research in areas such as genomics/proteomics, neurosciences, cancer, cardiovascular diseases, medical imaging, and immunology.

The cluster has used these specialized factor conditions to exploit Canada's competitive advantage in attracting significant investment to its clinical trials and advanced and cost-effective Contract Research Organization (CRO) sector – an integral part to the development of innovations in the global pharmaceutical industry.

The cluster is also supported by government financed research and also benefits from generous research and development tax credits.

### **Toronto benefits from some degree of rivalry**

Our analysis of rivalry in Toronto indicates healthy competitive conditions. There are no restrictions to entry and exit of competitors. All leading pharmaceutical firms have businesses in Canada, with head office either in Toronto or Montreal. Nevertheless, the full potential for competition is limited by the structural factors that weaken innovative demand. Consequently firms in Canada are not competing as aggressively on factors of innovation as are firms in Boston.

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<sup>23</sup> Ministry of Economic Development and Trade (September 2002) "The Ontario Business Report", page 3 [online]. Available from: <http://www.ontariocanada.com/ontcan/en/downloads/obr/obr-2002-sept.pdf>.

<sup>24</sup> ibid p2.

The health care environment has produced few Canadian owned world class competitors despite the importance of the health care spending in Canada. As stated above, Toronto has produced only three companies with revenues greater than \$100 million who are among the top five in the world in their product-market segment and the rest of Canada has produced one.<sup>25</sup> A vibrant cluster with the impressive factor conditions it has, should have produced more global leaders. Boston has four of the top twenty biotechnology firms in the world and Toronto has none.<sup>26</sup>

### **Toronto suffers from unsophisticated weak demand conditions**

On this factor the Toronto cluster is weakest. The region and the province suffer from demanding, but unsophisticated customer conditions. As stated above, the ideal environment features many buyers whose patterns of demand anticipate world demand rather than copying it. Such buyers insist on innovation and upgrading from suppliers. However, the environment in the region is just the opposite. Sophisticated demand drives healthy competition which in turn leads to innovation in products and processes while driving down costs – what analysts call a “positive sum game”. However, health care competition in Canada is a zero-sum game where the participants divide value instead of creating it because competition is focused primarily on containing costs. According to Porter and Teisberg<sup>27</sup>, “this restricts choice and access to services instead of making health care better and more efficient”. While Porter and Teisberg<sup>28</sup> are analyzing the US health care system, a major part of the problem there is the presence of large buying groups focused on reducing cost and “even worse, the objective has often not been to reduce the total cost of health care but to reduce cost that is borne by the system’s intermediaries”. For biopharmaceuticals, we find that the system is characterized by a single dominant buyer, the government itself. This dominant buyer restricts innovation and upgrading in the cluster by:

- focusing on the price of biopharmaceutical products instead of fostering an innovatively competitive environment
- limiting the reimbursement of new products in the marketplace
- slowing down the introduction of new products.

We discuss each in turn.

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<sup>25</sup> *Strengthening structures: Upgrading specialized support and competitive pressure*, pp. 34-38

<sup>26</sup> Euromoney Institutional Investor PLC & Responsive Database Services, Inc. TableBase, Med Add News, 2002.

<sup>27</sup> Michael E. Porter and Elizabeth Olmstead Teisberg, “Redefining Competition in Health Care”, *Harvard Business Review*, June 2004, pp. 65-76. In this article Porter critiques the US health care system but part of the criticism is aimed at single payer systems.

<sup>28</sup> Although, as Porter and Teisberg point out, the US health care system also suffers from competition occurring between large buyers with control of many patients rather than at the level of prevention, diagnosis, and treatment of individual health conditions.

*Dominant buyer conditions focus on price.* The prices for patented medicines are controlled federally by the Patented Medicine Prices Review Board (PMPRB). It uses international price benchmarking to regulate Canadian prices, in effect creating price ceilings. The Canadian price for new products cannot be more than the average price of the seven international peers. In 2003, Canadian prices for patented medicines were about 5% below the international median.<sup>29</sup> This practice creates disincentives for Canadian-based pharmaceutical innovation by restricting funds available for future research and development.

In addition to federally regulated prices, provincial governments implement various policies that have an impact on price. If we use the example of The Ontario Ministry of Health, it dominates the purchasing of biopharmaceutical products in the province through its drug plans for the elderly and lower income patients. Drug expenditures by the Ontario Ministry of Health account for 9 percent of its total expenditures. While the private sector (individuals, insurers, and employers) accounts for the majority of drug sales in Canada, the public buyer through regulation, controls the reimbursement price. For example, in Ontario a price freeze has been in effect since 1994. So even though many buyers exist – and they have every capability and incentive to be sophisticated buyers – one buyer dominates the process. And this buyer is focused on cost containment. A dominant buyer approaching biopharmaceuticals as commodities means less value placed on different ways to treat the same ailment, higher or lower risks of potential side effects, or other ways consumers might differentiate between similar products.

On a per capita basis, Ontarians spend about three quarters of their US counterparts on drug (\$512 in Ontario vs. \$674 in US).<sup>30</sup> While many applaud this, it represents a public policy choice. We have lower prices but the lack of a sophisticated buying process means a less well developed cluster and reduced innovation and upgrading from our impressive factors conditions. The single dominant buyer in the process in Ontario differs from the process in the US – one with multiple buyers whom are both demanding and sophisticated as a result of the pressure placed upon them by the end consumer who is more educated and has multiple choices of health care providers and a system that is less restrictive at the state level. Managed-care<sup>31</sup> comes down to assessing full costs, although Porter and Teisberg (2004) point out that the US system is far from ideal. Nevertheless, more competition between managed care companies alongside

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<sup>29</sup> PMPRB Newsletter – July 2004

<sup>30</sup> PMPRB July Release, available online at: [www.pmprb.cepmc.gc.ca](http://www.pmprb.cepmc.gc.ca), page 4, Canadian Institute of Health Information (CIHI) Quickfacts available online at: [www.secure.cihi.ca/cihiweb/splash/html](http://www.secure.cihi.ca/cihiweb/splash/html)

<sup>31</sup> According to MCOL e-dictionary, managed care is “a type of health care delivery that emphasizes active coordination and arrangement of health services. Managed care usually involves three key components: oversight of the medical care given; contractual relationships with and organization of the providers giving care; and the covered benefits tied to managed care regulations.”

government procurement results in more competition. In turn, this increases sophistication.

*Dominant buyer conditions reduce availability of new products.* Government procurement practices do not simply reduce price. To contain costs government has implemented mechanisms to limit reimbursement of new drugs. Ontario has the one of the most restrictive provincial drug formularies with only 35 percent of new drugs launched between 1997 and 2002 vs. 59 percent of new drugs listed in Quebec, one of the least restrictive provinces. Further, a price freeze has been in effect since 1994, not only limiting industry revenue, but further affecting prices for new products brought to market. By limiting the number of new innovative treatments that are reimbursed, the government's silo mentality is in effect raising total health care expenditures by focusing solely on the price of the drug listed at the expense of the total cost of treatment per patient.

*Dominant buyer conditions slow down availability of new products.* Even for new drugs that are listed, provincial Ministries are slow to list them. In Canada, new drugs face a two-stage approval process. Health Canada has one of the world's longest drug approval times. In 1998, the most recent year for which a full range of international comparisons is available, Canada had the slowest approval time among developed countries. Trends, since that time in comparison with the United States and Sweden, indicate that the situation has not improved – if anything, it has worsened. In 2001, average new chemical entities (NCE) approval time was 717 days vs. 480 in the US and 395 in Sweden.<sup>32</sup> In addition, it takes more than a year, a number that has been decreasing in more recent years, for new drugs to be approved for Ontario's formulary<sup>33</sup> which has an impact on all other sales in the province as other formularies and prescribing physicians often follow its lead. While other payers and prescribing physicians may have the ability to gain access to newer drugs, once approved by Health Canada, many take their lead from the Ontario formulary.

In summary, the biopharmaceutical cluster in Toronto and Ontario suffers from a very poor environment with respect to demand conditions. Pharmaceutical companies are not benefiting from the pressure created by sophisticated customers. The dominant buyer is so concerned about cost containment that its overwhelming motive is to keep the pressure on low prices. This is in contrast to US suppliers of new products and services to their health care providers and payers. This environment has produced a powerhouse of innovative providers of pharmaceuticals and technologies, even though it has room for improvement. In addition, health care budgets are segmented in Ontario. With hospital, physician, and drug costs all managed separately it is difficult for suppliers to make complex value propositions that involve increasing one budget item (e.g.,

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<sup>32</sup> Rx&D

<sup>33</sup> *Provincial Reimbursement Advisor* (August 2002), pp. 56-57.

drug costs) to produce greater reductions in other items (e.g., hospital or physician costs).

With fundamental weaknesses at the level of demand, the support form related and supporting industries has not developed to the level observed in other regions.

### **Toronto's biopharmaceutical cluster has a broad, but not deep, base of suppliers and related industries**

Our analysis of the quality of suppliers to Toronto's pharmaceutical industry indicate that we have a base level of supporting industries, but not the degree of specialization that is required for world class competitiveness. In the area of venture capital, we have fewer firms with highly specialized knowledge and focus in comparison to Boston. In fact research done by the Institute indicates that Toronto has only 18 venture capital firms purporting to have a specialty in health care while Boston, with a similar population to Toronto, has 44. Similarly in the area of management consulting, a critical input to health care business strategies, Toronto does not have the breadth and depth as can be found in Boston. We find that Boston has three times the number of management consulting firms who indicate they have a health care practice. In fact, none of the world's leading strategy consulting firms – McKinsey, BCG, Bain or Monitor – has a Toronto-based health care practice while each has one in their Boston offices. In the area of specialized legal support, Boston and Toronto have similar numbers of firms indicating this capability (20 vs. 17).<sup>34</sup>

These kinds of specialized support spring up in response to the existence of entrepreneurial firms with attractive businesses and unique-to-Toronto commercial opportunities. In Toronto, venture capitalists may be less inclined to finance startups that face price-driven customers who themselves have no competitors. Management consultants will be less inclined to develop local knowledge to assist Toronto firms when innovative business strategies are often precluded. And so the virtuous circle associated with Porter's diamond is short circuited.

In summary, the work done by Porter and other researchers points to the importance of both pressure and support in the development of world class clusters that innovate and upgrade. When elements of pressure – sophisticated and demanding customers along with capable rivals – coexist with support – high quality factor inputs and capable suppliers and related industries – vibrant clusters emerge. In addition a self-perpetuating dynamic is created where

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<sup>34</sup> Institute for Competiveness & Prosperity analysis based upon Boston Lawyer Directory, Ontario Bar Association, Massachusetts Venture Capital Services, Canadian Venture Capital Association, Boston Business Journal and Canadian Association of Management Consultants.

pressure draws forth support and support creates conditions for greater pressure. As a corollary however, if one of the elements of pressure or support is not fully developed, the cluster will not likely develop.

It is this latter condition that applies to the Toronto biopharmaceutical cluster. A key element of pressure, sophisticated demand, is resulting in the cluster underperforming its full potential given the high quality factor conditions in the region. Without this sophisticated demand, innovation is less frequently observed and supporting resources are not developed.

#### IV. Implications for Policy Makers

What can be done to strengthen Toronto's biopharmaceutical cluster within the constraints of the single payer system which is in place?

We discuss potential solutions that:

- Enhance customer sophistication by drawing more on the promise of disease management
- Strengthen related and supporting industries by providing targeted support for health sector venture capitalists
- Increase the capability for local firm rivalry by expanding outsourcing and by providing development support for health care entrepreneurs.

We discuss each in turn.

*Enhance customer sophistication by drawing more on the promise of disease management.* Within the current system, it is difficult to conceive of a dramatic increase in the level of competitive intensity driven by sophisticated customers. However, as governments, both federal and provincial, continue to be committed to innovation and commercialization they need to look for opportunities, perhaps within specific disease states, to open up competition and to encourage the flourishing of specialized providers and treatments. Disease state approaches consider the life cycle of a medical condition with patients and assess the full cost of preventing and treating the disease through its life. As Porter and Teisberg point out, "It is at this level that true value is created – or destroyed – disease by disease and patient by patient. It is here where huge differences in cost and quality persist. And it is here where competition would drive improvements in efficiency and effectiveness, reduce errors, and spark innovation... The fundamental economics of health care are driven at the level of diseases or

conditions. Numerous studies show that when physicians or teams treat a high volume of patients who have a particular disease or condition, they create better outcomes.”<sup>35</sup> The benefits of specialization by disease have been shown to exist in drug research and treatment.<sup>36</sup> By embracing disease management in a small number of disease states, the Ministry of Health could enhance its status as a sophisticated buyer. By focusing on the full cost and treatment outcomes in specific disease states the Ministry could stimulate competition by providers at all stages and approve new treatments based on fully assessed costs and success outcomes.

One suggestion for the Ministry of Health could be the creation of an “Adoption of Innovation Fund” as proposed by Porter and Teisberg for the US Medicare program to support the spread of promising therapies (approved by the US FDA or Canada’s Health Protection Branch). “Providers working with technology suppliers, pharmaceutical companies, and payers, would compete to win the funding under well defined standards for institutional review and informed patient consent”<sup>37</sup> This would encourage the dispersion of innovative, often expensive, new care treatments for patients. As a result of such a program, treatments would become more cost effective and more widely used.

***Strengthen related and supporting industries by providing targeted support for health sector venture capitalists.*** While market forces are most effective in drawing more venture capital to the cluster, some public policy support may be effective. The Accounts Receivable Insurance program of Canada’s Export Development Corporation (EDC) provides a model. EDC insures Canadian exporters against unpaid receivables from foreign buyers. It is a highly targeted program designed to help potential exporters overcome a problem that might prevent them getting started exporting. In a similar way, the greatest danger for a venture capitalist in funding a start-up is the first “reference sale” – the first trial with a prestigious customer. This reference helps smooth the way for future sales growth. A program with a panel of medical experts recommending “reference sale insurance” for venture-funded biopharmaceutical start-ups would encourage funding. As with EDC, the goal would be a lower cost program to government as the panel would provide solid expertise in recommending which new products to insure.

***Increase the capability for local firm rivalry by expanding outsourcing.*** Policy makers need to explore opportunities for getting more of its health care spending in the hands of entrepreneurial firms that are given the incentive to innovate and upgrade for the global market. If there are greater revenue streams available to entrepreneurial firms, more venture capital will be attracted to the cluster. With more firms serving the health care providers, rivalry will intensify, thereby

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<sup>35</sup> Porter and Teisberg, pp. 66-67

<sup>36</sup> *ibid.*, p. 67

<sup>37</sup> Porter and Teisberg, “Redefining Competition in Health Care”, p. 75

increasing beneficial pressure. A good example is the case of Hydro Quebec, which chose to outsource much of its engineering work instead of performing the work in house; in so doing, helping to create a competitive rivalry between two engineering consulting firms, SNC and Lavalin<sup>38</sup> giving them both scale to become global players<sup>39</sup> and spurring the creation of a strong cluster.<sup>40</sup> In contrast to the successful Hydro Quebec story, Ontario Hydro, operating in the same set of circumstances, built a large internal engineering department to build its facilities. As a consequence of this decision, Ontario Hydro did not help to create a globally competitive construction engineering cluster in Ontario and further, when construction was complete, eliminated these valuable human resources.

*Increase the capability for local firm rivalry by providing development support for health care entrepreneurs.* Many observers note the gap between research scientists and entrepreneurs in the life sciences field. Researchers do not have the business skills necessary to make their ideas and inventions easier to commercialize. A program could be designed at business schools to bring scientists and entrepreneurs together with content focused on issues related to commercialization of health-related innovations – product/service development, marketing and sales in the health sector, financial planning, human resources in health-related start-ups, etc. Beyond the provision of content, the program could pair off scientists and entrepreneurs to develop business plans around specific research opportunities. These business plans would be exposed to the group as a whole for critique and refinement. Finally, a panel of venture capitalists could be invited to review presentations of the plans and provide feedback. The desired output could be several projects that are funded, plus the development of commercialization skills among program participants. If done rigorously, the program could lead to a valuable credential that venture capitalists would look for in their consideration of funding.

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Given our huge investment in Canada's health care system, it is surprising at first blush why Canada's and Toronto's biopharmaceutical cluster isn't more globally competitive. However, our analysis of the cluster dynamics indicates that because of our unsophisticated demand structures and process, this unfilled potential is not surprising.

We can dramatically improve the results of globally competitive health care products and services, but only if we address the competitive pressure created by sophisticated customers. In turn, this will encourage greater competition among

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<sup>38</sup> Companies have subsequently merged

<sup>39</sup> See pp. 34-37 in *Strengthening structures: upgrading specialized support and competitive pressure*

<sup>40</sup> Martin, Roger L., Where are the Exports? The Canadian Health Care Mystery, November 2003 [online] available at: <http://www.competeprosper.ca/clusters/HealthCareInnovation.pdf>

cluster participants and attract deeper supporting and related industries to support it.