ADOPTING OUR ADVANTAGE:

Supporting a Thriving Health Science Sector in Ontario

PART III OF THE ONTARIO CHAMBER OF COMMERCE'S 2016 HEALTH TRANSFORMATION INITIATIVE

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ABOUT THE ONTARIO CHAMBER OF COMMERCE

For more than a century, the Ontario Chamber of Commerce (OCC) has been the independent, non-partisan voice of Ontario business. Our mission is to support economic growth in Ontario by defending business priorities at Queen's Park on behalf of our network's diverse 60,000 members.

From innovative SMEs to established multi-national corporations and industry associations, the OCC is committed to working with our members to improve business competitiveness across all sectors. We represent local chambers of commerce and boards of trade in over 135 communities across Ontario, steering public policy conversations provincially and within local communities. Through our focused programs and services, we enable companies to grow at home and in export markets.

The OCC provides exclusive support, networking opportunities, and access to innovative insight and analysis for our members. Through our export programs, we have approved over 1,300 applications, and companies have reported results of over $250 million in export sales.

The OCC is Ontario's business advocate.

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GLOSSARY

Angel investor: An individual who invests their own money in a venture, usually small amounts early in the development cycle. They may already be a successful entrepreneur who is also contributing expertise alongside capital. Angels are known for contributing "patient" capital, as they tend to have a longer-term outlook.

Cluster: Close assembly of interconnected firms and institutions, usually operating within the same industry or closely related industries.

Health science: Those sectors which contain and overlap with health and human sciences. These include biomedical, psycho-social, medical technologies (such as devices), pharmaceuticals, and relevant life sciences.

Valley of Death: A stage within the health technology innovation cycle that is particularly difficult for ideas or firms to navigate. Health science start-ups face two valleys of death:

> ***Technological Valley of Death:*** The stage in which researchers and entrepreneurs struggle to move an idea to a proof of concept.
>
> ***Commercialization Valley of Death:*** The point in which a firms attempts to go from demonstration to early adoption. This is the stage in which entrepreneurs must demonstrate revenue potential, enough to capture the investors that will allow them to expand.

Venture capital (VC): A type of equity financing, usually deployed for early-stage innovation-focused firms. VC investors buy shares of a firm rather than lend money, and tend to do so later in the investment cycle and in larger amounts than early, individual investors.

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INTRODUCTION

Ontario's health science sector is positioned for success. We are established leaders in fields such as medical technology and health IT, and are gaining traction in everything from genomics to global clinical trials. Ontario is also gifted with a robust research community and entrepreneurial culture.[1] Governments at both the federal and provincial level have identified the sector as an area of comparative advantage. Beyond Canada, the global market for health products continues to heat up.[2]

Yet, there is also a growing sense that much of the sector's potential is unrealized. A recent report from the Conference Board of Canada gave Ontario's broader innovation ecosystem a "B" grade, while reports from sources as diverse as Life Sciences Ontario (LSO), the Ontario Bioscience Innovation Organization (OBIO), PwC, and the Ontario Health Innovation Council (OHIC) all describe Ontario's capacity to capitalize, commercialize, and adopt innovation as challenged. Though top ranked in public spending on R&D, the province lags in industry R&D spending, patenting, and labour productivity. We are also facing serious hurdles getting our ideas to market, thus limiting return on both public and private investment.[3]

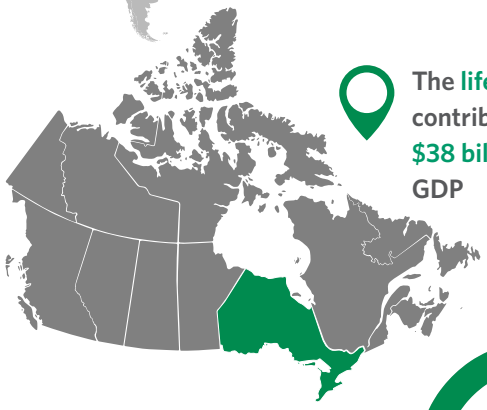
The commercialization challenge is particularly acute in the health science sector, as it is often characterized by long development cycles, cost intensive pathways to proof of concept, complex products and services, and highly regulated entry to market.[4] Compounding this, the government has inadvertently established a series of barriers to growth, especially as it relates to access to capital, talent, and the market. The result is an environment in which successful firms leave the province, stay but fail to scale, or supply their innovations in jurisdictions outside of Ontario.

Change across a series of touchpoints – from tax law to immigration to procurement guidelines – could kick-start a health innovation revolution in Ontario. To fully realize our potential in this sector, though, we need a governmental strategy that supports innovation through research funding, cluster development, and better engagement with business. The Ontario Chamber of Commerce believes the time is right to clear a pathway to success.

This report identifies four areas of challenge and opportunity for the provincial and federal governments, as well as for industry. It provides a set of recommendations that when applied together could support our growing health science sector and ensure Ontario reaps the benefits of its global success. We believe it is critical to focus on providing greater access to local capital, experienced talent, and the Ontario public health care system, ideally under a cohesive, federal innovation strategy.

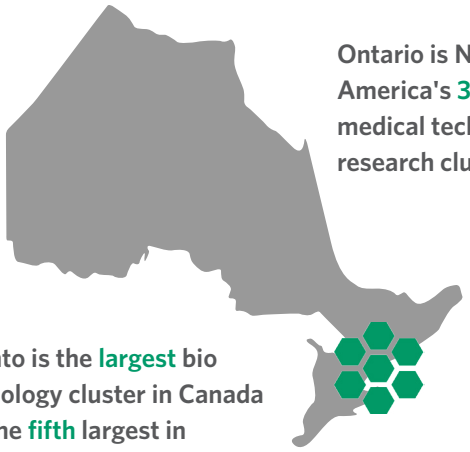
THE HEALTH SCIENCE SECTOR IN ONTARIO

Health sciences and related sectors play an important role in Ontario's economy and are helping put us on the map globally



The **life sciences** sector contributes more than **$38 billion** to Ontario's GDP

Life science in Ontario exports **$5.7 Billion** each year That's **two thirds** of all Canadian life science exports



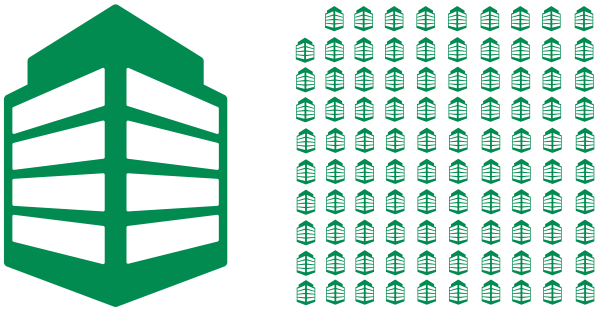
Ontario is North America's **3rd** largest medical technology research cluster

Toronto is the **largest** bio technology cluster in Canada and the **fifth** largest in North America

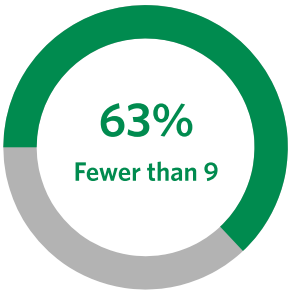
But while Ontario excels at creating solutions, we are not as strong at translating those into sales...

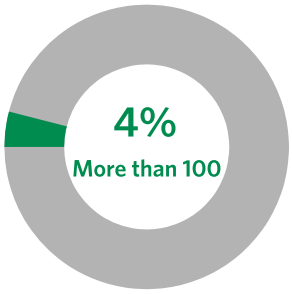
Ontario produces **fewer** health sciences firms compared to competitor jurisdictions

There are approximately **100** biotechnology companies on the Toronto Stock Exchange but only **1** of them is a billion-dollar firm



Ontario life sciences firms face a serious scalability challenge: **63%** of companies have **fewer than 9** employees, and **only 4%** of companies have **more than 100.**





Sources: LSO, 2015; InvestToronto. 2015. Toronto's Life Sciences Sector. http://www.investtoronto.ca/InvestAssets/PDF/Sector_One_Pagers_Life_Sciences_English.pdf; Government of Ontario. 2016. "Ontario Investing Over $4 Million to Expand R&D in Medical Devices"; https://news.ontario.ca/medt/en/2016/03/ontario-investing-over-4-million-to-expand-rd-in-medical-devices.html?utm_source=ondemand&utm_medium=email&utm_campaign=p; TRBOT, 2012; DEEP, 2014.

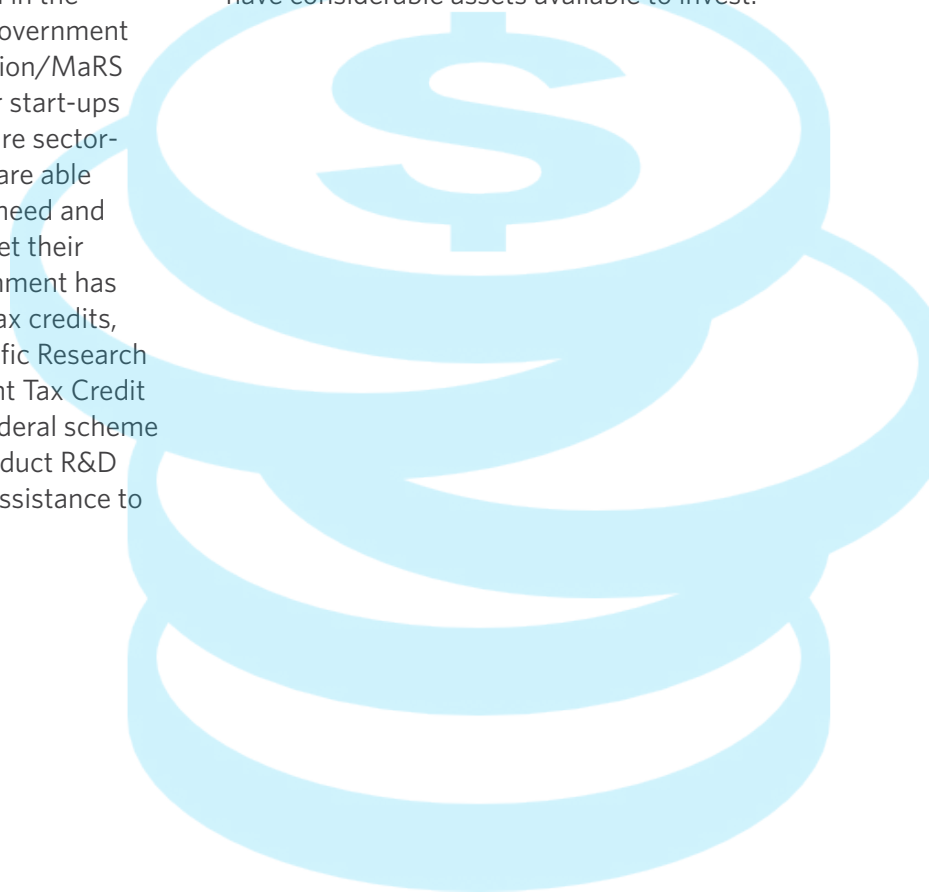
CHALLENGE:
Encouraging Local Investment

CHALLENGE:
Encouraging Local Investment

The Canadian venture capital sector has recently emerged from a decade of poor returns, the result of the dot-com bubble at the turn of the century and the recession of 2007/8. These lean years contributed to the country's reputation as a site of conservative and risk-averse investment. Innovative Canadian companies, especially those operating outside of traditional sectors like natural resources, have therefore found it difficult to attract the local capital necessary to develop their products, commercialize, and scale. The health science sector has been a notable victim of this environment.

Encouragingly, there have been some efforts in recent years to curb capital drought through programmatic changes in both the public and private sectors. For example, giving special attention to those commercialization challenges experienced in the development cycle "valley of death", the government has launched initiatives like MaRS Innovation/MaRS Discovery District. This kind of support for start-ups is critical, as incubators and accelerators are sector-specific and goal-oriented. Entrepreneurs are able to access the specialized knowledge they need and be in an environment that is designed to get their discoveries to market. Additionally, government has sought to incentivize innovation through tax credits, the most significant of which is the Scientific Research and Experimental Development Investment Tax Credit (SR&ED ITC or SR&ED), developed as a federal scheme in the 1980s to encourage business to conduct R&D in Canada. SR&ED delivers $1.8 billion in assistance to 18,000 businesses annually.[5]

However, when substantial private capital is made available within the health science sector, much of it comes from foreign sources. As local companies grow, they often face a "capital cliff" in which the share of domestic investors who are willing to provide necessarily large amounts of capital shrinks. This means made-in-Ontario companies tend to turn to the US to fund the next stage of their development.[6] Foreign investors are more aggressive when it comes to risk, and there is a perception that Canadian investors will only bite after an American has made a major commitment.[7] While matching Ontario entrepreneurs to capital is always welcome, it has become increasingly clear that out-of-Ontario financing can drain the province's talent, technology, and tax revenues by luring firms to other markets.[8] We are failing to develop or leverage more localized financing solutions, even though Canadian corporations and large institutions have considerable assets available to invest.[9]



As such, the capital environment within Ontario remains underdeveloped. While government involvement can increase the likelihood of a firm reaching initial public offering or being acquired, high levels of public investment may crowd out private venture capital, further compounding the challenge of too little domestic investment.[10] Further, while SR&ED has been broadly successful, some qualifying firms have expressed frustrations, particularly about the administration of the program and its narrow focus. Although SR&ED is one of the most generous R&D tax incentives in the world, Canada still ranks low on business R&D expenditure compared to other OECD countries.[11] The program is seen as poorly suited to high-tech or experimental innovation development.[12] A DEEP Centre survey of executives found the SR&ED process to be "onerous, lengthy and a boon for consultants and lawyers".[13] For SMEs especially, narrow eligibility criteria and overly complex application processes can discourage them from even applying.[14]

We can see the effects of these challenges in our lack of large, local health science firms. Looking at Canada broadly, our share of such firms is lower than comparator jurisdictions, even those with similar health care systems like the United Kingdom and Australia.[15] There are only 100 biotechnology companies listed on the Toronto Stock Exchange, and only one billion-dollar firm in this sector. In comparison, the UK and Australia each have five.[16]

Commercialization Valley of Death

Source: OHIC, 2014.

Recommendations

1 Encourage the investment of untapped capital in institutional funds into health science firms

Large institutions such as Canadian pension funds, banks, and telecommunications firms hold a high volume of liquid assets.[17] Between the Ontario Teachers Pension Plan and the Ontario Municipal Employees Retirement Savings (OMERS) Plan, for example, there is more than $170 billion in assets available for investment.[18] But given the small number of major institutions in Canada and their oversized capital assets, their investment strategy is less likely to include small, high-risk innovation portfolios. OMERS is currently leading the way in Ontario with OMERS Ventures, but in high tech, not in health science.[19] However, if their experience in that sector proves successful, it may inspire other institutions to create similar funds across a variety of innovative sectors.

Therefore, we call on major Canadian institutions to extend their investment portfolios to ventures in the health science sector, as a means of participating in and reinforcing the high-growth innovation economy into which Canada is transitioning. Additionally, the government should examine restructuring the Venture Capital Access Plan (discussed below) to better encourage pension funds, corporate VCs, and similar investment institutions to participate.

OMERS VENTURES

OMERS Ventures is the VC arm of one of the largest public employee pension funds in Canada. Its goal is to invest in knowledge economy firms through their entire development cycle. Through this initiative, OMERS has invested in some of the largest Canadian tech success stories, including HootSuite, Shopify, and Wattpad. While one of their target sectors for investment is health care IT, the majority are in traditional high-tech sectors like telecom, media, and software.

2 Improve the SR&ED credit

Access to SR&ED, and its effectiveness as a program, could be improved in three ways:

a. Provide firms with the ability to choose a refundable R&D wage tax credit, which would help to attract and retain talent as well as support R&D. This would offset the impact of the recently reduced ability of firms to claim wage expenditures.

b. Change SR&ED credit eligibility to allow non-Canadian firms that engage in commercial development research activities in Canada to benefit from the credit.

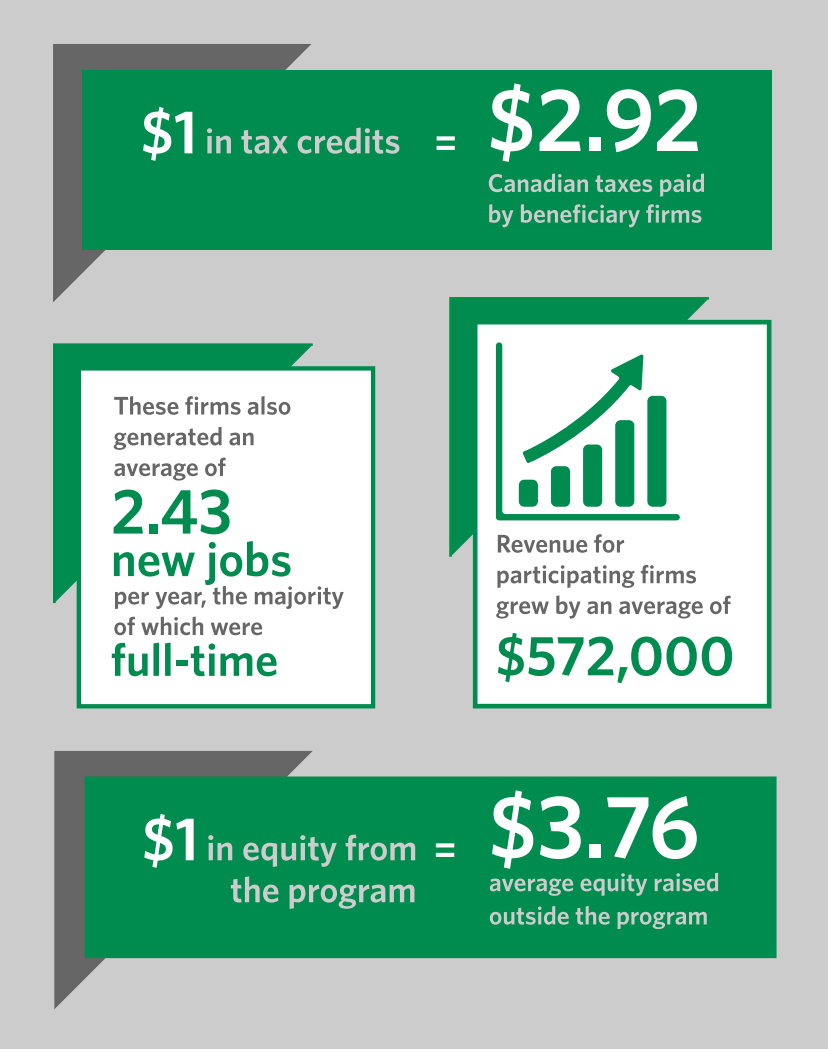
c. Make the SR&ED credit application more predictable, broad, and easy to navigate. As suggested by the DEEP Centre, a "cross-jurisdictional government interface" to help streamline the process and ensure that firms understand the assistance available would be incredibly valuable to entrepreneurs.[20]

Recommendations

3 Duplicate and expand the British Columbia angel investor tax credit

The government of British Columbia currently provides a 30% refundable tax credit to investors who put up to $200,000 into eligible businesses (up to a maximum of $60,000 in credits per investor, holding the principle for at least five years). According to the University of British Columbia, this credit results in greater tax revenues, creates jobs, and provides much-needed "capital leverage" for participating companies.[21]

This credit could be of particular assistance to health science entrepreneurs, as angel investors are "patient" capital that tends not to put excess pressure on companies to sell early.[22] As the development cycle in this sector lasts an average of 17 years before firms are ready to commercialize, patient capital is necessary.[23] For that reason, the Ontario government should look to duplicate this program. The OCC also echoes the Canadian Chamber of Commerce's call to expand the program federally, with a 15% matching tax credit between the federal government and the provinces to reach the overall credit of 30%.[24]



Source: Canadian Chamber of Commerce, 2015; Hellmann and Schure, 2010.

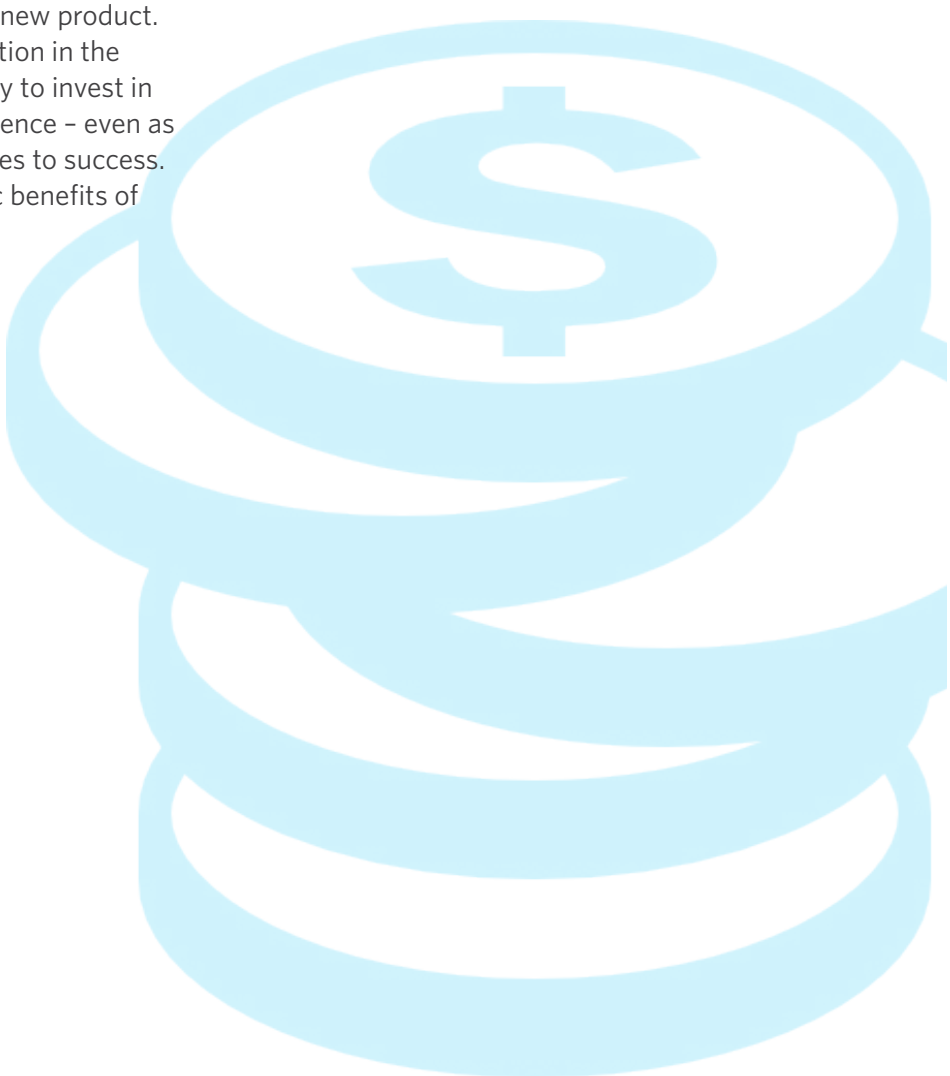
4 Extend flow-through shares to the health science sector

A flow-through share approach allows the tax deductions a new firm might enjoy to be renounced and instead passed along to investors, as a way of mitigating risk in innovative ventures and therefore incentivizing investment. With flow-through shares, investors are spending less than $1 for every $1 they invest. As the firm in which they are investing has no taxable revenue, this does not negatively impact their finances but instead makes it easier to raise capital. In Canada, flow-through shares are currently employed largely by the mining and extraction sector.

Recently, some groups have proposed the use of flow-through shares in the high tech sector, and increasingly health science as well, as both sectors create start-ups that will not generate income during the many years it takes to develop and bring to market a new product. Thanks to the flow-through share exemption in the extraction sector, it is currently less costly to invest in natural resources compared to health science – even as they have similarly long and risky timelines to success. A study by PwC found that the economic benefits of extending flow-through shares to the biotechnology sector alone would be substantial, with an increase in R&D spending of $411 million and an increase in taxes collected to the tune of $80 million.[25]

However, flow-through shares come with a series of potential downsides, including the passing on of SR&ED credits to investors. If flow-through shares are to be extended to other sectors, the guidelines should be looked at with fresh eyes and potentially re-vamped to ensure that the benefits "flow" in the right direction.

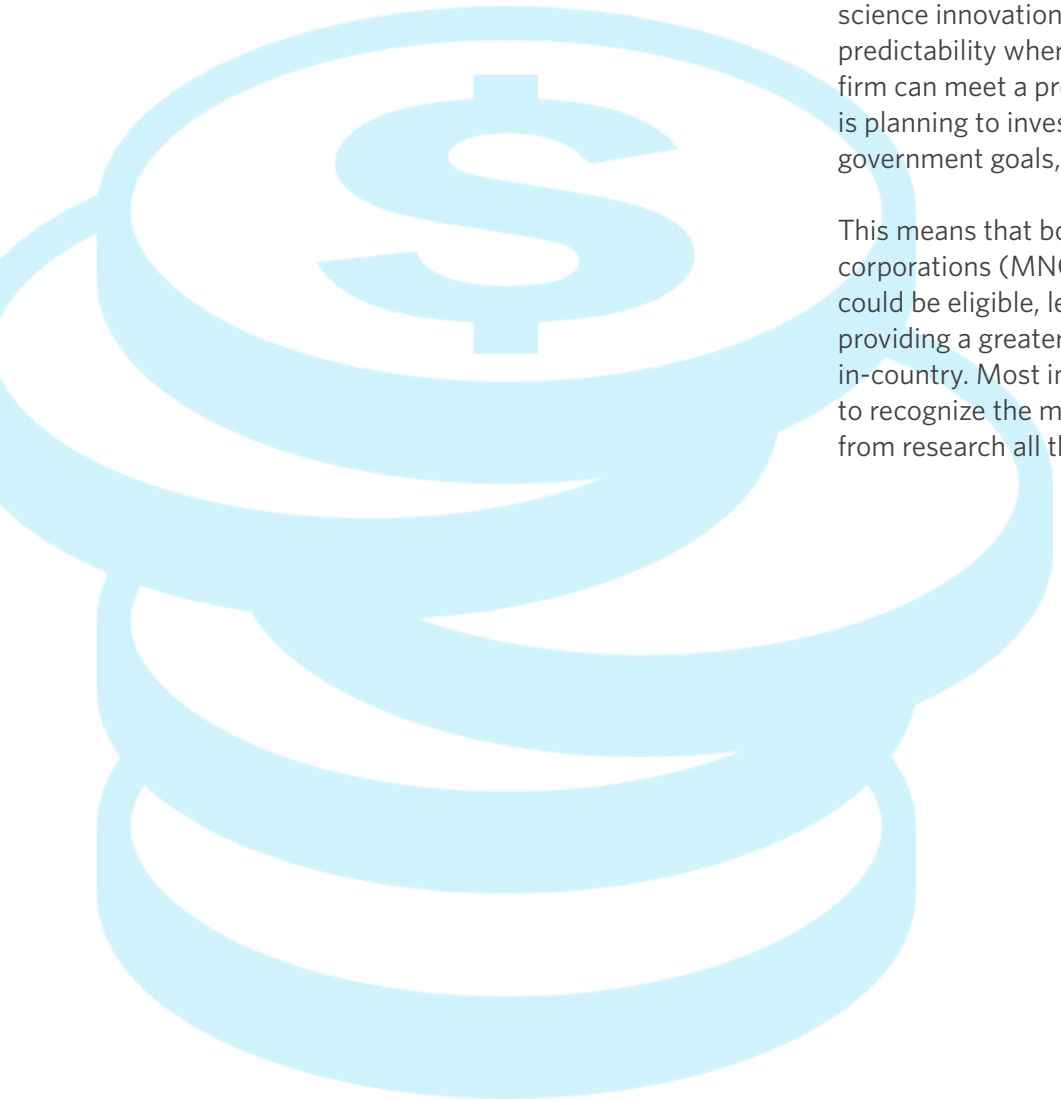
With that in mind, the OCC calls on government to extend the flow-through share program to the health science sector. We particularly encourage this if the high-tech sector is to be granted this exception; health science is a similarly innovative, high-growth sector that should be extended this privilege if evidence-based analysis indicates its benefit.



Recommendations

5 Renew the Venture Capital Action Plan (VCAP)

A possible means of utilizing public dollars while allowing the market to operate without being crowded out by government is the extension of the VCAP program. Set to expire in 2018, this program created a $400 million matching fund for venture capital dollars that has resulted in an uptick in available VC across the country. The Business Development Bank of Canada estimates that $900 million in private capital has been added to the ecosystem as a result of VCAP, leading to investments in nearly 100 Canadian firms.[26] We call on the government to renew VCAP, and to consider encouraging or incentivizing investment in this sector through a dedicated VCAP fund.



6 Expand federal sector funds to include health science

The federal government has created a series of dedicated sector funds to support companies seeking major project funding. These include the Automotive Innovation Fund in Ontario and an aerospace initiative in Quebec. They build on existing sectoral strengths, and are designed to improve the productivity and competitiveness of Canadian firms through increased R&D capacity, job creation, and by acting as a catalyst for private investment.

Although there are legitimate concerns with respect to the equity and effectiveness of sectoral funds, insofar as these funds exist they should be prioritised toward key industries, of which health science is one. A health science innovation fund would provide access and predictability where it is needed most. As long as a firm can meet a proposed investment threshold and is planning to invest in areas that align with broader government goals, any size of business is welcome.

This means that both local start-ups and multi-national corporations (MNCs) looking to invest in Canada could be eligible, leading to greater sector diversity and providing a greater "pull" factor for businesses to stay in-country. Most importantly, these funds are structured to recognize the multiple stages that require investment, from research all the way to adoption.

CHALLENGE:
Training and Retaining Experienced Talent

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Ontario has a tremendous health science talent pool, one that we have developed by investing heavily in our education system and research institutions, and which has been supplemented by our province's ability to attract the best and brightest immigrants. However, we still struggle with a skills gap, especially when it comes to experienced talent. Nearly a third of OCC members cite an inability to hire and retain skilled talent as the factor having the greatest impact on their ability to do business – and that number is even higher (39 percent) within the health sector.[27] An OBIO survey of health science companies revealed a similar story: 37 percent say that access to talent, networks, and expertise is a barrier to scaling.[28] Ontario's inability to grow, attract, and retain talented individuals is a major hurdle to commercializing and adopting our world-class innovations, and scaling the resulting businesses.[29] When it comes to Ontario's health science sector, we need to build a pipeline for experienced talent.

This sector faces the greatest difficulty in recruiting skilled managers, and investors report concerns about the lack of experience among entrepreneurs when it comes to acquiring funding for R&D or expanding to international markets.[30] As firms age, technical skills become less important than business skills, particularly management, finance, and/or sales capabilities. Critically, there is a link between a lack of financial and management skills and the high failure rate of start-ups.[31]

While we don't lack in entrepreneurial spirit, Ontario's health science start-ups often lack the experience necessary to create the kind of companies that can escape the commercialization valley of death.[32] Businesses that are able to successfully come to market and grow are the ones that generate the wealth and experience that can then be re-invested in the next start-up; this creates serial entrepreneurs who make it that much easier for the following generation of firms to succeed.[33] Today's start-ups are receiving a considerable amount of capital and mentorship from American or other outside investors, making a move abroad that much easier and more attractive.[34] Those experienced, serial entrepreneurs are scarce in Ontario because the climate creates few of them and retains even fewer. They are therefore not present to mentor or invest in new ventures, meaning the sector is experiencing a talent catch-22.

Recommendations

1 Build size-diverse private sector partnerships

Large firms and MNCs play an important role in the creation of a sectoral ecosystem. They can serve as mentors, investors, and purchasers of innovation. They can also act as industry leaders, particularly when interacting with government. For small firms, these "anchor customers" are particularly valuable as they contribute product or service validation and can be "market makers" by acting as early adopters.[35] Anchor customers are especially important if government contracts are difficult to win.

A DEEP Centre survey of executives found that many emphasized small firms as sources of innovation, with 90 percent agreeing that "SMEs play an important role in innovation and R&D".[36] Engagement with these firms is a critical source of competitive advantage for MNCs because they accrue innovation benefits from investing, mentoring, or creating closer supply chain relationships with start-ups and SMEs.[37] However, supplier diversity is not just "happenstance" – it is supported by dedicated programs.[38] Johnson & Johnson's JLabs initiative is an excellent example of such a large-scale program, wherein a major corporation creates an environment in which local start-ups can grow, and where the corporation gains unprecedented (but not exclusive) access to nnovative ideas.

To that end, the federal government can use tax credits to encourage collaborative R&D: SR&ED tax credits should be re-aligned to incentivize R&D between industry players, universities, or public research institutions. Many countries, particularly in Europe, allow for such credits, as they are often a means of supporting more exploratory science.[39]

THE BIRD MODEL

In order to take advantage of foreign interest in Canadian companies while ensuring they maintain a foothold here, we might look at the Binational Industrial Research and Development (BIRD) model operated between the US and Israel. Established in 1977, over 800 companies have used BIRD, and sales of products developed through the program have exceeded $8 billion.

Two high-tech companies, one registered in each country, jointly apply for BIRD funding to cover up to half of product development and commercialization costs. Often, joint proposals are between firms of differing sizes, with the larger company providing sales and service expertise while the smaller one tackles product development and manufacturing. This means that besides funding, one of the greatest advantages of BIRD is the linking of small firms to larger ones, establishing access to the experienced talent and mentorship that SMEs so often need.

Recommendations

2 Create executive-class visas

While the private sector can build talent through investment and mentorship, government can help attract talent by creating specialized visa programs. In *Breaking Barriers: Ontario's Scale-Up Challenge*, the Ontario Chamber of Commerce recommended the creation of a scale-up visa to help facilitate the hiring of specialized international talent, potentially under the International Mobility Program.[40] Similarly, Australia's experienced executive program, the Senior Executive (Provisional) Visa, could be an initiative we replicate in Canada.[41] This is a visa for senior employees who have significant assets and "a genuine and realistic commitment" to contribute to the management of a new or existing business – exactly the kind of talent our health science sector requires.[42]

CONNECT SAN DIEGO

CONNECT is a cluster development organization founded in 1985 by UC San Diego in partnership with the San Diego Regional Economic Development Council and other industry stakeholders. Its primary goal is to help companies scale so that they themselves can contribute to a self-sustaining health science cluster.

In order to combat the challenge of having too little experienced talent, CONNECT created Springboard, a group of over 500 "Entrepreneurs-in-Residence" who act as mentors to the city's start-up community. The 30-year success of the program has resulted in not only an environment rich in serial entrepreneurs and individuals experienced in the sector, but also created a series of mini-clusters outside of health, which contribute to a broader strengthening of the San Diego economy.

CHALLENGE:
Adopting and Diffusing Innovation Within the Public Market

CHALLENGE: Adopting and Diffusing Innovation Within the Public Market

While Ontario is a significant source of innovative health science, we struggle to integrate these discoveries into our public health care system. On the Global Competitiveness Index, Canada is ranked 55 out of 140 when it comes to government procurement of advanced technology.[43] Access to the Canadian market is estimated to take more than two years longer than the processes of other developed countries. Our process lacks transparency and predictability, and is considered burdensome and cumbersome by vendors. It is particularly difficult to navigate for SMEs, as there are fewer procurement processes geared towards assisting these companies as compared to other jurisdictions.[44]

It is particularly frustrating that many Ontario-based health entrepreneurs fail to find a local market for their products and services despite the evident need in the province, particularly in the publicly funded health care sector. For example, the province has made a major investment in genomics and individualized medicine, yet does not have a reimbursement framework for molecular diagnostic tests within its own system.[45] This means that Ontarians are not able to access the individualized disease testing that is being developed in their own backyard. If the government invests in our universities, hospitals, research institutions, and start-ups but the result of that investment is not available to Ontarians, we are not earning a satisfactory ROI.

The largest pathway to adopting new technologies into our health care system is procurement. Unfortunately, a cost-first mindset among buyers, siloed budgets at all levels of the system, and a timidity to engage creatively with the Broader Public Service Directive guidelines means that the path is littered with hurdles.[46] This problem has been highlighted by the Ontario Health Innovation Council (OHIC), which recommended greater collaboration between government and stakeholders to develop better co-ordinated pathways, including an optimization of existing adoption programs like MaRS EXCITE and the Council of Academic Hospitals of Ontario (CAHO)'s ARTIC initiative.[47]

The Ontario government has begun to dedicate funds toward technology adoption and diffusion, as this is an expensive and disruptive process that often effectively stops firms from supplying the public market. The $20 million Health Technologies Fund announced under the mandate of the Chief Health Innovation Strategist is a good start, but will require a larger and more long-standing investment to be truly impactful.

If innovative health tech companies across Ontario are unable to access the domestic market, it is much more difficult for them to create a business case to stay here.[50] OBIO's survey of health science companies found that many have trouble selling their products in Ontario, and note that Canada overall is seen as too focused on short-term cost considerations and not responsive to alternative approaches like risk-sharing, negotiation, or value-based pricing.[51]

Procurement reform is critical to providing Ontario patients access to Ontario discoveries, and ensuring our system is an attractive market for health innovation from other jurisdictions.[52] The OCC has previously examined the challenges to procurement in Ontario's health care system in *Prescription for Partnership: How New Models of Collaboration in Health Care Can Make Outcomes a Priority.* Our recommendations include value-based procurement practices that emphasize innovation and risk-sharing, and increased collaboration with all stakeholders, including vendors and health care providers. Fundamentally, public sector decision-making needs to strike a more consultative and transparent tone so that long-term relationships between public and private actors can be established, and the health care and health science sectors can be linked.

ADOPTION AND DIFFUSION PROGRAMS

The task of bringing innovative techniques and technologies into Ontario health care centres is being taken up in some corners of the sector. The province now has two major research adoption and diffusion programs: The Health Technology Exchange's Resources for Evaluating, Adopting and Capitalizing on Innovative Healthcare Technology (REACH), and the Adopting Research to Improve Care (ARTIC) Program, originally developed by the Council of Academic Hospitals of Ontario (CAHO).

The goal of REACH is to "help Ontario public healthcare delivery organizations use new ways to evaluate, procure and more rapidly adopt beneficial medical technologies addressing high-priority health system problems".[48] Any publically-funded health care organization can participate, with community hospitals being heavily represented in the program and its success stories. REACH has resulted in innovative procurement practices being put in place, and allowed institutions to explore the grey areas of the Broader Public Service Directives in order to better engage with industry. The goal is to increase capacity for innovation procurement and adoption, changing buyer culture and inspiring even non-REACH organizations to transform the way they incorporate innovation.

The ARTIC Program, now co-led by CAHO and Health Quality Ontario, is a model for accelerating the implementation of research evidence into broader practice. Too often research evidence and best practices that improve quality care are successfully implemented and adopted into practice in one organization, yet this knowledge is never spread to other organizations. The ARTIC model of supporting and accelerating the use of proven evidence means participating care centres are able to implement change a lot faster – within two years, instead of 17.[49] By facilitating the implementation of evidence quickly and efficiently, patients receive higher quality care, sooner. CAHO originally developed the ARTIC Program in 2010 to accelerate the adoption of research evidence within hospital settings. In 2014, CAHO and Health Quality Ontario formed a partnership to transition ARTIC into a provincial resource to support the rapid implementation of evidence across the health system. Through this partnership, the Program has extended its reach, with five projects currently underway that move beyond research hospitals into community hospitals, primary care and community services.

Recommendations

1 Ensure funding is provided at all stages of the innovation cycle

The government should consider enshrining a dedicated share of procurement budgets to go towards purchasing from Ontario-based start-ups. An example of this is the federal Small Business Innovation Research Program (SBIR) in the US, which requires large government departments to set aside 2.5 percent of their internal R&D funding for contracts with start-ups.[53] A similar program may be an appropriate initiative undertaken within the upcoming federal Innovation Agenda.

2 Create a single point of entry for firms

Rather than having to pitch and negotiate with individual physicians, hospitals, LHINs, or group purchasing/shared service organizations, firms should have a means of accessing a larger market through one touchpoint to encourage buyer interaction with new vendors and new products.

There have been some efforts to create such touchpoints, often through health technology assessment groups at Ontario hospitals, which have been encouraged by industry associations like MEDEC, the association of Canadian medical technology companies. Further, sectoral "knowledge brokers" and "idea champions",[54] now a formal initiative in Ontario through the Innovation Broker program of Office of the Chief Health Innovation Strategist, may be able to bring together health care buyers and innovative health science vendors. The OCC supports these efforts, as knowledgeable groups or individuals who are able to make connections between local innovation and local needs are of vital importance to bridging the public/private divide.

3 Identify where public institutions can lead, and where they can relinquish scope

It is difficult for government and its agencies to keep pace with technological change, for both structural and fiscal reasons. It is therefore beneficial for government to consult and collaborate with nimbler private sector actors and, based on those learnings, determine where it is reasonable for the public sector to step back from managing innovation. This could take the form of utilizing private sector trend forecasting to predict where disruptive innovation may next impact government. It may also result in identifying regulations or policies that could be modified or removed so that industry could take the lead to solve public health problems or create new forums for innovation.

In health care purchasing, this division of scope could manifest itself as alternative arrangements to purchasing innovation outright, e.g. lease agreements with medical device manufacturers or reimbursement metrics in which a product or service is evaluated against performance as a condition of reimbursement. Furthermore, if a private sector actor (for- or non-profit) possesses the technology and expertise to tackle a public challenge, government should seek to partner with them on service delivery rather than "re-invent the wheel". Public institutions are then themselves not called upon to react or evolve at the speed of innovation, but are able to harness its benefits nonetheless.

OPPORTUNITY:
Creating an Innovation Ecosystem

OPPORTUNITY:
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The recommendations above are useful tools for amplifying and accelerating the success of the health science sector. However, if we are to support innovative firms, industries, and clusters, all levels of government must provide the necessary leadership to create this economic ecosystem.

The federal Innovation Agenda

In his mandate letter to the Minister of Innovation, Science and Economic Development, Prime Minister Trudeau called for the development of a national Innovation Agenda. As of June 2016, this process has begun with a series of consultations to address the Agenda's six key areas of focus: Entrepreneurial and Creative Society; Global Science Excellence; World-Leading Clusters and Partnerships; Grow Companies and Accelerate Clean Growth; Compete in a Digital World; and Ease of Doing Business. These concentrations overlap well with both the challenges and opportunities in front of Ontario's health science sector.

The Ontario Chamber of Commerce welcomes such a mandate, as a national approach to innovation is long overdue. The Innovation Agenda will be particularly impactful if its ultimate scope includes a dedicated strategy for the health sciences sector; a strategy that is consistently and enduringly supported with the kind of policy, regulatory, and legislative change outlined in this report.

Intellectual property rights and patent law

An Innovation Agenda that addresses the needs of the health science sector must include a vision for intellectual property (IP) and patent law. Currently, Canada is not in line with international norms for patenting or enforcement, with a slow appeals process and a shorter patent life than most other countries.[55] As for IP legislation, we are aligned with common law, in which employers own inventions devised by employees during their term of employment.

As the Expert Panel of the Advisory Council on Science and Technology found in their investigation of commercialization of university research, this environment creates a series of problems. Without a coherent, federal IP strategy, research institutions miss commercialization opportunities (including to other countries). When researchers own IP, for example, negotiating licensing agreements is difficult and can involve costly litigation, particularly when there are multiple owners. A lack of consistent IP policy across institutions also lessens the ability of universities to collaborate with industry, as each partnership must begin with an understanding of the individual institutions' IP policy and a negotiation of how the industry partner will fit into it. This creates a lack of trust, diminishing the collaborative power of the partnership.[56]

To fix this problem, the Expert Panel recommended that the government replicate the US Bayh-Dole Act of 1980, which allows American universities to retain intellectual property rights to patents resulting from federal government-funded research. It resulted in an increased level of technology transfer activity (disclosure, licensing, and both patent applications and issuances), and contributed to grassroots cluster formation around universities, leading many to become hubs of job growth.[57]

Canadian law-makers would do well to consider a Bayh-Dole approach, taking into account the suggestions for modifications made over the past 35 years as well as how other countries have interpreted Bayh-Dole to best suit their needs.

Recognizing that such a broad approach is politically difficult to achieve, there are other international solutions that Canada can look to for a renewal of our IP and patent law. For example, Australia has created an "innovation patent" that is faster and less expensive than the traditional route to patent protection. As there has been discussion of a review of the system, it may benefit Ontario to wait and see if there is evidence to support its introduction here.

Another alternative is the patent box, a British innovation begun in 2013 that, on average, reduces the tax rate on income derived from patents developed and used

domestically. In the past year, patent boxes have been proposed in Saskatchewan and introduced in Quebec (there called the "deduction for a qualifying innovative manufacturing corporation" or DIC). With a DIC, a qualifying firm will calculate the share of its income derived from product patents, determined by the amount spent in-province on relevant R&D, labour, and in acquiring the patent. A company need not hold the patent to receive the tax credit, they need only have applied for it – giving early start-ups an advantage.

Cluster development

One aspect of the proposed Innovation Agenda that is highly relevant to the sustainability of Ontario's health science sector is "World-Leading Clusters and Partnerships". By supporting our existing and nascent health science clusters, we can more efficiently pool resources and attract global attention, investment, and talent.

Clusters can galvanize a local or regional economy by attracting and pooling skilled labour, through information sharing and "knowledge spillover", and by incentivizing supplier specialization.[58] Each of these impacts the other, multiplying the effect of innovation, driving new and faster innovation, and ensuring the cluster is self-sustaining. Research from the University of California has found that each innovation economy job creates five jobs elsewhere.[59] This amplifies the benefits of clusters in innovative sectors like health science.

Clusters require a robust ecosystem to grow, one that fosters interaction.[60] Successful clusters are those that have a view beyond their own jurisdictions, both geographic and sectoral. Their members support and seek partnership with others that complement them (i.e. Toronto with Hamilton and Kitchener-Waterloo, or health science with high-tech).[61]

In order to develop such an ecosystem, a region should create a cluster strategy led by industry and academia, coupled with the kind of investments that build on "competitive regional advantages" from both the public and private sectors.[62] Clusters are best positioned to grow when there is dedicated grassroots, in which industry leads and government acts as a support.[63] A cluster may be supported by formal government policy, but they are ultimately driven by industry. This leadership can currently be seen in Ontario among both cluster and sector associations, such as LSO and TO Health.

GOVERNMENT SUPPORT FOR CLUSTER GROWTH

In 2014, the Ontario government passed the Partnerships for Jobs and Growth Act, which was designed to support clusters. The first act of business was to introduce the Cluster Development Seed Fund (administered by the Ontario Chamber of Commerce) to support research, feasibility studies, and networking. Additionally, the federal government launched the Canadian Cluster Mapping Portal, in an attempt to provide the government with data on emerging cluster development.

In addition, OBIO has created an Ontario Bioscience Economic Strategy Team, which has defined priorities for the sector and outlined a plan for commercial viability and growth. As a result, Ontario already has the foundation to build a strong health science ecosystem. The next step is to ensure these voices are unified behind a cluster strategy.

However, Ontario is facing a major challenge to its cluster development agenda: In order to succeed, clusters require a demand side, not just a supply side. In this context, demand is created by an environment "driven by sophisticated consumers who demand high quality, innovative products".[64] Today, not enough of that demand and sophistication exist in our health care system, and what little we do have is stifled by poor interactivity between innovative firms and system gatekeepers.

Creating a demand-driven environment is largely in the hands of government, as outlined earlier in this report. Beyond reducing barriers to market, however, the Province has another role to play in supporting the development of clusters. Government can act as a convenor, encouraging collaboration at a high level, as interaction between clusters and their stakeholders "can generate positive economic benefits and knowledge spillovers".[65]

The public sector can facilitate such interaction in a number of tangible ways, from hosting forums for joint solutioning to investing in infrastructure, such as a high-speed rail line between Toronto and Kitchener-Waterloo. In bringing together stakeholders to execute on concrete tasks, the government could build confidence in the cluster.

Politicians and public servants alike should also be brand ambassadors and cheerleaders, indicating to international investors that the cluster has the support of government. If the public sector is unable to demonstrate that it is invested in the health of the cluster – by collaborating with industry, clearing regulatory pathways, or providing appropriate funding – global capital and talent may come but are unlikely to stay.

Ultimately, when creating a cluster strategy, stakeholders should define where public sector leadership is needed and where private sector leadership is needed. Each contributes their own talents, and can be a more appropriate actor for tackling specific challenges. For example, the government needs to take the lead on procurement, adoption, and diffusion within the health care system, while industry may be expected to take the lead on talent creation and retention, or developing a nimble cluster strategy.

TO HEALTH!

Toronto is an especially powerful player in health science, holding the title of the largest biotech cluster in Canada and the fifth largest in North America. [66] Leading the charge in formal cluster development in the region has been TO Health!, a spin-off organization of the Toronto Region Board of Trade. TO Health! is attempting to convene local health science stakeholders in order to present a unified narrative about the region's strengths, and present that narrative to risk capitalists, corporations, and talent around the world. This will help the cluster attract the ingredients it needs to succeed. TO Health! sees itself as linking, leveraging, and communicating the strengths of health science in Toronto.

In order to effectively brand and support the cluster, TO Health! currently has a three-year plan dedicated to defining and meeting its goals, and is in the process of developing a cluster development plan in partnership with industry, research institutions, and government.

Superclusters and mini-clusters

Ontario has a unique opportunity to build a health science supercluster in the Greater Toronto Hamilton Area (GTHA), alongside the existing high-tech cluster in Kitchener-Waterloo. There is considerable overlap between the two sectors, and a staggering amount of talent within a small geographic area. Toronto is a well-known centre of excellence in health science, but Hamilton has historically also been strong in this sector. The city recently established a life sciences cluster strategy led by the Synapse Consortium, and bolstered by partnerships with IBM and the applied research giant Fraunhofer. For global investors the entire Golden Horseshoe is a unified region, rich with top-notch science. Therefore, a single brand for this supercluster would be an impactful way of demonstrating Ontario's status as a major health science player.

In addition, there is an opportunity for government to support mini-clusters in other regions of the province. These tend to be anchored by major regional health centres and/or post-secondary institutions and create value by serving their communities through regionally-relevant research and by stimulating supportive sectors. The challenge for mini-clusters is to develop a unique value proposition rather than compete with larger, better funded clusters elsewhere. Thunder Bay Regional Health Science Centre and the Thunder Bay Regional Health Research Institute are an example of this kind of burgeoning mini-cluster, the efforts of which have resulted in the building of a particle accelerator that will provide improved access to medical isotopes throughout the region as well as promote innovative research into chemotherapy drug effectiveness.

CONCLUSION

Thanks to a new focus on innovation from both the governments of Canada and Ontario, and an incredible global demand for health science, the time is right to take advantage of our existing strengths. Ontario has the ingredients for a world-class health science sector. We must now ensure that we create the conditions to allow businesses to thrive, governments to receive a return on their investments, and patients to gain access to the kind of innovations that will improve their quality of life.

While the recommendations contained in this report will make it easier to capitalize innovative health science start-ups, attract and retain experienced talent, and access the public health care market, none of them are a silver bullet, nor can they operate in isolation from one another. Ontario requires a dedicated vision for health science innovation, one that recognizes our competitive advantages and makes use of our single-payer system as an economic driver.

Although health science is considered a risky investment, the potential rewards for Ontario are great. To reap those rewards, however, leadership must be shown by both the Province and private sector stakeholders, guided by an actionable federal Innovation Agenda. Failing to invest in the potential of our home-grown innovation is the true risk to Ontario's future prosperity.

WORKS CITED

[1] Conference Board of Canada. 2015. "How Canada Performs: Provincial and Territorial Ranking, Innovation". http://www.conferenceboard.ca/hcp/provincial/innovation.aspx;
Life Sciences Ontario. 2015a. *Life Sciences Ontario Sector Report 2015.* http://www.lifesciencesontario.ca/_files/file.php?fileid=fileMEGmaMmMlc&filename=file_LSO_Sector_Report_2015_FINAL___2015_02_25.pdf;
Ontario Bioscience Innovation Organization. 2016. *How Canada should be Engaging in a $9 Trillion Dollar Health Economy.* http://www.obio.ca/publications-1/2016/4/how-canada-should-be-engaging-in-a9-trillion-dollar-health-economy.

[2] Deloitte. 2015. *2015 Global health care outlook: Common goals, competing priorities.* http://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/gx-lshc-2015-health-care-outlook-global.pdf;
Deloitte. 2016. *2016 Global health care outlook: Battling costs while improving care.* http://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/gx-lshc-2016-health-care-outlook.pdf.

[3] Conference Board of Canada, 2015.

[4] Cooper, Teri. 2015. "Ending the 17-year 'valley of death' in getting treatments to patients". *Health Care Current* (Deloitte). http://blogs.deloitte.com/centerforhealthsolutions/collaboration-and-innovation-ending-the-17-year-valley-of-death-in-getting-treatments-to-patients;
Ontario Health Innovation Council. 2014. *The Catalyst: Towards an Ontario Health Innovation Strategy.* http://www.ohic.ca/sites/default/files/Ontario%20Health%20Innovation%20Council%20Report.pdf;
LSO, 2015a.

[5] Canadian Chamber of Commerce. 2011. "Policy Brief: The Scientific Research and Experimental Development (SR&ED) Tax Incentive Program". http://www.chamber.ca/download.aspx?t=0&pid=e1c0b24c-9bae-e211-8bd8-000c291b8abf.

[6] Institute for Competitiveness & Prosperity. 2016. *Clusters in Ontario: Creating an ecosystem for prosperity.* http://www.competeprosper.ca/work/working_papers/working_paper_26;
DEEP Centre. 2014. *Canada's Billion Dollar Firms: Contributions, Challenges and Opportunities.* http://deepcentre.com/wordpress/wp-content/uploads/2014/07/DEEP-Centre-Canadas-Billion-Dollar-Firms-July-2014_ENG.pdf;
OBIO, 2016.

[7] DEEP, 2014.

[8] OBIO, 2016.

[9] Lorinc, John. 2013. "Dead Money". *Canadian Business.* http://www.canadianbusiness.com/economy/dead-money.

[10] ICP, 2016.

[11] Canadian Chamber of Commerce, 2011.

[12] Canadian Chamber of Commerce, 2011.

[13] DEEP, 2014.

[14] Canadian Chamber of Commerce, 2011.

[15] DEEP, 2014.

[16] DEEP, 2014.

[17] Loric, 2013.

[18] Herman, Dan. 2015. "Public cash – what's the role of pensions in supporting innovation?" DEEP Centre blog. http://deepcentre.com/blog/public-cash-whats-the-role-of-pensions-in-supporting-innovation.

[19] Herman, 2015.

[20] DEEP, 2014.

[21] Hellmann, Thomas and Paul Schure. 2010. *An Evaluation of the Venture Capital Program in British Columbia.* Project Report: British Columbia Ministry of Small Business, Technology and Economic Development. http://www.mikevolker.com/Hellmann_Venture_Capital_Report_2010.pdf.

[22] DEEP, 2014.

[23] Cooper, 2015.

[24] Canadian Chamber of Commerce. 2015. *Stimulating Canadian Innovation: How to Boost Canada's Venture Capital Industry.* http://www.chamber.ca/download.aspx?t=0&pid=2f738ba4-bc66-e511-8835-005056a00b05.

[25] Canadian Chamber of Commerce, 2015.

[26] Business Development Bank of Canada. 2016. "Venture Capital Action Plan secures $1.35 billion in capital with final closing of HarbourVest Canada Growth Fund". https://www.bdc.ca/en/about/mediaroom/news_releases/pages/venture-capital-action-plan-

WORKS CITED

secures-1-35billion-capital-final-closing-harbourvest-canada-growth-fund.aspx.

[27] OCC membership survey conducted by Leger, January 2016, n=853.

[28] OBIO, 2016.

[29] Life Sciences Ontario. 2015b. *LSO Annual Fall Symposium: Catalyzing Collisions & Clusters.* Event Summary and Recommendations. http://www.lifesciencesontario.ca/_files/file.php?fileid=fileiQedRemxcJ&filename=file_LSO_Fall_Event_Notes.pdf.

[30] ICP, 2016;
Herman, Dan and Anthony D. Williams. 2013. *Driving Canadian Growth and Innovation: Five Challenges Holding Back Small and Medium-Sized Enterprises.* DEEP Centre. http://deepcentre.com/wordpress/wp-content/uploads/2013/03/DEEP-Centre-May-2013-Driving-Canadian-Growth-and-Innovation.pdf; DEEP, 2014.

[31] Herman and Williams, 2013.

[32] Conference Board of Canada, 2015; Snowdon, Anne, Richard Zur and Jeremy Shell. 2011. *Transforming Canada into a Global Centre for Medical Device Innovation and Adoption.* World Health Innovation Network. http://worldhealthinnovationnetwork.com/our-work/publications/15-publications/28-transforming-canada-into-a-global-centre-for-medical-device-innovation-and-adoption.

[33] Canadian Chamber of Commerce, 2015.

[34] Canadian Chamber of Commerce, 2015.

[35] DEEP Centre. 2015. *Catalyzing Canadian Growth: Understanding the Role of Large Firms in Helping Small Businesses Succeed.* http://deepcentre.com/wordpress/wp-content/uploads/2015/11/DEEPCENTRE_CATALYZING_CANADIAN_GROWTH_NOV_2015.pdf.

[36] DEEP, 2015.

[37] DEEP, 2015.

[38] DEEP, 2015.

[39] Canadian Chamber of Commerce, 2011.

[40] Boutilier, Scott. 2016. *Breaking Barriers: Ontario's Scale-Up Challenge.* Ontario Chamber of Commerce. http://www.occ.ca/portfolio/breaking-barriers-ontarios-scale-up-challenge.

[41] DEEP, 2014.

[42] Department of Immigration and Border Protection, Australia. https://www.border.gov.au/Trav/Visa-1/160-.

[43] OBIO, 2016.

[44] DEEP, 2014.

[45] OBIO, 2016.

[46] OHIC, 2014;
Challinor, Ashley. 2016. *Prescription for Partnership: How New Models of Collaboration in Health Care Can Make Outcomes a Priority.* Ontario Chamber of Commerce. http://www.occ.ca/wp-content/uploads/2013/05/REPORT_Prescription-for-Partnership.pdf.

[47] OHIC, 2014.

[48] Health Technology Exchange. "What is REACH?" http://www.htx.ca/content/what-is-reach.

[49] Council of Academic Hospitals of Ontario. 2015. *Healthier, Wealthier, Smarter: A Health Research Agenda for Patients, People and Prosperity.* http://healthierwealthiersmarter.ca/wp-content/uploads/2015/05/CAHO-White-Paper.pdf.

[50] Snowdon, Anne, Jeremy Shell, and K. Kellie Leitch. 2010. *Innovation Takes Leadership: Opportunities & Challenges for Canada's Health Care System.* World Health Innovation Network. https://www.uwindsor.ca/odettewin/sites/uwindsor.ca.odettewin/files/innovation_takes_leadership_white_paper.pdf; Ontario Bioscience Innovation Organization. 2013. Realizing the Promise of Healthcare Innovation in Ontario.
http://static1.squarespace.com/static/55bbf3f3e4b08b3622073685/t/562e7048e4b0f32b8b9e28ca/1445883976191/Innovation+Adoption+Report+for+Distribution.pdf.

[51] OBIO, 2016.

[52] OBIO, 2013.

[53] Boutilier, 2016.

[54] Snowdon et al, 2010.

WORKS CITED

[55] OBIO, 2016.

[56] Tantiyaswasdikul, Kallaya. 2013. "Intellectual Property Rights Policy and University Technology Transfer Output in Canadian Universities". Review of Integrative Business & Economics Research, Vol. 2, Issue 2. http://sibresearch.org/uploads/2/7/9/9/2799227/riber_b13-185_467-482.pdf;
Snowdon et al, 2011.

[57] Loise, Vicki and Ashley J. Stevens. 2010. "The Bayh-Dole Act Turns 30". Science *Translational Medicine,* Vol. 2, Issue 52. http://www.bu.edu/otd/files/2011/02/The_Bayh-Dole_Act_Turns_30.pdf.

[58] ICP, 2016.

[59] Herman and Williams, 2013.

[60] ICP, 2016.

[61] LSO, 2015b.

[62] ICP, 2016;
Office of the Prime Minister of Canada. 2015. Minister of Innovation, Science and Economic Development Mandate Letter. http://pm.gc.ca/eng/minister-innovation-science-and-economic-development-mandate-letter.

[63] ICP, 2016.

[64] ICP, 2016.

[65] ICP, 2016.

[66] Toronto Region Board of Trade. 2012. Life Sciences Cluster: Background Material. https://www.bot.com/portals/0/unsecure/advocacy/life-sciences-primer.pdf.