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The purpose of this report is to provide a data-driven approach to gauge Canada's progress in developing a successful technology industry, one that is marked ideally by a high rate of startup creation, company growth, and ability to compete in global markets.

To understand how Canada fares, we used the notion of a ‘funnel’ in our analysis to ‘measure’ where companies are situated in Canada’s innovation pipeline, from the startup to world-class stage. We established a funnel with five stages and later combined these into two stages for the purposes of comparison with other jurisdictions. We define an ‘earlier-stage’ company as one with cumulative financing of less than $10 M and a ‘later-stage’ company as one that had received more than $10 M in funding.

We looked at the performance of over 2,600 technology companies in Canada, paying particular attention to 423 businesses with over $10 M of capital. We measured the companies’ relative position in the funnel to get a sense of how Canadian firms are progressing.

Based on additional analysis of revenue and employee growth and financing in public or private markets, we identified businesses with the potential to grow to world-class size, but only if they maintain current growth trajectories. For inclusion on this list, the company had to have:

- public capital above $10 M, revenue above $1 M and revenue growth rates above 20%, or
- private capital above $10 M with at least 30 employees and employee growth rates above 20%.

In total, we identified 50 Canadian companies that had met these criteria by the end of 2017. This represents 12% of all of the 423 Canadian companies above $10 M in capital.

Our analysis also looked at how Canada stacks up against other major regions in the world (the US, the UK, France, and Germany). We found some promising as well as weak points for Canada’s high-tech industry.

- We have a higher startup rate than Germany and France but trail the UK on the same metric.
- We lead all European jurisdictions in terms of scaling rates.
- We report a rate of startup and scaleup that is dramatically lower than the US and, in particular, Massachusetts, California and New York.
- We have lower rates of both startup and scaleup than Pennsylvania, Illinois, and Georgia.
While the emphasis of this report is on our ability as a jurisdiction to scale companies, we must note that there is a tremendous opportunity to improve the number of startups we generate. Although we have made significant progress in the last 10 years, the data clearly show that we have further work to do. While we tend to look to California as the ‘gold standard’, it may perhaps be more instructive to compare ourselves with New York and particularly Massachusetts, which has one of the best track records for company creation and scaling.
A Framework for a National High-Tech Funnel

This Impact Brief promotes the development of an evidence-based approach to gauging our success at starting and scaling companies. The purpose of this research is to measure the rate of startup and scaleup in Canada and compare that to jurisdictions worldwide. Our work is based on publicly available data that any government, business or individual can access at low cost. We intend to replicate this study annually as part of a long-term benchmarking exercise.

One of the objectives of this report was to develop metrics that could show at any point in time not only how a business performs in terms of its ability to scale but also how Canada as a whole is faring. In order to show where a company is situated relative to its peers, we made use of the concept of a ‘high-tech funnel’. The notion of a sales funnel is typically encountered in discussions at the company level; it can show the management and sales teams where prospective or existing customers are currently in terms of engagement. Thus, companies can track customers as they proceed through the stages of the sales funnel, from awareness to purchase to after-sales servicing.

Similarly, we should be able to track companies as they move through Canada’s technology funnel, from inception and scaleup to globally competitive markets. We should also be able to measure the funnel and therefore gauge not only the progress of each company, but also the general system for innovation in Canada. Such a data-driven framework would help innovators and the wider innovation ecosystem identify areas of the funnel on which efforts should be concentrated to build a more effective technology pipeline.

In order to develop such a funnel for Canada, we divided more than 2,400 Canadian companies into stages of the funnel according to the amount of capital acquired. Categories that range from inception/startup to world-class status proved particularly useful (refer to Table 1).

<table>
<thead>
<tr>
<th>Funnel Classifications</th>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
<td>Capital Raised</td>
</tr>
<tr>
<td>World Class</td>
<td>Over $1 B</td>
</tr>
<tr>
<td>Scaling</td>
<td>$100 M – $1 B</td>
</tr>
<tr>
<td>Growth</td>
<td>$10 M – $100 M</td>
</tr>
<tr>
<td>Emergence</td>
<td>$1 M – $10 M</td>
</tr>
<tr>
<td>Startup</td>
<td>Under $1 M</td>
</tr>
</tbody>
</table>

To construct Canada’s technology funnel, we used statistics available from CB Insights for private companies and individual financial statements for public companies (all obtained at the end of December 2017). Statistics were recorded for all companies that are currently active (i.e. not sold or out of business) across a range of industries (internet, healthcare, software, mobile and telecommunications, computer hardware and services, and electronics). Table 2 shows the number of companies that had received financing divided along the various stages of the funnel.
Two caveats regarding these numbers should be explained. First, the data are probably more accurate for larger companies than smaller ones because CB Insights may be more likely to miss recording funds from smaller companies that are not as widely reported. Second, the failure of firms is not generally reported; so CB Insights may include firms that are no longer in business. This could lead to over-reporting across categories. But since these data gaps would affect numbers for all jurisdictions, the numbers can be used as good general guides when doing cross-country comparisons.

We have further divided the number of private companies by province to see the funnel in selected regions in Canada (Table 3).
One can also compare leading provinces on a per-population basis as in Table 4.

### Private Company Capitalization Per Population

<table>
<thead>
<tr>
<th>Stage</th>
<th>Capital</th>
<th>Canada</th>
<th>Ontario</th>
<th>Quebec</th>
<th>BC</th>
<th>Alberta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (in thousands)</td>
<td>35,151</td>
<td>13,448</td>
<td>8,164</td>
<td>4,648</td>
<td>4,067</td>
<td></td>
</tr>
<tr>
<td>World Class</td>
<td>Over $1 B</td>
<td>0</td>
<td>0</td>
<td>0.24</td>
<td>0.65</td>
<td>0.00</td>
</tr>
<tr>
<td>Scale</td>
<td>$100 M – $1 B</td>
<td>0.43</td>
<td>0.67</td>
<td>0.24</td>
<td>0.65</td>
<td>0.00</td>
</tr>
<tr>
<td>Growth</td>
<td>$10 M – $100 M</td>
<td>6.20</td>
<td>8.40</td>
<td>4.65</td>
<td>8.39</td>
<td>1.72</td>
</tr>
<tr>
<td>Emergence</td>
<td>$1 M – $10 M</td>
<td>14.51</td>
<td>17.62</td>
<td>11.02</td>
<td>20.22</td>
<td>6.88</td>
</tr>
<tr>
<td>Startup</td>
<td>Under $1 M</td>
<td>47.48</td>
<td>50.94</td>
<td>31.72</td>
<td>60.89</td>
<td>23.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>68.62</td>
<td>77.63</td>
<td>47.65</td>
<td>90.15</td>
<td>32.46</td>
</tr>
</tbody>
</table>

### Identifying High-Potential Firms

Equipped with the general funnel classifications described in the last section, we then used two growth rates that could be used to identify high-potential companies.

1. **Revenue Growth**

   Metrics like revenue growth are popular as they can produce stunningly high numbers such as those seen in the Deloitte’s Technology Fast 50 and Inc. Magazine’s annual reports on growth. Such measures tend to favour small companies. In fact, the larger a company, the harder it is to maintain high growth rates. Revenue growth is the best metric to use for evaluating public companies.

2. **Employment Growth**

   As firms grow, they hire employees to develop or sell products, to create a customer base, and to fulfill a myriad of other critical functions. The faster a firm hires employees, the faster it can grow. This close connection between revenue and employment makes the rate of growth in employment another potential proxy for revenue growth.

   The only issue in using employment numbers as a metric is that the only available source is LinkedIn. We have done tests to determine the accuracy of these employee-reported numbers and found that they report numbers in the correct range for most companies and thus can be a useful indicator of scale and potential.

In evaluating our choices for metrics, we concluded that revenue growth is an effective way to measure company potential for public companies and employee growth is a good proxy for private companies.
We paid close attention to the top three levels of the funnel, which may represent the fastest growing firms based on revenue for public firms and employment for private firms. Based on this, we identified businesses with the potential to grow to world-class size, if they maintain current growth rates. For inclusion on this list, the company had to have:

- public capital above $10 M, revenue above $1 M and revenue growth rates above 20%, or
- private capital above $10 M with at least 30 employees and employee growth rates above 20%.

The OECD defines high growth as 20%, so this was the base hurdle we chose. Anecdotal evidence though implies that to achieve world-class status, a firm will need to grow at a rate of in excess of 60%.

### Number of High-Potential Companies

Table 5

<table>
<thead>
<tr>
<th>Stage</th>
<th>Capital</th>
<th>20% - 30% Growth</th>
<th>30% - 50% Growth</th>
<th>Above 50% Growth</th>
<th>Total Number of High-Growth Companies</th>
<th>Total Number of Companies per Stage</th>
<th>High-Growth Companies (% of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Class</td>
<td>Over $1 B</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>11</td>
<td>27%</td>
</tr>
<tr>
<td>Scale</td>
<td>$100 M – $1 B</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>15</td>
<td>62</td>
<td>24%</td>
</tr>
<tr>
<td>Growth</td>
<td>$10 M – $100 M</td>
<td>8</td>
<td>7</td>
<td>17</td>
<td>32</td>
<td>350</td>
<td>9%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>12</td>
<td>10</td>
<td>28</td>
<td>50</td>
<td>423</td>
<td>12%</td>
</tr>
</tbody>
</table>
In order to examine and compare Canada’s rate of company creation to other jurisdictions, we split the funnel into two parts. We have arbitrarily classified companies with below $10 M of capital as ‘earlier-stage’ and companies with over $10 M of capital as ‘later-stage’. The following analysis was done only on private companies as obtaining all public company records for such a study was not feasible.

**Provincial Comparison**

Figures 1 and 2 highlight the number of companies per 1M population and the percentage of late-stage private companies operating in Canada’s most populous provinces. While Ontario leads the country in the rate of later-stage businesses, it trails British Columbia in terms of the number of earlier-stage startups created on a per-capita basis. The following charts show how Canada’s system is skewed towards earlier-stage companies.
Worldwide Comparison

We can also create a similar funnel for major startup countries in the world (Figures 3 and 4). There may be issues in Europe with data availability due to language of reporting, but the trends in numbers are instructive nonetheless and may prove valuable over time.

Although Canada dramatically trails the US in the creation and scaling of private companies, we lead major European countries in late-stage or established companies. We also trail the UK in early-stage firms.
Comparison to Most Populous US States

Comparing Canada to major US population centres shows just how far we need to go to foster world-class companies (Figures 5 and 6). We trail all major US regions in our ability to create private technology companies and trail all but Florida in our ability to turn those companies into firms that can scale.
Comparison to Smaller Population States

Finally, we can compare Canada to smaller US states, some with capitals and other cities that are on par with Toronto in terms of population and size (Figures 7 and 8). The numbers clearly show that Canada has both a startup and a scaleup challenge as it trails even mid-size US states in its rate of company creation and only exceeds Ohio in its rate of scaleups.
What Have We Learned?

While the emphasis of this report is on our ability as a jurisdiction to scale companies, the analysis points out a tremendous opportunity to improve the number of startups we generate. We have made significant progress in the last 10 years, but we have further work to do.

While we tend to compare ourselves with California, it may actually be just as instructive to compare ourselves with New York and particularly Massachusetts, which has the best record around for company creation and scaling.
Evidence-based Approach to Innovation Systems

The following Globe and Mail article reported that the Government of Canada was pleased to announce five new programs to spur business expenditures on research and development (R&D), touting it as a “new” beginning: “This is the start of a new trend for Canada. Until now Canadian Industry has lagged behind its foreign competitors in research and development.”

For more than five decades, we have seen the proliferation of new government programs at the federal and provincial levels aiming to spur business R&D and the growth of an innovation economy. Yet every year, we also see reports that Canada trails the rest of the OECD countries on R&D metrics (e.g. OECD Science, Technology and Innovation Outlook 2016 – Canada Country Profile).
While Canada still struggles with business expenditures on R&D more broadly, our current national obsession relates to scaling technology companies. The narrative on this subject is typically centred on: Canada is good at creating technology companies but often fails to scale them to a world-class size. As a result, both federal and provincial governments have been launching programs and funding mechanisms to grow tech companies. But what we lack is a way to define success and measure progress along the way.

One way to further our understanding of the challenges we face in commercializing technology and deciding what best practices to adopt is to employ an evidence-based approach. We have the opportunity to use data-driven strategies to better understand and improve our ability to scale companies to a world-class level; or to use an example from popular culture: just like the Oakland A’s team whose data analysis approach to beat teams with significantly higher payrolls was popularized in the movie Moneyball.

Using data effectively will help in several ways. It will assist CEOs and founders of startups and growing companies answer questions such as:

- How fast should I be trying to grow?
- How much capital should I raise?
- How should I allocate my expenditures to optimize growth?
- How many people do I need to hire?
- What skill sets should they have?

A data-driven approach will also help policy makers:

- debunk myths about scaling, patenting, growth, etc.,
- better understand the issues companies face,
- develop more effective policy tools and frameworks,
- track changes in performance, and
- evaluate policies.

The Impact Centre at the University of Toronto is developing a data-driven approach to determine the root causes of the successes and failures of technology companies in Canada. We are actively using the findings from our research to promote best practices in technology commercialization as well as company creation and growth.

Our research suggests that our challenges are not, as previously thought, only in the areas of patenting, R&D capacity, commercialization, and later-stage financing. Our challenges also involve market development and the creation of companies that are financially attractive to investors.
Our research is discovering new ways of examining activities in the technology industry and discovering new solutions to challenges that have plagued Canada for years. This work is practitioner-oriented and aligns well with policy and economics approaches to understanding innovation such as those that were developed by the Brookfield Institute for Innovation + Entrepreneurship, Startup Genome, and the University of Toronto’s Munk School of Global Affairs. It is also complementary to the work done by the Lazaridis Institute for the Management of Enterprises and its use of a survey methodology to understand firm behaviour.

We hope that the analysis presented in this Impact Brief is the foundation for an evidence-based strategy. We hope that we can continue to use this approach to evaluate our progress as a nation in developing a burgeoning technology industry and assess the effectiveness of the many programs created to foster growth.
Methodology

This study looked at the fundraising patterns of technology companies in Canada and the US. Public company data were obtained from Google Finance, and private company data were obtained from CB Insights and LinkedIn. All numbers were collected in December 2017. All amounts are in US dollars.

This study was not intended to be academically rigorous, nor was it intended to be all-encompassing about the topic. It was designed only to add to the conversation on innovation and highlight areas worthy of future research by looking at data available from publicly available sources. We plan to complete further research on this subject in the future.
About the Impact Centre

**Science to Society**

We generate impact through industry projects and partnerships, entrepreneurial companies, training and research.

We bridge the gap between the university and industry to accelerate the development of new or improved products and services based on physical technologies. We work with graduate students and researchers to help them commercialize their discoveries. We provide undergraduate education and training for students at all levels to ease their transition into future careers.

The Impact Centre conducts research on all aspects of innovation, from ideation and commercialization to government policy and broader themes such as the connection between science and international development. We study how companies of all sizes navigate the complex path between a discovery and its market and how their collective innovations add up to create a larger socioeconomic impact.

Our objective is to understand how we can improve our ability to create world-class technology companies, how governments, companies, and academia can identify and adopt best practices in technology commercialization.

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**Contributors**

Charles Plant  
Author  
Senior Fellow  
cplant@imc.utoronto.ca  
416-458-4850  
@cplant

Emina Veletanlić  
Editor  
Manager, Strategic Initiatives  
eveletanlic@imc.utoronto.ca  
416-978-1457

Lidia Seline  
Researcher  
lseline@imc.utoronto.ca

James Li

Harim Ulfig