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Debunking Canada's Brain Drain Myth

The link between talent migration, IP and prosperity

White paper by Charles Plant | March 2021

Summary

Canadians spend a lot of time fretting over the so-called "brain drain" – the out-migration of skilled talent, particularly to the United States. Most recently, the discussion has focused on the loss of technology workers. But is Canada really losing substantial numbers of software engineers and computer scientists to the siren call of Silicon Valley and other foreign locales? A review of the evidence suggests that a more urgent concern is the loss of talented individuals who know how to commercialize intellectual property rather than create the technology itself. And that has a profound impact on Canada's ability to compete, create jobs and ensure long-term prosperity.

Debunking Canada's Brain Drain Myth

Canada has renewed its focus on the creation and commercialization of intellectual property (IP). Inherent in this drive is the necessity to hire and employ professionals to create this IP. While we can always hire experienced personnel from a pool of immigrants, Canada has long seen the need to increase the number of graduates from science, technology, engineering and math (STEM) programs. Canadian universities have stepped up to this challenge – enrolment in STEM programs increases year by year.

But what if many of these domestic grads are choosing to find jobs internationally, particularly in the United States where there are many rich employment opportunities in STEM? If a brain drain is actually occurring, Canada will not benefit from increases in enrolment and we will not have increased our ability to create home-grown intellectual property. The potential, if not the actuality, for brain drain is real. Canada encountered the phenomenon with the out-migration of medical professionals 20 years ago. Since the topic has cropped up again, this time with regard to STEM graduates, it is worth examining the issue and its causes more closely.

> *"Canada has renewed its focus on the creation and commercialization of intellectual property (IP)."*

Case in Point #1

Emile (not his real name) graduated at the top of his class in computer science from a Canadian university and went on to earn a master's degree in computer science from another Canadian university. After one year in the master's program, he was contacted by Google, which had found his name on a list of scholarship recipients. The company interviewed him remotely and later paid for a visit to Silicon Valley where he was offered a job. While attracted by the salary, Emile was aware of the high costs associated with living and working in Silicon Valley, along with other issues. He decided that he would rather stay in Canada. Emile went on to work at a subsidiary of Intel in Canada, which allowed him to learn the dynamics of large companies and score a brand-name company for his first job.

After working at the Intel sub for several years, he chose to relocate and set out to find a job in another city. His objective was to find a rapidly growing firm that could offer him a fast path to greater and more varied experiences. His search took only several weeks. He contacted three companies: Amazon and two Canadian companies that were scaling well. One of the Canadian companies responded to his cold email within a day. They interviewed him by phone, brought him to Toronto for an interview and made him a job offer in less than two weeks. Amazon and the other company replied but at a pace much slower than the business Emile eventually joined.

Emile still gets a call every three or four months from Google to see if he has changed his mind. He also gets similar calls from Amazon in Canada. But for Emile, the job experience was the most important variable in both of his job searches . In joining his current company, he got the type of work and experience he wanted to position himself for the future he desired. His employer, by recruiting aggressively, was able to compete against larger, more established competitors.

Canada could have lost a graduate to employment in the U.S. but, luckily, we didn't. We could also have lost him to a Canadian subsidiary of a U.S. company but we didn't. The key takeaways? The local scaleup kept a talented young employee in Canada by recruiting aggressively and offering interesting work and the potential for career advancement.

Runaway Stats

The most recent wave of discussion about Canada's purported brain drain was sparked by a 2018 study that came out of Brock University and the University of Toronto. Entitled, "Reversing the Brain Drain: Where is Canadian STEM Talent Going?", the study looked at graduates from 2015 and 2016 in 22 science, technology, engineering and mathematics subjects at three universities: the University of Toronto, University of

Waterloo and University of British Columbia.

As the study came to be discussed in the news media, the findings grew more generalized. The years 2015 and 2016 became "recent years" and three universities became "top universities." The website Immigration.ca, for example, reported that: "Canada lost two thirds of recent software engineering graduates from its top universities to the United States, according to a new study. A third of recent computer engineering and computer science graduates are also currently working south of the border, the study reveals, showing the major brain drain problem facing the Canadian economy."

Even the Globe and Mail extrapolated generously from the study, stating that "Canada's best and brightest computer engineering graduates are leaving for jobs in Silicon Valley at alarmingly high rates, fuelling a worse 'brain drain' than the mass exodus by Canadian doctors two decades ago, according to a new study."

And still the brain drain myth continues. A recent story in BetaKit included this line: "A report from the Innovation Economy Council states that while STEM and technology job numbers have risen since February, nearly a third of computer science graduates are still leaving the country."

Inevitably, the generalizations make the leap from news stories to policy recommendations, as seen in the Financial Post's account of a presentation to the House of Commons Industry Committee in May 2020:

> *The pandemic-related economic crisis is "an ironic opportunity for Canada" because it has led to structural changes that would normally take years happening in a few months, said Jim Balsillie, chairman of the Council of Canadian Innovators.*
>
> *He said the closure of the Canada-U.S. border, for instance, should spur the government to create a program to put Canadian innovation students to work domestically, with many having seen their co-op placements in Silicon Valley evaporate.*
>
> *'The border may not open for eight or 12 months. So we have an unusual opportunity to reverse the brain drain — I mean, it is reversed temporarily — but we can actually make Canada a preferred destination,' Balsillie told the Commons industry committee.*

The brain drain myth has also been the impetus or explanation for the start of programming to counter it. In January 2017, Reuters reported that

> *Some of Canada's largest corporations and top executives launched two separate initiatives this week, investing millions of dollars into startup programs they hope will help stem a brain drain in fields like artificial intelligence and financial technology.*
>
> *NextAI, which was unveiled on Wednesday, and Diagram, announced on Tuesday, both aim to halt the loss of the country's best technology talent by helping to launch new Canadian-based companies through seed funding and mentorship.*
>
> *Industry leaders are concerned that without capital, private and public sector support, Canada will be unable to attract skilled tech entrepreneurs, while existing workers and students will be pulled away by global tech giants. More than 300,000 Canadians already work in Silicon Valley.*

So, can we expand the claims of a very narrow study to the industry as a whole? And should it then be the impetus that drives conversations with government and actual funding of programs?

Alex Usher, president of Higher Education Strategy Associates and a noted commentator on Canada's post-secondary sector, summarizes the flaws of the original research in an opinion piece in The Globe and Mail:

1. **The original report only covers three universities.**

2. **By only covering 22 programs, it does not include all STEM graduates.**

3. **It only reports on the behaviour of LinkedIn users.**

One could also criticize the study for lacking a representative sample of those university programs because the authors only reported on the activities of people who were willing to talk to them.

So, what we have is a very specific study which was methodologically flawed and later generalized in the media to include all of Canada and all STEM fields. Then it becomes part of conversations with government, part of the lobbying process and, lo and behold, in a few years we'll end up with a government program designed to fix a problem that, under more scrutiny, doesn't exist or, at the very least, isn't as severe as the public commentary suggests.

What are the facts?

Is there really a STEM brain drain? We set out to expand on the original Brock-Toronto study by seeing what other data is available from LinkedIn that might provide further illumination.

- To expand the number of universities examined, we looked at the data from not just three universities but from 37 universities covering 84 per cent of the current university enrolment in Canada. This represented 4.4 million graduates.
- We looked at both graduate and undergraduate programs, not just undergraduate ones.
- Our study looked at graduates from the top engineering, computer science and math specialities for all of these universities, not just those from specific programs. We loosely call these "tech" grads although acknowledge that it does not include all tech grads, just ones from leading programs. It also does not cover grads from general sciences, physics, biology and chemistry.
- We looked at all years from 1980 to 2020, covering 40 years, not just three.
- We divided results into decades to see if there were any patterns.
- We paid attention only to those graduates working in the U.S. There has never been a perception that Canada is losing grads in great quantities to other countries, so adding grads who go to other countries seems to magnify the perception that there is a significant brain drain to the U.S.

The net result was to look at the self-reported records of over 440,000 graduates, not just several hundred. And what did we find? Lots!

What percentage of "tech" grads work in the U.S.?

Overall, we found that 43,575 of the Canadian tech graduates who chose to be on LinkedIn report themselves as working in the U.S. This represents less than 10 per cent of the over 440,000 grads whose data was included. This is a substantial difference from the claim that 25 per cent of STEM grads work outside Canada. (Even this result is flawed, but we will get to that later.) There are some distinct trends in the data that can be seen in Exhibit 1.

EXHIBIT 1: Percentage of 'Tech' Graduates Working in the U.S.

University	% Working In U.S.
McGill University	18%
University of Waterloo	15%
University of British Columbia	14%

University	% Working In U.S.
University of Toronto	13%
Queen's University	12%
Simon Fraser University	11%
University of Victoria	11%
University of Windsor	11%
University of Alberta	10%
Concordia University	10%
McMaster University	9%
University of Calgary	9%
Western University (excludes affiliated colleges)	9%
Carleton University	9%
University of Manitoba	9%
University of Ottawa	8%
University of Saskatchewan	8%
Dalhousie University	8%
Brock University	8%
York University	7%
University of Guelph	7%
Athabasca University (PT only)	6%
Wilfrid Laurier University	6%
Memorial University of Newfoundland	6%
University of Regina (excludes colleges)	6%
Trent University	6%
Ryerson University	5%
Université de Montréal	4%
Mount Royal University	4%
Université Laval	3%
Ontario Tech University	3%
Université du Québec à Montréal	2%
Université de Sherbrooke	2%
École des Hautes Etudes Commerciales	2%
Kwantlen Polytechnic University	2%
Université du Québec à Trois-Rivières	1%
MacEwan University	0%

One of the first things you'll notice is that McGill ranks highest in tech grads working in the U.S. with 18 per cent, although McGill was not included in the original Brock-Toronto study. Waterloo, UBC and U of T were indeed the next three universities in terms of percentage of graduates working in the U.S. But the extent of the problem, if one exists, does not extend to all universities. It would appear more likely that a graduate from a "name brand" university will end up working in the U.S. Overall, though, there are plenty of universities where the percentage of graduates working in the U.S. is below 10 per cent.

Why is there a difference between these results and other studies?

There may be many reasons for the difference in results that go beyond the fact that we are looking at more universities rather than the select few where the brain drain phenomenon is most pronounced.

Because we looked at graduate as well as undergraduate programs, it is likely that we have a more realistic picture of the extent of the issue. Anecdotal reports indicate that graduate programs are more likely to have foreigners attending them and that these students desire to find work in Canada after graduating. (This is anecdotal only and worthy of further study.)

Whatever the case, to do a study of only undergraduate programs is questionable. After all, we should be more concerned if the rate is higher among those with graduate degrees, given their higher level of training and employment potential.

What is the trend over time?

We also wanted to expand on other research to determine whether there is any difference in rates of employment of tech grads over time. To do that, we broke graduates down by decade. Exhibit 2 shows the changes over time:

EXHIBIT 2: Tech Grads Working in the U.S. by Decade

Decade	Tech Grads	Number in U.S.	% in U.S.
1980s	38,195	5,044	13.2%
1990s	68,015	9,322	13.7%
2000s	116,295	14,522	12.5%
2010s	194,168	13,128	6.8%
Overall	440,721	43,575	9.9%

The data show a clear decline from the 2000s to the 2010s. Whereas over 12 per cent of Canadian tech grads used to be employed in the U.S., the number has declined to under seven per cent. This trend was observed with every university in the study. In fact, the rate of decline is similar in all universities. The University of Waterloo is a good case in point. Fifteen per cent of their ’80s grads are employed in the U.S. This increased to 18 per cent of ’90s grads and 21 per cent of ’00s grads. But for the ’10s, the Waterloo number is down to 13 per cent.

There are a number of factors that may contribute to this change.

- LinkedIn users may be slow at changing their geographic location, perhaps being faster to change employers than locations. This is a trend suggested by entrepreneur and consultant Rob Darling who has done significant research on Waterloo grads.
- This may be a factor of graduate-undergraduate mix, i.e, there may now be more graduate-school attendees and this may be skewing the data. (Darling’s research does not include graduate degrees.)
- Perhaps more students are staying in Canada because the job opportunities are better here now than they used to be.
- Perhaps U.S. firms are hiring in Canada and employing them in Canada instead of moving employees to the U.S.

We set out to look at several of these variables.

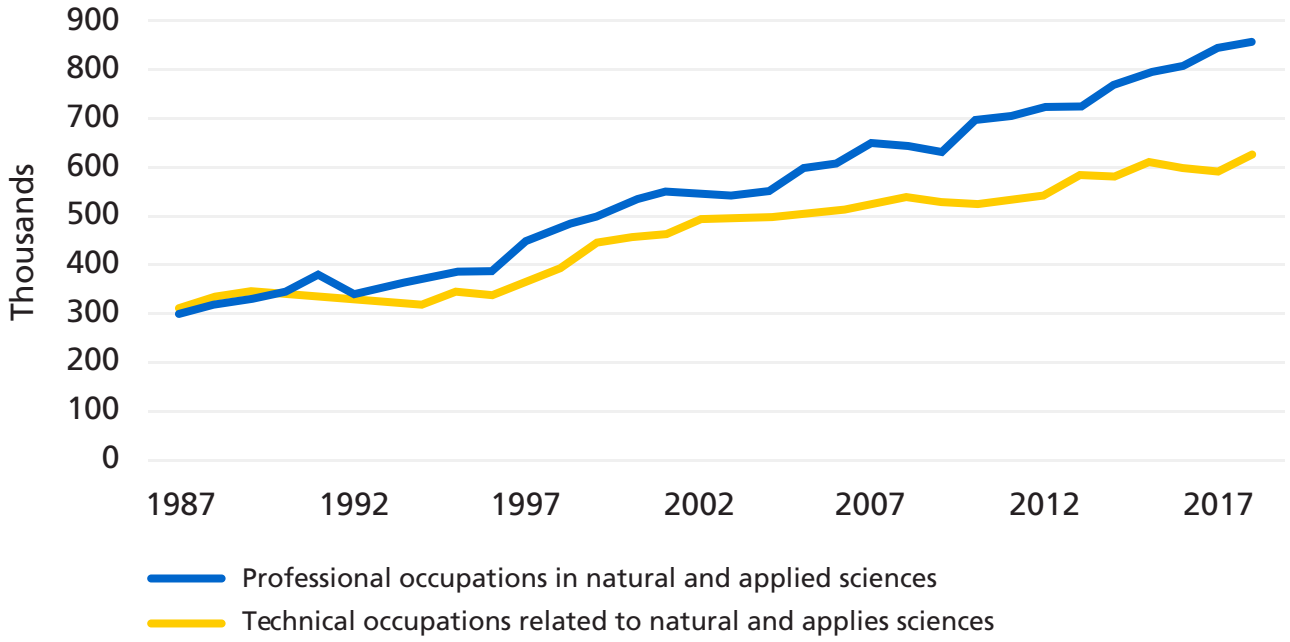
Employment potential in Canada

One factor influencing the observed drop in employment of Canadian grads in the U.S. could be the increase in the number of opportunities in Canada. Exhibit 3 shows the increase in employment in technical positions in Canada. These positions are classified as professional and technical occupations in natural and applied sciences. The data is produced by Statistics Canada and includes occupations in:

- Physical sciences
- Life sciences
- Civil, mechanical and industrial engineering
- Electronics and electrical engineering
- Architecture, drafting, surveying, geomatics and meteorology
- Mathematics, statistics and actuarial science
- Computer and information systems

EXHIBIT 3: Canadian Employment in Professional and Technical Occupations

The rise in employment, particularly in professional occupations, is dramatic and may have contributed to the decrease in the rate of U.S. employment. The growth rate in jobs in the 2010s was 43 per cent whereas the growth rate in the decade before was only 23 per cent.

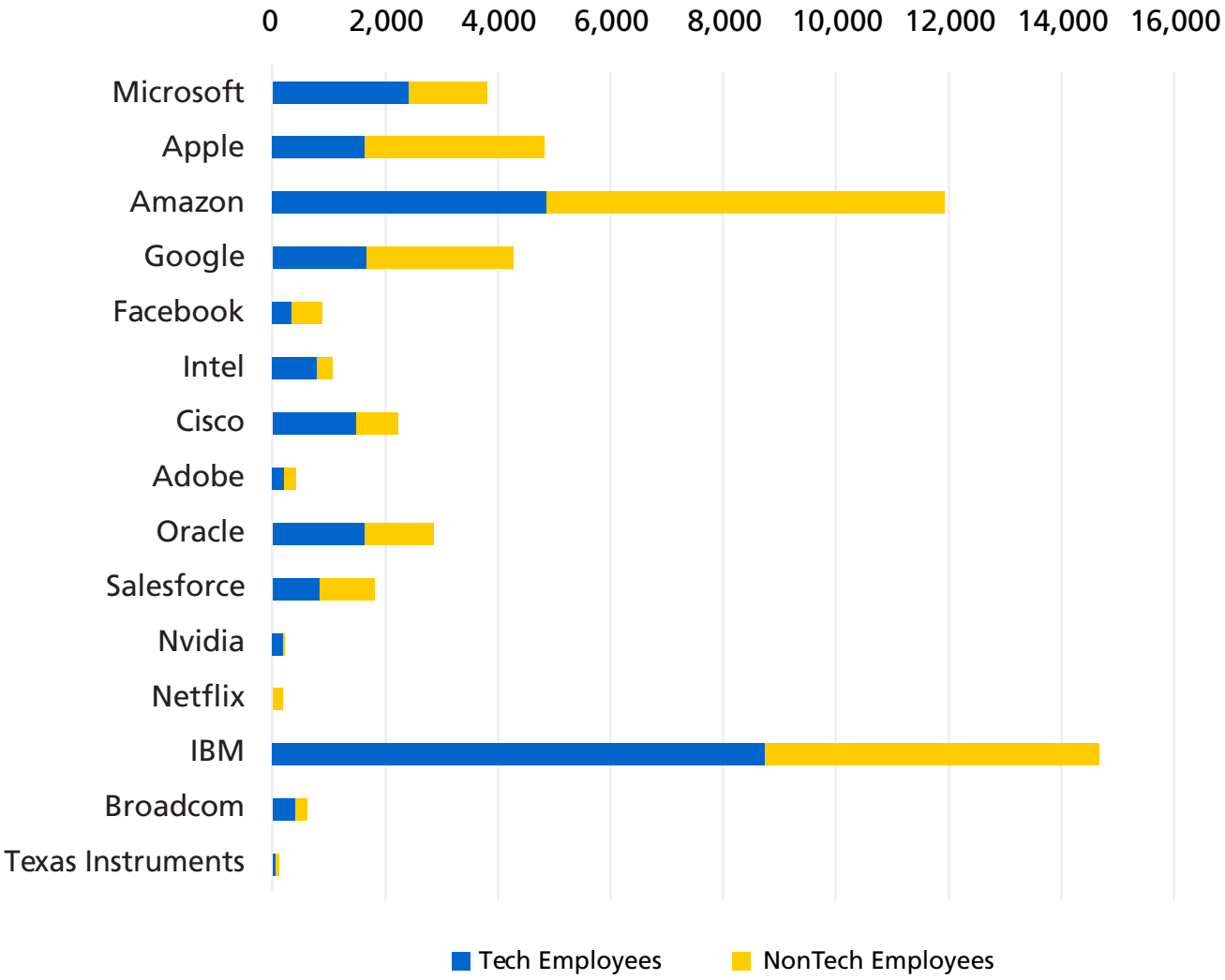


Employment by U.S. firms in Canada

One reason why employment of Canadian grads in the U.S. may be declining is the increase of employment of Canadian grads by U.S. firms with locations in Canada. To examine this, we looked at the employment of Canadians by the 15 leading U.S. tech firms. This represents only computer technology. This data was obtained from LinkedIn and so is subject to errors arising from self-reporting.

> *The rise in (tech) employment, particularly in professional occupations, is dramatic and may have contributed to the decrease in the rate of U.S. employment.*

EXHIBIT 4: Employment in the U.S. of Canadians by Leading Tech Firms



In total, only 25,000 tech employees work at the leading U.S. tech firms in Canada. Another 24,500 are in non-technology roles. To test the issue further, we looked at employment in Canada by the five leading employers: IBM, Amazon, Apple, Google, and Microsoft. Exhibit 5 shows the changes in levels of employment by year of graduation.

EXHIBIT 5: Employment in Canada by IBM, Amazon, Apple, Google, and Microsoft

	1980s	1990s	2000s	2010s
Total Graduates	13,455	21,376	36,884	65,262
Increase in # of Graduates		59%	73%	77%
Employment in leading firms	372	730	1,338	3,086
Increase in Employment		96%	83%	131%

One can see from this table that the rate of increase in hiring in Canada by the five largest U.S. tech firms is much greater than the rate of increase in the creation of tech graduates by the top universities. What this implies is that some of the decline in employment by firms in the U.S. has been made up by employment by these firms in Canada.

Due to limitations of the methodology of this research, we cannot definitely claim that this phenomenon can be generalized to all U.S. technology firms or to all Canadian universities.

- LinkedIn data is from individuals self-reporting and may be subject to error.
- We only looked at graduates of the top five universities as measured by rate of hiring in the U.S.
- We also only looked at the hiring in Canada by the five top U.S. tech employers.

LinkedIn data, while notoriously inaccurate for research of this type, is nonetheless directionally correct, in that the same biases and reporting errors exist broadly across a homogeneous group. This would imply that the data is showing a trend, for these universities and employers at least, and this is worthy of further research.

If it does prove to be the case, then there is a compelling reason to examine whether or not this is a good thing for Canada. While not losing the raw material for the creation of intellectual property to the U.S., we are nonetheless losing the benefits of the creation of IP as it is accruing to U.S. based firms. We maintain the tax revenue from employment, along with the hope that these individuals may come to be employed later by Canadian firms, but meanwhile their IP generation does not benefit Canada.

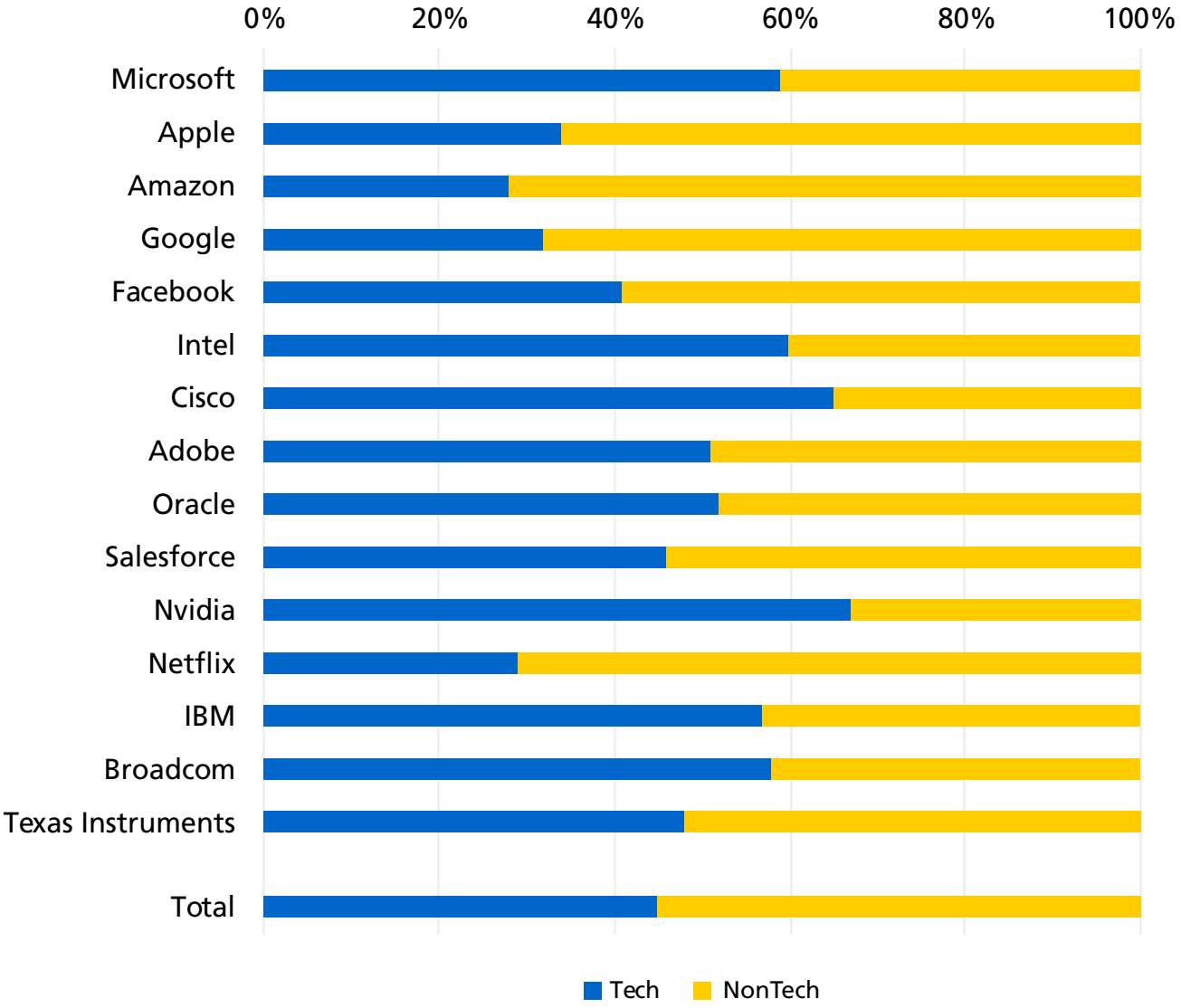
Employment in non-tech fields

In Canada we have a habit of only talking about STEM jobs. This conversation entirely misses the fact that there are more jobs in tech companies for non-tech people than there are for tech employees. These non-tech employees are the ones creating Market IP and Process IP, not just Technical IP.

While most discussions of intellectual property focus on Technical IP – patents and such – there are two other important elements. The first is Market IP, which is comprised of three elements: the knowledge that comes from identifying a large market that is ripe for disruption; understanding the needs of that market; and understanding the competition. The second is Process IP – knowledge and experience of the commercialization process. (For a more fulsome discussion of all three elements, see Towards a New Understanding of Intellectual Property: IP 2.0.)

The following exhibit shows the employment worldwide by the leading U.S. tech firms in tech roles versus non-tech roles.

EXHIBIT 6: Percentage of Tech and Non-Tech Employees in Major Firms

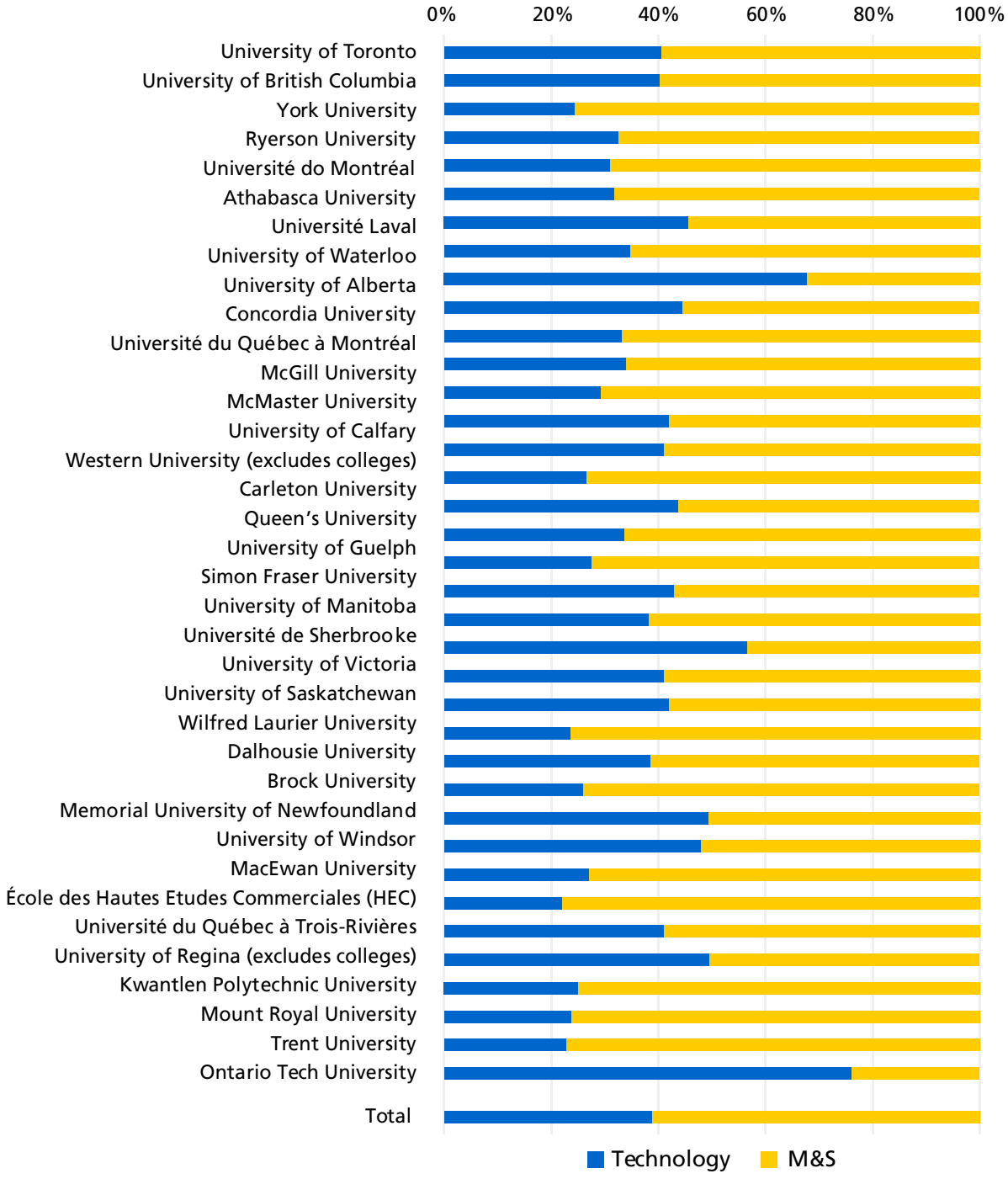


In total, 55 per cent of the employees of the top U.S. tech firms are employed in non-tech roles. That begs the question, What about the employment of Canadian grads by U.S. firms? Are we losing only tech grads to the U.S. or are we also losing other grads whose jobs involve commercialization of the technology – those that create Process and Market IP? As it turns out, we are losing more non-tech grads than we are losing tech grads.

To calculate the rate of loss of non-tech Canadian graduates, we went back and looked at the graduates of the largest 37 universities in Canada, determined which ones were working in the U.S., and then compared the total number working in business development, sales, marketing, and communications (roles that help commercialize technology and produce Market and Process IP) to the number working in engineering and IT.

Using this method, we find that there are 59 per cent more graduates from Canadian universities in the U.S. who are working in roles to commercialize technology than there are in roles to create technology. This means that if there is a brain drain, it is a loss of commercialization talent rather than Technical IP talent. Exhibit 7 shows, by university, the extent of this phenomenon.

EXHIBIT 7: Percentage of Graduates in U.S. Working in Tech vs M&S Roles



This issue is harder to see as the individuals working in commercialization roles – those who are contributing along with tech grads to the creation of Market IP and Process IP – are from a greater variety of programs, with a much wider variety of talents. And our lack of focus on the commercialization of IP, while we obsess over the creation of Technical IP, means that we are missing this completely.

Canada's problem, if we get right down to it, is not the creation of Technical IP but the creation of Market and Process IP. Our problem is the commercialization of IP, and the loss of talent to do this is particularly problematic.

Why are we losing talent?

The big question is: If we have a brain drain, what is the cause? Let's look at another case history.

Case in Point #2

Like Emile, Arjun (not his real name) graduated at the top of his class and went on to get a master's degree in computer science from another Canadian university. When he graduated, he applied to numerous companies and ended up working at a startup. Nine months later he received an offer from Amazon to work in the U.S. Not wanting to relocate, he asked if he could work in Canada instead. Amazon was pleased to hire him here.

Arjun's objective was to work for a brand-name company, one that was world leading. It didn't hurt that Amazon was also willing to pay considerably more than the startup firm he began his career with. Arjun has now worked at Amazon five years and has no intention of leaving. He gets a small-company experience within one of the world's largest tech firms because he works on a small team with a considerable degree of independence. He is also pleased with the impact of his work and how he is connected to the results.

Arjun gets recruiting calls from U.S. firms such as Facebook on a regular basis. Many contact him four times a year but, to date, he is content to stay at Amazon.

Canada almost lost Arjun to the U.S. but ended up losing him to a U.S. firm. Based upon the recruiting efforts of other U.S. firms, it is likely that he'll make a move to another U.S. subsidiary and we will have lost the chance to repatriate him. While he has remained in Canada geographically, he still works for a U.S. company – and may yet move to another U.S.-owned company in Canada – and therefore his IP contributions flow to the U.S. rather than to Canada.

Anecdotal reports indicate that there are a number of reasons that Canadians may end up working for U.S. firms. These include:

- **Compensation**
  Certainly, the salary surveys indicate a much higher salary potential in the U.S. versus in Canada. On the other hand, living expenses can be much higher in the U.S. U.S. firms are also paying higher in Canada and out-competing many local firms.
- **Experience**
  Working for a U.S. firm is likely to deliver a very different experience, particularly due to the scale at which they operate. The same experience could be gained though by working for the Canadian subsidiary of a U.S. firm.
- **Name brand**
  Having a well-known company such as Google on your resume can impress future employers. It is an implied endorsement that says, "Google thought this person was qualified to work for them." But, as with experience, this kind of implied endorsement can be gained by working for the Canadian subsidiary of a U.S. firm.
- **Location**
  For some people, the "cool factor" of working in Silicon Valley would be very appealing. Such prestige, and the warmer weather, are difficult to compete with.
- **Speed**
  American firms are much more aggressive about hiring than Canadian firms. Their practice of proactively looking for employees instead of waiting for prospects to come to them, and their habit of continually following up, increases the competitiveness of recruiting talent.

> *"American firms are much more aggressive about hiring than Canadian firms."*

Conclusion

Canada's ability to compete is at the heart of the brain drain issue. It really doesn't matter the extent of the brain drain; what matters is what it means. And what it means is that Canadian companies are not as competitive as U.S. companies when it comes to hiring. The consequences are considerable: losing talent – especially those who know how to commercialize intellectual property – strikes at the heart of a nation's ability to compete, create jobs and ensure long-term prosperity.

The solution to brain drain concerns isn't a government program; the solution is for Canadian companies to become more competitive than their U.S.- based or American-owned Canadian-based rivals. They need to raise larger venture capital rounds so they can pay higher salaries, and they need to become more aggressive in their hiring, going after employees instead of waiting for them to apply, and being faster in responding to job seekers. We need to see the race for talent with a global perspective and develop Process IP that will effectively compete in a global market for talent.

Charles Plant

Charles Plant is a serial entrepreneur, innovation economist, university lecturer and consultant. As founder of The Narwhal Project, he is conducting research into what it takes to create world-class technology companies. Plant has written more than 35 research papers and a book entitled Triggers and Barriers: A Customer Perspective on Innovation. He is currently working on his second book: Unicorn Math: Developing an Algorithm for Rapid Growth.

Plant was co-founder and CEO for 15 years of Synamics, a software firm that provided mass calling platforms to telcos. He has been an officer, director and/or investor in more than a dozen technology companies. He has worked for the MaRS Discovery District and has taught at York University's Schulich School of Business and at the University of Toronto. A Chartered Accountant, Plant also has an MBA in marketing and is currently pursuing a PhD in Economics.

About Communitech

Communitech helps tech companies start, grow and succeed. That's our mission, our mantra, our reason for being. Everything we do ties back to collaboration and helping – values that run deep in our organization.

Communitech was founded in 1997 by a group of entrepreneurs committed to making Waterloo Region a global innovation leader. At the time it was crazy talk, but somehow this community managed to pull it off. Today, Communitech is a public-private innovation hub that supports a community of more than 1,400 companies – from startups to scale-ups to large global players.

Communitech helps tech companies start, grow and succeed in three distinct ways:

- Communitech is a place – the centre of gravity for entrepreneurs and innovators. A clubhouse for building cool shit and great companies.
- Communitech delivers programs – helping companies at all stages with access to capital, customers and talent. We are here to help them grow and innovate.
- Communitech partners in building a world-leading ecosystem – making sure we have all the ingredients (and the brand) to go from a small startup to a global giant.

Learn more at
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