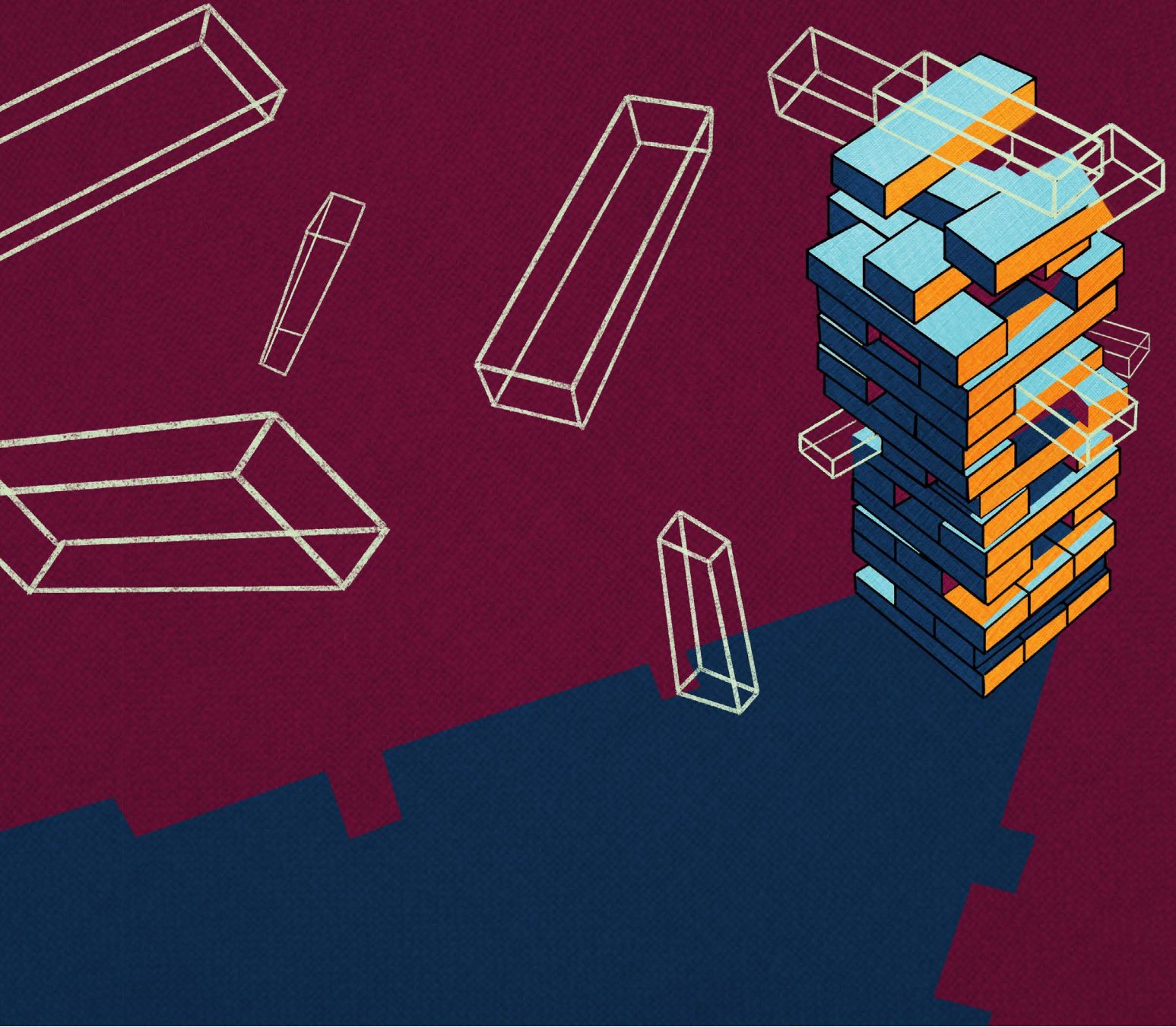


The Intangible Shift

Changing Gears to Compete in
the New Economy

February 2020



AUTHORS

CREIG LAMB

Senior Policy Analyst

Creig is a Senior Policy Analyst at the Brookfield Institute, where he leads the Skills for an Innovation-Driven Economy workstream. Creig's research is focussed on examining how technology is reshaping skills demands and preparing Canadian firms and workers for the future. Creig holds a Master of Public Policy from the University of Toronto and a Bachelor of Communications from the University of Ottawa.



creig.lamb@ryerson.ca | [@creiglamb](https://twitter.com/creiglamb)

DANIEL MUNRO

Dr. Daniel Munro is Senior Fellow and Director of Policy Projects in the Innovation Policy Lab at the Munk School of Global Affairs and Public Policy at the University of Toronto, and Researcher in Residence at Actua. Dan's research focuses on innovation policy, skills and education, and the distributive implications of innovation and technology. Dan holds degrees in political science from the University of Toronto (B.A.), Western University (M.A.), and the Massachusetts Institute of Technology (Ph.D.).



dan.munro@utoronto.ca | [@dk_munro](https://twitter.com/dk_munro)

The Brookfield Institute for Innovation + Entrepreneurship (BII+E) is an independent and nonpartisan policy institute, housed within Ryerson University, that is dedicated to building a prosperous Canada where everyone has the opportunity to thrive in an inclusive, resilient economy. BII+E generates forward-looking insights and stimulates new thinking to advance actionable innovation policy in Canada.

ISBN: 978-1-77417-011-3

For more information, visit brookfieldinstitute.ca

 [/BrookfieldIIE](https://www.facebook.com/BrookfieldIIE)

 [@BrookfieldIIE](https://twitter.com/BrookfieldIIE)

 [The Brookfield Institute for Innovation + Entrepreneurship](https://www.linkedin.com/company/brookfield-institute-for-innovation-entrepreneurship)

20 Dundas St. W, Suite 921
Toronto, ON M5G 2C2

SPECIAL THANKS + ACKNOWLEDGEMENTS

CONTRIBUTORS

Sarah Doyle, Director of Policy + Research, BII+E

Mark Hazelden, Senior Director, BII+E

Erin Warner, Marketing and Communications
Specialist, BII+E

Coralie D'Souza, Director of Communications,
Events and Community Relations, BII+E

Eliza King, Copyeditor

Jay Lintag, Graphic Designer

REVIEWERS

Danielle Goldfarb, Head, Global Research, RIWI
Corp

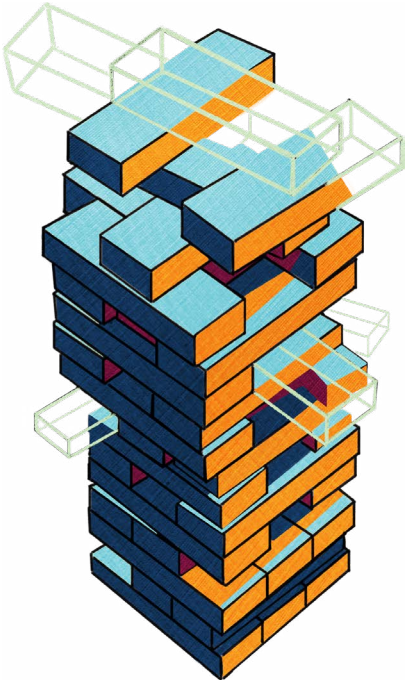
Stian Westlake, Senior Fellow, Nesta

Cam Vidler, VP, Industry and Innovation, Business
Council of Canada



TABLE OF CONTENTS

Authors	i	Intangibles play a major role in improving productivity and competitiveness	14
Special Thanks and Acknowledgements	ii		
Introduction	2	Slow Shift	19
Purpose of the Report	3	Is Canada Ready to Compete in the Age of Intangibles?	20
Understanding Intangibles	4	Focus Areas	
What Are Intangibles?		Endnotes	27
Kinds of Intangibles			
What’s Different About Intangibles?	8		
Towards New Economic Thinking	11		
Canada’s Intangible Shift	12		
What are we measuring?			
Canada is making the intangible shift			



KEY MESSAGES

- + Canada's economy is undergoing a fundamental shift. A rising share of economic growth and prosperity is being driven by *intangible assets and investments* — including data, digital services, brand equity, marketing, and training.
- + Although Canada has experienced a substantial increase in intangible investments across many sectors, we lag international peers in terms of the pace and scale of our intangible shift, putting our economy at risk of falling behind. There is an urgent need for new policies and business strategies to enhance Canada's competitiveness in the age of intangibles.
- + Accelerating the intangible shift in Canada, to ensure that all firms, workers, and communities can share in the growth and prosperity benefits, will require new thinking and policy in innovation financing, data governance, intellectual property (IP), trade, competition, skills and education, distribution, and other key areas.
- + This report launches the Brookfield Institute for Innovation + Entrepreneurship's *Intangible Shift* Research Program — a two-year initiative that will contribute to a robust, evidence-based understanding of intangibles; examine implications for productivity, growth, employment, and income and wealth distribution; and identify pressing policy needs and concrete, implementable policy options to ensure that Canada is prepared to compete effectively.

CHAPTER 1: INTRODUCTION

Canada's economy is undergoing a fundamental shift. A rising share of economic growth and prosperity is being driven by *intangible* assets and investments — such as data, digital services, brands, design, marketing, and firm-specific training — and a declining share by *tangible* assets — such as buildings, machinery, equipment, and product inventories. Between 1976 and 2008, business sector investment in intangibles grew from 5 to 13 percent as a share of GDP in Canada. Meanwhile, investments in tangible assets fell from 27 to 16 percent as a share of GDP. By 2018, investment in just one slice of intangibles — data, databases, and data science — reached an estimated \$29 to \$40 billion.¹ The intangible shift in Canada's economy is large and growing.

Firms and countries investing in intangibles are experiencing faster growth and substantial productivity improvements — a critical development at a time when long-term prospects for growth are stagnating, and one that Canada cannot afford to miss. Although intangibles are on the rise in Canada, we lag many peer countries on the pace and scale of our intangible shift. Canadian businesses in all sectors would benefit from greater investment in a variety of intangibles,

but too few are seizing the opportunities. Firms face a variety of barriers to making intangible investments, including financing, unclear data governance, intellectual property challenges, and competition, trade, and foreign investment policies ill-suited to an increasingly intangible economy. At the same time, a rapid shift to intangibles puts many firms and workers at risk of being displaced or left behind. A key challenge is to find ways to enable firms and workers across all sectors in the Canadian economy to compete and share in the productivity and growth benefits of intangibles.

How can we enable and manage an intangible shift? Economists and policymakers are just beginning to understand how the unique properties of intangibles allow for rapid growth, but also how they require new resources, skills, financing, policy frameworks, and other conditions to generate benefits. Firms and countries that understand and adopt policies and strategies to meet these new realities can position themselves for robust growth. Those that do not may be left behind. Canada's future competitiveness, and the well-being of individuals and communities, depends critically on how well businesses and policymakers manage the intangible shift.

PURPOSE OF THE REPORT

This report provides an introduction to intangibles — including their significance and the issues they raise — for policymakers, business leaders, and other stakeholders. In particular, this report:

- + offers a general overview of intangibles and highlights their unique economic properties;
- + indicates the importance of intangibles to productivity, growth, employment, and income and wealth distribution;
- + examines the extent to which Canada's economy is being driven by intangible assets and activities, how this has changed over time, and how Canada compares to peer economies;
- + introduces policy and business strategy areas that require further investigation.

Our aim is to provide decision makers across Canada's public and private sectors with further clarity on how intangible-based economies operate, and to identify some key policy and business strategy changes that can help position Canada for success. The rise of intangibles is a trend that cannot be ignored; it poses substantial opportunities and challenges for economic growth and employment. Those who understand the new economics of intangibles will be better positioned to design effective policies and business strategies. This report helps Canadian policymakers and practitioners get up to speed on the intangible shift.

INTANGIBLE SHIFT: A RESEARCH PROGRAM

The Brookfield Institute's *Intangible Shift* Research Program is a two-year initiative that will examine new economic realities generated by intangible assets and activities and their implications for policy and business strategy. Our research and communications activities will help to develop a robust, evidence-based understanding of intangibles and their unique properties; identify implications for productivity, growth, employment, and income and wealth distribution; and identify concrete, implementable policy options to ensure that Canada is prepared to compete effectively in the intangible economy.

The current report launches this two-year, multi-report research program that will cover the basics of the intangible economy and investigate critical issues in depth. Future deep dive insight reports will examine:

- + Financing innovation and growth in the intangible economy
- + Data ownership, use, and governance
- + Intellectual property and policy
- + Rethinking foreign direct investment (FDI)
- + Rethinking competition policy
- + Skills, talent, and education
- + Intangibles and inequality
- + Measuring intangibles

CHAPTER 2: UNDERSTANDING INTANGIBLES

Over the past few decades, intangible investments have become a large share of new investments in many economies. The rise of intangibles, their contribution to firm innovation and value creation, and their implications for productivity, growth, and employment have caught the attention of economists and policymakers. But what are intangibles, and why do they matter? How, if at all, do they prompt us to think differently about innovation, competitiveness, and prosperity? Understanding intangibles is a critical first step in developing strategies and policies for Canada to succeed in these new economic conditions.

WHAT ARE INTANGIBLES?

Intangibles are investments and assets that do not have a concrete physical existence, but which generate — or have the potential to generate — long-term economic value.² They include things like data, digital services, brands, design and marketing, relationships, and expertise — in contrast to (though often complementing) tangible assets, such as buildings, machinery, equipment, and vehicles.

Like tangible investments, intangible investments can produce long-term benefits for the firms that make them. They are used in the production of goods and services, and represent “foregone current consumption for the benefit of greater future consumption.”³ Investment of time and resources to develop and test algorithms that analyze data to predict consumer behaviour, for example, is a kind of intangible investment that can generate a long-term return for a firm. The algorithm may be quite valuable if its predictive powers are strong, but ultimately it is an intangible asset. It cannot be held, packaged, or shelved like shoes or chocolate bars.

KINDS OF INTANGIBLES

Previous work on intangibles (and the related ideas of *knowledge-based capital* and *intellectual assets*) distinguishes between three main categories of intangible investments: *computerized information*, *innovative property*, and *economic competencies*.⁴ Under each, we highlight some prominent and important types of intangible investments and assets. The key in all cases is that firms spend resources to develop or acquire assets that lack a physical existence but which, over time, generate value.

Computerized Information

Economists use the term *computerized information* to refer to things like software, databases, data processing and analysis, and other data and information stored in or used by computers to make them more effective and efficient in the long-run. These are investments that can be made by firms whose business models are focused on data or digital platforms, as well as firms whose activities are not data-focused, but for whom computerized information and analysis can help to improve their performance.

Data and Digital Platforms

Investing in the collection and analysis of data is a key activity in the growing intangible economy.⁵ Global technology giants, as well as some Canadian firms, are collecting and generating data to create and improve products and services, more effectively market existing products and services, re-engineer production and supply chain logistics, and identify new and improved business models and opportunities. According to experimental estimates by Statistics Canada, investments in data, databases, and data science by Canadian firms was between \$29 to \$40 billion in 2018, with accumulated stock of data-related assets estimated at \$157 to \$217 billion.⁶

Data collection and analysis is essential to Canada's emerging AI sector,⁷ as well as to new and established firms involved in fintech activities.⁸ Many firms and investors view data as so important to the long-term success of companies that they are willing to operate at a loss — sometimes for years — while they collect and analyze ever-larger data sets and improve their analytical assets.

At the same time, data collection and analysis have long been important — and recently even more important — to many firms whose core activities are not directly data-related. Financial services firms have a history of collecting and using data about customers and economic opportunities; manufacturing firms have used data to improve production models; and data-driven customer

insights and supply chain logistics are critical to retail businesses. New technologies for data collection and analysis have accelerated the speed and scale with which firms use data to compete, making investments in these technologies and processes ever more important for success.

Innovative Property

The category *innovative property* refers primarily to creation and discovery work conducted by a firm for some future benefit, as well as the intellectual property it generates.⁹ This includes research and development (R&D) that leads to a patent or license; oil and gas and mineral exploration; new architecture and engineering design; design and product development; financial industry development costs; and creating entertainment and artistic originals.

Design

Design is an important feature of successful product development. Firms make investments in intangibles such as research and development, market research, and design engineering to improve long-term returns. The success of the Blackberry, for example, owed much to Research in Motion (RIM)'s investments in both function and design, with the aesthetically pleasing Blackberry keyboard playing a central role in many users' product loyalty.¹⁰ Similarly, Steve Jobs aggressively prodded Apple engineers and designers to fuse functionality and design in a range of products — including, notably, the iPhone and iPad.¹¹

Baldwin et al. estimates Canadian firms' total investment in new architecture and engineering design, and other science and engineering services — of which design is a significant component — at \$15.6 billion in 2008.¹² Looking just at Ontario, Muntean estimates that between 1998 and 2008, Ontario firms' nominal spending in these categories grew from \$4.7 billion to \$8.6 billion.¹³ Recognizing that these data capture more than design, it is nevertheless clear that design and related services constitute a large and growing share of business investment and innovative activities.

THE POWER OF DESIGN AT LULULEMON

The Canadian yoga and athletic wear company Lululemon offers a compelling illustration of the benefits — and occasional risks — of intangible investments in design to create and capture markets. Twenty years ago, Lululemon released a line of specially-designed nylon and Lycra pants for yoga enthusiasts who wanted something other than regular cotton pants. The company's original fabric, Luon, was trademarked in 2005, and has since been complemented by its Luxtreme, Nulux, Silverescent, and other function-specific fabrics and styles that use different fabrics and technologies to improve sweat-wicking, reduce odors, and fit-form as desired.¹⁴

Lululemon's newest innovations emerge from its Vancouver-based Whitespace lab, which employs 50 researchers, including designers, physiologists, engineers, neuroscientists, and biomechanists. Launched in 2012, the lab explores human behaviour, market trends, fabrics, and other technologies to generate ideas for new and improved yoga wear. The lab organizes itself around three functions which, together, comprise a substantial intangible investment:

- + *innovation management*, which identifies and defines the problems the team will work on;
- + *advanced technology*, which identifies and tests solutions to the problems; and
- + *scientific research*, which considers how potential solutions can be realized and how they are likely to fare in the market.¹⁵

With other major sportswear companies such as Nike and Adidas developing and capturing market share for their own yoga and activewear lines, Lululemon's investments in design are as much a survival imperative as a strategy for differentiation. Based on its unique combining of intangible design investments and tangible products, Lululemon's annual revenues grew from \$1.5 to \$3.4 billion between 2014 and 2019, and the company has an estimated worth of \$23.4 billion.¹⁶

Research and Development

Investment in research and development (R&D) has been an important signal of, and contributor to, innovation and growth for many decades; but the nature of R&D in the intangible age may be changing. Firms that spend on R&D are investing in a process — supported by highly-skilled people and tangible equipment — that they expect will result in new value through the creation of a new or improved product, service, or process. Although R&D is not a new phenomenon, it fits the definition of intangible investment, and viewing it through that lens offers greater clarity on its importance and the scale and nature of Canada's broader intangible shift.

R&D spending is associated with productivity and GDP growth. A multi-country study by the OECD found that a 0.1 percentage point increase in the ratio of a country's business expenditures on R&D (BERD) to GDP eventually generates 1.2 percent higher GDP per capita.¹⁷ At the firm-level, R&D spending is associated with innovation, growth, and an ability to adopt and benefit from new technologies. Rates of return to R&D at the firm level range from 20 to 30 percent — higher than returns to physical capital, according to work by the OECD.¹⁸

While business R&D is a large and important contributor to innovation and growth, Canada's BERD intensity is low by OECD standards. At 0.82 percent as a share of GDP, Canada's BERD ranked 24th of 36 OECD countries in 2017, and amounted to less than half the OECD average of 1.67 percent.¹⁹ Furthermore, as many have noted, Canada's BERD intensity has been falling steadily for nearly 20 years, while the OECD average has been rising.²⁰ Not surprisingly, Canada's production of patents, trademarks, and industrial designs — often the result of R&D — is similarly weak. Of 22 advanced countries examined in a recent study, Canada ranks 18th on patents, 19th on trademarks, and last on industrial designs.²¹

Economic Competencies

Economic competencies refer to firms' investments in their brands and customer acquisition, as well as in the talent and organizational structures needed to be productive and grow. This includes investment in human capital, including training costs; advertising and market research to develop brand equity; and developing new business processes and organizational structures.

Marketing and Brand Equity

Brand recognition and loyalty play a large role in the success of many firms. Consumer decisions may be shaped by feelings and attitudes about brands as much as, or even more than, the quality and price of the products themselves. As such, many firms recognize that it can be just as important to invest in brand awareness and loyalty activities as it is to improve products and services. The kinds of design and marketing investments needed to enhance brand recognition and loyalty — as well as the brand itself, once developed — are intangible investments and assets that contribute to firms' overall value.

Skeptics suggest that advertising spending does not create new value — that it merely redistributes value among firms. Others point out that advertising and marketing budgets are “necessary for developing new brands and maintaining the value of existing brands.”²² There are some studies that show that advertising increases overall sales, and is not merely a reallocation among competing firms.²³ In that case, firms have good reason to think about investments and strategies to protect and enhance the important intangible asset of brand equity.

FUELLING GATORADE'S BRAND EQUITY

The sports drink company Gatorade provides a good illustration of the importance of intangible investments to improve brand recognition and attitudes, including how brand loyalty can be lost and won back.

In the mid-2000s, Gatorade was losing market share to other sports drink makers, such as Powerade, and “lifestyle waters”, including Vitamin Water. According to some observers, this was partly a function of Gatorade's shift from “science of hydration” branding to “lifestyle” branding, and

the subsequent loss of athlete consumers. After its acquisition by PepsiCo, Gatorade had more R&D and marketing expertise at its disposal to rethink its brand and marketing approach. Based on extensive research, the company eventually shifted to a “sports fuel” brand and introduced some product variation, which helped it to regain athlete consumers and acquire additional market share.²⁴ As of 2018, Gatorade reportedly accounts for three-quarters of the sports drink market, with next closest rival, Powerade, holding 15 percent.²⁵

Firm-Specific Skills and Training

The skills and expertise of workers are key factors in production and economic growth. Investments in their development — whether by firms, governments or individuals themselves — constitute an especially large intangible investment. When firms make investments to train workers in new processes or to develop new skills and knowledge, they expect that their investment will generate a return in the form of greater productivity and/or improved products and services.

In some cases, skills and knowledge are developed in formal education institutions and are “general” or transferable; that is, they can be used by workers in a variety of employment settings. These include literacy, numeracy, critical thinking, and communication skills, as well as a wide range of general and expert knowledge in widely applicable fields such as engineering, business, design, economics, and sociology. Other skills and expertise are useful only in specific settings, such as how a firm’s unique production, accounting, or other organizational processes work, or knowledge of firms’ proprietary designs, recipes, and strategies.

A key challenge for firms is determining how much to spend and on what kinds of training, given the risk that the employees in whose skills development they invest might leave the firm and carry the investment with them. This challenge goes some way towards explaining why many Canadian firms underinvest in worker training.²⁶ Nevertheless, investment in skills development — of which firm-specific training is an important part — constitutes one of Canada’s key intangible strengths.

WHAT’S DIFFERENT ABOUT INTANGIBLES?

Tangible and intangible investments are alike in at least one key sense: Firms make upfront investments in assets that they expect will generate long-term returns. In other ways,

however, intangible investments and assets are very different. As business investment increasingly shifts to intangibles, existing frameworks for fostering innovation, growth, and distribution must be updated to accommodate new economic realities. To make the right adjustments, we need to develop a clearer understanding of the unique features and behaviours of intangibles, and what they imply for business strategy and policy.²⁷

Scalability

Unlike tangible assets that are used up over time, intangible assets can be used repeatedly without being depleted. Intangibles are largely ideas-based assets, and, like ideas, can be shared and used many times, in different places and by different people. This gives intangibles the property of *scalability*.²⁸ Whereas tangibles-based business activities involve continuously acquiring and using resources to produce concrete products that can only be sold once, intangibles can often generate a return on an initial investment without having to find new resources to make additional units.

Consider smartphone applications. Developers may spend substantial time and energy designing and developing an app, and collecting and analyzing data to improve its performance. Once completed, however, they can sell or license the app to users almost without limit, since each additional unit sold requires no additional resources to produce. As a result, a popular app can quickly generate massive returns. By contrast, when a bakery creates a new and popular donut, sales will be limited by the extent to which they can acquire ingredients and the labour needed to produce more donuts, which, once sold, cannot be sold again.

The scalability of intangible assets creates both opportunities and challenges:

- + Scalability opens growth paths that can benefit individual firms and economies, but it can also disorient and create challenges for inexperienced managers and entrepreneurs. These challenges might include developing

or adopting new payment systems, customer service functions, and financial management processes that can handle large volumes.

- + Intangibles can decouple economic growth from employment growth. Intangibles-based firms can grow very quickly with minimal labour needs and costs, leading to fewer opportunities for workers in the labour market. Thus, scalability raises questions about the distribution of opportunities to participate in and benefit from the innovation economy.
- + Scalability can generate extreme first-mover advantages and winner-take-all dynamics. Large firms that make substantial upfront investments in technology, data collection and analysis, or organizational processes, for example, can become superstar firms against whom other firms have difficulty competing.²⁹ For example, Facebook has developed such a large network of users that new firm entries in the social media sector have serious difficulty succeeding. This raises concerns about business dynamism, the distribution of returns, and the consolidation of economic — as well as social and political — power in intangible-driven sectors.³⁰

Sunkness

Intangible investments are hard to recover once they have been made. Tangible assets, such as buildings, equipment, and product inventories, can be sold — and therefore used as collateral for financing — because they have general use value to other firms. By contrast, intangible assets, like certain kinds of data, brands, recipes, and firm-specific knowledge, can be difficult if not impossible to sell, especially if not protected as intellectual property and/or when the asset ages and becomes obsolete. Intangible investments are more *sunk* than tangible investments; it is difficult for anyone other than the firm that made them to benefit.³¹

Consider the substantial investments that brand-name clothing lines make to improve awareness of and loyalty to their brands. When the brand is valued and there are additional

potential customers to whom clothing might be sold, investment in marketing and greater brand awareness are smart investments. When consumers eventually lose interest in the brand, the company can redeploy or sell physical assets, but the marketing investments are neither recoverable nor something that another firm might want to buy. Similarly, consider how rapidly data about consumer behaviour can become obsolete. Data about entertainment product consumption (e.g., purchases and rentals of CDs, DVDs, and other products) can be very useful when those product categories are still relevant, but as they lose relevance (e.g., as consumers shift to streaming services), earlier investments in understanding consumer behaviour can lose almost all value.

This feature of intangible investments also generates unique challenges:

- + Because it is harder to recover intangible investments, they are riskier to make. Furthermore, because of the additional risk, firms might underinvest in intangibles — even when their long-term success depends on making those investments.
- + Intangibles-based firms have greater difficulty raising capital for other business activities because they lack conventional collateral. As Cecchetti and Schoenholtz note, financing intangible investments requires a solution to the “tyranny of collateral.”³² Even if financiers can develop finance mechanisms to support firms with long-term potential, they still face substantial risk in the absence of saleable assets. The need to rely on risk capital over conventional lending is further complicated by the relative scarcity of risk capital in Canada.³³

Skills Sensitivity

Intangibles tend to require different skills and expertise than tangible assets. Design, data analysis, digital product development, marketing, and R&D require advanced analytical, technical, and quantitative skills, as well as strong creativity and communication. Digital skills are especially

important given the large role that data and digital technologies play in intangible economies. Moreover, given the unique legal, financial, risk assessment, and management challenges intangibles can present, specialized legal and financial skills are also important. Finally, because intangibles often work best when combined with other intangibles, teams need good collaboration skills.³⁴

As intangibles — and specific types of intangibles — become a more prominent feature of economies, demand for different kinds of skills and expertise than those relevant to tangible investments and assets will increase. Firms and economies that want to succeed will need to find ways to better identify, develop, and employ people with those skills through education, workplace training, and immigration. Yet, there are challenges:

- + Firms and economies that want to benefit from intangible investments must identify or develop specialized skills among workers. Some of the skills needed are in short supply and difficult to develop quickly. Digital skills shortages are an especially prominent concern among some Canadian firms and policymakers.³⁵ Additionally, a range of unique legal, managerial, financial, and other corporate skills and expertise are needed for firms involved in intangibles to succeed. The need for other non-technical skills, attitudes, and behaviours — such as social skills, communication, creativity, problem-solving, and design — is also increasing.³⁶
- + The mirror of intangibles generating higher demand for (and contributing to shortages of) certain specialized skills is a decrease in demand for other kinds of skills that have more value in a tangibles-based economy. Research shows that demand for routine skills — such as those required in certain kinds of manufacturing and process-oriented occupations — may be declining relative to non-routine skills in the Canadian economy.³⁷ This is an especially fraught issue in Canada, where enthusiasm for an intangible shift could

leave many workers caught in the gap and unable to develop new skills and acquire good employment.³⁸

Synergies

Intangibles often work best when combined with other intangibles and tangibles. For example, firms that develop sophisticated databases and digital capacity to improve marketing of their existing products and services achieve significant performance advantages. Research shows that firms in the U.S. that develop sophisticated data analytics capacity and use it to drive decision-making experience significant improvements in output and productivity levels.³⁹

Similarly, firms that invest to attract or develop better management capacity — i.e., who make intangible investments in management-level, firm-specific human capital — can enhance benefits from their existing lines of business. Firms that combine management training and changes with information and communications technology (ICT) investments raise the productivity of those ICT investments.⁴⁰ This is not entirely surprising, as previous research has found that at least half of the difference in labour productivity growth between the U.S. and Europe between 1995 and 2004 can be attributed to superior U.S. management practices.⁴¹

The key message for analysis and policy is to recognize that the intangible shift is not merely about new businesses and activities emerging that are entirely intangibles-based, but about combinations of intangible and tangible assets and activities. There are many opportunities and incentives for all firms to make intangible investments that can improve their businesses. The intangible shift generates opportunities for new business models, as well as opportunities for existing firms to complement their current product, service, and process areas with new intangible investments to drive innovation and growth.

TOWARDS NEW ECONOMIC THINKING

Intangible investments and assets are increasingly important, and make substantial contributions to firm and economic performance. Although certain intangible assets have almost always been a part of the economy, recognizing them as intangibles — and achieving greater clarity on their unique properties and behaviour — puts us in a better position to pursue and manage these economic opportunities.

Success in the intangible economy requires firms and policymakers to recognize and respond to the different behaviour of intangible investments and assets, including scalability, sunkness,

skills sensitivity, and synergies. Intangibles have major implications for financing, employment, education, and other business and policy concerns. Indeed, whereas conventional economic thinking and policy have been built on assumptions about scarcity, competition, constant returns to scale, price transparency, and other ideas, intangibles challenge these assumptions — and thus challenge policy to respond in new ways. We will examine some of these implications in Chapter 4.

CHAPTER 3: CANADA'S INTANGIBLE SHIFT

An intangible shift is happening in Canada and globally. Businesses and governments are making efforts to seize opportunities and address challenges presented by these investments and assets. But exactly how big has the intangible shift been in Canada, and how do we compare with other economies? What do recent and future trends look like? How much has the intangible shift affected — and how much will it continue to affect — productivity, growth, and the distribution of benefits and risks?

Across Canada, investments in intangible assets are growing rapidly, contributing to significant improvements in economic output and productivity. Canadian firms exhibit particular strength when it comes to investing in branding, talent, and organizational improvements. However, compared to peer jurisdictions, Canadian firms invest less in some key intangible assets: industrial R&D and ICT. This may help to explain Canada's poor productivity track record.

To strengthen our intangible economy, Canada might consider building on areas of strength, while also improving on industrial R&D and intangible ICT investments. This, however, often requires complementary investments in other intangibles, such as managerial expertise, business processes, and skills training.

WHAT ARE WE MEASURING?

Intangible assets are those that provide future benefits but do not take a physical form. This could be anything from the data software used

to improve operational efficiency to targeted advertising campaigns. Previously, intangibles were viewed as an intermediate expense in the system of national accounts (SNA), separate from tangible capital investments. However, despite not having a physical form, intangibles act similarly to tangible investments, in that they are employed in the production of goods and services for future benefits. As such, many have argued they should be measured alongside tangible capital in the SNA.

Current efforts to measure the size and economic impact of intangible investments focus on the three aforementioned categories of the intangible economy: computerized information, innovative property, and economic competencies.⁴² However, they provide only rough estimates of the economic activity generated by intangible investments. These measurements are most useful when considering the relative size of various components of the intangible economy, and whether intangibles change our understanding of what contributes to economic growth.⁴³ In that case, while we are able to provide some indications of the size, trajectory, and implications of intangible investments in Canada, identifying better measures and metrics is an urgent priority.

CANADA IS MAKING THE INTANGIBLE SHIFT

Investments in intangible assets are a critical and rising component of economic growth in Canada. In 2008, the Canadian business sector invested \$151 billion in intangible assets, representing roughly 13 percent of gross domestic product (GDP) in

that year.⁴⁴ Canadian firms invest most heavily in economic competencies — including branding, talent, and organizational improvements.

Investments in intangibles have increased more rapidly than tangibles, but Canadian firms continue to invest more in tangible assets.⁴⁵ In 1976, intangible investments contributed nearly 5 percent to Canada’s gross domestic product (GDP). By 2008, this increased to over 13 percent. Meanwhile, tangible assets as a proportion of GDP declined by 11 percentage points, from nearly 27 percent in 1976 to 16 percent in 2008. In 1976, for every \$100 Canadian firms spent on tangibles, they spent \$23 on intangibles. By 2008, Canadian firms were spending \$66 on intangibles for every \$100 invested in tangible assets.⁴⁶

Economic competencies comprised roughly 60 percent, or \$87 billion, of Canada’s investments in intangibles in 2008, of which investments in organizational structures amounted to \$66 billion, advertising roughly \$17 billion, and firm-specific human capital roughly \$4 billion. Innovative property represents the second-largest component of intangible investments across Canada, at approximately \$47 billion in 2008. Business R&D comprised one-third of total investment in this category of intangibles. Finally, investment in computerized information was the third largest component of intangibles, of which software

investment represented the largest component at \$17 billion in 2008.⁴⁷

Intangibles in the Provinces

Investment in intangibles varies from province to province. Ontario has a more intangible-intensive economy than the rest of Canada, where investments in intangibles grew from 9.2 percent of output in 1998 to 10.4 percent of output in 2008. This outstripped tangible investments, which fell from 12 percent of business sector output in 1998 to 10 percent of business sector output in 2008.⁴⁸

Economic competencies comprise the largest category of intangible investments in Ontario, as in Canada overall. In 2008, the Ontario business sector spent roughly \$26 billion on brand equity, firm-specific human capital, and organizational change, representing 50 percent of the province’s intangible economy. Innovative property is the second largest category of investment in Ontario, with roughly \$17 billion spent in 2008, representing one third of the province’s intangible economy. R&D and new architecture and engineering design are the largest expenditures in this category. Finally, computerized information is the smallest category, comprising 16.4 percent of Ontario’s intangible economy in 2008.⁴⁹

Table 1: Intangible investment as a percentage of gross domestic product in the Canadian business sector

	1976	1990	2000	2008
Total estimated intangible business investment	4.9	8.6	12.6	13.2
Computerized information	0.2	0.8	1.2	1.5
Innovative property	1.9	2.7	4.2	4.1
Economic competencies	2.7	5	7.1	7.6

Source: Adapted from Baldwin, J. R., Gu, W., & Macdonald, R. 2012. “Intangible Capital and Productivity Growth in Canada.” SSRN Electronic Journal. <https://doi.org/10.2139/ssrn.2093526>

INTANGIBLES PLAY A MAJOR ROLE IN IMPROVING PRODUCTIVITY AND COMPETITIVENESS

In the long run, productivity is the most important driver of a country's economic growth. There are three major contributors to labour productivity growth:

- + labour composition — a measure of the skills and abilities of the workforce;
- + capital deepening — the largest contributor to productivity in Canada, which includes tangible and intangible capital investments; and
- + multifactor productivity (MFP) — a residual, imperfect measure of technological change.

Across many advanced countries, intangible investments have been shown to be major contributors to productivity, typically contributing between 20 and 30 percent of overall productivity growth.^{50 51}

How do intangible investments affect productivity?

Intangible assets, such as human capital, R&D, software, and data, have been shown to have significant positive impacts on firm productivity. R&D plays a major role in increasing a country's competitive advantage by developing new and better ways of doing things within a firm, while also promoting the diffusion of technology throughout the economy.⁵²

ICT, which includes intangibles such as software and databases, is often regarded as the main infrastructure of the knowledge economy. ICT helps to generate new business processes and opportunities, and improve the efficiency and effectiveness of old ones.⁵³ A recent study of the productivity slowdown in Canada since the early 2000s concluded that declining ICT contributions were a major factor, explaining between 20 and 40 percent of the overall productivity slowdown in Canada.⁵⁴

Other intangibles, such as human capital, also play an important role in improving productivity. According to a study of differences in labour productivity growth between the United States and Europe, at least half of the difference between 1995 and 2004 can be attributed to superior management practices in the United States.⁵⁵

However, the productivity-enhancing effects of intangible investments are often contingent on investments in other intangibles — that is, the benefits of intangibles may only be realized when complementary investments in other intangibles are made.⁵⁶ ICT is perhaps the intangible asset most associated with improved productivity. For firms to achieve the productivity-enhancing benefits of ICT, though, they often also must make investments in additional intangible assets, such as new organizational processes, managerial expertise, and worker training.^{57 58} Similarly, there is evidence of complementarity between R&D and ICT in reducing inefficiencies in production.⁵⁹

Intangibles are a major driver of productivity growth in Canada

In line with other jurisdictions, intangible investments are major contributors to productivity in Canada. Between 1976 and 2008, intangible assets accounted for roughly 40 percent of the impact of capital deepening on labour productivity. Of the three main categories of intangible capital, innovative property and economic competencies each contributed more to productivity than software.⁶⁰

In Ontario, which is more intangible-intensive than the rest of Canada, intangible investments contribute more to productivity growth than tangible capital. Between 1998 and 2008, intangible capital contributed 26.2 percentage points to total labour productivity growth, while tangible capital contributed 17.9 percentage points.⁶¹

However, the decline in labour productivity between the periods of 1980-2000 and 2000-2015 is not explained by changes in intangible investments, but by an increase in the use of tangible capital to extract resources in the mining,

Table 2: Intangible investment as a percentage of gross domestic product in the Canadian business sector

	1976-2000	2000-2008	2000-2008 less 1976-2000
Labour productivity growth	1.7	0.8	-1
contribution of			
Capital deepening	1.3	1.4	0.1
<i>Tangible</i>	0.8	0.8	0
ICT (excluding software)	0.3	0.3	-0.1
Non-ICT (excluding mineral exploration)	0.4	0.5	0.1
<i>Intangible</i>	0.5	0.6	0
Computerized information	0.1	0.1	0
Innovative property	0.2	0.2	0
Economic competencies	0.3	0.2	0
Labour composition	0.4	0.3	-0.1
MFP	0.1	-0.8	-0.9

Source: Adapted from Baldwin, J. R., Gu, W., & Macdonald, R. 2012. "Intangible Capital and Productivity Growth in Canada." SSRN Electronic Journal. <https://doi.org/10.2139/ssrn.2093526>

oil and gas sector, and a decline in the utilization of capital in the manufacturing sector.⁶²

Compared to international peers, Canada lags when it comes to key areas of the intangible economy

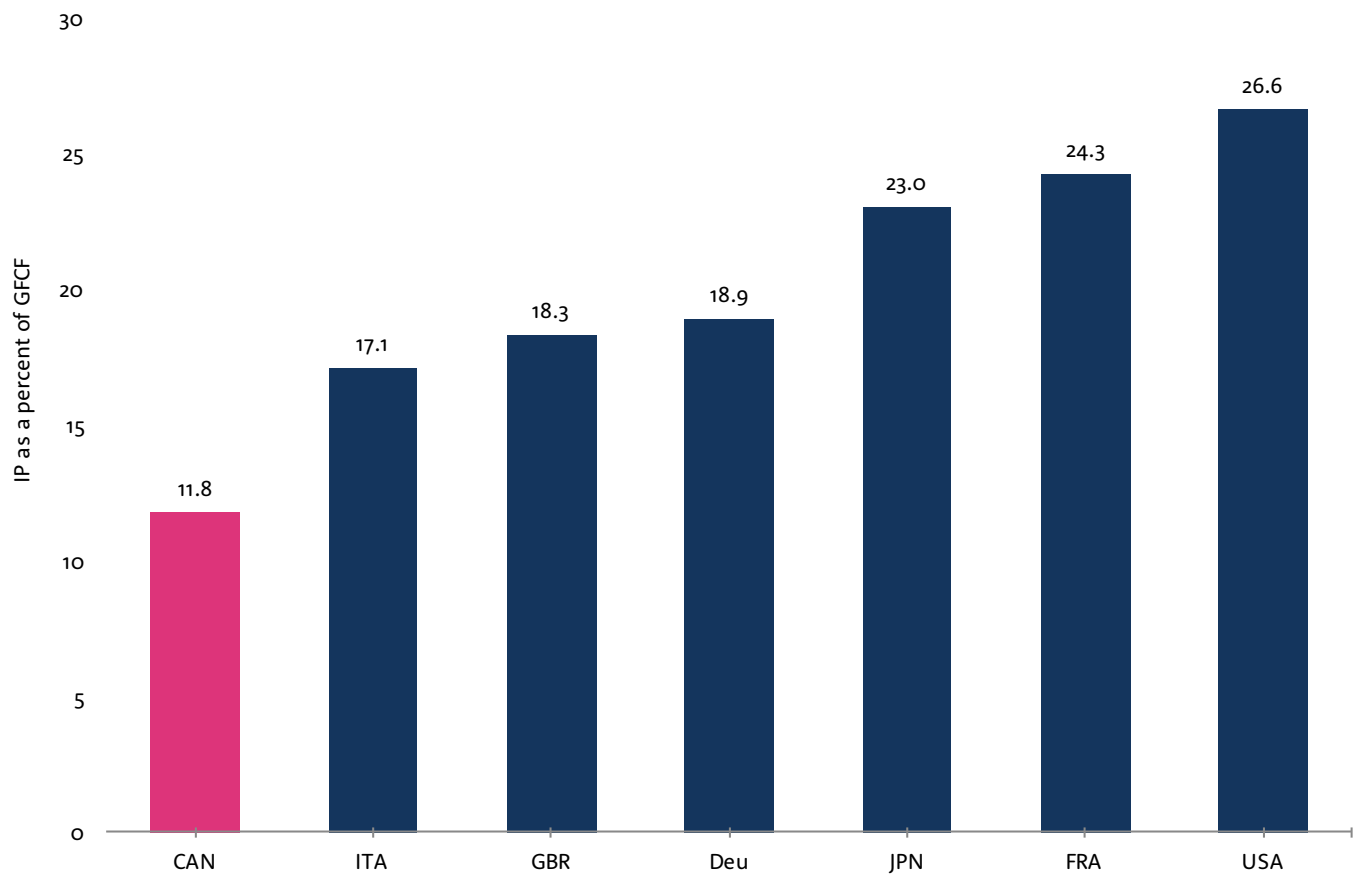
Canada's intangible shift is accelerating, but we lag global peers. Although high-quality, comparable data are limited, there are some measures that reveal just how far behind peer economies Canada is in making the intangible shift. Consider OECD data on IP products (such as R&D, mineral exploration, software and databases, and literary and artistic originals), and on ICT, computer software and databases, telecommunications equipment, and computer hardware.⁶³

In 2016, Canada ranked last among G7 countries (for whom data were available) in investments in IP products and ICT as a proportion of gross-fixed capital formation (GFCF), a measure of capital investments minus disposal of assets in a given period. IP products made up nearly 11.8 percent of GFCF in Canada in 2016 — more than 5 percentage points lower than Italy, the next closest comparator, and nearly 15 percentage points lower than the G7 leader, the US.

Investments in ICT follow a similar trend, although they represent a lower proportion of GFCF across countries and the spread between countries is not as large. In Canada, ICT investments were just over 9 percent of GFCF, compared to nearly 16 percent in the US.

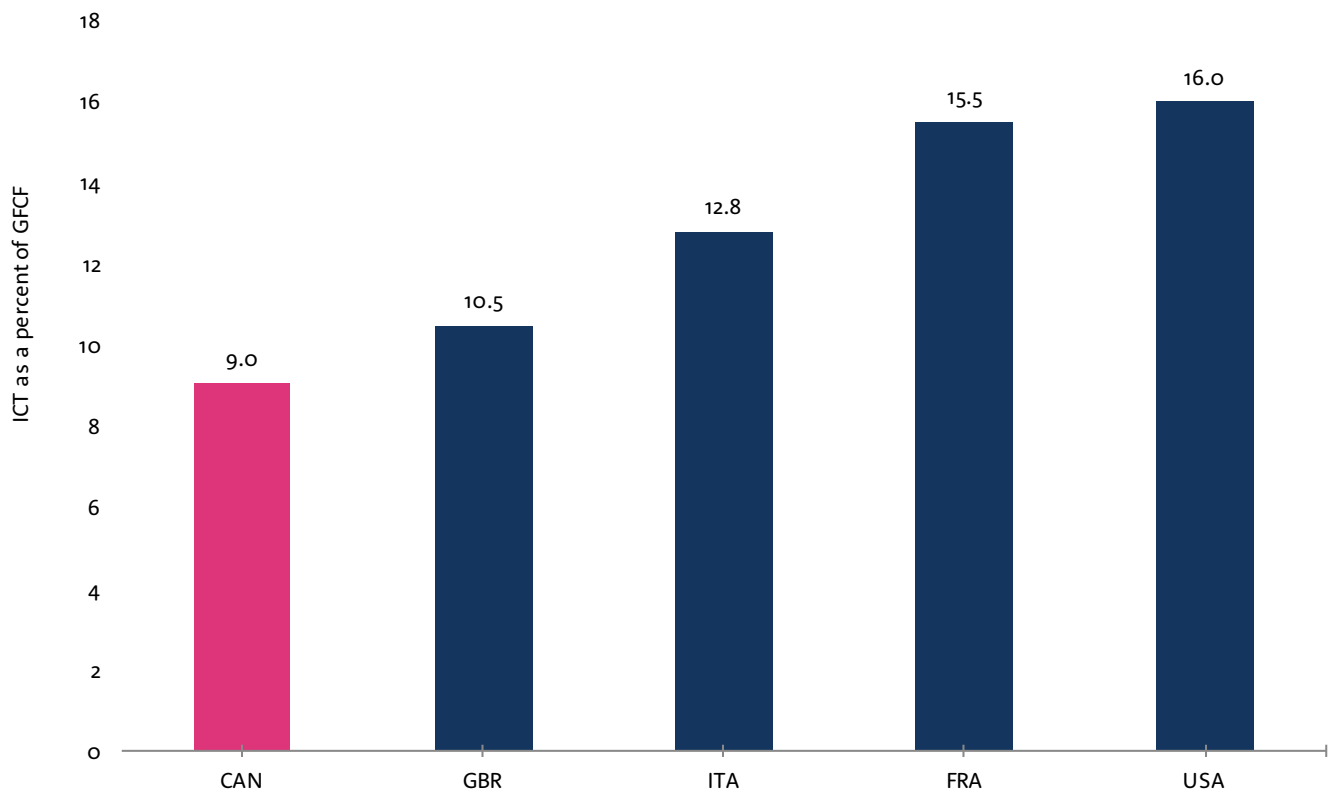
Figure 1

Intellectual property (IP) products as a percent of gross-fixed capital formation (GFCF), 2016



Source: OECD. 2020. *Investment by asset (indicator)*. Paris: OECD.
<https://data.oecd.org/gdp/investment-by-asset.htm>

Figure 2
Information and communications technology (ICT) as a percent of gross-fixed capital formation (GFCF), 2016



Source: OECD. 2020. *Investment by asset (indicator)*. Paris: OECD.
<https://data.oecd.org/gdp/investment-by-asset.htm>

Other, admittedly less current, data show that total investment in intangibles is lower in Canada than in the United States. In the United States, the business sector invested 15.6 percent of GDP in intangible assets from 2000 to 2003, compared to 12.6 percent in Canada. While Canada and the US invest in economic competencies at a similar intensity, Canadian firms invest less than their US

counterparts in R&D and software. Levels of non-scientific R&D are consistent between the two countries.⁶⁴ Canada's weak standing when it comes to investment in ICT and industrial R&D has been long documented. For example, between 2008 and 2014, the gap between Canadian and US ICT investment grew from 31.6 percent to 43.7 percent.⁶⁵

Table 3: Intangible investment as a percentage of gross domestic product in the Canadian business sector

	1980-1989	1990-1999	2000-2003	1980-1989	1990-1999	2000-2003
	Canada			United States		
Total intangible	7.1	9.7	12.6	11.3	13.5	15.6
Computerized information	0.5	1.1	1.3	0.8	1.5	2.2
Scientific research and development	1	1.4	1.7	3.4	2.8	2.9
Non-scientific research and development	1.5	1.8	2.3	1.9	2.6	3
Brand equity	1.4	1.5	1.6	1.8	1.9	2
Firm-specific resources	2.7	3.9	5.7	3.5	4.6	5.4

Source: Adapted from Baldwin, J. R., Gu, W., & Macdonald, R. 2012. "Intangible Capital and Productivity Growth in Canada." *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2093526>

Lower investment in software may explain Canada's poor productivity performance

From the mid-1970s to 1995, the contribution to labour productivity from intangible capital was similar in Canada and the US. After 1995, however, intangibles contributed less to labour productivity in Canada, largely due to lower investments in software. This reduced Canada's labour productivity growth relative to that of the United States by 0.2 percentage points per year for the 1995-to-2003 period.⁶⁶

Computerized information, a core component of the intangible economy which includes software, contributed less to labour productivity in Ontario and Canada than it did in the US, UK, France, Italy, Austria, and Denmark from the mid to late 1990s throughout the 2000s.⁶⁷ This all suggests that some of Canada's comparatively poor productivity performance can be partially explained by our weak record of software investment.

SLOW SHIFT

While Canada's intangible economy is sizable, growing fast, and contributing significantly to productivity and economic growth, there are areas of weakness. To compete in an increasingly intangible world, we need to consider why Canada is successful in some areas and less so in others, and devise policies and strategies to improve our overall performance. At the same time, we need to find better ways to measure intangible investments and their contribution to productivity and growth — both in Canada and abroad. The picture we suggest is one of a lagging Canada, but the picture is fuzzy. A key task of the *Intangible Shift* research program will be to identify better measures of intangibles, in order to provide a stronger foundation for policy analysis and change.

CHAPTER 4: IS CANADA READY TO COMPETE IN THE AGE OF INTANGIBLES?

Intangible investments and activities are critical to innovation, productivity, and economic growth. Although Canada is experiencing an intangible shift, we lag other advanced economies on the extent and intensity of the shift, leaving us poorly positioned to compete effectively in the global economy. At the same time, Canada's more gradual shift to intangibles offers firms, workers, and policymakers more time to ensure that the right supports and programs are in place to lower the risks and maximize the benefits for all.

Over the next two years, the Brookfield Institute's *Intangible Shift* research program will explore the opportunities and challenges of the intangible economy in depth, focusing on the policies and supports needed to enable and manage intangibles-based growth. To avoid being left behind, Canada needs to take action in a number of specific policy areas, including human capital, financing, IP and data policy, competition and trade rules, and social policy. But we need further research and insights to identify concrete, implementable, and effective policies and strategies.

FOCUS AREAS

We have identified a number of key focus areas that will require substantial examination and action. For each area we indicate its importance, identify some gaps and challenges, and highlight where further research and action are needed.

FINANCING INNOVATION AND GROWTH

Financing is a critical component of innovation and growth. Firms with the potential to scale, but who lack access to financial resources to conduct R&D, explore new markets, invest in human capital, improve marketing and branding, and other activities face significant lost opportunities. Where firms and their owners have access to collateral in the form of tangible assets, conventional sources of financing are easier to attract. However, when businesses are based on intangible assets, financing innovation and growth is more challenging for both firms and potential lenders.

This is a consequence of the *sunkenness* feature of intangible assets, and the associated increase in investment risk.

Firms' acquisition or creation of intellectual property, trademarks, and copyrights may have potential as collateral in attracting funding, but there are challenges with each. The value of IP, for example, might not be apparent or substantial until combined with other assets, which may not be part of the "collateral package."⁶⁸ In the case of pre-commercialization IP, it may be difficult or impossible to assign independent value. Moreover, all three assets — IP, trademarks, and copyright — have value only to the extent that others can be excluded from their use. Firms whose IP is unclear, and/or who have had difficulty defending their IP, may find that it lacks collateral value to lenders and other stakeholders.

Much intangible financing will likely come from risk capital. In the absence of financial innovation, this means that the pool of financing available for intangible-based businesses will be limited by the pool of venture capital (VC). While Canada's venture capital environment has seen dramatic improvements in recent years, there is a large gap between what firms want and the total pool of what VCs can offer.⁶⁹ Crowdfunding for intangible investments is another opportunity, though there are many regulatory and supply issues that would need to be addressed with that model.⁷⁰ Financial innovation of some kind will be needed to support the intangible shift.

- + What are the challenges to financing intangible investment and innovation?
- + Are there financing models and mechanisms that are more suited to the intangible economy?
- + What are the barriers to offering more intangibles-focused financing?
- + What new rules and regulations are needed to allow intangible assets to serve as collateral?

DATA OWNERSHIP, USE, AND GOVERNANCE

Data is a central feature of intangible economies. Some businesses would face serious challenges, and others would not exist at all, if not for their ability to collect and use vast troves of data. This includes both businesses for whom data is a central part of their business model, as well as those for whom data plays a supporting role in a broader business strategy. For firms running algorithms to predict and drive consumer insights and behaviour, the more data — and the more good data — they can collect and analyze, the more robust their data analytics become. First-movers and large firms with resources to outperform competitors on data collection and analysis can quickly entrench their advantages, deter competitors, and "extract monopoly rents from their customers."⁷¹ Accessing data is a core competitive activity in intangible economies, and raises questions about what measures, if any, might be required to maintain a fair, competitive market.⁷²

Although they represent only one source among others, data collected from consumers and citizens raise special concerns about what data are being collected, by whom, and for what purposes. Data politics and governance raise a host of issues, including meaningful consent for collection and use, privacy, data security, fair use, and ownership of raw and processed data. While these are ethical and political issues, they are also business issues with substantial implications for the prospects of data-reliant businesses. If access to data is limited or unevenly distributed, firms that rely on data may have difficulty pursuing their intangible-based activities.

There are a host of existing policies and regulations in Canada related to data ownership, use and governance — including the *Personal Information Protection and Electronic Documents Act* (PIPEDA)⁷³ and the *Digital Charter*⁷⁴ — as well as ongoing initiatives and consultations to address the spectrum of data issues, including the federal government's National Data Strategy and Ontario's

current data strategy.⁷⁵ Yet, to some observers, the existing laws, regulations, and policies are ill-equipped to both support innovation and address risks, while not enough is known about the emerging data strategies to pass judgment.⁷⁶

- + How should we govern the collection, control, and use of data?
- + Are new rules and regulations needed to ensure meaningful consent, privacy, secure storage, and fair use of data?
- + To what extent can new models — such as data trusts, data portability, and data licensing — address firms’ and citizens’ concerns about data rights, use, and governance?

INTELLECTUAL PROPERTY AND POLICY

One of the main challenges in an ideas-based economy is to find ways to ensure that firms can capture returns on their intangible investments. When a firm purchases a tangible asset — like a new truck — it is easy for them to prevent others from using it. But when the investment is intangible, such as spending on R&D to generate a new business process, it can be difficult to prevent others from copying and benefiting from the idea. Employees with knowledge of the new process might join another firm and share the idea, allowing the latter firm to benefit without making the same investment as the former firm. Given these risks, firms have reason to underinvest in intangibles.

Intellectual property protections, such as patents and copyrights, are an important way for firms to maintain control over their intangible assets and prevent others from using them. When granted, a patent or copyright makes it illegal for others to use the asset without a license or other permission. In theory, firms that can protect intangible investments through IP should make greater intangible investment. In reality, however, for IP to function effectively and drive greater investment, firms must understand, and know how

to use and protect, IP, while laws and regulations must provide adequate protection and support to IP owners.

Previous research suggests that Canadian firms, especially start-ups, lack sufficient IP knowledge and skills, and that existing IP laws and practices are ill-equipped to support Canadian firms in the global economy.⁷⁷ Not surprisingly, Canada lags many other advanced economies in patenting activity. Patenting rates in Japan, Switzerland, and Sweden are three times, and in the United States two times, greater than patenting rates in Canada.⁷⁸

- + Does Canada have adequate intellectual property laws, provisions, and supports to ensure success in a global intangible economy?
- + Do Canadian entrepreneurs have adequate knowledge of, and skills to manage, intellectual property?
- + Why do many Canadian researchers and firms sell IP rights to foreign firms, rather than using them to launch and grow successful firms?
- + How can IP policy and practice be designed to encourage an intangible shift and innovation that benefits Canadians and Canadian firms?

SKILLS, TALENT, AND EDUCATION

The intangible shift will increase demand for certain kinds of specialized skills, while reducing demand for other kinds of skills. People with high-demand skills will have greater opportunities to participate in and benefit from the intangible shift than those without high-demand skills. In that case, there is a risk that the intangible shift will benefit some and harm others. Moreover, firms’ success in the intangible age will depend on their ability to attract, develop, and retain people with the right skills — which means a skills access gap might emerge between firms and allow some to speed farther ahead. Ensuring that all people have the skills to participate in and benefit from the intangible shift will help both workers and firms.

The kinds of skills needed — and thus the skills that workers, educators, firms, and other stakeholders need to help develop — include specialized digital and data analytics skills, advanced management skills, creativity, problem-solving, and a suite of human skills such as communication, teamwork, and empathy. During its ongoing intangible shift, for example, the U.S saw the share of employment in occupations with “high digital content” rise from 4.8 to 23 percent between 2002 and 2016,⁷⁷ while demand for people with teamwork, collaboration, interpersonal, judgment, and creative skills also increased.^{80 81 82 83}

There are many policy challenges related to skills for the intangible economy. Although aggregate trends are fairly clear, we need greater clarity about which specific kinds of skills, in what mixes, in what sectors, and in what regions are needed to support specific intangible activities. To be sure, skills challenges are characteristic of the economy as a whole, not merely the intangible economy. The difference with intangibles is that the needs may be more urgent, and simultaneously less precise, given the novelty of intangible investments to many businesses and policymakers.

- + Do Canadian firms have access to the skilled talent needed to enable and manage the intangible shift? Where are there gaps? How do we know?
- + Are existing labour market information systems capable of tracking rapidly-evolving skills demands to inform policies and programs aimed at talent attraction and development, while enabling people to make informed education and career decisions?
- + Are educational institutions able to stay abreast of changing skills demands to effectively prepare people for the labour market?
- + How do we ensure that workers have the skills and supports needed to adapt and share in the benefits of the intangible shift?

COMPETITION POLICY

Canada has many of the ingredients to support an innovative economy, and yet our innovation performance has long been characterized as weak.⁸⁴ One explanation for Canada’s poor innovation outcomes to date is a lack of competitive pressure, both domestic and global. As Nicholson has observed, “Canadian firms have been as innovative as they have needed to be.”⁸⁵ Canadian firms have frequently had ways other than innovation to maintain growth and profits — including, at different times, a robust labour supply, favourable exchange rates, high commodity prices, and, critically, limited competition.

The intangible shift is changing the competitive landscape for Canadian firms, introducing both new incentives and new challenges. Previously comfortable incumbents are being challenged by intangibles-driven firms (e.g., Uber challenging conventional taxi businesses). At the same time, established global giants such as Amazon, Google, and Facebook arguably make it difficult for start-ups to emerge and grow because the former have already secured access to critical intangible assets including IP, data, networks, and highly-skilled talent. In some cases, Canadian firms might finally be facing the kind of competitive pressure to innovate that they have lacked, while in other cases, the extraordinary advantages of first-moving and fast-growing firms might have generated nearly insurmountable barriers to new and emerging Canadian firms.

The policy challenge in this environment is to find a way to maintain fair and innovation-incentivizing competition. Current policy debates suggest that, in some sectors, the pendulum may have swung too far in the direction of what the Expert Panel on Business Innovation calls “cozy oligopoly” — where both barriers to entry and sector concentration are so high that they effectively eliminate

incentives for others to innovate and compete.⁸⁶ These are issues that the Competition Bureau and other agencies will need to navigate.

- + How is the intangible shift changing the competitive landscape?
- + To what extent are we seeing the emergence of healthy competition and new incentives for Canadian firms to innovate, versus rising market concentration and rising barriers to entry leading to innovation-dulling “cozy oligopolies”?
- + Should Canadian competition policy be refreshed to allow for more or less, or different kinds of, competition in light of the intangible shift?

FOREIGN DIRECT INVESTMENT (FDI)

Historically, Canada has made efforts to attract and accommodate foreign investment. In addition to providing employment, foreign firms often bring skills, knowledge, technology, and access to global supply chains that can provide benefits to domestic firms. To be sure, many have raised concerns about Canada’s economy being a branch plant economy, where foreign firms provide jobs and technology, but take profits back to their home countries and perform limited research and innovation here. Nevertheless, the employment and technology benefits have been viewed as valuable enough that Canada has offered a range of incentives to foreign firms.

The intangible shift is changing the FDI landscape and associated economic calculations. Increasing numbers of foreign, intangibles-based firms are making investments in Canada and elsewhere, not to have closer access to markets and to develop partnerships, but instead to have access to globally-scarce talent, as well as new sources of IP and data that are critical for intangibles-based growth. At the same time, these intangibles-driven firms do not generate the same numbers of jobs as would be expected from tangible-based foreign

firms. The old approach to attracting foreign investment now risks bringing in firms whose activities would amount to a net economic loss, rather than gain, for Canadian workers and the economy.⁸⁷

- + In ways should Canada’s approach to FDI change in the age of intangibles?
- + What new criteria and metrics should be used to evaluate foreign investment?
- + What would we gain, and what would we lose, by adopting tighter rules for intangibles-based foreign investment?
- + To what extent would a more restrictive approach to FDI reduce the competitive pressure Canadian firms face, and, in turn, their incentives to innovate?

INEQUALITY IN THE INTANGIBLE ECONOMY

While the intangible shift provides opportunities for many firms and workers for growth and prosperity, there are important questions about the distributive implications of intangibles. Intangible-based business models that require less labour to succeed will provide fewer workers with good employment opportunities and incomes, leaving many behind. The dynamic may be compounded by the link between intangibles and skills-biased technological change - that is, workers with highly specialized skills may continue to find good employment opportunities and income in an intangible economy, while others may see their opportunities and incomes deteriorate.

Moreover, given the winner-take-all or winner-take-most dynamics for firms, vast disparities in opportunities and outcomes among firms can emerge which also have implications for employment and income. If Canada is to make an intangible shift that benefits more than a select few, we will need to understand and address some key issues:

- + Who benefits, and who is left behind, in an intangibles-based economy?
- + What are the employment implications of the intangible shift?
- + What are the income and wealth implications of the intangible shift?
- + Is inequality a *necessary* feature of an intangible shift, or are there examples where the shift happens with little or no increase in inequality?
- + What business practices and public policies shape distributive outcomes — for better or worse — and what can we learn from them to better manage Canada’s intangible shift in the interests of all?

the impact, if any, of specific policies and programs on the performance of our intangible economy.

- + What metrics and data should we collect and analyze in order to have a meaningful picture of Canada’s intangible shift?
- + How can we collect and analyze data in ways that allow for meaningful comparisons over time, across regions, and relative to international peers?
- + What is needed to develop clearer understandings of the relationships among intangibles and productivity, growth, employment, and distribution?
- + What are the main challenges to measuring and analyzing Canada’s intangible economy, and how can these be addressed?

MEASURING INTANGIBLES: NEEDS, CHALLENGES, STRATEGIES

While there have been considerable efforts in Canada and internationally to measure the growth and impact of intangible investments on productivity and economic growth, it is often done on an ad-hoc basis. Baldwin, Gu, and Macdonald (2012) applied a more extensive measure of intangibles than currently used in the system of national accounts (SNA), and extended this to the growth accounting framework. However, these more robust measures of intangible investments have yet to be included in the SNA on an ongoing basis. This limits our ability to track how Canada’s intangible economy is performing over time. It also inhibits our understanding of what impacts investments in intangibles have on our economic performance, as well as key areas of strength, weakness, and opportunity in Canada’s intangible economy.

For Canada to compete in the intangible economy, we must consistently measure our performance. This is particularly important from a policy perspective, as it would help us to identify areas that require intervention, while also understanding

A DEVELOPING AGENDA

These areas of focus are suggestive and not exhaustive. Together they make up a subset of policy areas that require attention, but the exact questions and methods of investigation are open to further discussion. Moreover, there are likely other policy areas not mentioned that will need new thinking and action, and that we hope will emerge from discussions prompted by this report. This is an emerging field with few signposts to guide the way. Engaging with policymakers, practitioners, and other researchers will be essential to charting a research and policy agenda that makes sense for Canada in the age of intangibles.

MANAGING THE INTANGIBLE SHIFT

The intangible shift presents significant opportunities and challenges for firms, workers, and policymakers. Investments in intangible assets are rising in Canada — especially in branding, talent development, and organizational improvements — contributing to significant improvements in economic output and

productivity. But Canada is falling behind other countries both in terms of achieving and managing the intangible shift. Other countries are in high gear and pulling away. There is an urgent need for action to enhance Canada's competitiveness in the age of intangibles.

Accelerating and benefitting from the intangible shift will require new policy thinking. Because intangibles exhibit unique properties and behaviour, existing frameworks and policies

are inadequate for the new opportunities and challenges we face. Fresh thinking on financing, data and IP policy, competition and trade policy, skills and education, distribution, and other policy domains is needed. In the absence of new thinking and new policies tailored to the realities of intangibles, Canada could miss out on substantial growth and employment opportunities. Our economic and social well-being requires a new policy agenda for the age of intangibles.

ENDNOTES

1. Statistics Canada. 2019. “The value of data in Canada: Experimental estimates.” *Latest Developments in the Canadian Economic Accounts*.
2. Haskel, J. and S. Westlake. 2018. *Capitalism Without Capital: The Rise of the Intangible Economy*. Princeton: Princeton University Press. Muntean, T. M. 2014. “Intangible Assets and Their Contribution to Labour Productivity Growth in Ontario.” *International Productivity Monitor*, 27: 22–39. OECD. 2011. “New sources of growth: Intangible assets.” Paris: OECD. <https://www.oecd.org/sti/inno/46349020.pdf> Asselin, R. and S. Speer. 2019. *A New North Star: Canadian Competitiveness in an Intangibles Economy*. Ottawa: Public Policy Forum.
3. Muntean, T. M. 2014. “Intangible Assets and Their Contribution to Labour Productivity Growth in Ontario.” *International Productivity Monitor*, 27: 22–39.
4. Corrado, C., Hulten, C., & Sichel, D. 2009. “Intangible Capital and U.S. Economic Growth.” *The International Association for Research in Income and Wealth*, 55(3): 661–685. Haskel, J. and S. Westlake. 2018. *Capitalism Without Capital: The Rise of the Intangible Economy*. Princeton: Princeton University Press. Muntean, T. M. 2014. “Intangible Assets and Their Contribution to Labour Productivity Growth in Ontario.” *International Productivity Monitor*, 27: 22–39. OECD. 2011. “New sources of growth: Intangible assets.” Paris: OECD. <https://www.oecd.org/sti/inno/46349020.pdf>
5. Ciuriak, D. 2018. *Rethinking Industrial Policy for the Data-driven Economy*. CIGI Papers No. 192. Waterloo: CIGI. Asselin, R. and S. Speer. 2019. *A New North Star: Canadian Competitiveness in an Intangibles Economy*. Ottawa: Public Policy Forum.
6. Statistics Canada. 2019. “The value of data in Canada: Experimental estimates.” *Latest Developments in the Canadian Economic Accounts*.
7. Aaronson, S. 2018. *Data is Different: Why the World Needs a New Approach to Governing Cross-border Data Flows*. Waterloo: CIGI. <https://www.cigionline.org/publications/data-different-why-world-needs-new-approach-governing-cross-border-data-flows> CIGI. 2018. *Data Governance in the Digital Age. A CIGI Essay Series*. Waterloo: CIGI. <https://www.cigionline.org/data-governance-digital-age>
8. Breznitz, D., S. Breznitz, & D. Wolfe. 2015. *Current State of the Financial Technology Innovation Ecosystem in the Toronto Area*. Toronto: Innovation Policy Lab. Hinton, J., D. Lombardi, & J. Wajda. 2017. *Bringing Canadian Fintech to the International Stage*. CIGI Brief No. 111. Waterloo: CIGI. <https://www.cigionline.org/sites/default/files/documents/PB%20no.111web.pdf>
9. Haskel, J. and S. Westlake. 2018. *Capitalism Without Capital: The Rise of the Intangible Economy*. Princeton: Princeton University Press.
10. Savov, V. 2016. “Blackberry’s success led to its failure.” *The Verge*. September. <https://www.theverge.com/2016/9/30/13119924/blackberry-failure-success> McNish, J. and S. Silcoff. 2015. *Losing the Signal: The Spectacular Rise and Fall of Blackberry*.
11. Isaacson, W. 2011. *Steve Jobs*. New York: Simon & Schuster.
12. Baldwin, J. R., Gu, W., & Macdonald, R. 2012. “Intangible Capital and Productivity Growth in Canada.” *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2093526>

13. Muntean, T. M. 2014. “Intangible Assets and Their Contribution to Labour Productivity Growth in Ontario.” *International Productivity Monitor*, 27: 22–39.
14. Bhasin, K. and G. Porter. 2018. “How lululemon helped turn America into a nation of yoga pants.” *Financial Post*. October 31. <https://business.financialpost.com/news/retail-marketing/how-america-became-a-nation-of-yoga-pants>
15. Lawrence, C. 2016. “A Perspective From the lululemon Whitespace Team.” *MISC Magazine*. <https://miscmagazine.com/perspective-lululemon-whitespace-team/>
16. Macrotrends. 2019. Lululemon. <https://www.macrotrends.net/stocks/charts/LULU/lululemon-athletica-inc/net-worth>
17. Council of Canadian Academies (CCA). 2009. *Innovation and Business Strategy: Why Canada Falls Short*. Ottawa: Council of Canadian Academies. <https://cca-reports.ca/reports/innovation-and-business-strategy-why-canada-falls-short/>
18. OECD. 2013. *New Sources of Growth: Knowledge-Based Capital: Key Analysis and Policy Conclusions — Synthesis Report*. 1–70. Retrieved from <http://oe.cd/kbc>.
19. Author calculations based on OECD, Main Science and Technology Indicators. [Stats.oecd.org](https://stats.oecd.org).
20. Conference Board of Canada. 2018b. *How Canada Performs: Innovation—Patents*. Ottawa: Conference Board. <https://www.conferenceboard.ca/hcp/provincial/innovation/patents.aspx>
21. Conference Board of Canada. 2018. *How Canada Performs: Innovation—Venture Capital*. Ottawa: Conference Board. <https://www.conferenceboard.ca/hcp/Provincial/innovation/venture-capital.aspx>
22. Muntean, T. M. 2014. “Intangible Assets and Their Contribution to Labour Productivity Growth in Ontario.” *International Productivity Monitor*, 27: 22–39.
Corrado, C., Hulten, C., & Sichel, D. 2005. *Measuring Capital in the New Economy Title: Measuring Capital and Technology: An Expanded Framework*. Retrieved from <http://www.nber.org/books/corro5-1%0Ahttp://www.nber.org/chapters/co202>
23. Haskel, J. and S. Westlake. 2018. *Capitalism Without Capital: The Rise of the Intangible Economy*. Princeton: Princeton University Press.
24. Wang, O. 2018. “How Gatorade fuelled its business growth.” *Prophet*. <https://www.prophet.com/2018/08/gatorade-digital-business-growth-strategy/>
25. Owusu, T. 2018. “Bodyarmor takes the fight to rival gatorade.” *The Street*. <https://www.thestreet.com/markets/bodyarmor-takes-the-fight-right-to-rival-gatorade-on-twitter-14571158>
26. Munro, D. 2014. “Employers Must Start Investing in Skills Training.” *Financial Post*. <https://business.financialpost.com/executive/management-hr/employers-must-start-investing-in-skills-training-or-risk-having-public-policy-nudge-them-along>. Munro, D. 2019a. *Brave New Work: Skills, Training and Lifelong Learning*. Ottawa: Public Policy Forum. <https://ppforum.ca/publications/skills-training-and-lifelong-learning/>
27. This section draws on Haskel & Westlake’s (2018) discussion of what they call the “four S’s” of intangibles: *scalability*, *sunkenness*, *synergies*, and *spillovers*. We have not included the *spillovers* feature because we feel that it is not enough of a distinct feature of intangibles to warrant special analysis. Conversely, we have included a category that Haskel & Westlake did not include - *skills sensitivity* - because we feel this feature of intangibles is important and deserves more attention.

28. Haskel, J. and S. Westlake. 2018. *Capitalism Without Capital: The Rise of the Intangible Economy*. Princeton: Princeton University Press.
29. Ciuriak, D. 2018. *Rethinking Industrial Policy for the Data-driven Economy*. CIGI Papers No. 192. Waterloo: CIGI.
- Autor, D., et al. 2019. "The Fall of the Labor Share and the Rise of Superstar Firms." MIT Economics Working Paper. <https://economics.mit.edu/files/12979>
30. Hacker, J. and P. Pierson. 2010. *Winner-Take-All Politics: How Washington Made the Rich Richer and Turned Its Back on the Middle Class*. New York: Simon & Schuster.
31. Haskel, J. and S. Westlake. 2018. *Capitalism Without Capital: The Rise of the Intangible Economy*. Princeton: Princeton University Press.
32. Cecchetti & Schoenholtz 2018
33. Although Canada has witnessed large and rapid growth in available venture capital in recent years, demand still far exceeds supply. Conference Board of Canada. 2018. *How Canada Performs: Innovation—Venture Capital*. Ottawa: Conference Board. <https://www.conferenceboard.ca/hcp/Provincial/innovation/venture-capital.aspx>
- Grant, M. 2017. *Wisdom of the Crowd? Crowdfunding and Canadian Innovation*. Ottawa: Conference Board of Canada. <https://www.conferenceboard.ca/e-library/abstract.aspx?did=9239>
34. Haskel, J. and S. Westlake. 2018. *Capitalism Without Capital: The Rise of the Intangible Economy*. Princeton: Princeton University Press.
35. Cutean, A. and M. Ivus. 2017. *The Digital Talent Dividend: Shifting Gears in a Changing Economy*. Ottawa: Information and Communications Technology Council. https://www.ictc-ctic.ca/wp-content/uploads/2018/01/ICTC-Report_The-Digital-Talent-Dividend-FINAL-ENGLISH-1.30.18.pdf
- Searle, P. 2019. "Council of Canadian Innovators' 2019 Federal Budget Submission." https://www.canadianinnovators.org/newscentre/featured_news/ccis_2019_federal_budget_submission
36. McKean, M. 2018. *Are Canada's Business Schools Teaching Social and Emotional Skills?* Ottawa: The Conference Board of Canada. https://www.conferenceboard.ca/docs/default-source/education/9999_bschools-rpt.pdf?sfvrsn=d84d4313_2
- Deming, D. and Kahn, L. B. 2018. "Skill Requirements across Firms and Labor Markets: Evidence from Job Postings for Professionals." *Journal of Labor Economics*, 36(S1): S337–S369. <https://doi.org/10.1086/694106>
37. Lamb, C. 2016. *The Talented Mr. Robot: The impact of automation on Canada's workforce*. Toronto: Brookfield Institute.
38. Lamb, C. and M. Lo. 2017. *Automation Across the Nation: Understanding the potential impacts of technological trends across Canada*. Toronto: Brookfield Institute.
- Speer, S. 2019. *Forgotten People and Forgotten Places: Canada's Economic Performance in the Age of Populism*. Ottawa: Macdonald-Laurier Institute. http://macdonaldlaurier.ca/files/pdf/MLI_Speer_ScopingSeries1_FWeb.pdf
39. Brynjolfsson, E., Hitt, L., & Kim, H. 2011. "Strength in numbers: How does data-driven decision-making affect firm performance?" *International Conference on Information Systems 2011, ICIS 2011*, 1: 541–558. <https://doi.org/10.2139/ssrn.1819486>
- Brynjolfsson, E. and McElheran, K. 2016. "Data in Action: Data-Driven Decision Making in U.S. Manufacturing." Rotman School of Management Working Paper No. 2722502: 1-56.
40. Van Ark, B., O'Mahony, M., & Timmer, M. P. 2008. "The productivity gap between Europe and the United States: Trends and causes." *Journal of Economic Perspectives*, 22(1): 25–44. <https://doi.org/10.1257/jep.22.1.25>

41. Bloom, N., Sadun, R., & Van Reenen, J. 2012. "Americans Do IT Better: US." *American Economic Review*, 102(1): 167–201. <https://doi.org/10.1257/aer.102.1.167>. Available
42. Corrado, C., Hulten, C., & Sichel, D. 2009. "Intangible Capital and U.S. Economic Growth." *The International Association for Research in Income and Wealth*, 55(3): 661–685.
- Baldwin, J. R., Gu, W., Lafrance, A., & Macdonald, R. 2011. "Investment in Intangible Assets in Canada: R&D, Innovation, Brand, and Mining, Oil and Gas Exploration Expenditures." *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1517255>
- Baldwin, J. R., Gu, W., & Macdonald, R. 2012. "Intangible Capital and Productivity Growth in Canada." *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2093526>
- Muntean, T. M. 2014. "Intangible Assets and Their Contribution to Labour Productivity Growth in Ontario." *International Productivity Monitor*, 27: 22–39.
- Gu, W. 2018. "Accounting for Slower Productivity Growth in the Canadian Business Sector after 2000: The Role of Capital Measurement Issues." *International Productivity Monitor*, 34: 21–39.
43. Baldwin, J. R., Gu, W., Lafrance, A., & Macdonald, R. 2011. "Investment in Intangible Assets in Canada: R&D, Innovation, Brand, and Mining, Oil and Gas Exploration Expenditures." *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1517255>
44. Baldwin, J. R., Gu, W., & Macdonald, R. 2012. "Intangible Capital and Productivity Growth in Canada." *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2093526>
45. Ibid.
46. Ibid.
47. Ibid.
48. Muntean, T. M. 2014. "Intangible Assets and Their Contribution to Labour Productivity Growth in Ontario." *International Productivity Monitor*, 27: 22–39.
49. Ibid.
50. Corrado, C., Haskel, J., & Jona-Lasinio, C. 2017. "Knowledge Spillovers, ICT and Productivity Growth." *Oxford Bulletin of Economics and Statistics*, 79(4): 592–618. <https://doi.org/10.1111/obes.12171>
51. OECD. 2013. *New Sources of Growth: Knowledge-Based Capital: Key Analysis and Policy Conclusions — Synthesis Report*. 1–70. Retrieved from <http://oe.cd/kbc>.
52. Pieri, F., Vecchi, M., & Venturini, F. 2018. "Modelling the joint impact of R&D and ICT on productivity: A frontier analysis approach." *Research Policy*, 47(9): 1842–1852. <https://doi.org/10.1016/j.respol.2018.06.013>
53. Ibid.
54. Mollins, J., St-amant, P., & Canada, B. 2018. "The Productivity Slowdown in Canada: An ICT Phenomenon?" *International Productivity Monitor*, 35: 95–112.
55. OECD. 2013. *New Sources of Growth: Knowledge-Based Capital: Key Analysis and Policy Conclusions — Synthesis Report*. 1–70. Retrieved from <http://oe.cd/kbc>.
56. Brynjolfsson, E., Rock, D., & Syverson, C. 2019. "The Productivity J-Curve: How Intangibles Complement General Purpose Technologies." *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3346739>

57. Corrado, C., Haskel, J., & Jona-Lasinio, C. 2017. “Knowledge Spillovers, ICT and Productivity Growth.” *Oxford Bulletin of Economics and Statistics*, 79(4): 592–618.
<https://doi.org/10.1111/obes.12171>
Biagi, F. 2012. “Are ICT, Human Capital and Organizational Capital Complementary in Production? Evidence from Italian Panel Data.” *Joint Research Centre Technical Reports, Institute for Prospective Studies, European Commission*. doi (Vol. 10). <https://doi.org/10.2791/99567>
58. Brynjolfsson, E., Rock, D., & Syverson, C. 2019. “The Productivity J-Curve: How Intangibles Complement General Purpose Technologies.” *SSRN Electronic Journal*.
<https://doi.org/10.2139/ssrn.3346739>
59. Pieri, F., Vecchi, M., & Venturini, F. 2018. “Modelling the joint impact of R&D and ICT on productivity: A frontier analysis approach.” *Research Policy*, 47(9): 1842–1852.
<https://doi.org/10.1016/j.respol.2018.06.013>
60. Baldwin, J. R., Gu, W., & Macdonald, R. 2012. “Intangible Capital and Productivity Growth in Canada.” *SSRN Electronic Journal*.
<https://doi.org/10.2139/ssrn.2093526>
61. Muntean, T. M. 2014. “Intangible Assets and Their Contribution to Labour Productivity Growth in Ontario.” *International Productivity Monitor*, 27: 22–39.
62. Gu, W. 2018. “Accounting for Slower Productivity Growth in the Canadian Business Sector after 2000: The Role of Capital Measurement Issues.” *International Productivity Monitor*, 34: 21–39.
63. While these do not directly correspond to more established measures of the intangible economy, and ICT includes tangible ICT investments (e.g., hardware), there is enough of an overlap to allow for a more recent examination of how Canada compares internationally when it comes to the intangible economy.
64. Baldwin, J. R., Gu, W., & Macdonald, R. 2012. “Intangible Capital and Productivity Growth in Canada.” *SSRN Electronic Journal*.
<https://doi.org/10.2139/ssrn.2093526>
65. Lamb, C., Munro, D., & Vu, V. 2018. *Better, Faster, Stronger: Maximizing the Benefits of Automation for Ontario’s Firms and People*.
66. Baldwin, J. R., Gu, W., & Macdonald, R. 2012. “Intangible Capital and Productivity Growth in Canada.” *SSRN Electronic Journal*.
<https://doi.org/10.2139/ssrn.2093526>
67. Muntean, T. M. 2014. “Intangible Assets and Their Contribution to Labour Productivity Growth in Ontario.” *International Productivity Monitor*, 27: 22–39. Note: The exact dates being compared between countries did not directly correspond.
68. OECD. 2013. “Supporting Investment in Knowledge Capital, Growth and Innovation.” Paris: OECD.
<http://dx.doi.org/10.1787/9789264193307-en>
69. Grant, M. 2014. *Start Me Up: Funding Canada’s Emerging Innovators*. Ottawa: Conference Board of Canada.
<https://www.conferenceboard.ca/e-library/abstract.aspx?did=6123>
Conference Board of Canada. 2018. *How Canada Performs: Innovation—Venture Capital*. Ottawa: Conference Board.
<https://www.conferenceboard.ca/hcp/Provincial/innovation/venture-capital.aspx>
70. Grant, M. 2017. *Wisdom of the Crowd? Crowdfunding and Canadian Innovation*. Ottawa: Conference Board of Canada.
<https://www.conferenceboard.ca/e-library/abstract.aspx?did=9239>
71. Bergen, B. 2019. “Without a national data strategy, Canada’s prosperity is at risk.” *Vancouver Sun*. April 16.
<https://vancouver.sun.com/opinion/op-ed/benjamin-bergen-without-a-national-data->

- [strategy-canadas-prosperity-is-at-risk](#)
Ciuriak, D. 2018. *Rethinking Industrial Policy for the Data-driven Economy*. CIGI Papers No. 192. Waterloo: CIGI.
- Medhora, R. 2018. *Rethinking Policy in a Digital World*. CIGI Policy Brief No. 143. Waterloo: CIGI.
72. Munro, D. 2019b. “America’s Antitrust Movement.” CIGI Online. June 20. <https://www.cigionline.org/articles/americas-antitrust-movement>
73. Office of the Privacy Commissioner of Canada. 2019. *The Personal Information Protection and Electronic Documents Act*. Ottawa: Government of Canada. <https://www.priv.gc.ca/en/privacy-topics/privacy-laws-in-canada/the-personal-information-protection-and-electronic-documents-act-pipeda/>
74. Innovation, Science and Economic Development. 2019. *Canada’s Digital Charter: Trust in a digital world*. Ottawa: Government of Canada. https://www.ic.gc.ca/eic/site/O62.nsf/eng/h_00108.html
75. Government of Ontario. 2019. *Ontario’s Data Strategy*. Toronto: Government of Ontario. <https://www.ontario.ca/page/ontarios-data-strategy>
76. Bergen, B. 2019. “Without a national data strategy, Canada’s prosperity is at risk.” *Vancouver Sun*. April 16. <https://vancouversun.com/opinion/op-ed/benjamin-bergen-without-a-national-data-strategy-canadas-prosperity-is-at-risk>
Medhora, R. 2018b. *A National Data Strategy for Canada: Key Elements and Policy Considerations*. CIGI Papers No. 160. Waterloo: CIGI. https://www.cigionline.org/sites/default/files/documents/Paper%20no.160_3.pdf
Scassa, T. 2019. *Canada’s Data Plan: We Need a Data Strategy that Supports our Values and Encourages Innovation*. Ottawa: Public Policy Forum. <https://ppforum.ca/wp-content/uploads/2019/01/Canadas-Data-Plan-Data-Strategy-that-Supports-Our-Values-and-Encourages-Innovation-PPF-JAN2019-EN.pdf>
77. Bawa, K., and M. Tawfik. 2019. “In an arms race of innovation, intellectual property is critical.” *The Globe & Mail*. June 27. <https://www.theglobeandmail.com/business/commentary/article-in-an-arms-race-of-innovation-intellectual-property-is-critical/>
Gallini, N. and A. Hollis. 2019. *To Sell or Scale Up: Canada’s Patent Strategy in a Knowledge Economy*. Montreal: Institute for Research and Public Policy. <https://irpp.org/research-studies/to-sell-or-scale-up-canadas-patent-strategy-in-a-knowledge-economy/>
78. Conference Board of Canada. 2018b. *How Canada Performs: Innovation—Patents*. Ottawa: Conference Board. <https://www.conferenceboard.ca/hcp/provincial/innovation/patents.aspx>
79. Muro, M., Liu, S., Whiton, J., & Kulkarni, S. 2017. *Digitization and the American Workforce*. *Brookings Institute* (November).
80. Tambe, P., & Hitt, L. M. 2012. “Now IT’s Personal: Offshoring and the Shifting Skill Composition of the U.S. Information Technology Workforce.” *Management Sciences*, 58(4): 678–695.
81. Agrawal, A., Gans, J., & Goldfarb, A. 2019. “Prediction, Judgment, and Complexity.” *The Economics of Artificial Intelligence*: 89–114. <https://doi.org/10.7208/chicago/9780226613475.003.0003>
82. Bakhshi, H., Frey, C. B., & Osborne, M. 2015. “Creativity vs. Robots — The creative economy and the future of employment.” *Nesta* (April): 1–40.
83. Kenworthy, L., Kielstra, P., & Tabary, Z. 2015. Driving the skills agenda: Preparing students for the future. *The Economist Intelligence Unit*: 1–21. <https://doi.org/http://dx.doi.org/10.1002/ibd.20321>

84. Conference Board of Canada. 2018. *How Canada Performs: Innovation—Venture Capital*. Ottawa: Conference Board.
<https://www.conferenceboard.ca/hcp/Provincial/innovation/venture-capital.aspx>
 Conference Board of Canada. 2018b. *How Canada Performs: Innovation—Patents*. Ottawa: Conference Board.
<https://www.conferenceboard.ca/hcp/provincial/innovation/patents.aspx>
 Council of Canadian Academies (CCA). 2009. *Innovation and Business Strategy: Why Canada Falls Short*. Ottawa: Council of Canadian Academies.
<https://cca-reports.ca/reports/innovation-and-business-strategy-why-canada-falls-short/>
 Council of Canadian Academies (CCA). 2018. *Competing in a Global Innovation Economy: The Current State of R&D in Canada*. Ottawa: Council of Canadian Academies.
<https://cca-reports.ca/reports/competing-in-a-global-innovation-economy/>
 Nicholson, P. 2013. *Paradox Lost: Explaining Canada's Research Strength and Innovation Weakness*. Ottawa: CCA.
https://cca-reports.ca/wp-content/uploads/2018/10/paradoxlost_en.pdf
 Nicholson, P. 2018. *Facing Facts: Reconsidering Business Innovation Policy in Canada*. Montreal: IRPP. <https://irpp.org/research-studies/facing-facts-reconsidering-business-innovation-policy-canada/>
85. Nicholson, P. 2013. *Paradox Lost: Explaining Canada's Research Strength and Innovation Weakness*. Ottawa: CCA.
https://cca-reports.ca/wp-content/uploads/2018/10/paradoxlost_en.pdf
86. Council of Canadian Academies (CCA). 2009. *Innovation and Business Strategy: Why Canada Falls Short*. Ottawa: Council of Canadian Academies.
<https://cca-reports.ca/reports/innovation-and-business-strategy-why-canada-falls-short/>
 Munro, D. 2019b. "America's Antitrust Movement." CIGI Online. June 20.
<https://www.cigionline.org/articles/americas-antitrust-movement>

