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At the Crossroads: Innovation and Inclusive Growth

*Ooh, standin' at the crossroad, tried to flag a ride
Ooh-ee, I tried to flag a ride
Didn't nobody seem to know me, babe, everybody pass me by*

“Cross Road Blues” by Robert Johnson, 1936

Introduction

Welcome to Canada—and to a snowy Montebello. This day is dedicated to a discussion about innovation and inclusive growth. It is great to have so many experts with us today. Thank you.

We know that technological advances are key to improving an economy’s potential to grow. They have raised living standards in G7 countries and across the globe, and have helped lift more than one billion people around the world out of extreme poverty since the Second World War.¹ The current wave of innovation—digitalization and automation—promises to raise trend growth in the economy even more.

However, as we are discussing today, technological advances can leave people behind. It is perhaps only in the last decade or so that mainstream macroeconomists have sharpened their focus on how income distribution may affect long-term growth and macro dynamics. There is compelling evidence that innovation has been an important reason behind rising income

¹ The data for this calculation are taken from M. Roser and E. Ortiz-Ospina, [Global Extreme Poverty](#) (2018). Poverty is defined as a consumption level below Int\$1.90 per day, adjusting for price differences and inflation.

I would like to thank Gurnain K. Pasricha, Lori Rennison and Eric Santor for their help in preparing this speech.

inequality in advanced economies in recent decades.² Research also finds that rising inequality can result in weaker and less-stable macroeconomic outcomes. This places us, as policy-makers, at a crossroads. Do we choose to stay on the same road and repeat the past? Or do we apply fresh thinking to policy and choose a new road where innovation delivers even stronger and more-inclusive growth?

This is the challenge that the G7 countries have set for themselves for 2018. Canada is proud to lead the G7's work this year to better understand the issues so that we can set priorities for policy.

The context we are working in matters. The global economy is enjoying the most robust and synchronous growth we've seen in close to a decade. Businesses and consumers are feeling more confident. Yet, we know that many people in advanced economies are also anxious about what digitalization and automation might bring. They are worried about being left behind. For workers in some industries, such as manufacturing, this may seem like old news. For drivers, lawyers, investment advisors and many others, it's new. By some estimates, close to half of the tasks done by workers could already be automated using current technology.³

This anxiety has real costs. It has eroded trust in the framework for international co-operation in areas that have served us well in the past: trade policy and financial sector regulation are good examples.

As a way of spurring discussion today, I will cover three points:

- (i) Technological progress will raise economic growth, although the channels through which it contributed to rising inequality in the past are still forces to be reckoned with.
- (ii) It doesn't have to be this way—if we apply fresh thinking in some key areas, we can make policy choices that manage the side effects of innovation, without stifling it.
- (iii) Policy-makers themselves need to dig into the technology—the better we understand it and the underlying business incentives, the better policy choices we will make.

The past provides insight for the future

Technology has transformed our daily lives at an astonishing pace. Google is not yet 20 years old. Who knew, even 5 years ago, that some people would be making a small fortune as professional video-game players? And, while parents have been worrying about how much screen time their kids should have, a growing number of professions—from firefighters to surgeons—have embraced the “gamification” trend, integrating video exercises into their training programs.

² See International Monetary Fund, [World Economic Outlook, Chapter 3, “Understanding the Downward Trend in Labor Income Shares,”](#) April 2017; and G. Michaels, A. Natraj and J. Van Reenen, “[Has ICT Polarized Skill Demand? Evidence from Eleven Countries over Twenty-Five Years,](#)” *Review of Economics and Statistics* 96, no. 1 (March 2014): 60–77.

³ [According to McKinsey & Company](#), 46 per cent of tasks could be automated in the United States using current technology. In Canada, the share is slightly lower (42 per cent). See C. Lamb, “[The Talented Mr. Robot: The Impact of Automation on Canada’s Workforce,](#)” Brookfield Institute, June 2016.

Let's remember that per capita output has increased around five times in G7 countries since the early 1950s. Our average life expectancy during this period has risen from 67 to 81 years.⁴ Not bad. Yet, recent voting behaviour and public discourse make it clear that many people question what is in it for them and their families when it comes to technology and globalization. A study here at home showed that the more pessimistic people were about technology, the more worried they were about their own prospects.⁵

Many of us would agree that the data point to a concerning trend. The share of income going to labour has been declining in many economies, including the G7.⁶ The share of income going to the top 1 per cent has nearly doubled since 1980 in some of our countries, amounting now to as much as 20 per cent.⁷

If we want to find a better road forward, identifying the underlying issues is the right place to start. One question is, what is it exactly about innovation—and, to a lesser extent, globalization—that opens the door to these outcomes? There's a lot of good research, including by people in this room, pointing to many possible forces at play. I think three stand out:

- *Technology has benefited skilled workers more than other workers because it has made them more productive.* People in more-routine jobs have tended to be replaced entirely. Digitalization will likely reinforce this dynamic. Machine learning and other technologies mean that tasks requiring routine cognitive skills, such as reading medical scans or preparing legal and investment advice, can now be automated too. That said, I do not share the dystopian view of a world without workers. People will still have an absolute advantage in tasks that require common sense and a human touch. And they will also find employment in areas where they have a comparative advantage. The question is not so much whether there will be jobs for people, but, rather, how well they will pay, and what the working arrangements will be.⁸
- *Some types of technology lead to market concentration and the rise of “superstar” firms.* These firms tend to have fewer employees than conventional companies and can earn impressive monopoly profits.⁹ Market concentration happens quite naturally in industries with prominent network effects and other scale economies. There is nothing new in that. Phone companies are traditional examples, and social media companies and online

⁴ Data were taken from the [Penn World Table](#) and the [UN World Population Prospects: The 2017 Revision](#). Between 1950–55 and 2010–15, life expectancy at birth increased from 67 years to 81 years, calculated as an average across the G7 countries.

⁵ Ipsos, “[Ipsos Canada Next](#),” 2017.

⁶ T. Piketty, *Capital in the Twenty-First Century* (Cambridge, MA: Harvard University Press, 2014); The World Inequality Lab, [World Inequality Report 2018](#). Countries included are the United States, Canada and 28 European countries.

⁷ The richest 1 per cent of the population in the G7 countries took home between 7 and 11 per cent of national pre-tax income in 1980. That share has grown to between 9 and 20 per cent in recent years. Data were taken from the [World Wealth and Income Database](#).

⁸ See L. G. Kletzer, “[The Question with AI Isn't Whether We'll Lose Our Jobs—It's How Much We'll Get Paid](#),” *Harvard Business Review*, January 31, 2018.

⁹ See D. Autor, D. Dorn, L. F. Katz, C. Patterson and J. Van Reenen, “[The Fall of the Labor Share and the Rise of Superstar Firms](#),” National Bureau of Economic Research Working Paper No. 23396 (May 2017); and S. Barkai, “[Declining Labor and Capital Shares](#),” Job Market Paper, University of Chicago (2017).

marketplaces are more-modern examples. What is new is that the “winner-takes-all” effect is magnified in the digital economy because user data have become another source of monopoly power. Data from a large network create a formidable barrier to entry. Another barrier to entry can come from firms using their position as gatekeepers to crucial online services to impede their competitors. And, it’s easier to avoid taxes when production is not tied to a large factory with a fixed physical location.¹⁰

- *Technology has helped to separate work into discrete tasks, allowing businesses to make more use of short-term, temporary jobs to maintain flexibility or respond to changing needs. Workers in these types of jobs tend to have less bargaining power than regular employees. They usually earn lower incomes, get fewer benefits and have less job security.¹¹ This may be one reason why we have seen relatively weak wage growth in Canada and other G7 countries despite improving labour market conditions. With the current wave of innovation, the “gig economy” is likely to keep growing.¹²*

It doesn’t have to be this way

We do not have to be hostage to these forces. That’s my second point. Canada’s priority as G7 host is to find ways to embrace technological progress while handling the challenges of digitalization and automation.

Adequate income and equality of opportunity are critical to handling the challenges of the digital economy. Adequate financial incentives to innovate and take ideas to market are critical to embracing technological progress. Trade-offs need to be made between these two objectives, and there are different views about what “adequate” means in practice. It is the job of governments to make these important choices, not central banks.

In any case, central bankers do not have the mandate or the tools to directly influence the pace of technological progress or the distribution of income. We do have a stake in supporting strong and sustainable growth, and that is why we play an important advisory role and help shed light on some of the trade-offs at play.

There are many policy areas to consider. Let me talk about a couple that I think should be priorities: developing skilled workers through inclusion, and keeping market power in check.

Developing a skilled workforce

Developing a skilled workforce is about education, training and continuous learning. It’s also about reducing the barriers to participation in the workforce.

We know that the fields of science, technology, engineering and mathematics (STEM) are an important part of the equation. Businesses in Canada tell us that it is increasingly difficult to find

¹⁰ See J. De Loecker and J. Eeckhout, “[The Rise of Market Power and the Macroeconomic Implications](#),” draft working paper, August 24, 2017.

¹¹ See A. Haldane, “[Work, Wages and Monetary Policy](#)” (speech at the National Science and Media Museum, Bradford, UK, June 21, 2017).

¹² Monopsonies are also increasingly prevalent in labour markets in the United States, which may be driving down wage growth and contributing to the decline in labour share. See J. Azar, I. E. Marinescu and M. Steinbaum, “[Labor Market Concentration](#),” SSRN (December 15, 2017).

the right people in these areas, and I imagine this is the case globally. The obvious implication is that we need to find better ways to make these fields of study more accessible and interesting to students, starting at an early age. Improving our track record in terms of gender balance would add to the pool of STEM skills, but this will require some new ideas.¹³

We also know that on-the-job training and reskilling will become even more important because of the accelerating pace of change. Even a recent graduate may not have the exact skills needed to be a perfect match for the job. An increasing number of mid-career employees may find that their skills have become obsolete and that retraining is needed. As Governor Stephen S. Poloz mentioned recently, we will need more engagement from businesses to tackle this issue. They are best placed to know their own people and their own business needs in real time.¹⁴

The question is, how can public policy and academic institutions encourage and complement any new efforts by businesses? Each of our countries has interesting approaches to build on. Germany's apprenticeship program is well known and established. It has been successful in giving students valuable vocational training while also meeting business needs.¹⁵ The Creative Destruction Lab in Canada is a lesser-known example in the tech field of universities working with students and businesses to bring the best ideas in science, machine learning and artificial intelligence to market.¹⁶

Let's not forget that technology itself can be used to better match people with jobs, and to attract people into the labour force and keep them there. This will strengthen sustainable economic growth while supporting inclusiveness at the same time. Finding ways to include more women in the labour force, and empower them, is a priority for the G7 this year.

Another promising avenue to explore is how to adopt technologies that remove barriers for people with disabilities. Right now, just over 10 per cent of the labour force across the G7 consists of persons with disabilities. If their employment rate were raised to the same level as that for the rest of the labour force, we could add up to 12 million workers.¹⁷ Chat and email functions on our phones have already transformed workplace accessibility for the hearing-impaired. Entrepreneurs in Canada and elsewhere are developing technology to help people who are visually impaired see far-away details. Soon, driverless cars will help make people with a range of disabilities more mobile. As governments work to nurture innovative tech start-ups, they could emphasize technologies to enhance workplace and social inclusion.

¹³ See A. M. Munoz-Boudet, "[STEM Fields Still Have a Gender Imbalance. Here's What We Can Do About It](#)," World Economic Forum, March 16, 2017.

¹⁴ See S. S. Poloz, "[Three Things Keeping Me Awake at Night](#)" (speech to the Canadian Club Toronto, Toronto, Ontario, December 14, 2017).

¹⁵ More information on Germany's program is available on its Federal Ministry for Economic Affairs and Energy [website](#).

¹⁶ The Rotman School of Management launched the [Creative Destruction Lab](#) at the University of Toronto six years ago. The lab has since expanded to Vancouver in collaboration with the University of British Columbia's Sauder School of Business, and elsewhere across Canada.

¹⁷ This calculation excludes Japan. Data were taken from [EuroStat](#) for Germany, France, Italy and the United Kingdom (2011); from the [Bureau of Labor Statistics](#) for the United States (2016); and from [Statistics Canada](#) for Canada (2012).

Keeping market power in check

We are not going to get the full benefits of innovation if we leave market power unchecked.

I'm focusing on the tech industry because the discussion is about digitalization, but some of my points could apply elsewhere. The five biggest global technology companies have a market capitalization of about US\$3.5 trillion. That's almost one-fifth of the size of the US economy. The tech industry is making a valuable contribution to our economic performance. That said, the size and market dominance of some of the tech firms raise many of the usual concerns about the potential effects of monopoly power on prices and competition.

A new source of market dominance relates to data. Access to and control of user data could make some firms virtually unassailable.¹⁸ They can easily drive out competition by combining their scale with innovative use of data to anticipate and meet evolving customer needs, at a lower price (and sometimes for free). This has a couple of undesirable consequences. First, firms operating in less-competitive environments innovate less; we need the dynamism from firm entry and the contestability of markets to raise the trend line on growth as much as possible.¹⁹ Second, the biggest firms may well return to monopoly pricing in the long run. These consequences get in the way of stronger, more-inclusive growth.

That is why we should prioritize the modernization of anti-trust and competition policy, as well as the relevant legal frameworks. There are many unanswered questions, especially about how best to remove barriers to entry. If user data are the primary source of monopoly rents in the digital age, how should we regulate who owns these data and how they are shared? Some interesting ideas include giving users control of their data—perhaps even making firms pay users for their data—and regulating tech platforms as utilities.²⁰ Intellectual property rights present similar issues. Patents are a key way to protect the return on valuable research and development. Given that they create barriers to entry and that the pace of technological change is accelerating, do we need to rethink our approach? It is good to see authorities across the G7 countries looking at all these issues.²¹ International collaboration is necessary because of the ubiquity and cross-border nature of many digital services.

New technologies pose additional regulatory and legal questions. For example, the sheer complexity of algorithms used for data analytics makes them difficult to interpret, audit and govern. In some cases, algorithmic pricing could lead to *tacit* collusion—price fixing without the quiet glass of scotch between commercial rivals. Even if it were identified, tacit collusion would

¹⁸ P. Aghion, N. Bloom, R. Blundell, R. Griffith and P. Howitt, "[Competition and Innovation: An Inverted-U Relationship](#)," *The Quarterly Journal of Economics* 120, no. 2 (May 2005): 701–728

¹⁹ One striking example of this issue is that concentration has increased in three-quarters of US industrial sectors since the early 1970s. See S. Leduc, "[Seeking Gazelles in Polar Bear Country](#)" (speech to the Sherbrooke Chamber of Commerce, Sherbrooke, Quebec, October 3, 2017).

²⁰ I. A. Ibarra, L. Goff, D. J. Hernández, J. Lanier and E. G. Weyl, "[Should We Treat Data as Labor? Moving Beyond 'Free.'](#)" *American Economic Association Papers & Proceedings* 1, no. 1 (December 27, 2017), forthcoming.

²¹ For example, see the Japan Fair Trade Commission's Competition Policy Research Center, [Report of Study Group on Data and Competition Policy](#), June 6, 2017; Competition Bureau, [Big Data and Innovation: Implications for Competition Policy in Canada](#), September 2017; and Autorité de la concurrence and Bundeskartellamt, [Competition Law and Data](#), May 10, 2016.

not meet some current legal definitions of collusion.²² Legal clarity is also required in many jurisdictions with respect to data privacy, information security and consumer rights.

We also need to determine how best to manage the risks that concentration in digital services can pose for the financial system. Top of mind for me are the growing operational risks (including cyber risks) from a very concentrated set of third-party service providers that our financial institutions use—cloud services, data aggregators and related analytics. How concerned should we be about these third parties—telecommunications companies and tech companies—given that they typically fall outside the current regulatory perimeter? This is another question that would benefit from concerted attention at the international level. Good progress is already being made on issues related to international taxation to avoid base erosion and profit shifting.²³

Policy-makers need to dig in

This brings me to my final point. Policy-makers need to dig in and be proactive. Good policy decisions can only come from a clear understanding of the new technologies and the related business incentives.

Let me give some examples from my own backyard.

At the Bank of Canada, we are focused on understanding the many ways in which digitalization and automation are affecting the economy and the financial system. For example, as non-traditional pricing models become more prevalent, we are rethinking how best to measure inflation. We are looking at how digitalization might be affecting labour markets and the transmission of monetary policy, and how a global digital marketplace for goods and services changes the ways in which domestic inflation pressures are generated. Our researchers are also studying emerging technologies in financial services to understand how the ecosystem is evolving, and to spot new risks as they emerge.

The workforce needs to have the right skills for the digital economy. So do public policy-makers. The Bank of Canada has several irons in the fire that take a learning-by-doing approach; one example is the work staff are undertaking to apply machine learning and techniques such as distant reading to analyze vast amounts of unstructured information. The goals are to increase the range and depth of skills of our staff, improve our projections and reduce the uncertainty we face when making policy decisions. We are also working on how we could use machine-learning applications to increase efficiencies and manage operational risks in all parts of our business. All the institutions represented in this room are doing interesting work in this area.

Public sector institutions need to innovate in their business cultures. We should be open to more-diverse perspectives and expertise, work more often with private sector experts and take

²² See "[Price-Bots Can Collude Against Consumers](#)," *The Economist*, May 6, 2017.

²³ The Group of 20 and the Organisation for Economic Co-operation and Development have made some progress with an initiative known as [BEPS](#) (base erosion and profit shifting). The idea behind BEPS is to make it harder for global firms to shift profits to other countries and keep them hidden from their home tax authorities. This makes sense for fairness considerations and for ensuring that governments have enough resources for effective social programs.

manageable risks.²⁴ The Bank of England and the Monetary Authority of Singapore are leaders in exploring fintech with the private sector.²⁵ The Bank of Canada also has several experiments under way. One is in partnership with the TMX Group and Payments Canada. It uses distributed ledger technology to build a delivery versus payment settlement system for securities.²⁶ Our experience with these types of partnerships so far is that we can quickly harness deep subject matter and business expertise, define realistic yet ambitious objectives and make faster progress than if we were working alone.

It's good to see that G7 central banks, among others, have already been comparing notes on our work in these areas.

Conclusion

It is time to conclude. I do not need to convince you that the digital economy is a promising way to raise trend growth and overall living standards. We cannot be satisfied, though, if some of the potential gains are left on the table, because many people will be left behind and important markets will be virtually uncontested.

It does not have to be this way if we choose a road for policy that effectively manages the downsides of innovation without stifling it. Of all the areas where we could develop and implement a better strategy, here are my top three: (i) develop a dynamic workforce with the skills to match the jobs, and encourage more labour force participation; (ii) keep market power in check, particularly the power that comes from control of consumer data, to encourage competition and limit monopoly profits; and (iii) manage the growing operational risks associated with the digital services that are provided by a concentrated set of firms to systemically important financial institutions.

We will need to judge wisely when it is best to use public policy tools to manage risks and when to let private enterprise work its magic. We'll need to work together and in the field to inform these judgments. I am confident that, together, the G7 will show leadership and will build with the private sector a shared sense of responsibility for the future.

²⁴ The Bank of Canada's Risk Appetite Statement can be found on page 51 of the Bank's [2015 Annual Report](#).

²⁵ The Bank of England's [Fintech accelerator](#) program brings central bank and private sector experts together to create proofs of concept that could be useful in central banking and demonstrate solutions for real-world problems. The Monetary Authority of Singapore's [FinTech Regulatory Sandbox](#) gives financial institutions and fintech firms an opportunity to experiment with new financial products without having to comply with all current legal and regulatory requirements. The MAS and the Bank of Canada are working together on a proof of concept for cross-border payments using blockchain technology.

²⁶ More information on the Bank of Canada's research and experiments is available on its [website](#).