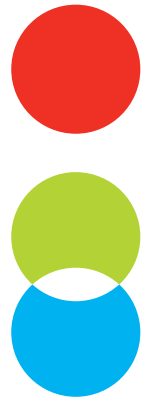The Conference
Board of Canada

Artificial Intelligence and the Global Trade Environment

Strategic Foresight

Preface

This briefing presents four plausible scenarios developed during a Global Commerce Centre strategic foresight workshop on AI (artificial intelligence) global adoption and the openness of the global trade environment. It provides insights into the challenges and opportunities that industries, the government, and the public may face as AI technologies and global economic trends continue to evolve. All four workshop groups highlighted the role of government policies and the need for good governance, ethical frameworks, and educational programs.

This strategic foresight workshop was conducted under the Chatham House Rule. The identity and affiliations of those who participated in the individual group discussions are kept confidential.

Contents
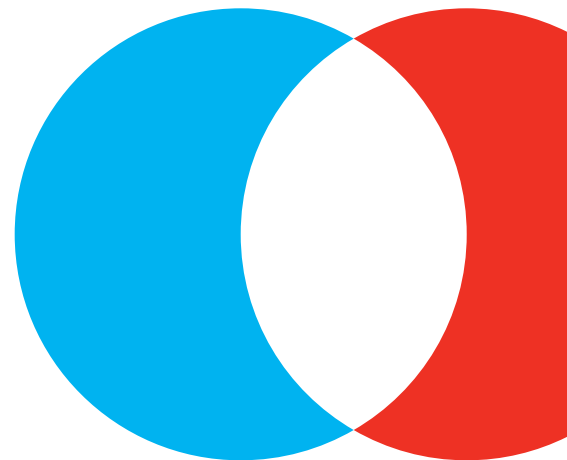
Background

The Conference Board of Canada's Global Commerce Centre (GCC) held a strategic foresight workshop on November 19, 2018.

The workshop allowed GCC stakeholders to discuss and develop a series of plausible futures with specific assumptions on AI (artificial intelligence), global adoption, and the openness of the global trade environment.

This report's four scenarios (A, B, C, and D) provide insights into the challenges and opportunities that industries, the government, and the public may face as AI technologies and global economic trends continue to evolve.

All four scenarios highlight the role of government policies and the need for good governance, ethical frameworks, and educational programs. These components are necessary to ensure that the Canadian population has the right skills and knowledge to use and benefit from emerging technologies such as AI.

Introduction

The past decades have "witnessed a strong trend toward the international dispersion of value chain activities such as design, production, marketing, [and] distribution."[1] The creation of global value chains[2]—defined as the international fragmentation of production—has allowed companies to generate economies of scale and increase productivity while lowering costs.

Yet, the global economy is being subjected to forces that may disrupt this trend. In particular, the digitalization of the economy; the fast improvement of technologies, such as artificial intelligence; and the rise of populism in several western countries are some of the forces that could significantly alter the global trade landscape in the coming years.

To what extent will changes in the global economy, and the fast advancement of AI technologies, affect global value chains in the future? What sort of impact might these technologies—as well as trends in global economic openness—have on Canadian businesses? These are some of the questions that were addressed during a strategic foresight workshop held on November 19, 2018, by The Conference Board of Canada's Global Commerce Centre (GCC).

Unlike traditional economic forecasting that focuses on the development of a probable or most-likely future, strategic foresight aims to develop a series of plausible futures. The goal of a strategic foresight exercise is to offer insights to decision-makers in governments, businesses, and other organizations on:

- how best to prepare for all possible outcomes;
- what they might do to shift toward a future preferred by governments and businesses;
- how to recognize and adapt to events and trends that may point toward a specific future.[3]

Consistent with the GCC's goal to help Canadian leaders understand the implications of global economic shifts for businesses and governments, the strategic foresight workshop allowed GCC stakeholders to discuss and develop a series of plausible futures regarding global value chains and the adoption of AI.

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1 OECD, "Global Value Chains (GVCs)," 2019, https://www.oecd.org/sti/ind/global-value-chains.htm.

2 Global value chains are defined as the international fragmentation of production—i.e., the fragmentation of the production process of a good or development process of a service in different stages across several countries.

3 Conference Board of Canada, The, "The Strategic Foresight Initiative," 2019, https://www.conferenceboard.ca/topics/security-safety/strategic-foresight.aspx.

This report explains the structure of the GCC strategic foresight workshop, summarizes the key points discussed during the workshop, and presents the main conclusions of the exercise.

Workshop structure and overview

Foresight uses a combination of emerging trends and drivers of change, as well as some creativity, in visualizing how these trends and drivers interact to create plausible alternate futures.[4]

At the beginning of the workshop, the Conference Board introduced two drivers of change: (1) AI adoption across the global economy in 2035 and (2) the global trade environment. These drivers were used to build an analytical matrix with global trade on the Y-axis and global AI adoption on the X-axis. The matrix represents the four scenarios to consider when examining the intersection between AI and global trade, with each quadrant representing one scenario. (See Exhibit 1.)

This matrix assumes that the baseline comprises the current situation in the global economy. Scenarios to the right assume a widespread AI adoption while scenarios in the upper half assume an open and a relatively free global economy. These assumptions are reversed to the left and lower half of the matrix, respectively.

Workshop participants were split into four groups, each with its own Conference Board facilitator. Each group was assigned one scenario and tasked with developing a narrative that explains how their scenario will evolve from 2018 to 2035. The groups were also required to answer the following questions about their scenario:

1. In your scenario, what do global value chains look like in 2035?
2. Identify two threats to Canadian businesses.
3. Identify two opportunities for Canadian businesses.
4. What key regulation should Canada be developing to ensure safe and reliable integration of AI in the economy?
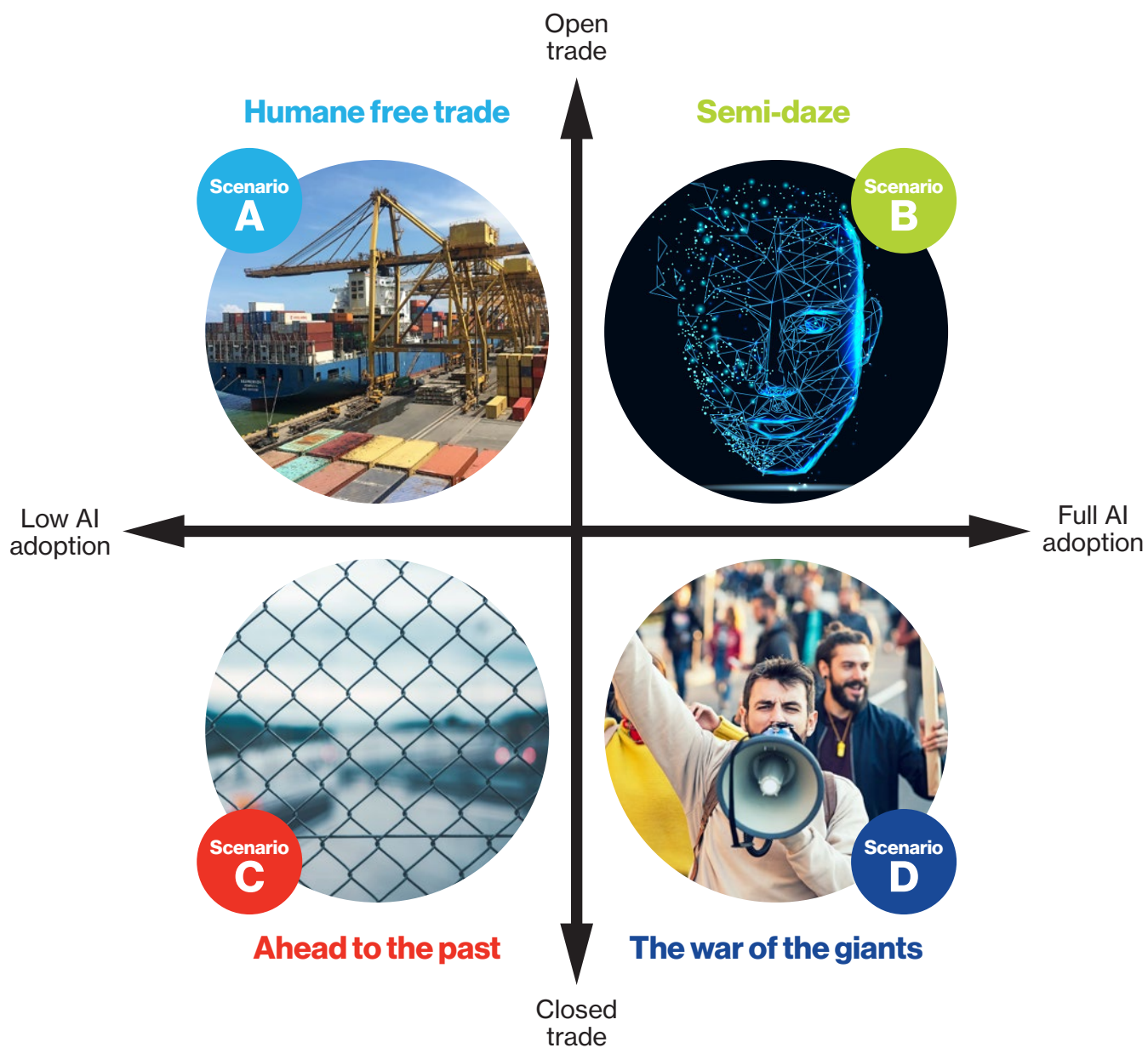
The Global Commerce Centre (GCC) helps Canadian leaders understand global economic shifts and their practical implications. The Centre's private and public sector members meet regularly to hear new research and business insights on global trade.

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4   Kabilan, Satyamoorthy, "Foresight and Innovation: Today's Science Fiction, Tomorrow's Reality?" The Conference Board of Canada, April 15, 2013, https://www.conferenceboard.ca/commentaries/technologyinnovation/default/hot-topics-in-technology-and-innovation/2013/04/15/Foresight_and_Innovation_Today_s_Science_Fiction_Tomorrow_s_Reality.aspx.

Exhibit 1
Matrix of four scenarios showing the intersection between AI and global trade

Open
trade

Humane free trade

Scenario
A

Semi-daze

Scenario
B

Low AI
adoption

Full AI
adoption

Scenario
C

Scenario
D

Ahead to the past

The war of the giants

Closed
trade

Source: The Conference Board of Canada.

Scenario A

Low global artificial intelligence adoption and free trade global trend

Scenario narrative

The international community has decided to invest fully in deregulating trade and dismantling barriers to trade. Goods from abroad become cheaper and more diverse. Current technologies, like the Internet, continue to stimulate international development and economic growth, leading to the creation of new free trade and preferential trade agreements. Countries become more specialized, with Canada increasing its competitiveness in the high-wage service sector.

Many economies, including Canada, see AI technologies as culturally incompatible with societal norms and conventions. AI technologies are also perceived as being too costly compared to labour. The international community also concluded that such technologies generate environmental costs. For these reasons, Canada and many of its trading partners continue to engage in global trade without the widespread use of AI technologies. Over time, global supply chains become longer.

Opportunities

This scenario presents several opportunities for Canadian businesses. Firms operating in the resource extraction sector (including the oil sands) continue to be competitive. Job markets remain tight in Canada, without being overly

disrupted by technological changes. Lastly, in this low global AI adoption scenario, Canada's small market size (and access to a limited amount of data compared with the U.S. and China) will not be an impediment to becoming globally competitive.

Threats

Canada's decision to opt out of AI will lead to a range of challenges. The absence of innovative AI technologies in Canadian business operations will prevent the Canadian economy from operating at full efficiency. Some sectors will lose global market share as they compete with foreign firms in countries that have integrated these technologies more deeply into their operations.

Suggested policies

This scenario assumes that distrust over AI technologies will increase over time, due to concerns with data security, data privacy, and data abuse. To offset these concerns, several regulatory approaches could be considered. For example, the government should ensure that AI technologies are applied neutrally without cultural biases that discriminate against certain groups. The government should also put in place privacy and data protection regulations to rebuild trust in AI technologies and to address social media breaches, biases,[5] and unsafe

> Governments should implement regulations that encourage the ethical integration of AI into the economy. As well, regulations and international rules must encourage the free flow of data across the international community.

AI applications. Ideally, private firms should adopt AI practices to appease societal concerns about data privacy and protection. However, broader regulations will likely be needed to protect source code and algorithms. Currently, Canada lags in protecting algorithms.

Governments should implement regulations that encourage the ethical integration of AI into the economy. Specifically, AI users must consider the fact that the data used to build the technology (through deep learning) could lead to biases. Regulations and international rules must also encourage the free flow of data across the international community.

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5   For example, a study by ProPublica found that an AI algorithm, used by parole authorities in the U.S. to predict the likelihood of criminals reoffending, was biased against black people. Marr, Bernard, "Artificial Intelligence Has a Problem With Bias, Here's How to Tackle It," *Forbes*, January 29, 2019, https://www.forbes.com/sites/bernardmarr/2019/01/29/3-steps-to-tackle-the-problem-of-bias-in-artificial-intelligence/#3d4f83d67a12.
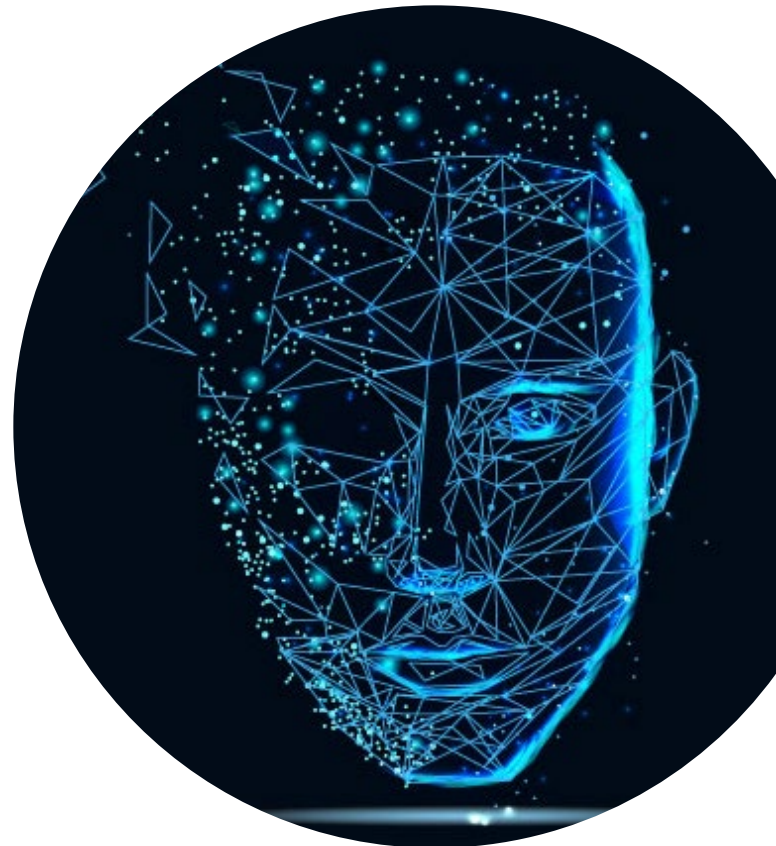
Scenario B

Semi-daze

Widespread global artificial intelligence adoption and free trade global trend

Scenario narrative

The global economy is moving toward freer trade, greater cross-border investment, and faster economic growth and technological innovations. These changes lead to the annulment of Brexit and bridge "outsider" countries like North Korea into the free market. India and China become global leaders in AI technologies, fueled by rapid growth in their goods-producing sectors. African countries also benefit from strong growth in global trade and invest in the development of their domestic economies.

Growth in the services sector has slowly outpaced growth in the goods sector by 2035, fueled by increasing demand for services in India, China, and Africa. The World Trade Organization, World Intellectual Property Organization, World Customs Organization, and Organisation for Economic Co-operation and Development continue to serve as international forums for countries to proactively engage with each other.

Opportunities

This scenario presents many opportunities for Canadian businesses. Most importantly, industries in Canada will have the opportunity to become global leaders in the development and implementation of AI technologies. In turn, this will bolster growth in productivity and

Canadian GDP across sectors. For example, transportation and health care are likely to benefit from increased efficiencies in their management systems, thanks to AI.

Threats

This scenario is associated with several potential challenges. Ethical concerns may emerge in the long run over the development and use of AI. For example, benefits associated with AI and global trade may not be shared equally across the international community. Also, those benefits could be allocated to only a few large multinational corporations or countries with the means and data to develop AI.

There may also be concerns over data security and privacy. Canadian businesses might be adversely affected by data fraud and infiltration if not sufficiently protected. Furthermore, the adoption of new AI technologies and 3D printing may disrupt the Canadian labour market across different sectors—including financial services, manufacturing, and the shipping sector.

Suggested policies

Canada should design its regulations on global trade and AI technologies based on international standards and ensure continued cooperation with the international community. Meanwhile, regulations on data and information flow must be designed to strike a balance between privacy and security considerations and information flows. The government should also introduce measures to encourage private firms to innovate so that they can effectively compete with global competitors.

Under the semi-daze scenario, industries in Canada will have the opportunity to become global leaders in the development and implementation of AI technologies.

Scenario C

Low global artificial intelligence adoption and protectionist global trade trend

Scenario narrative

A perfect storm shakes the world economy during the 2020s. Trends in populist protectionism, spikes in data infringements, and fears of workforce and investment displacements limit AI adoption in advanced countries.

The steady rise of data-related scandals—including breaches, privacy violations, and data misuse—plague government agencies, private firms, and social media sites. This leads to the erosion of trust from governments and consumers in the further development of AI. Soon, data security becomes another target for populist leaders questioning the benefits of open borders. Subsequently, AI-related investment dries up, hastened as well by the swift changes to data regulations that are implemented. Over time, little to no data are being shared across borders—further hindering AI development and adoption. (AI development requires access to very large amounts of data.)

Additionally, the fear that low-skilled workers are being left behind (due to AI) fuels even more populist movements and leads governments to back away from investing in AI.

Gradually, global productivity falls and value chains become virtually non-existent. Countries' comparative and absolute advantages are significantly dialed-back in a world retreating from globalization and AI, and this causes production costs to soar. This lack of specialization leads, by extension, to a decline in job creation,

consumption, and economic growth. It is almost as though the trend toward globalization, and the embrace of technological change that started in earnest after the Second World War, never happened.

Opportunities

In Canada, firms operating in basic-needs sectors have the best potential for growth. There is less international demand for Canada's natural resources, so production and consumption become increasingly localized. And the economy tilts toward firms providing shelter, food, clothing, and some low value-added manufacturing products. Another opportunity for Canadian businesses is to reconfigure regional value chains—swapping north-south trade for east-west trade (i.e., developing internal Canadian markets).

Threats

Socio-political instability rises due to the higher costs and disinvestment that are stymieing economic growth. This, in turn, causes additional fragmentation within Canada. Some provinces raise barriers to trade and investment, making a shift to east-west trade less likely. There is fear that some provinces could decide to leave the Confederation to maintain access to markets south of the border.

Suggested policies

Policy responses in this scenario could include different key actions. Policy-makers must first integrate the ethical application of AI into education and training programs. This integration will, in turn, help to ethically integrate AI in the

> Sectoral roundtables may alleviate the struggle between the government's necessity to protect the public and the private sector's need to stay globally competitive by integrating innovative technologies into their operations.

economy and rebuild trust in AI. It would also increase Canada's labour force skills in the technology and, over time, allow Canada to develop a comparative advantage in AI. At the same time, Canada should work with its trading partners to rebuild global trust in the technology. Policy-makers should also conduct sectoral roundtables to identify sector-specific threats and opportunities deriving from AI adoption. Canadian firms in some industries, such as manufacturing, might have to adopt and implement AI quickly if they do not want to fall behind their competitors. On the other hand, industries such as health care might require more caution and public support when implementing AI due to their use of sensitive information. Sectoral roundtables have the potential to alleviate the struggle between the government's necessity to protect the public and the private sector's need to stay globally competitive by integrating innovative technologies into their operations.

Scenario D

Widespread global AI adoption and protectionist global trade trend

Scenario narrative

The widespread adoption of AI leads to increased inequality among countries and within domestic populations, which contributes to widespread protectionism around the world.

More specifically, the adoption and use of AI technologies across different sectors results in substantial structural changes in the economy. This causes disruption in the labour market as technologies replace a significant number of jobs. These changes lead to a rise in inequality, civil unrest, and pressure on the government to raise trade barriers. This promotes a vicious cycle: the more widespread adoption of AI causes job losses, more stringent protectionist measures, and a decline in global trade. Declining global trade results in more job losses and, in turn, applies more pressure on governments to raise trade barriers to protect jobs from foreign competition.

Threats

Since Canada is a small economy that is highly dependent on trade, the rise of global protectionism causes a real threat to domestic economic growth. Limited access to international markets will lead to a contraction in Canada's economy, causing civil unrest in parts of the population. Workers disenfranchised by protectionist measures will exert more pressure on the government to reinforce employee protections against market forces. In this context, the federal government develops policies to support a "Made in Canada" strategy to address

workers' concerns. Yet, there is also a push from the business community to lower wages so that firms can more easily compete in foreign markets, where they are likely to face high tariffs.

Large corporations based in the most populous countries are the main winners in this scenario as the size of the population allows them to have access to enough data to develop deep learning (AI) technologies. Governments of populous countries encourage corporations to invest in their domestic market rather than abroad, and to focus on vertical, rather than horizontal, integration.[6] Global value chains slowly dissipate in favour of more localized value-added supply chains.

Smaller economies, such as Canada's, struggle in this scenario. Barriers to trade and to cross-border data flow prevent these economies from accessing sufficient data to fully develop AI technologies and reap the benefits that they offer.

Opportunities

Canadian businesses may still see opportunities emerging from this scenario. For example, the Canadian government may provide financial support to companies that have the potential to integrate vertically. Large resource extraction firms, which continue to export thanks to Canada's significant endowment in natural resources relative to other countries, might be able to gain access to technologies that will allow the processing of natural resources

within Canada. This adds value to Canada's resources at home, rather than exporting primary goods that are then processed in another country. Additionally, the Canadian industries producing goods that are typically imported will expand as Canadian businesses and consumers shift from buying imported goods to purchasing domestically produced ones (as a result of the protectionist environment). Also, in the face of rising global protectionism, Canadian policy-makers could mobilize their efforts to eliminate barriers to interprovincial trade and movement of people to encourage more trade within Canada.

Suggested policies

Policy responses in this scenario (widespread adoption of AI resulting in rising protectionism) could include several tools. For example, educational programs in applied sciences could include courses on approaches to integrate AI technologies into our economy in an effective, safe, and ethical manner. Although Canada already has advanced university research centres in AI (in Montréal, Toronto, and Edmonton), we also need to focus on strategies to transfer research outcomes into business opportunities. This is so that Canadian firms can use the newly created technologies in their operations. Finally, policy-makers could also put in place a framework that supports workers when confronted with quick labour market displacements resulting from technological innovations.

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6   A vertical integration occurs "when a firm extends its operations within its value chain. It means that a vertically integrated company will bring in previously outsourced operations in-house." Corporate Finance Institute, "Vertical Integration," CFI, n.d., https://corporatefinanceinstitute.com/resources/knowledge/strategy/vertical-integration/.

Scenario analysis

This strategic foresight exercise allowed GCC members to explore alternative, plausible futures related to AI adoption and the level of global protectionism. As well, the members could visualize how global value chains would evolve in difficult or uncomfortable conditions. Several key insights emerged from the workshop:

Ethical concerns: Each group identified ethical concerns related to their respective scenario. Some of these concerns were highlighted by all four groups, such as concerns related to the distribution of trade benefits; potential inequalities in AI access within countries and across the global economy; and the risk that only a few large multinational corporations might benefit from and have access to AI. Most of the groups highlighted the need for policies to encourage the ethical integration of AI technologies in our economy.

Mixed impact on value chains and labour: Each group identified unique impacts on value and supply chains in Canada. Each group also indicated that the Canadian workforce will have to cope with broad economic shifts. There are winners and losers in each scenario. However, thoughtful policy approaches must be encouraged to support displaced workers during structural transitions.

Government avenues: The groups suggested that government policies address a range of issues related to AI adoption and global trade

trends. Notably, participants suggested that the government:

- protects data and works with its trading partners on setting protection standards to strike a balance between privacy and information flows;
- ensures that independent AI operators are not gobbled up by the tech giants;
- supports firms in their efforts to compete at the international level;
- undertakes specific sectoral analyses on potential threats and opportunities from AI adoption to make certain that AI is effectively integrated across the economy;
- integrates AI into educational and training programs;
- introduces a program to support workers when confronted with quick labour market displacements resulting from technological innovations.

A synopsis of the scenarios is presented in Table 1.

Table 1
Scenario responses

	Scenario A Humane free trade	Scenario B Semi-daze	Scenario C Ahead to the past	Scenario D The war of the giants
Scenario characteristics	Low global AI adoption and open/free trade global trend	High global AI adoption and open/free trade global trend	Low global AI adoption and closed/protectionist global trade trend	High global AI adoption and closed/protectionist global trade trend
Direction of trade	Upward	Upward	Downward	Downward
What will global value chains look like in 2035?	• Global value chains continue to develop and strengthen. • Focus shifts toward human capital and away from new technologies that are perceived as too costly.	• Value chains mostly expand in India, China, and Africa. • Growth in the services sector outpaces that of the goods sector, fueled by strong international demand for services.	• Global value chains are virtually non-existent. • Production costs rise substantially, specialization falters, and investments stagnate.	• Global supply chains are replaced by vertically integrated local networks supported by AI. • These are smaller and cater to regional markets.
Threats to Canadian businesses	• The rejection of AI can be viewed by businesses as a policy failure. • Economy lags because of lower efficiency, reduced competitiveness at the global stage, and difficulty in attracting capital.	• Data security and privacy might become problematic because of deregulated data flows. • Threats also include deregulation in the financial sector, job losses among low-skilled workers, and challenges in finding workers with the right skills.	• There is reduced access to international markets. • East-west trade is unlikely because of internal politics. • Civil strife and unrest results, causing labour shocks.	• Since Canada is a small economy that is highly dependent on trade, limited access to exporting markets due to global protectionism will lead to a contraction of Canada's economy. • Smaller economies, like Canada's, will struggle in this scenario as barriers to trade and to cross-border data flow limit the ability to develop AI to its full potential.
Opportunities for Canadian businesses	• Firms with comparative advantages, like energy and mineral extraction, continue to be insulated from changes in the global economy.	• Businesses in Canada can become global leaders in the creation and adoption of AI technologies. • There is increased efficiency in transportation, health care, and other services.	• Firms operating in basic-needs sectors have the best potential for growth. • Supply chains are reconfigured to fit Canadian needs to satisfy the Canadian market	• Constraints in the domestic market may encourage Canadian firms to create foreign affiliates to have access to larger markets while avoiding barriers to trade. • Policy-makers could put in place a plan to eliminate barriers to interprovincial trade and movement of people to encourage more trade within Canada.
Key regulations	• Regulations are required and must be moral and human-inspired. • Users of AI technologies, created from consumer data, must consider potential biases and privacy issues.	• Globally inspired regulations are implemented to encourage international development and cooperation on data sharing. • Regulations are implemented for a better balance between privacy and free flows of information across borders.	• There is an imperative to rebuild trust in AI. • The ethical application of AI must be integrated into educational programs. • Sectoral roundtables to address sector-specific concerns. • Measures are established to support free competition.	• Considerations should be included about the ethics of AI in educational programs. • There should be a focus on strategies to convert research outcomes into business opportunities. • A policy framework could be created to support workers when faced with labour market disruptions.

Source: The Conference Board of Canada.

Conclusion

The four scenarios developed during the strategic foresight exercise provided some interesting insights into the challenges and opportunities that industries, the government, and the public may face as AI technologies and global economic trends continue to evolve.

This workshop captured several major themes. Some commonalities across groups included an emphasis on data ethics, promoting international trade, and building trust in AI. Scenario B "Semi-daze," for example, suggested that regulations and precautions are necessary even when the economy is expanding and fueled by AI technologies.

Canadian businesses will need to be proactive and respond quickly to the changing global environment. In particular, businesses will need to anticipate the threats and opportunities that may emerge from fast-evolving technologies such as AI. They will also need to assess the future direction of global economic integration (i.e., whether the global economy is moving toward more protectionism or freer trade) to better plan their business strategies.

This strategic foresight report has identified four potential futures for consideration. The issues discussed during this exercise will likely become even more important in the coming years as the capacity of AI technologies expands. Like the adoption of automation, the use of AI may yield mixed results in Canada. All four scenarios highlighted the role of government policies and the need for good governance, ethical frameworks, and educational programs to ensure that the Canadian population has the right skills and knowledge to use and benefit from emerging technologies.

Acknowledgements

About the Global Commerce Centre

The Global Commerce Centre (http://www.conferenceboard.ca/gcc) helps business and government leaders respond effectively to the dramatic changes in the global economy. The Centre provides evidence-based tools and strategies to help companies succeed in global markets, and brings together public and private sector leaders to discuss effective solutions to global commerce challenges.

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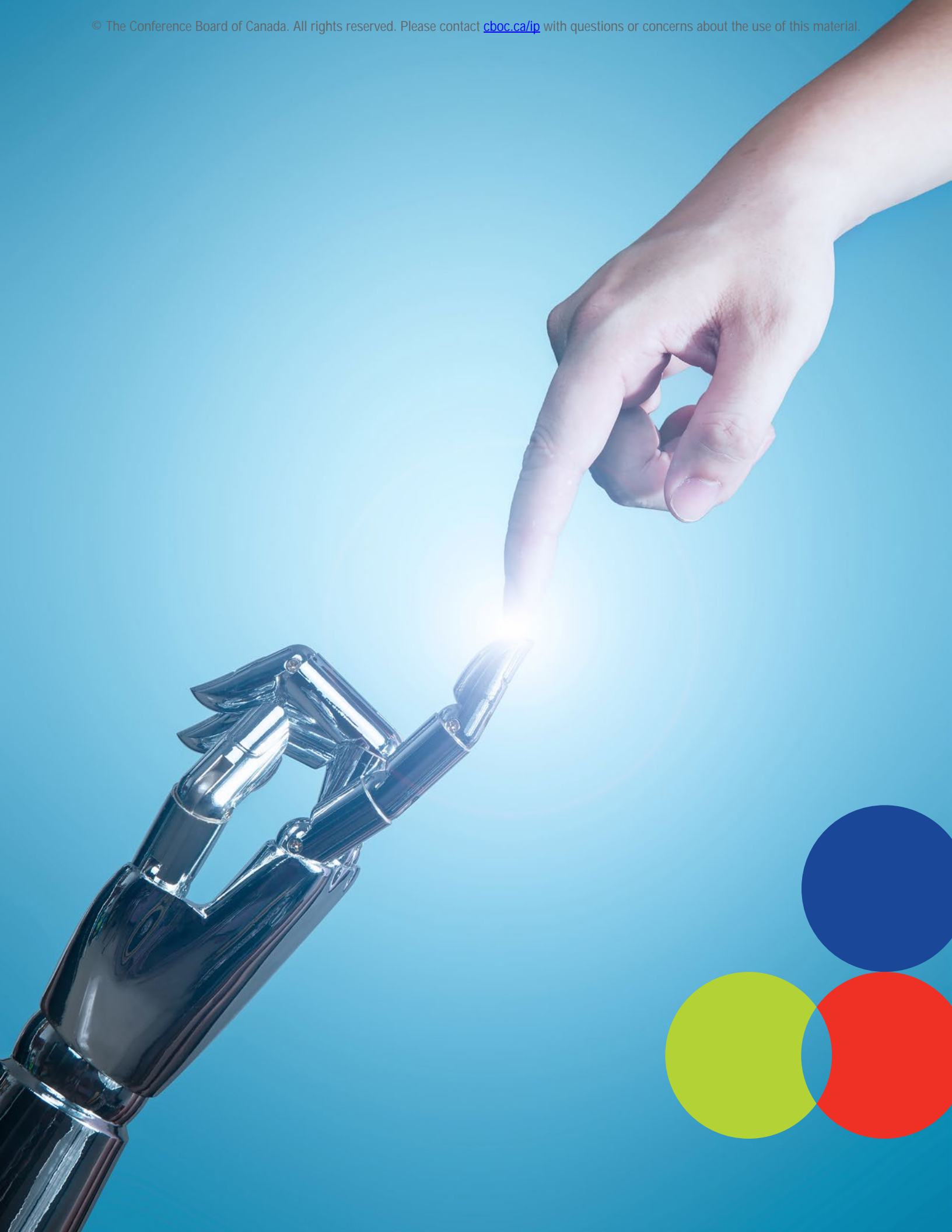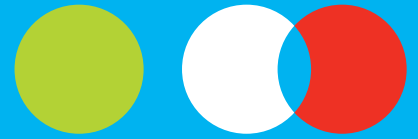
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**Artificial Intelligence and the Global Trade Environment:
Strategic Foresight**
Julie Adès, Henry Diaz, and Nigel Russell

**The Conference
Board of Canada**