ASIA PACIFIC FOUNDATION OF CANADA
FONDATION ASIE PACIFIQUE DU CANADA

INVESTMENT MONITOR

2022

Lagging Foreign Direct Investment in Research and Development

Past trends, current relations, and potential in R&D FDI collaboration between Canada and the Asia Pacific

TABLE OF CONTENTS

Click on title to go to section

LIST OF FIGURES

Click on title to go to section

ASIA PACIFIC FOUNDATION OF CANADA
FONDATION ASIE PACIFIQUE DU CANADA

ABOUT APF CANADA

The Asia Pacific Foundation of Canada (APF Canada) is a not-for-profit organization focused on Canada's relations with Asia. Our mission is to be Canada's catalyst for engagement with Asia and Asia's bridge to Canada.

APF Canada is dedicated to strengthening ties between Canada and Asia with a focus on seven thematic areas.

Our research provides high-quality, relevant, and timely information, insights, and perspectives on Canada-Asia relations. Providing policy considerations and business intelligence for stakeholders across the Asia Pacific, our work includes Reports, Policy Briefs, Case Studies, Dispatches, Digital Media, and a regular Asia Watch newsletter that together support these thematic areas.

APF Canada also works with business, government, and academic stakeholders to provide custom research, data, briefings and Asia Competency training for Canadian organizations. Consulting services are available by request. We would be pleased to work with you to meet your research and business intelligence needs.

- Business Asia
- Perspectives Asia
- Strategic Asia
- Digital Asia
- Engaging Asia
- Sustainable Asia
- Education Asia

ASIA PACIFIC FOUNDATION OF CANADA
FONDATION ASIE PACIFIQUE DU CANADA

MESSAGE FROM THE PRESIDENT AND CEO

Innovation, research, and development are at the frontiers of global competition as the world undergoes the Fourth Industrial Revolution, also known as Industry 4.0. The drive for innovation leads governments and firms around the world to allocate substantial resources to research and development (R&D) activities at home and internationally. Multinational enterprises open R&D offices in host countries around the world, drawing on local talent and resources to drive technological innovation. This collaboration provides the basis for foreign direct investment (FDI) flows in R&D between Canada and the Asia Pacific economies.

Tracing this collaboration in R&D, this Investment Monitor report identifies a relatively low level of FDI in R&D between Canada and the Asia Pacific (just below 5% of total Canadian inward and outward FDI flows with the region from 2003 to 2021). Historical trends in R&D FDI, captured in this report, indicate that Asia Pacific investors have become more active in Canadian R&D activities since the mid-2010s, while Canadian investors were very active in the early 2010s. The report finds that the COVID-19 pandemic has not negatively impacted FDI in R&D between Canada and the Asia Pacific. In fact, FDI in R&D between the two grew during the pandemic. Due to recent trends, the report concludes that FDI in R&D will continue to grow as investors from both sides of the Pacific seek to expand their activities in new industries and sectors that require international collaboration and higher investment in R&D.

This marks the second report in our 2022 Investment Monitor series. It follows the first report, which examined the overall investment trends in 2021, by providing a closer look at the investments in R&D activities between Canada and the Asia Pacific. In our third and final report this year, we will examine FDI trends in the critical minerals sector. I look forward to sharing our upcoming report with you in October.

Since 2017, APF Canada has published regular reports on bilateral FDI flows between Canada and the Asia Pacific to facilitate evidence-based policy-making and public discourse on Canada's engagement with the region. Six years into this initiative, the Investment Monitor

continues to track two-way investment at the national, provincial, and city levels. Last year, our Investment Monitor report examined the impact of the pandemic on FDI between Canada and Asia.

On behalf of APF Canada, I would like to acknowledge the efforts of those involved in producing this report, especially our sponsors, Export Development Canada, the Government of British Columbia, and Invest Alberta. I would also like to thank the many investment attraction agencies and other government entities across Canada for their engagement and support for the Investment Monitor project.

And finally, I would like to thank the members of our APF Canada research team who were responsible for writing and finalizing this report: Anastasia Ufimtseva, Program Manager, Business Asia; Charlotte Atkins, Project Specialist, Business Asia; Jeffrey Reeves, Vice-President, Research & Strategy; Charles Labrecque, Research Director; our Junior Research Scholars, Rachael Gurney, Pia Silvia Rozario, and Shirley Wang; and APF Canada's communications team for producing the final publication, Michael Roberts, Communications Director, and Chloe Fenemore, Graphic Designer.

JEFF NANKIVELL
President and CEO,
Asia Pacific Foundation of Canada

ASIA PACIFIC FOUNDATION OF CANADA | FONDATION ASIE PACIFIQUE DU CANADA

MESSAGE DU PRÉSIDENT ET CHEF DE LA DIRECTION

L'innovation, la recherche et le développement sont aux frontières de la concurrence mondiale alors que le monde connaît une quatrième révolution industrielle, aussi connue sous le nom d'industrie 4.0. La poursuite de l'innovation amène les gouvernements et les entreprises du monde entier à allouer une quantité importante de ressources aux activités de recherche et développement (R et D) aux niveaux local et international. Les entreprises multinationales (EMN) établissent des bureaux de R et D dans des pays hôtes autour du monde, puisant dans les ressources et les talents locaux pour stimuler l'innovation technologique. Cette collaboration sert de base pour le mouvement des investissements étrangers directs (IED) en R et D entre le Canada et les économies de l'Asie-Pacifique.

En examinant cette collaboration, ce rapport d'*Investment Monitor* définit un niveau d'IED relativement bas entre le Canada et l'Asie-Pacifique (un peu moins de 5 % des mouvements totaux d'IED canadiens entrants et sortants avec la région entre 2003 et 2021). Les tendances historiques des IED en R et D, dont témoigne ce rapport, indiquent que les investisseurs de l'Asie-Pacifique sont devenus plus actifs dans les activités canadiennes de R et D depuis le milieu des années 2010, alors que les investisseurs canadiens étaient très actifs au début des années 2010. Le rapport indique que la pandémie de COVID-19 n'a eu aucun impact négatif sur les IED en R et D entre le Canada et l'Asie-Pacifique. En fait, le nombre d'IED en R et D entre les deux parties a augmenté durant la pandémie. En raison des tendances récentes, le rapport conclut que le nombre d'IED en R et D continuera d'augmenter alors que des investisseurs des deux côtés du Pacifique cherchent à élargir leurs activités dans de nouvelles industries et de nouveaux secteurs qui nécessitent une collaboration internationale et plus d'investissement en R et D.

Il s'agit du deuxième rapport de 2022 de notre série *Investment Monitor*. Il fait suite au premier rapport, qui a examiné les tendances globales des investissements en 2021, en examinant de

près les investissements en activités de R et D entre le Canada et l'Asie-Pacifique. Dans notre troisième et dernier rapport de cette année, nous examinerons les tendances d'IED dans le secteur crucial des minéraux. J'ai hâte de vous partager notre prochain rapport en octobre.

Depuis 2017, la FAP Canada publie des rapports réguliers sur les mouvements bilatéraux des investissements entre le Canada et l'Asie-Pacifique afin de faciliter la création de politiques fondée sur les preuves ainsi que le discours public sur l'engagement du Canada avec la région. Six ans après le début de cette initiative, *Investment Monitor* continue de suivre le mouvement des investissements aux niveaux national, provincial et municipal. L'année dernière, le rapport d'*Investment Monitor* a examiné l'impact de la pandémie sur les IED entre le Canada et l'Asie.

De la part de la FAP Canada, j'aimerais souligner les efforts de ceux qui ont participé à la production de ce rapport, en particulier nos commanditaires, Exportation et développement Canada, le Gouvernement de la Colombie-Britannique et Invest Alberta. Je tiens également à remercier les nombreuses agences d'attraction des investissements et autres entités gouvernementales partout au Canada pour leur engagement et leur soutien envers le projet *Investment Monitor*.

Enfin, je souhaite remercier les membres de l'équipe de recherche de la FAP Canada responsables de la rédaction et de la finalisation de ce rapport. Anastasia Ufimtseva, gestionnaire de programme, commerce avec l'Asie; Charlotte Atkins, spécialiste de projets, commerce avec l'Asie; Jeffrey Reeves, vice-président, Recherche et stratégie; Charles Labrecque, directeur de la recherche; nos apprentis chercheurs-boursiers, Rachael Gurney, Pia Silvia Rozario et Shirley Wang; ainsi que l'équipe de communication de la FAP Canada, qui a produit la version finale du rapport : Michael Roberts, directeur de la communication, et Chloe Fenemore, graphiste.

JEFF NANKIVELL
Président et chef de la direction,
Fondation Asie Pacifique du Canada

EXECUTIVE SUMMARY

Research and development (R&D) plays a central role in the economic development of countries and is a key element of corporate strategies, because innovation provides countries and firms with a competitive advantage. Given R&D's importance to both firms and countries, this report seeks to understand the state of R&D investment between Canada and the Asia Pacific.

To gain a better understanding of Canada–Asia Pacific investment in R&D activities, this report analyzes cross-border flows in FDI focused on R&D. It relies on a sub-set of data from the Asia Pacific Foundation of Canada's (APF Canada) Investment Monitor legacy database of two-way investment flows between Canada and the Asia Pacific tracking FDI in R&D. Based on this data, the report analyzes key investments in R&D and identifies investment trends.

This report focuses on:

1. Detailed analysis of R&D investments between Canada and the Asia Pacific at the national and sub-national levels, from 2003 to 2021;
2. Sectoral analysis of R&D deals to identify the sectors that benefited the most from FDI in R&D between Canada and the Asia Pacific;
3. National and sub-national policies designed to promote FDI in R&D; and
4. The preferred establishment mode for investments made in R&D.

KEY TAKEAWAYS FROM THE REPORT

Canadian and Asia Pacific investors generally favour greenfield investment over mergers and acquisitions when investing in R&D.

Our data from 2003 to 2021 indicate that 60% of deals made by Asia Pacific investors in Canada's R&D sector were greenfield. During the same period, 96% of deals made by Canadian investors in the Asia Pacific were greenfield.

Foreign investment in R&D accounts for less than 5% of FDI flows between Canada and the Asia Pacific.

Asia Pacific investment in Canadian R&D makes up only 2% of total FDI flows, while Canadian investment in Asia Pacific R&D makes up only 1% of total FDI flows.

Foreign investment in R&D between Canada and the Asia Pacific shows contrasting growth trajectories.

Canadian FDI in the Asia Pacific's R&D activities was flowing at a rapid pace before the 2010s; in contrast, Asia Pacific FDI in Canadian R&D started to pick up in the mid-2010s.

2020 and 2021 saw an increase in FDI from Canada to the Asia Pacific and from the Asia Pacific to Canada.

Canadian investment in Asia Pacific R&D grew from C$31M in 2019 to C$139M in 2021. Similarly, Asia Pacific economies expanded their investment in Canada's R&D rapidly from C$324M to C$1B over the same period.

Sectoral distribution of R&D investment over time has become more concentrated in software and computer services.

When looking at the FDI flows between Canada and the Asia Pacific from 2017 to 2021, the software and computer services sector was the largest recipient of both inward and outward FDI flows in R&D, accounting for 28% of Canada's investment in the Asia Pacific and 65% of Asia Pacific investment in Canada.

China, Australia, and India received the majority of Canadian FDI in R&D flowing to the Asia Pacific from 2003 to 2021.

Jointly, these three countries have received 76% of Canadian outward FDI, with China receiving 35%, Australia 30%, and India 11% of Canadian FDI in R&D from 2003 to 2021.

The Canadian province of Ontario is the main beneficiary of Asia Pacific investment in Canada's R&D activities.

Our data indicate that Ontario received around 65% of the total R&D investment from Asia Pacific economies going to Canada from 2003 to 2021.

RÉSUMÉ

La recherche et le développement (R et D) jouent un rôle central dans le développement économique des pays et constituent un élément clé des stratégies d'entreprise, car l'innovation fournit aux pays et aux entreprises un avantage concurrentiel. Compte tenu de l'importance de la R et D pour les entreprises et les gouvernements, ce rapport cherche à comprendre l'état actuel des investissements en R et D entre le Canada et l'Asie-Pacifique.

Afin de mieux comprendre les investissements entre le Canada et l'Asie-Pacifique dans les activités de R et D, ce rapport analyse les mouvements internationaux d'IED en matière de R et D. Il s'appuie sur un sous-ensemble de données provenant de l'ancienne base de données d'*Investment Monitor* de la Fondation Asie Pacifique du Canada (FAP Canada) regroupant les mouvements d'IED bilatéraux en R et D entre le Canada et l'Asie-Pacifique. Sur la base de ces données, ce rapport analyse les investissements clés en R et D et définit les tendances des investissements.

Le présent rapport porte sur :

1. Une analyse détaillée des investissements en R et D entre le Canada et l'Asie-Pacifique aux niveaux national et infranational entre 2003 et 2021;
2. Une analyse sectorielle des transactions de R et D définissant les secteurs ayant le plus bénéficié des IED en R et D entre le Canada et l'Asie-Pacifique;
3. Les politiques nationales et infranationales favorisant les IED en R et D; et
4. La méthode priorisée pour effectuer des investissements en R et D.

PRINCIPALES CONCLUSIONS

Les investisseurs du Canada et de l'Asie-Pacifique préfèrent généralement les investissements dans des installations nouvelles aux fusions et aux acquisitions lorsqu'ils investissent en R et D.

Nos données d'entre 2003 et 2021 indiquent que 60 % des transactions effectuées par des investisseurs de l'Asie-Pacifique dans le secteur de la R et D du Canada étaient dans des installations nouvelles. Lors de cette même période, 96 % des transactions effectuées par des investisseurs canadiens vers l'Asie-Pacifique étaient dans des installations nouvelles.

Les investissements étrangers en R et D constituent moins de 5 % des mouvements d'IED entre le Canada et l'Asie-Pacifique.

Les investissements de l'Asie-Pacifique en R et D canadienne constituent seulement 2 % des mouvements totaux d'IED, alors que les investissements canadiens en Asie-Pacifique constituent seulement 1 % des mouvements totaux d'IED.

Les investissements étrangers en R et D entre le Canada et l'Asie-Pacifique indiquent des trajectoires de croissance contrastées.

Les IED canadiens dans les activités de R et D de l'Asie-Pacifique affluaient rapidement avant les années 2010; en revanche, les IED de l'Asie-Pacifique en R et D canadienne ont commencé à augmenter au milieu des années 2010.

Les années 2020 et 2021 ont vu une augmentation des IED du Canada vers l'Asie-Pacifique et de l'Asie-Pacifique vers le Canada.

Les investissements canadiens en R et D de l'Asie-Pacifique ont passé de 31 M$ CA en 2019 à 139 M$ CA en 2021. De même, les investissements des économies de l'Asie-Pacifique en R et D canadienne ont passé de 324 M$ CA à 1 G$ CA durant cette même période.

Au fil du temps, la distribution sectorielle des investissements en R et D est devenue plus concentrée dans le secteur des logiciels et des services informatiques.

Si l'on examine les mouvements d'IED entre le Canada et l'Asie-Pacifique entre 2017 et 2021, le secteur des logiciels et des services informatiques a été le principal bénéficiaire de mouvements entrants et sortants d'IED en R et D, constituant 28 % des investissements canadiens en Asie-Pacifique et 65 % des investissements de l'Asie-Pacifique au Canada.

La Chine, l'Australie et l'Inde ont reçu la majorité des IED canadiens en R et D destinés à l'Asie-Pacifique entre 2003 et 2021.

Ensemble, ces trois pays ont reçu 76 % des IED en R et D sortant du Canada entre 2003 et 2021, dont 35 % pour la Chine, 30 % pour l'Australie et 11 % pour l'Inde.

La province canadienne de l'Ontario est le principal bénéficiaire des investissements de l'Asie-Pacifique en activités de R et D canadiennes.

Nos données indiquent que l'Ontario a reçu environ 65 % des investissements totaux provenant d'économies de l'Asie-Pacifique vers le Canada entre 2003 et 2021.

INTRODUCTION

Research and development (R&D) is composed of activities carried out by market and non-market actors to develop new or improve old products and processes.[1] According to the Organisation for Economic Co-operation and Development's (OECD's) Frascati Manual, which quantifies R&D outputs, R&D is produced through knowledge creation and dissemination that spur innovation at the national and global levels to meet national needs and address global challenges.[2] In addition to being central to resolving global and domestic challenges, R&D is an important driver of economic growth and productivity,[3] as it allows firms to produce new products and/or services that will either produce novel products or reduce corporate operating costs, improving their international competitiveness and generating higher profits. While global R&D spending was expected to decline due to the COVID-19 pandemic, the spending levels remained high and even expanded across some industries and countries.[4] These statistics indicate the importance of R&D for countries and companies around the world.

Given that R&D contributes to economic growth and productivity, corporations and governments spend large amounts of money on R&D activities. For example, in 2019, firms, academic institutions, and governments spent 2% of global GDP (equivalent to C$3.05T) on R&D.[5] In 2020, estimated gross domestic expenditure on research and development (GERD) reached C$3.11T, with the United States and China leading the global spending on R&D and accounting for C$778B and C$770B, respectively.[6] These two countries are also home to the companies that spent the most on R&D in 2020, such as Amazon (C$57.3B), Alphabet (C$37B), and Huawei (C$29.1B).[7]

The race for R&D supremacy is also spreading to new regions. In addition to the continued dominance of R&D powerhouses in the Asia Pacific, such as China, Japan, and South Korea, new innovation hubs in the region are on the rise, with Vietnam, India, and the Philippines rising rapidly in the Global Innovation Index ranking by the World Intellectual Property Organization (WIPO).[8] Canada is also trying to expand its R&D capabilities by designing programs to encourage domestic R&D.[9]

Cross-Border R&D Investment Flows Between Canada and Asia Pacific Economies

Given that FDI is an important mechanism for technology spillover and innovation in investment-recipient countries,[10] investment-recipient countries interested in expanding their innovation capabilities design specific policies to attract FDI in the R&D sector and establish investment attraction agencies to support FDI in this sector.[11] Canada and several Asia Pacific

countries have indicated their interest in expanding R&D collaborations and increasing FDI in the R&D sector. For example, Canada's Trade Commissioner's office[12] lists several collaborative science and technology opportunities with Asia Pacific countries, including China,[13] India,[14] Japan,[15] and South Korea.[16] Simultaneously, the Asia-Pacific Economic Cooperation (APEC) has noted the importance of encouraging innovation in the Asia Pacific region[17] and identified the importance of FDI in promoting the Asia Pacific's integration into global value chains, which could provide firms with the potential to engage in R&D activities.[18] These political signals indicate an interest, at least from the government, in expanding R&D FDI flows between Canada and the Asia Pacific.

Existing research tends to focus on the FDI patterns in R&D by either focusing on global/country-level data or by following the investment activities of multinational enterprises (MNEs). These reports show that FDI by MNEs in R&D doubled between 2003 and 2017[19] and that MNE commitments to R&D projects have expanded from 2014 to 2019, with 5,300 greenfield investment projects (approximately 6% of all FDI project announcements).[20] While these trends provide an interesting benchmark, they do not provide an in-depth analysis of the FDI flows in R&D between Canada and the Asia Pacific. In this report, we not only discuss the trends in R&D investment between Canada and the Asia Pacific but also discuss policies that might motivate FDI in R&D activities.

Methodology

According to the OECD's Frascati Manual, R&D activities must meet five criteria – novelty, creativity, uncertainty, systemic nature, and transferability/reproducibility – to be classified as R&D.[21] The R&D activities are composed of three types of research: basic (to acquire new knowledge about the observable world), applied (to acquire new knowledge about the specific outcome), and experimental (to produce additional knowledge in order to improve existing products and processes).[22]

We have used this definition to classify deals in the Investment Monitor database into R&D and non-R&D categories based on project descriptions. The team compiled a comprehensive list of R&D deals using a Python program to parse the Investment Monitor database with a focus on keywords commonly associated with R&D, such as "research," "novel," and "developing." After generating the list of R&D deals, the team conducted a manual cross-check of the deals captured by the Python program to ensure that the selected deals follow Frascati's definition of R&D. At this stage, the deals were re-classified as non-R&D if they did not meet the definition.

Focusing on the R&D deals, this report examines key trends in cross-border investment across Canada and the Asia Pacific to account for historical trends and identify recent developments. To do so, the report not only discusses FDI volumes and deal numbers over the years, but also examines the sectoral distribution of FDI in R&D, explores the sub-national distribution of

R&D, and analyzes several national and sub-national policies that may aid in the attraction of R&D flows. By tracking these developments, the report identifies the growing importance of the software and computer services, biotechnology, and pharmaceuticals sectors in cross-border investment flows between Canada and the Asia Pacific. The report also notes that over the past five years, investors have begun to diversify their investment destinations to benefit from R&D activities occurring in different cities.

The report discusses these dynamics by first tracing Asia Pacific FDI in Canada's R&D before turning to Canadian R&D in Asia Pacific economies. Throughout the report, several short sections about R&D investment are added to highlight areas of interest, for example, the preference for greenfield FDI in R&D, the impact of bilateral investment treaties on R&D, and the implication of government policies on R&D. The report aims to provide critical information to help shape corporate and government thinking about FDI in R&D between Canada and the Asia Pacific economies.

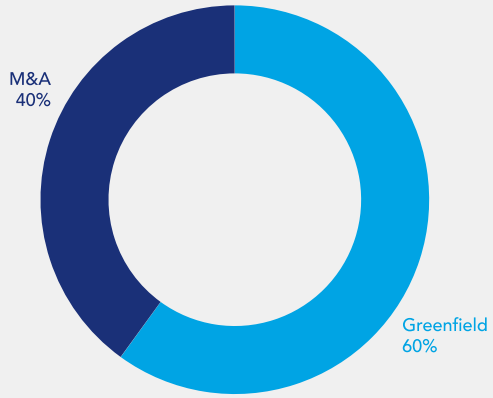
BOX 1

The Importance of Greenfield Investments in R&D

Our data suggest that FDI in R&D activities flowing between Canada and the Asia Pacific economies is far more likely to be a greenfield investment than a merger and acquisition (M&A) deal. As seen in Figures 1 and 2, the majority of investment in R&D from the Asia Pacific to Canada (60%) and from Canada to the Asia Pacific (96%) from 2003 to 2021 went to greenfield projects. The preference for greenfield investment captured by our data on R&D FDI is unique to the nature of R&D investment.

FIGURE 1

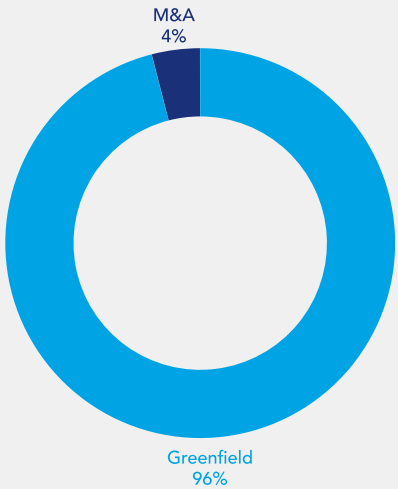
Asia Pacific R&D Investment into Canada by Project Type, 2003-2021



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

FIGURE 2

Canadian R&D Investment into the Asia Pacific by Project Type, 2003-2021



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

Investors' preference for greenfield FDI in R&D altered during the pandemic. In 2020, Asia Pacific investors interested in Canada's R&D sector showed reluctance to pursue greenfield opportunities in R&D. Thus, in 2020, greenfield investment in R&D from the Asia Pacific to Canada totalled a mere C$65M, compared to C$471.2M from inward M&As. This disruption to the greenfield investment trend observed in 2020, however, is not observed when looking at Canada's FDI in R&D in the Asia Pacific. The move toward M&A deals among Asia Pacific investors interested in Canadian R&D can be attributed to the economic impact of public health measures associated with the COVID-19 pandemic. Indeed, our data reveal a decline in new project announcements in the first two months of 2020 compared to previous years.[23] The OECD points to extensive lockdown measures as the likely cause of the observed reduction in greenfield FDI in 2020. These measures may have resulted in the inability of corporations to survey sites and interact with new colleagues. Relatedly, supply chain disruptions may have impacted corporate cost calculations by assigning higher risk to greenfield projects.

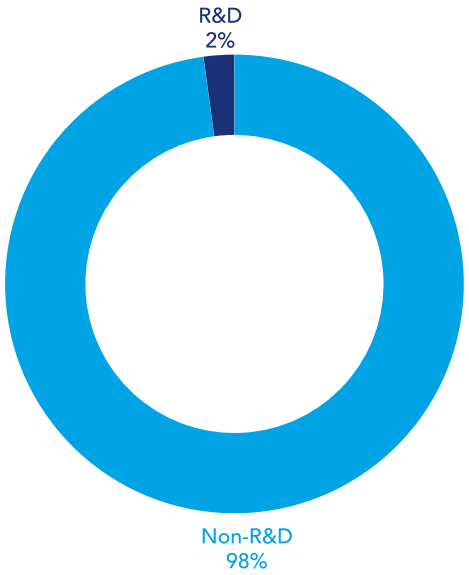
What explains the preference for the greenfield establishment mode when it comes to FDI in R&D? The literature suggests that the preference for greenfield FDI is contingent on R&D intensity, the extent of diversification, international experience, cultural distance, the host market governance environment, the size of the investment relative to the firm, and the time of entry. All these factors are highly deal-dependent, though host countries share certain attitudes that may affect firms' establishment mode choice. For example, as opposed to greenfield investments, M&As are often subject to increased scrutiny by host governments, especially when M&As may impact their national security in cases when these deals occur in "strategic industries"[24] or may be pursued by companies from a home country that is considered to be a threat to the host economy.[25] On the other hand, greenfield R&D investments often face a more favourable regulatory environment and are usually offered generous incentives by central and regional governments, which perceive greenfield FDI as a contributing factor to aggregate employment, exports, and the trade balance.[26]

ASIA PACIFIC FDI IN CANADIAN R&D ACTIVITIES

Asia Pacific investment in Canada's R&D has been relatively small compared to the total volume of FDI. From 2003 to 2021, R&D accounted for only 2% of total inward investment from the Asia Pacific (Figure 3). While R&D accounts for a small portion of annual inward investment from the Asia Pacific to Canada, the growth in this area since 2015 is notable due to the Canadian federal and provincial governments' increased focus on attracting foreign support for domestic innovation.

FIGURE 3

Proportion of Inward R&D to Non-R&D Investment, 2003-2021



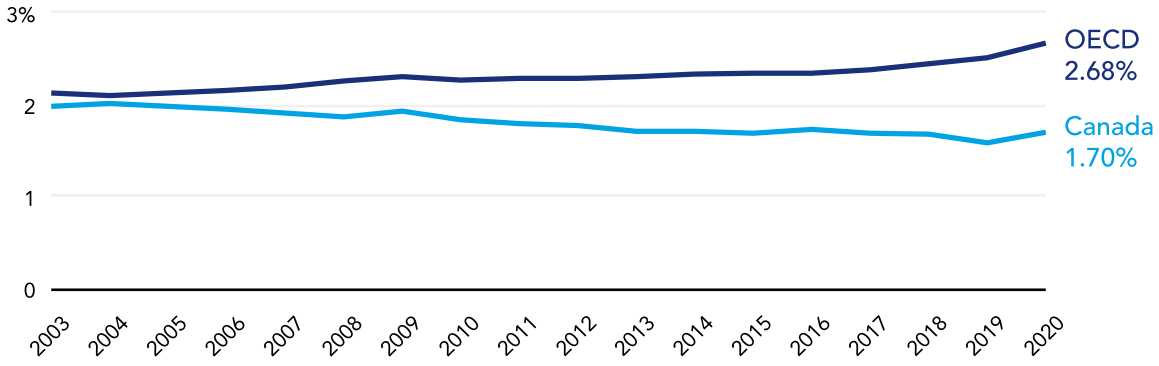
Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

The Canadian R&D Landscape

The relatively low level of Asia Pacific investment in Canadian R&D may be related to Canada's R&D intensity, which is a measure of domestic expenditure on R&D expressed as a percentage of GDP. Canadian research and development productivity has lagged behind other developed Western economies.[27] Since 2003, Canada's R&D intensity, measured in terms of GERD, has remained below the OECD's average (Figure 4). According to the OECD's data, Canada consistently spends less on R&D than its economic counterparts, and the proportion of R&D spending has gradually declined since 2003. In 2020, Canada's GERD was only 1.7%, compared to other high-performing OCED countries such as South Korea, Japan, and the United States, which average over 3% in their R&D spending.[28]

FIGURE 4

Canada's Gross Domestic Expenditure on R&D (as a % of GDP)



Source: OECD (2022), Gross domestic spending on R&D (indicator). doi: 10.1787/d8b068b4-en (accessed on May 2022)

Existing literature suggests that one of the causes of Canada's low R&D intensity is linked to government policies to create a supportive environment for R&D, which have been lacking in the past.[29] In recent years, federal and provincial governments have attempted to spur private sector development by encouraging science and technology development through tax incentives, grants, and industrial programs. The lack of a robust R&D network in Canada was a key point in Prime Minister Justin Trudeau's 2015 Liberal Party platform. The Liberals' "Innovation Agenda" committed the party to invest C$200M per year to develop a more innovative Canadian economy.[30] In the 2016 budget, the Trudeau government committed C$800M to stimulate business-led innovation networks over the next four years, and, in the 2017 budget, it committed an additional C$950M to develop innovation superclusters (see Box 2). The Trudeau government continues to emphasize the importance of building a more innovative Canadian economy that has strong connections to global partners in R&D.[31] Since this pivot toward a more innovative economy, Canada has seen an increase in FDI from the Asia Pacific region. Although it cannot be confirmed whether these new policies caused the observed increase in FDI in Canada's R&D, Canada has become a more attractive R&D investment destination since the implementation of these R&D policies.

BOX 2

Canada's Innovation Supercluster Initiative

In the federal government's 2017 budget, the Canadian government committed to investing up to C$950M over the following five years to create a series of business-led, innovation-focused superclusters across Canada. The project aims to stimulate Canadian research and development to create new jobs, generate new intellectual property, and enhance Canada's global competitiveness in new technology industries. The supercluster project was modelled after successful clusters in Silicon Valley, Tel-Aviv, and the Toronto-

Waterloo corridor. Superclusters are designed to stimulate the economy and innovation by aggregating capital resources, expertise, and talent in a single location to foster innovation and development.[32] Therefore, they may spur regional and national economic development.[33] While superclusters are business-led initiatives, their continued success hinges on the collaboration between research universities, non-profit organizations, established corporations, venture capital, and government.[34] Supercluster projects are fostered through domestic resources, but require a connection to global networks of innovation.

In 2018, Canada launched its five supercluster projects located across the country (see Table below). These five sectors were chosen based on their expected economic benefit to Canada, their global impact, and their potential to generate new Canadian intellectual property.[35] The Supercluster Initiative aims to balance domestic business development and innovation while also stimulating FDI.[36] The initiative recognizes that innovation requires co-operation with global partners, who may also become important investors in R&D projects based in Canada.

Supercluster	Region (Headquarters)	Purpose	Funding from ISED 2018-2022
Ocean	Atlantic (St. John's, NL)	Focused on ocean-based industries, fisheries, oil and gas, marine renewables, marine defence, and shipping, as well as marine ecosystem protection.[37]	C$152M[38]
Scale AI	Quebec (Montreal, QC)	Focused on the integration of AI and robotics to create intelligent supply chains.[39]	C$230M[40]
Advanced Manufacturing	Ontario (Hamilton, ON)	Focused on developing advanced manufacturing technology and helping businesses adopt new technology.[41]	C$230M[42]
Protein Industries	Prairies (Regina, SK)	Focused on accelerating the development of the plant protein sector and developing advanced food processing technologies.[43]	C$152M[44]
Digital Technology	British Columbia (Vancouver, BC)	Focused on big data analysis, quantum computing, AI and machine learning, robotics, and other advanced digital technologies.[45]	C$152M[46]

Foreign companies can participate in the Supercluster Initiative if they are incorporated and active in Canada. Although no information is available on Asia Pacific investments to the Supercluster Initiative, there is some evidence to suggest that the superclusters have encouraged some foreign companies to open new subsidiaries in Canada. For example, in

2018, Fujitsu Intelligence Technology, a subsidiary of Japanese multinational enterprise Fujitsu Limited, opened a new artificial intelligence base in Vancouver. As of 2022, the Vancouver-based Digital Technology Supercluster lists Fujitsu Intelligence Technology as a member.[47] Although it is unclear whether the supercluster motivated the initial investment, Fujitsu highlighted the region's proximity to research institutions, local talent in the information technology industry, and a thriving startup business ecosystem as motivating factors for its location, as well as support from the provincial and federal governments.[48]

The supercluster project will continue to attract local and international investment. In the federal budget 2022, the government re-branded the Supercluster Initiative as Canada's Global Innovation Cluster, committing another C$750M over six years to expanding the existing clusters.[49] No new cluster initiatives have been announced yet, but the funding will be divided between the five existing clusters on a competitive basis. The project renewal emphasizes addressing supply chain disruptions and fighting climate change.[50] The rebranding of the Supercluster Initiative hints at a pivot toward deepening global connections for Canadian R&D that may attract more FDI into the clusters.

Overview of Asia Pacific FDI in Canadian R&D at the National Level

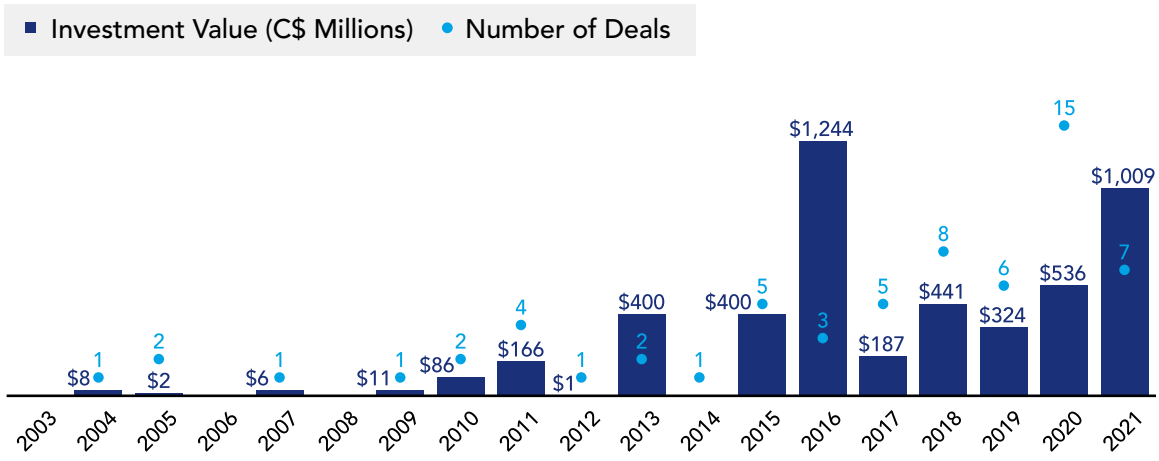
Our data indicate that Asia Pacific investment in Canadian R&D activities was slow in the early 2000s and did not take off until 2013 (Figure 5). The increase in investment observed in 2013 coincides with the scaling up of the government's support for R&D. The initial wave of major investments by Asia Pacific investors were led by large, established multinational corporations (MNCs) with significant existing R&D portfolios. For example, in 2013, Japan's Mitsubishi Group acquired 60% of Medicago, a Quebec-based biopharmaceutical company that develops antiviral treatments and vaccines, for C$399M. During the same year, South Korea's Samsung Electronics opened an R&D centre in Vancouver, BC.

Fujitsu's decision to locate its AI headquarters in Vancouver was deliberate and drew on the company's existing links in the city and benefited from supportive government institutions and local talent. Vancouver's connection to the Eastern part of Canada and its proximity to the Silicon Valley in the South attract R&D companies to the city such as Fujitsu. But despite this positive environment, challenges remain as foreign-owned companies find it difficult to access some federal funding opportunities designed to boost R&D activities. To learn more, see our interview with Dr. Todd Law, an offerings manager at Fujitsu Intelligence Technology Ltd. in Vancouver.

Read more ▸

FIGURE 5

Asia Pacific R&D Investment into Canada, 2003-2021



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

Foreign MNCs typically have superior technology, capital resources, and management capabilities compared to domestic firms in the same sector, making it easier for them to invest in R&D projects overseas.[51] The pioneering role of large Asia Pacific MNCs, such as Huawei, Samsung, and Mitsubishi, in Canadian R&D illustrates this. But while large MNCs still play a role in Canadian R&D, smaller firms and startups have taken the lead in recent years.

From 2015 to 2016, Asia Pacific investment in Canadian R&D continued to grow steadily in terms of investment value (Figure 5). A peak in investment value was reached in 2016, with C$1.2B invested in R&D, accounting for 10% of total inward investment in that year. The most significant deal in 2016 was Japan's Sunovion Pharmaceuticals Inc.'s acquisition of Cynapsus Therapeutics, a Canada-based pharmaceutical company that develops drugs for Parkinson's disease, for C$900M.

After the peak, 2017 marked a decrease in FDI flows into Canadian R&D in terms of investment values, with slow growth continuing in 2018 and 2019. Despite the slow growth in FDI, we observed several significant R&D deals. In 2017, India-based Triassic Solutions opened an AI research facility in Toronto and invested C$168M. The following year, Asia Pacific investors made eight R&D acquisitions in Canada with an average deal value of C$55M. The most significant investment in 2018 was made by a Chinese transportation app, Didi Chuxing Technology Co., which opened a research laboratory in Toronto for C$122M. In 2019, Mitsubishi Aircraft, a subsidiary of Japan's Mitsubishi Group, opened a new aerospace development office in Boisbriand, Quebec, at a cost of C$204M. This was the first Asia Pacific investment in Canada's aerospace sector.

Data released by Statistics Canada indicate that the impact of the COVID-19 pandemic on R&D activities in 2020 was minimal compared to the impact it had on the rest of the Canadian

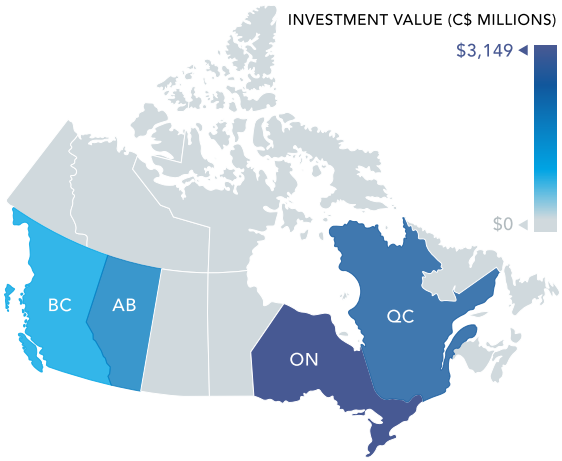
economy.[52] Our data reiterate Statistics Canada's findings, showing that R&D investment has not been negatively impacted by the pandemic. Instead, Canadian inward R&D investment saw monumental gains in 2020 and 2021. Our data indicate that 2020 was a significant year in terms of the number of completed transactions. The number of completed deals stood at 15 in 2020, which is significantly higher than the yearly average of 4.2 completed transactions occurring between 2013 and 2019. The value of the completed R&D investments in 2020 was also relatively high, accounting for 8% of total inward investments, and comparable to 2016 values. Although 2021 saw fewer transactions than the previous year, the investment value increased by 88% from the previous year. The growth in R&D in the last two years is likely the result of the federal and provincial policies initiated in 2016 and 2017, which are making Canada a more desirable place for R&D.

Overview of Asia Pacific FDI in Canadian R&D at the Sub-National Level

The majority of investment (99%) made by Asia Pacific economies in Canadian R&D between 2003 and 2021 went to four Canadian provinces – Ontario, Quebec, Alberta, and BC (Figure 6). Ontario outpaced the other provinces in both deal value and number of completed deals by securing FDI worth C$3.1B through 35 R&D deals. Quebec came second by bringing in C$1.2B of FDI through 12 R&D deals. Alberta and BC ranked third and fourth in terms of R&D FDI from the Asia Pacific, with the former receiving C$430M through two deals and the latter C$87.5M through 14 deals.

FIGURE 6

Asia Pacific R&D Investment into Canada by Province, 2003-2021

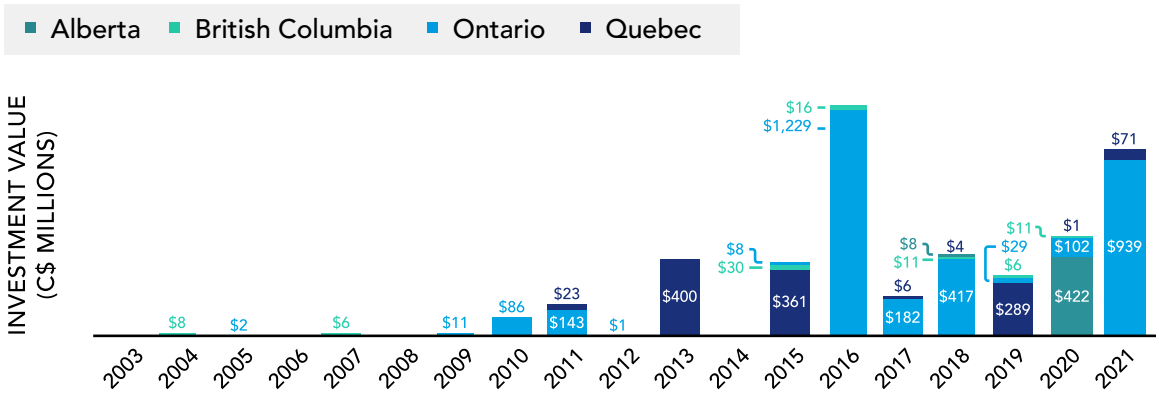


Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

At the provincial level, the majority of the Asia Pacific FDI in R&D activities in the last two years went to Alberta and Ontario, with BC and Quebec receiving some investment but at much lower values (Figure 7). The provincial distribution varies from year to year. For example, in 2021, Ontario and Quebec were the only two provinces that received R&D investments from the Asia Pacific. Accounting for 93% of Canada's total inward R&D investment from the region, Ontario received C$939M of R&D investments through six deals. Quebec secured C$70.8M, accounting for the remaining 7% of the total R&D investment from Asia Pacific economies in the same year. In 2020, Asia Pacific investors were active in four provinces: Alberta, Ontario, BC, and Quebec, with the majority of investment going to Alberta (79% or C$422M) (Figure 7).

FIGURE 7

Asia Pacific R&D Investment into Canada by Province

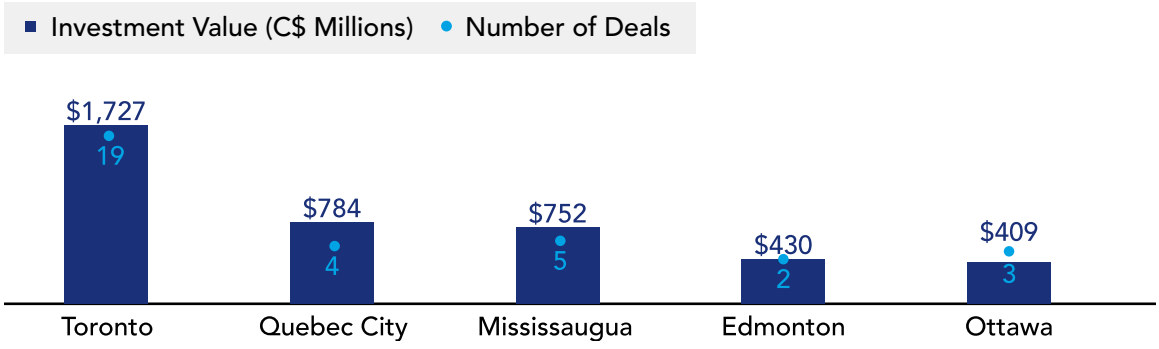


Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

At the city level, Toronto received the highest investment (C$1.7B through 19 deals) from Asia Pacific investors between 2003 and 2021 (Figure 8). In Toronto, the largest R&D deal was the C$900M acquisition of Toronto-based biotechnology company Cynapsus Therapeutics by Tokyo's Sunovion Pharmaceuticals. During the same period, Quebec City received C$784M through four deals and was the second-largest destination for Asia Pacific R&D investment. The largest of these deals – Mitsubishi Chemicals' acquisition of Quebec's biotech company Medicago in 2013 and 2015 – accounted for 92% (C$723M) of Asia Pacific investment in Quebec. Mississauga and Edmonton secured the third and fourth positions in terms of R&D FDI inflows by bringing in C$752M and C$430M, respectively, in deal value. Mississauga's largest investment, worth C$385M, came from Infosys, which is an Indian information and technology company that has opened a new digital development centre in the city. Ottawa was the fifth-largest investment-recipient city, which brought in C$409M of FDI in R&D activities during the 2003 to 2021 period.

FIGURE 8

Asia Pacific R&D Investment into Canada by Major Destination City, 2003-2021

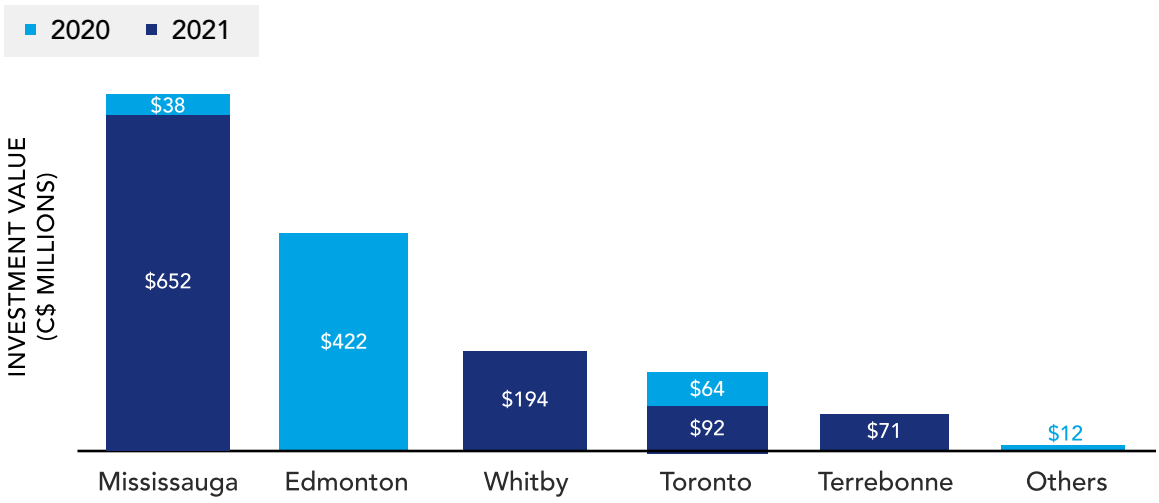


Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

In 2020, Asia Pacific investment in R&D focused on cities across different provinces. Edmonton received 79% (slightly under C$422M) of the total Canadian inward R&D investment from the Asia Pacific economies. Edmonton's 2020 investment value came from a single deal, the acquisition of Quest Pharmatech Inc. by a South Korean company, Dual Industrial Co. Ltd. Toronto became the second-largest recipient of R&D investments in 2020 by securing 12% (slightly under C$64M) of the total investments. The city of Toronto benefited from several investors, with the largest investor, Novum Pharmaceutical Research Services, investing C$49M in Toronto to expand its R&D office. Mississauga and Vancouver secured 7% (C$38M) and 2% (C$11M), respectively, of the total Canadian R&D investments from the Asia Pacific (Figure 9).

FIGURE 9

Asia Pacific R&D Investment into Canada by Major Destination City, 2020 vs. 2021



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

In 2021, the majority of Asia Pacific investment in R&D went to cities in the province of Ontario, with 65% (C$652M) going to Mississauga. The investment was driven by two Indian IT firms, HCL Technologies and Infosys Technologies, that established innovation centres in Mississauga, with the former bringing in C$268M and the latter C$385M. Whitby came in second in 2021 by securing 19% (C$194M) of total Canadian inward R&D investments, followed by Toronto with 9% (C$92M). Whitby benefited from an investment by AUTOCRYPT, a South Korean company that is developing security solutions for autonomous vehicles, while Toronto obtained investment from Australian accounting software developer Practice Ignition. Terrebonne, the only city outside of Ontario to receive R&D investment from the Asia Pacific in 2021, received 7% (slightly under C$71M) of total inward R&D investments from the Asia Pacific (Figure 9). Terrebonne-based Loop Industries sold 10% of the company to SK Global Chemicals for C$71M.

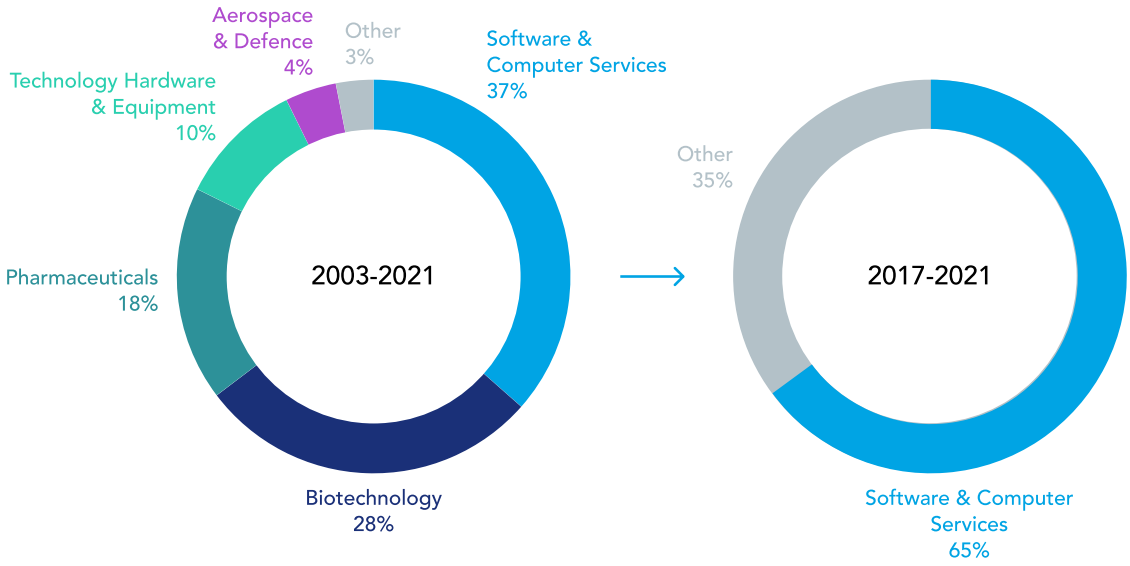
In Which of the Canadian R&D Sectors Do Asia Pacific Companies Invest?

Asia Pacific economies have been predominantly interested in Canada's advanced R&D sectors. Between 2003 and 2021, software and computer services (37%), biotechnology (28%), pharmaceuticals (18%), technology and hardware equipment (10%), and aerospace and defence (4%) were the top five inward R&D investment-receiving sectors from the Asia Pacific (Figure 10). Analyzing the sectoral distribution of Asia Pacific investment in Canada's R&D at the aggregate level, we find that inward investment has over time shifted toward information and communications technology (ICT), leaving other sectors behind. The Canadian ICT sector is defined as software and computer services, communication services, computer and communications equipment, and electronic components.[53]

Prior to 2017, biotechnology and pharmaceuticals accounted for the majority of inward FDI (72% of overall inward investment from 2003 to 2016). Since 2017, biotechnology and pharmaceuticals have accounted for only 22% of total R&D spending by Asia Pacific investors in Canada, while investments in ICT have accounted for 65% of total R&D spending (Figure 10). The nature of Asia Pacific investment in the Canadian ICT sector has also evolved over time. Prior to 2017, Asia Pacific investments in the Canadian ICT sector were primarily in technology and hardware; however, since 2017 the ICT investment has shifted entirely to software and computer services.

FIGURE 10

Asia Pacific R&D Investment into Canada by Sector, 2003-2021



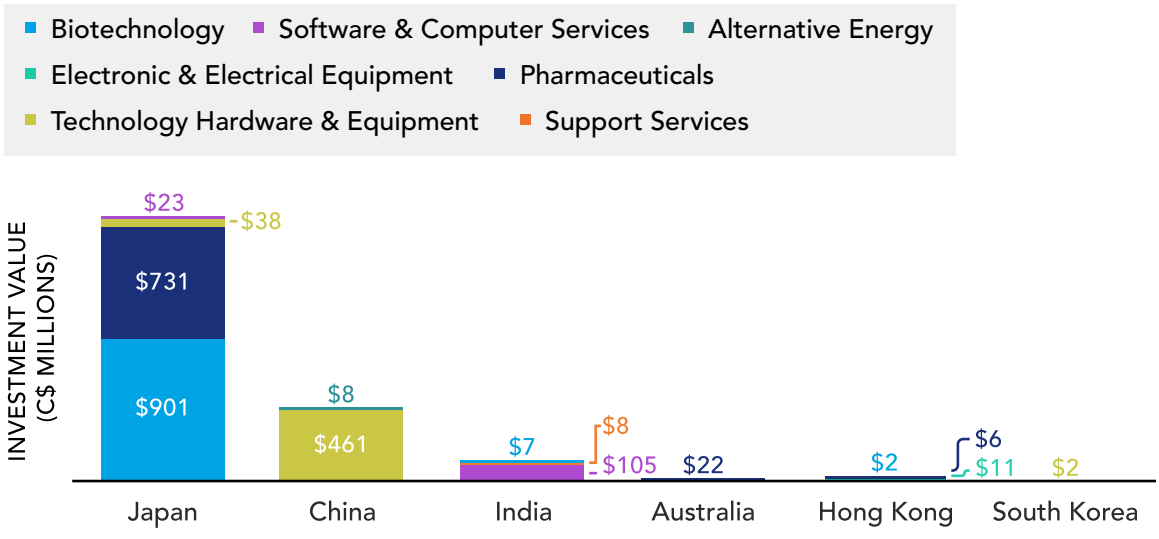
Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

The top five Asia Pacific economies investing in Canadian R&D from 2003 to 2021 were Japan, India, South Korea, China, and Australia. Japan has traditionally been the largest investor in Canadian R&D, accounting for 40% of overall investment from 2003 to 2021, with a total of C$1.9B invested. Following Japan, India has ranked as the second most significant investor with C$1.1B invested since 2003. South Korea has been the third most significant investor with C$969M invested, and China has been the fourth-largest investor, having invested C$597M. However, this order has changed significantly over the past five years (from 2017 to 2021), following the rise of R&D in the ICT sector. During that period, India emerged as the leading investor, followed by South Korea and Japan. For India and South Korea, most of their total investment came after 2017.

Prior to 2017, Japan was the clear leader in Canadian R&D investment, particularly in biotechnology and pharmaceuticals. From 2003 to 2016, Japan invested C$1.6B in Canadian R&D, with C$901M in biotechnology and C$731M in pharmaceuticals (Figure 11). The single largest deal was by Sunovion Pharmaceuticals Inc. for C$900M in 2016. As part of this transaction, Sunovion acquired Toronto-based biotechnology company, Cynapsus Therapeutics Inc. Since 2017, Japan's R&D investment has declined and shifted away from biotechnology and pharmaceuticals. Similar to Japan, China was a large investor in Canadian ICT prior to 2017 but has scarcely invested in the last five years. Huawei Technologies invested C$455M from 2010 to 2016 in Canada's technology hardware and equipment. Through these investments, Huawei opened and expanded its R&D innovation centres in Ottawa and Markham, Ontario. Despite active R&D investment prior to 2017, China has only invested C$128M since.

FIGURE 11

Asia Pacific R&D Investment into Canada by Source Economy and Sector, 2003-2016

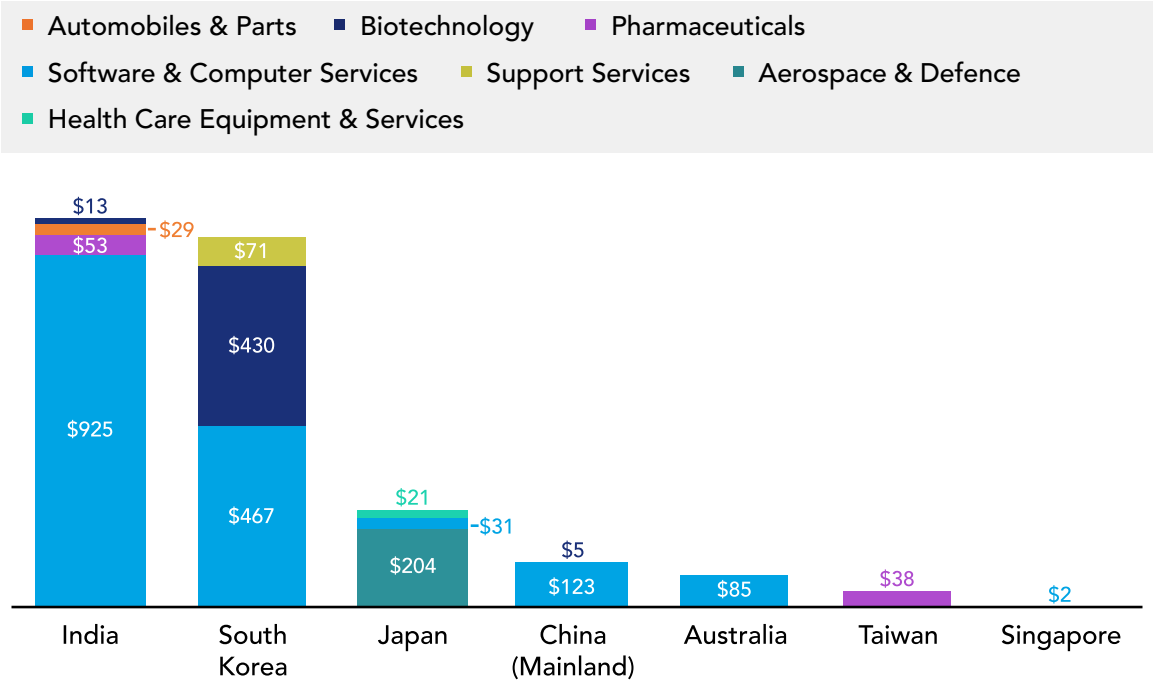


Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

In comparison to Japan and China, the majority of India's investment came after 2017 and is primarily going to ICT sectors, particularly software and computer services (Figure 12). India has invested C$1B in Canadian R&D, with C$925M in software and computer services. The single largest software deals were the investments by Infosys Technologies for C$384M and HCL Technologies for C$267M. Both companies opened new R&D offices in Canada in 2021. Prior to 2017, India had only invested C$119M across three sectors: biotechnology, software, and support services.

FIGURE 12

Asia Pacific R&D Investment into Canada by Source Economy and Sector, 2017-2021



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

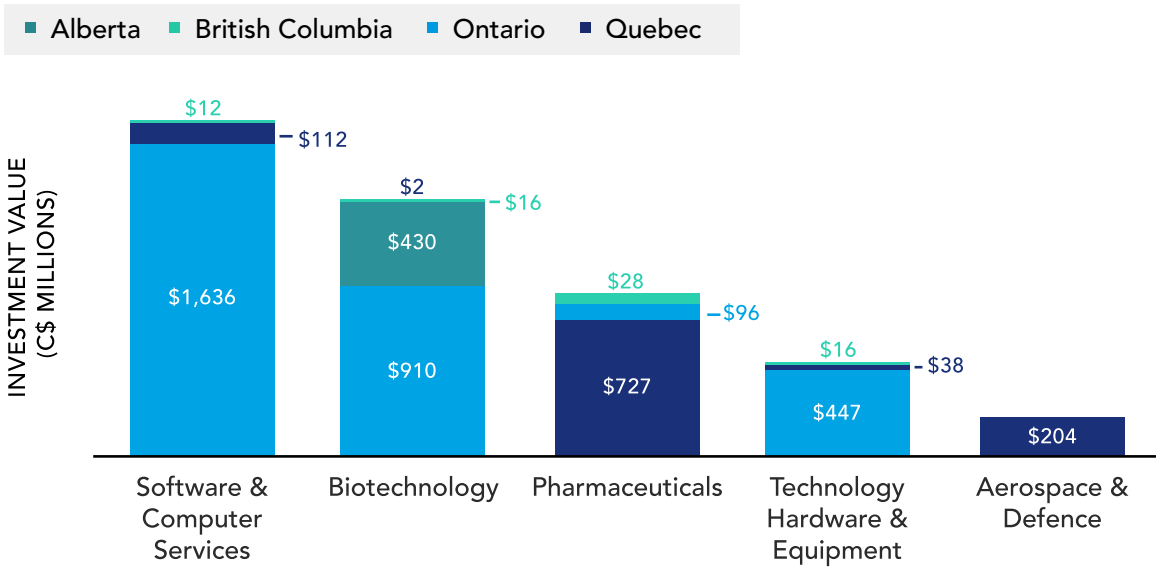
Similarly, South Korea became the second-largest investor in the past five years (2017-2021), trailing closely behind India, with C$967M invested (Figure 12). South Korea has displaced Japan as the largest investor in biotechnology, having invested C$430M. The most significant deal was the C$421M acquisition of OncoQuest Inc. by South Korea's Dual Industries. South Korean investors have also completed six deals worth C$647M in the Canadian software and computer services sector. The largest transaction in this sector by South Korean firms was a C$194M investment by autonomous vehicle company, AUTOCRYPT, which opened a new office in Whitby, Ontario.

Sub-National Distribution of Asia Pacific FDI in Canadian R&D Across Sectors in Canadian Provinces and Cities

As shown in Figure 13, Ontario, the largest manufacturing and technology hub in Canada, has attracted the majority of FDI across the top five investment-recipient R&D sectors, except for pharmaceuticals and aerospace and defence. The province secured 93% (C$1.6B) of the total R&D investment made by Asia Pacific investors in Canada's software and computer services sector in the last 18 years. The biotechnology sector was dominated by Ontario and Alberta, which received 67% (C$910M) and 32% (C$430M), respectively. Quebec outpaced other provinces in the pharmaceuticals sector, securing the highest volume of R&D investments (C$727M) due to a large number of biomedical research professionals and research centres, both public and private, located in the province. Ontario attracted the majority (89%) of Asia Pacific R&D FDI in the technology and hardware equipment sector, with investment standing at C$447M. Although the aerospace and defence sector was one of the largest R&D investment-recipient sectors for Canada during the 2003 to 2021 period, only Quebec benefited from the C$204M in investments going into this sector from the Asia Pacific.

FIGURE 13

Asia Pacific R&D Investment into Canada by Province and Sector, 2003-2021



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

In the past two years, sectoral distribution has varied. In 2021 around 98% (C$918M) of the investments received by Ontario were in the software and computer services sector, with the rest of the investment (C$21M) in the health-care sector. Quebec secured C$70.8M, through a single deal in the waste management sector. In 2020, the biotechnology, pharmaceuticals,

and software sectors enjoyed a steady inflow of capital across four provinces. Alberta's biotechnology sector attracted C$422M worth of FDI through a single deal. Ontario attracted C$102M via seven deals. Around 85% (C$87M) of the R&D investments made by Asia Pacific investors in Ontario went to the pharmaceuticals sector, and the rest went to the software sector (C$15M). BC has received investment in the biotechnology sector and software and computer services sector, while Quebec only received investment in the software and computer services sector.

BOX 3

The Ontario Story: A Tale of Multiple Cities

Between 2003 and 2021, Ontario secured the highest share of inward R&D investment from the Asia Pacific, in comparison with other investment-recipient provinces. In the last two years, Mississauga, Toronto, Ottawa, and Whitby have attracted several large investments into their R&D sectors. This section highlights some of the policies and programs at the provincial and city levels that helped Ontario spearhead R&D investments from Asia Pacific economies. Over the past two years, Mississauga has been among the most attractive FDI destinations for Asia Pacific investors. The presence of more than 75 Fortune 500 companies, over 1,400 MNCs, and two innovation districts in Mississauga could be one of the many factors that have driven these transactions.[54] According to our data, Whitby received its first major R&D deal from the Asia Pacific in 2021 after remaining overlooked for almost two decades. The recent success of the city could be attributed to the growing supply of skilled workers and the availability of programs and facilities such as 1855 Whitby (a tech accelerator), the Spark Centre, and the Ontario Power Generation X-Lab, among other favourable factors.[55] Simultaneously, Toronto, Ottawa, and other cities in Ontario also performed well compared with cities in other provinces. The next sub-sections shed light on the factors that may have attracted Asia Pacific R&D investment into specific cities and provinces, with a focus on Ontario as an illustrative example.

R&D tax credit: Each Canadian province has an R&D tax credit program, but Ontario has three tax credit programs that support R&D activities, specifically the Ontario business-research institute tax credit, the Ontario innovation tax credit, and the Ontario research and development tax credit.[56] Any company that is permanently established in Ontario and any company that has a partnership agreement with a company with a permanent establishment in Ontario can apply for this tax credit. Those companies will qualify for tax credits if they have qualified expenditures on scientific research and experimental development incurred under legal contracts with eligible research institutes, such as universities and colleges, hospital research centres, Ontario Centres of Excellence, and other organizations conducting research.[57]

Availability of talent at a lower cost: Ontario currently has 17 colleges and 15 universities that attract over 400,000 students and researchers from across Canada and around the world.[58] Canadian universities, including the University of Toronto, McMaster University, University of Ottawa, University of Waterloo, and Sheridan College are well known for their R&D activities.[59] According to Invest Ontario, the province is capable of supplying high-quality talent that is on par with talent found in top US tech hubs, at a fraction of the cost, up to 24% less than its US competitors. Salaries in Ontario, including the Greater Toronto Area, are also cost-competitive with most US cities, and include further cost savings for employers due to a public health-care system.

Scaling up biomanufacturing and life sciences sector: Ontario has launched a two-phase plan to scale up its biomanufacturing and life sciences sector. In the first phase, Ontario aims to attract high-value investment in the sector by promoting Ontario in key markets and reducing bureaucratic red tape. The long-term goal is to create 85,000 high-value-added jobs in the life sciences sector by 2030, which is a 25% increase from 2020.[60]

Presence of innovation districts: There are several innovation hubs located in Ontario. For instance, Toronto-Waterloo Corridor is the largest tech cluster in North America after Silicon Valley. The corridor houses 15,000 tech companies and 5,200 tech startups and generates 17% of Canada's GDP.[61] Industries such as aerospace, AI, robotics, automation, and advanced manufacturing are booming in this corridor. The province is also home to several innovation centres, such as the Lakeview Innovation District in Mississauga, McMaster Innovation Park, Brampton's innovation district, and the Spark Centre in Oshawa.[62]

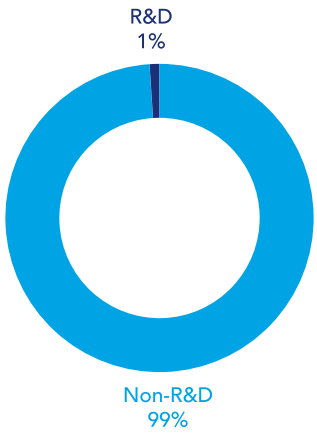
All these factors point out the unique advantages that investors can benefit from if they locate their operations in Ontario. It is also likely that these programs spur domestic R&D activities that lead to the expansion of domestic businesses with R&D capabilities. They also increase the opportunity for foreign investors to harness Canadian talent and ideas.

CANADIAN FDI IN THE ASIA PACIFIC'S R&D ACTIVITIES

The Asia Pacific's R&D sector has received only a small portion of Canadian outward FDI in the region. APF Canada's Investment Monitor has captured only C$2.7B in Canadian R&D investment in the region between 2003 and 2021, making up just over 1% of total Canadian investment in the Asia Pacific during this period (Figure 14). The current trends in the Asia Pacific's spending on R&D may lead to the expansion of Canadian R&D in the region in the future.

FIGURE 14

Proportion of Outward R&D to Non-R&D Investment, 2003-2021



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

The Asia Pacific Research and Development Landscape

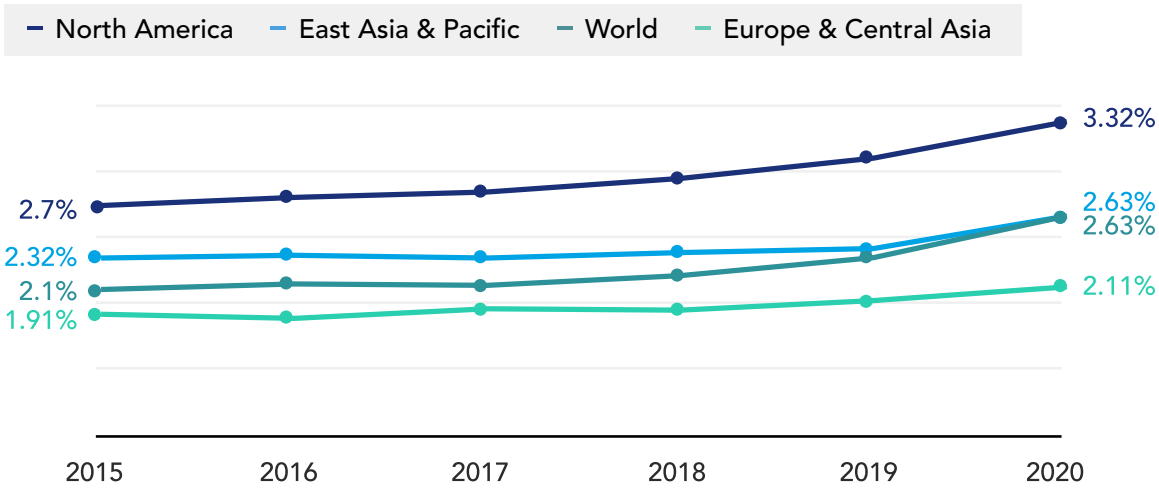
Asia Pacific economies increased their R&D programs in the past two years, despite the relative stagnation in R&D expenditure in Central and East Asia and the Pacific over the past few years (Figure 15). In 2021, R&D spending was concentrated in the technological and environmental sectors and was referenced heavily in the budgets for several Asia Pacific economies, including India, South Korea, and Australia.[63] The efforts of Asia Pacific countries to boost local R&D are reflected in the Global Innovation Index, which was launched by WIPO to track the innovativeness of countries around the world.[64] The Global Innovation Index rankings for 2021 show that a quarter of the top 20 innovative countries were in Asia.[65] Among these top 20 innovative countries are South Korea (5th place), Singapore (8th place), mainland China (12th place), Japan (13th place), and Hong Kong (14th place).

Several factors may be causing the rise in R&D expenditure. First, economic returns on R&D investment are generally higher than economic returns in other industries, especially in developing countries.[66] This may encourage developing countries in the Asia Pacific to devote more resources to R&D. Second, climate change incentivizes countries to pursue innovation through R&D in response to extreme weather events and natural disasters. Higher returns on R&D investment coupled with the climate change-driven R&D will likely lead to an increase in

R&D spending by private and public investors across Canada and the Asia Pacific. However, it is also possible that spending on R&D may remain limited among the developing Asia Pacific countries due to structural barriers, such as low government capacity and weak intellectual property rights protections.

FIGURE 15

Regional R&D Expenditure (as a % of GDP), 2015-2020



Source: UNESCO Institute for Statistics (uis.unesco.org). Data as of May 2022.

BOX 4

China's R&D Programs and Incentives

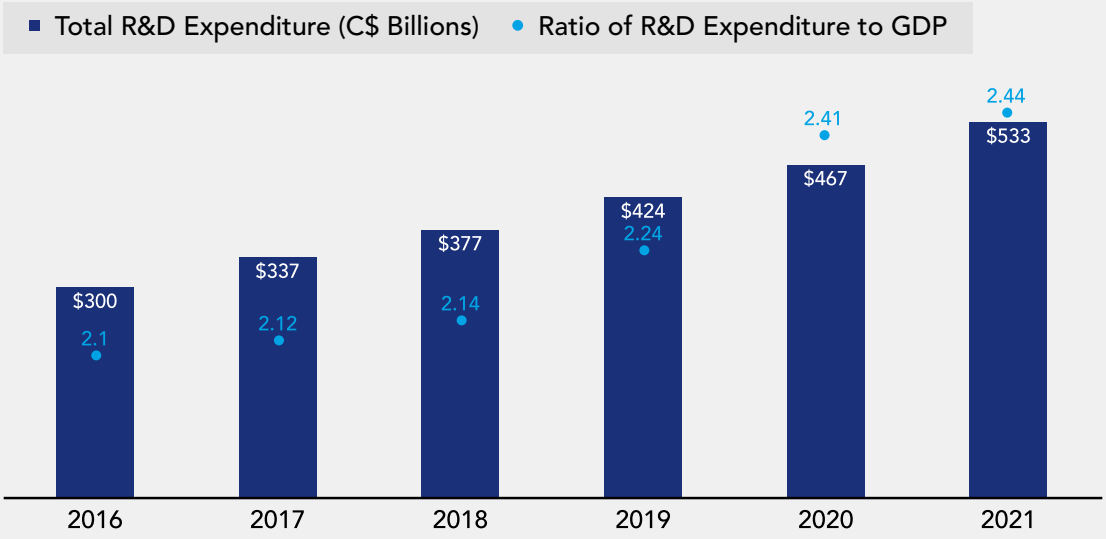
China is the leading spender on R&D in the region and serves as a regional case of state-supported innovation. Over the past few years, the Chinese government has emphasized the importance of R&D in spurring economic growth. In the 13th five-year plan, which provides a high-level overview of China's policy goals and priorities in the next five years (covering the period from 2016 to 2020), the government announced its goal of ensuring that R&D spending reaches 2.5% of GDP. Since the plan's announcement, China has doubled its R&D spending; for example, in 2018 China's expenditure on R&D increased by 11.8%,[67] with C$353B spent on R&D in total, which corresponded to 2.14% of the country's GDP.

Furthermore, in 2015, Premier Li Keqiang unveiled the Made in China 2025 (MIC2025) strategy. The strategy aimed at increasing China's role in the high-tech manufacturing industry to reduce its reliance on foreign technology by developing domestic innovation capacity. The policy generated concerns among some Western countries, such as the United States, due to fears that the MIC2025 strategy would allow Chinese products to supplant high-tech goods that are currently dominated by US manufacturers.[68] While

the phrase "Made in China 2025" has been retired by the Chinese government,[69] there is substantial overlap between the 10 sectors prioritized by the MIC2025 policy and the seven sectors identified under the 14th five-year plan. This suggests that, while China may have changed its tactic, R&D remains at the forefront of China's ambitions over the next five years.

FIGURE 16

China's R&D Expenditure (as a % of GDP and total R&D expenditure), 2016-2021



Source: National Bureau of Statistics of China (http://www.stats.gov.cn/english/PressRelease/202201/t20220127_1827065.html). Data as of May 2022.

In 2021, China's R&D expenditure reached 2.4% of GDP (Figure 16). As China's expenditure on R&D expanded, so did the government's role in supporting R&D. In the 14th five-year plan, which was approved in March 2021, innovation was designated as one of the five categories under which all other quantitative targets and initiatives were placed. The innovation category in the 14th five-year plan promoted the digitalization of China's economy. The plan set a target for the digital economy, which is expected to grow over the next five years to 10% of China's total GDP.[70] The section on innovation also revealed a 10-year plan to increase basic research, which includes an annual 7% increase in R&D spending.[71] The plan also identified seven fields under the innovation category for further development and exploration: quantum computing, biotech, aerospace technology, artificial intelligence, neuroscience, integrated circuits, and the life and health sciences. All these sectors were central to the MIC2025 plan, suggesting consistency in China's pursuit to upgrade its high-technology industries by promoting domestic innovation.

Opportunities for Canadian Investors in China's R&D Sector

The Canada-China FDI relationship in R&D is among the most advanced in the Asia Pacific region. Between 2003 and 2021, Canadians invested over C$943M in China's R&D sector, making China the largest recipient of Canadian investment in R&D in the Asia Pacific. Over the same period, Chinese companies invested C$597M in Canada, placing China in the top five Asia Pacific investors in Canadian R&D, behind Japan, India, and South Korea. This relatively modest FDI in the Canadian sector attests to the late entry and early exit of Chinese investors in the Canadian R&D sector; Chinese investors did not make significant investments in Canada until 2010 and have not made any investments since 2018 due to increasing geopolitical tensions between Canada and China.

To encourage investment in, and the development of, R&D activities overseas, the Canadian government has launched the Canadian International Innovation Program (CIIP), which provides Canadian companies with support for foreign R&D partnerships. The CIIP is available to small and medium-sized companies (SMEs) that want to collaborate with foreign partners to develop a product that can be easily commercialized, and companies are able to apply for a maximum of C$600,000 in program funding.[72] China is among the countries promoted under the CIIP.

In the past few years, the Chinese government has improved business conditions for foreign companies operating in China in a bid to attract high-tech industries and spur R&D. For example, the Foreign Investment Law enacted by China in January 2020 improves legal protections for foreign investors, and the government has also reduced barriers to foreign ownership by getting rid of several of its 50% foreign ownership limits so that investors can operate their fully owned businesses in China. Several improvements have also been made in intellectual property protection.[73] Together, these changes have contributed to China's rise in the World Bank's Ease of Doing Business index, from 78th place in 2018 to 31st place in 2020.[74] While some businesses may still be reticent to explore the Chinese market, these changes will improve the attractiveness of high-tech and R&D investment in China.

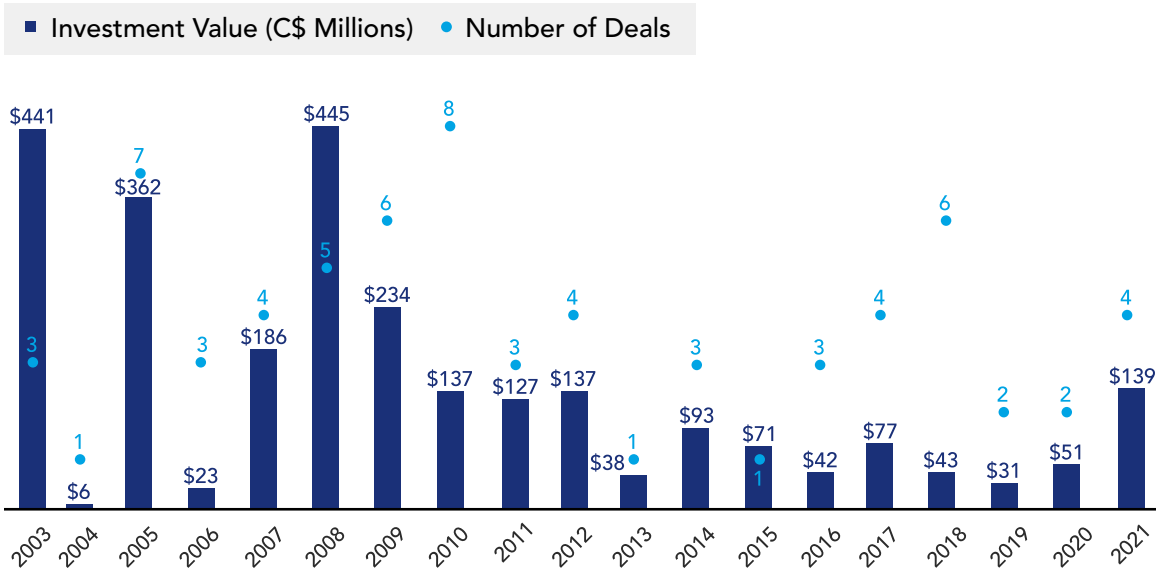
Overview of Canadian FDI in Asia Pacific R&D at the National Level

Canadian R&D investment in the Asia Pacific has fluctuated significantly over time. This may be due in part to the general instability of investments in the R&D industry, including the ebbs and flows of innovative ideas and volatility caused by the growing competitiveness of the R&D market. The early 2000s are representative of the fluctuation in Canadian outward R&D as there were a few notable surges of investment into the Asia Pacific prior to the 2008-2009 financial crisis (Figure 17).

From 2009 to 2020, Canadian R&D investment in the region experienced a consistent decline and slow growth, apart from 2018. In 2018 the number of deals completed by Canadian investors in Asia Pacific R&D jumped to six, which is the highest number of deals since 2010 (Figure 17). This increase was likely related to the legalization of cannabis in Canada, as half of the deals completed in 2018 were related to investments in hemp and cannabis. However, 2019 witnessed the lowest volume of Canada's FDI in Asia Pacific R&D in the period from 2003 to 2021. Since then, Canadian investment in Asia Pacific R&D has continued to recover, with an increase in FDI visible each year. Despite the pandemic, Canadians invested C$139M in Asia Pacific R&D in 2021, the highest value invested in the industry since 2009.

FIGURE 17

Canadian R&D Investment into the Asia Pacific



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

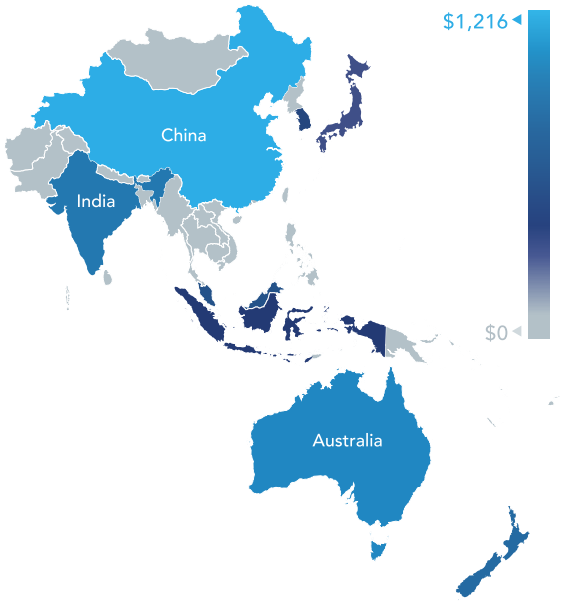
Canadian companies were attracted by large Asia Pacific economies when investing in R&D projects in the region. The top five recipients of Canadian R&D investment in the Asia Pacific from 2003 to 2021 were China (Mainland), India, Australia, Taiwan, and New Zealand. China received 35% of total Canadian R&D investment in the Asia Pacific during this period, followed by Australia (30%) and India (11%). As indicated by the map in Figure 18, the other economies in the region have received relatively less cumulative investment from Canadian investors interested in Asia Pacific R&D.

Over the past five years (2017-2021), there have been subtle changes in the composition of FDI destinations in the Asia Pacific region. While China and Australia remain dominant investment destinations, South Korea has become one of the top investment destinations in the past five years and New Zealand became the third-largest investment destination. South

Korea received no Canadian R&D investment prior to 2017, and New Zealand had not received any investment since the landmark 2009 R&D investment by Calgary-based Smart Technology. However, New Zealand began receiving more investment again in 2020. Our data thus indicate that between 2017 and 2021 R&D investment has become more diverse, with new investment recipients like South Korea becoming prominent.

FIGURE 18

Canadian R&D Investment into the Asia Pacific, 2003-2021



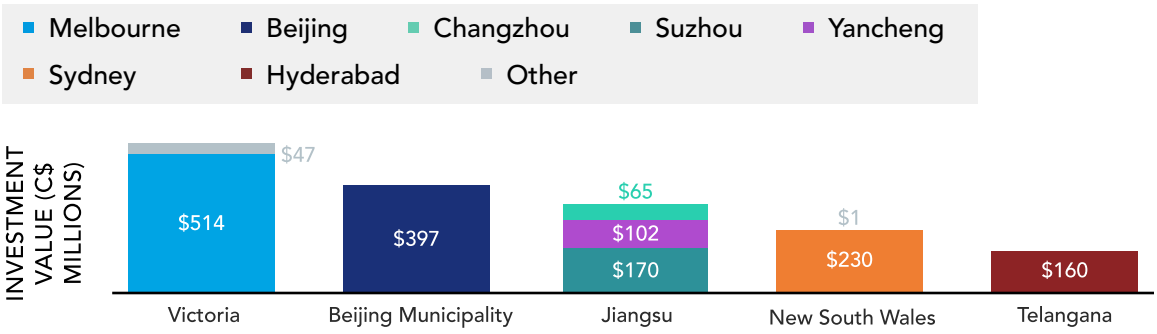
Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

Overview of Canadian FDI in Asia Pacific R&D at the Sub-National Level

At the sub-national level, Australian, Chinese, and Indian cities and provinces were among the top five largest recipients of Canadian R&D FDI from 2003 to 2021. At the provincial level, the Australian state of Victoria is Canada's top destination for outward FDI in Asia Pacific R&D (Figure 19). Having received more than C$561M over the past 17 years, it ranks far ahead of its closest contenders: Beijing municipality (C$397M), Jiangsu province (C$338M), New South Wales (C$231M), and Telangana (C$160M). In terms of deal count, Victoria also reigns supreme, having received eight transactions, more than any other province. In 2020 and 2021, Canadian investors diversified their investment to provinces outside of the top five. In 2020, Canterbury (C$45M) and Seoul (C$6M) were the top destinations for Canadian FDI in Asia Pacific R&D. In 2021, Guangdong ranked first, with C$78M invested by Canadian firms.

FIGURE 19

Canadian R&D Investment into the Asia Pacific by Province and City, 2003-2021



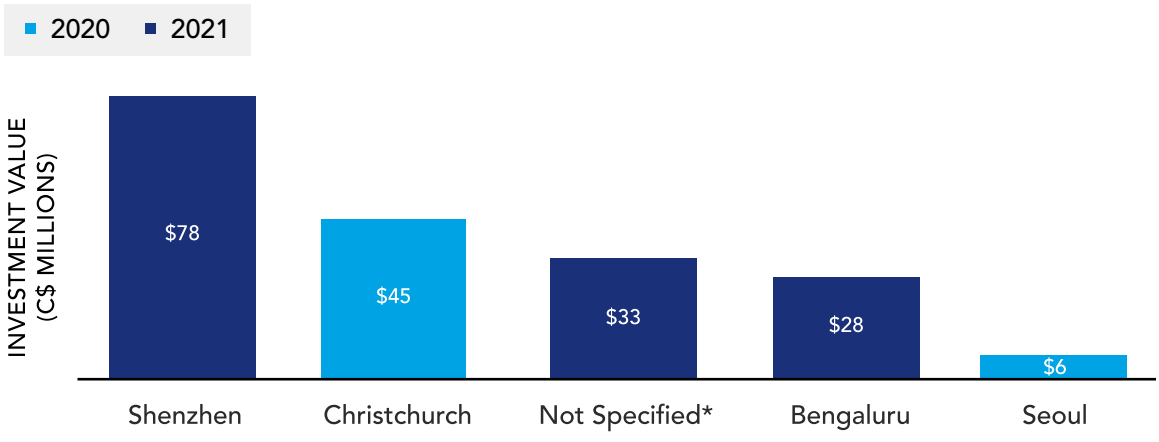
Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

At the city level, Melbourne leads in investment value after receiving C$514M in Canadian investment in R&D. It is tied with the city of Beijing for most transactions received over this period, with each receiving six investments. Melbourne owes its dominance to a major 2008 deal worth nearly C$340M in which Vancouver-based Westport Innovations Inc., a producer of alternative engine fuel technologies, partnered with Kenworth Trucks, a division of Paccar Australia, to produce liquefied natural gas vehicles. The largest investment in the city of Beijing was in 2003. During that year, Nortel Networks established an R&D centre in the city worth C$365M in the telecoms sector. The only South Asian city to rank in the top five is India's Hyderabad, which ranks fifth in overall FDI in R&D over this period, with C$160M invested.

Despite the top five cities' pre-eminence since 2003, Canadian firms have demonstrated interest in pursuing new cities for their investments (Figure 20). In 2020, Canadian investors made only two outward deals in Asia Pacific economies, both in the software and computer services sector. As part of the first deal, Vancouver-based optics and AI firm NexOptic opened a new office in Seoul worth C$6M. The second investment in 2020 was made by Vodafone New Zealand, a subsidiary of Canada-based Brookfield Asset Management, which opened a 5G innovation lab in Christchurch worth C$45M. In 2021, Shenzhen was the recipient of two R&D deals: POET Technologies' C$40M investment in an optoelectronics design and development centre and eLeapPower's C$37M investment in an electric vehicle engineering centre. Vancouver-based athletic apparel company Lululemon Athletica also established a new technology hub in Bengaluru for C$28M.

FIGURE 20

Canadian R&D Investment into the Asia Pacific by Destination City, 2020 vs. 2021



*An unspecified city in South Korea was the recipient of a C$33M investment by Blockchain Research Institute, a think tank based in Toronto.

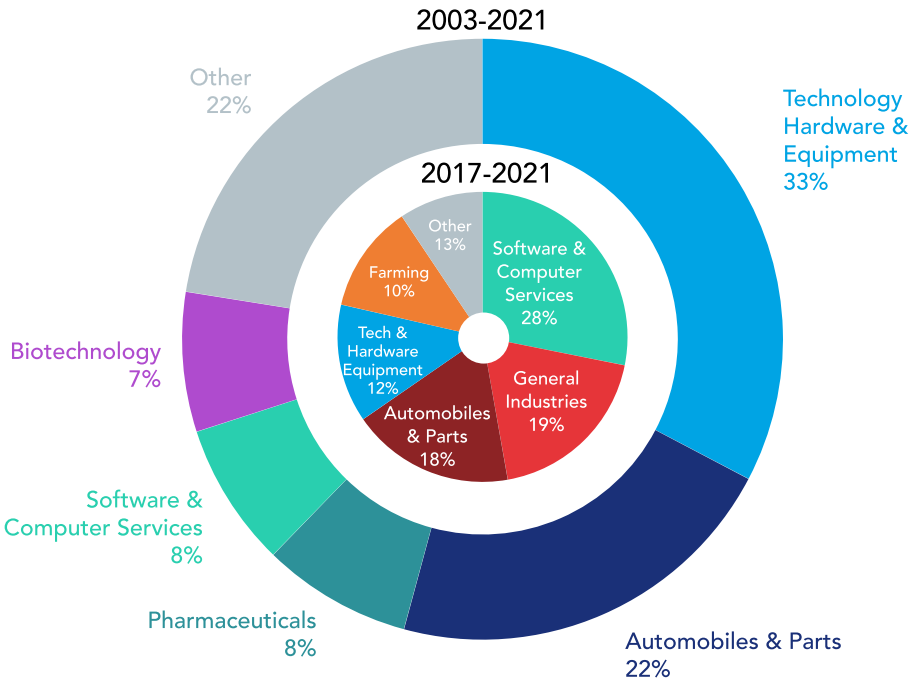
Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

In Which Asia Pacific R&D Sectors Do Canadian Companies Invest?

The technology sector has dominated outward investment in the Asia Pacific, with C$878M worth of Canadian investment (33%) going to that sector between 2003 and 2021 (Figure 21). The automobiles and parts sector was the second most attractive sector to Canadian businesses, which invested C$578M in this sector in the Asia Pacific region. The pharmaceuticals sector ranked a distant third place, with C$216M invested by Canadian firms in this sector. The dominance of the technology sector in the Canadian R&D mix in the Asia Pacific is the result of a single investment made by Nortel Networks, an Ontario-based firm. In 2003, Nortel invested C$365M to set up a campus with an R&D centre in Beijing. Before Nortel's bankruptcy, the campus acted as Nortel's headquarters in the region and a research hub to study and develop wireless and fixed-line equipment. This investment alone makes up nearly 42% of total Canadian investment in the technology sector.

FIGURE 21

Canadian R&D Investment into the Asia Pacific by Sector, 2003-2021



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

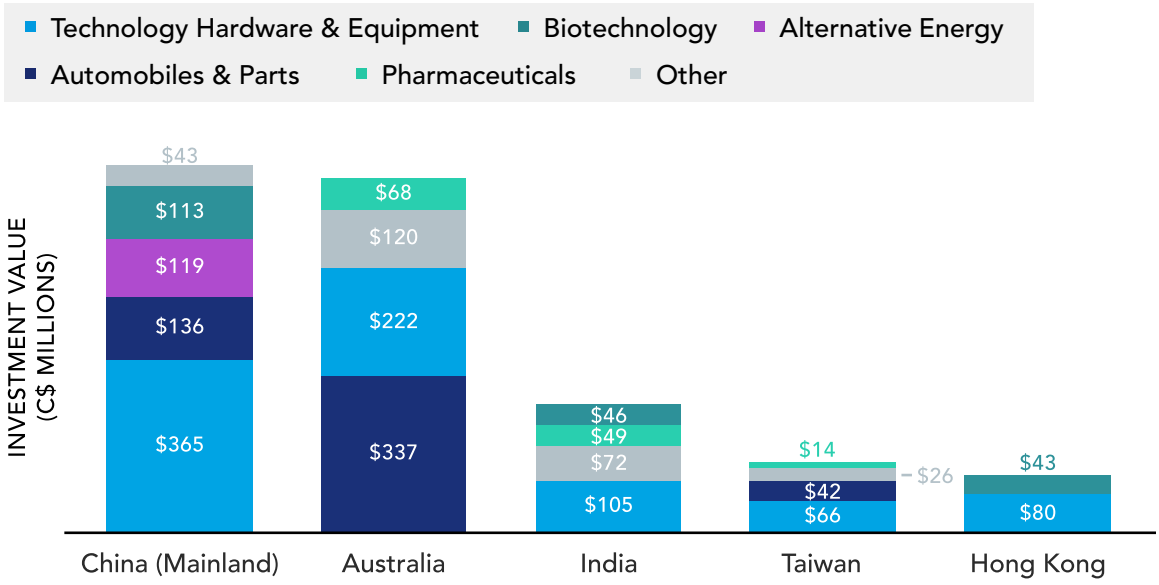
From 2017 to 2021, technology played a much smaller role in Canadian investment in Asia Pacific R&D (Figure 21). During this period, the technology sector fell to fourth place in terms of Canada's R&D spending. Instead, the software and computer services and general industries sectors have received the majority of Canadian investment, with C$96M and C$65M invested,

respectively. Another notable aspect of investment during this period is that there is a more equitable distribution of investment between sectors.

Between 2003 and 2016, the technology hardware and equipment sector dominated Canadian outward investment flows into the region (Figure 22), making up a significant portion of investment in each of the top five R&D investment-recipient economies. However, in the 2017 to 2021 period, China was the only economy to receive any investment in this sector, and it only made up 24% of investment in mainland China, with other sectors such as automobiles and parts and general industries making up a larger portion of the investment (Figure 23). Conversely, the software and computer services sector made up 28% of investment during 2017 to 2021 but did not even make it to the top five R&D sectors in the 2003 to 2016 period, suggesting a shift away from investment in the technology sector and a growing interest in software-related R&D projects in the ICT industry.

FIGURE 22

Canadian R&D Investment into the Asia Pacific by Destination Economy and Sector, 2003-2016



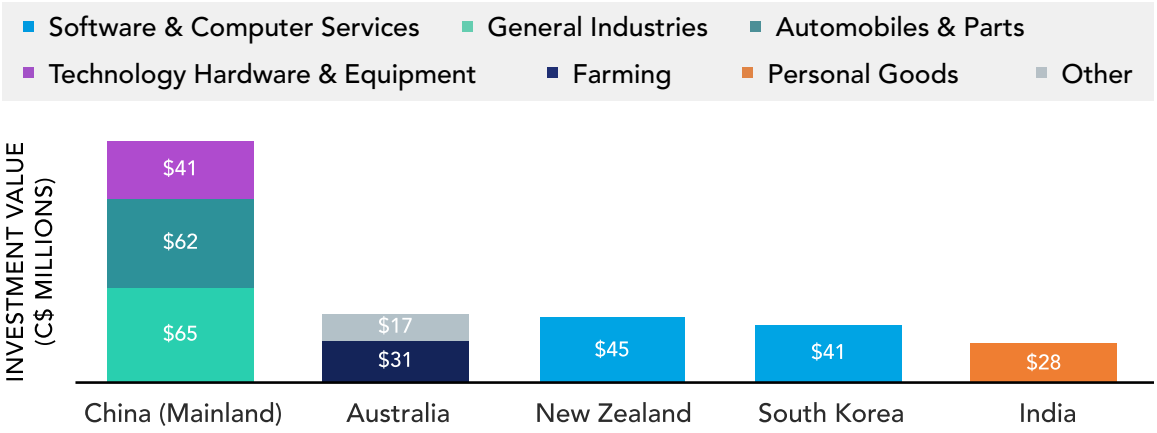
Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

It is also notable that the new economies that appear in the 2017 to 2021 period, among which are New Zealand and South Korea, received 100% of their R&D investments in the software and computer services sector (Figure 23). The surge in investment in New Zealand was the result of a single investment worth C$45M by Canada-based Brookfield Asset Management in a 5G innovation centre in Christchurch, New Zealand, in 2020. In contrast, despite having received less investment overall, South Korea received three investments during this period, the largest of which was a C$33M investment by Canada-based Blockchain Research Institute

in 2021 to open a research centre in South Korea. While these investments cannot necessarily be said to indicate a larger trend, it is worth monitoring the development of the software and computer services sector in these countries as Canadians look for opportunities to diversify and explore new markets.

FIGURE 23

Canadian R&D Investment into the Asia Pacific by Destination Economy and Sector, 2017-2021



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

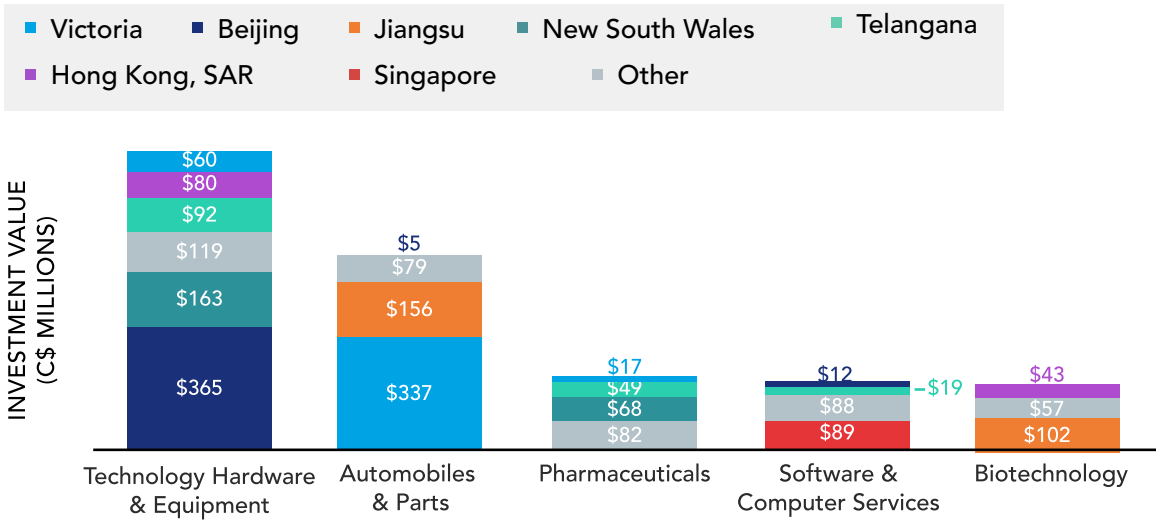
Another important trend to observe is the increasing investment from Canada to New Zealand and South Korea. Over the past two years, Canadian investors have made significant investments into New Zealand and South Korea, which have received C$45M and C$39M, respectively. While historically China has dominated Canada's investment in R&D in the Asia Pacific region, the addition of New Zealand and South Korea in 2020 and 2021 is noteworthy as these two countries are typically ranked lower in terms of their R&D FDI in Canada, coming in fifth and ninth place overall. The observed changes in investment destinations confirm that Canadian businesses are beginning to diversify their R&D investments across the Asia Pacific region in the pursuit of new opportunities.

Sub-National Distribution of Canadian FDI Across R&D Sectors in Asia Pacific Provinces and Cities

At the sub-national level, certain provinces have dominated Canadian investment in R&D sectors. For example, Beijing municipality has been the primary recipient of Canadian investment in the technology hardware and equipment sector, with over 40% of investment in this sector going to Beijing between 2003 and 2021. Furthermore, Victoria has dominated the auto parts sector even more thoroughly, having received nearly 60% of outward Canadian FDI in auto parts R&D investment during the same period (Figure 24).

FIGURE 24

Canadian R&D Investment into the Asia Pacific by Province and Sector, 2003-2021



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

However, as R&D sectors evolve, new provincial and municipal hubs have appeared and will likely attract increasing investment. For example, Guangdong was the recipient of 56% of R&D FDI in 2021 due to the technology hardware and auto parts deals by POET Technologies and eLeapPower, which invested in Shenzhen. The FDI boom in Guangdong's R&D sector may have been driven by the province's R&D-related policies.

BOX 5

R&D Relationship With Taiwan Considering FIPA

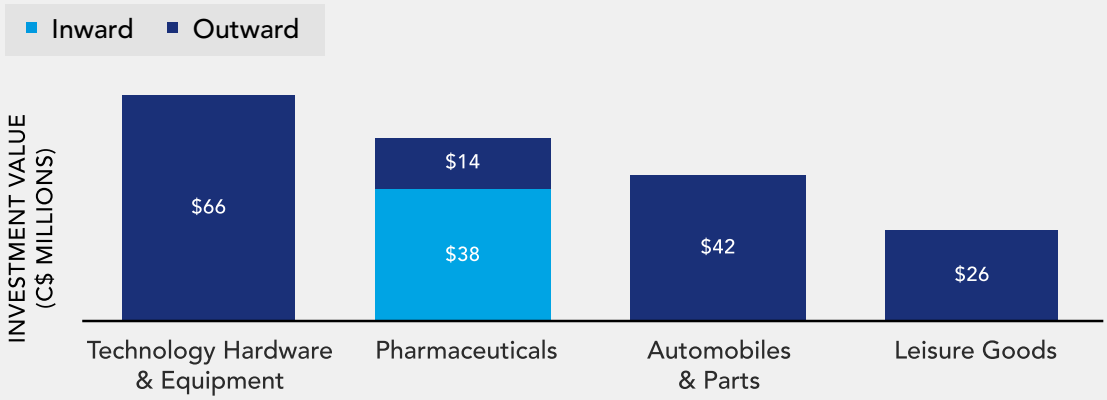
On January 9, 2022, the Canadian International Trade Minister, Mary Ng, and Taiwanese Minister and the head of the Cabinet's Office of Trade Negotiations, John Deng, announced the launch of exploratory discussions on a foreign investment promotion and protection arrangement (FIPA) between Canada and Taiwan.[75] In recent years, Taiwan has been seeking a stronger international presence by forging ties with technologically advanced countries, such as Canada, Japan, and the United States. Simultaneously, Minister Ng has indicated Canada's interest in strengthening economic partnerships with the Indo-Pacific region.[76] Canada's dwindling trade relationship with China has further motivated the government to explore new trade and investment avenues with Taiwan, a technology and innovation hub in the region.[77] The FIPA is expected to enhance bilateral investment between Canada and Taiwan by ensuring a non-discriminatory investment environment and protection of intellectual property rights, especially in R&D activities in areas such as innovation, advanced technology, and green energy, among others.[78]

Existing Trends in Bilateral R&D FDI Between Canada and Taiwan

Bilateral FDI in the R&D sector between Canada and Taiwan has been dominated by Canadian investors acquiring assets or establishing new plants in Taiwan. According to the Investment Monitor database, between 2003 and 2021, Taiwan received almost C$4B worth of Canadian investment, accounting for 1.5% of total Canadian FDI in the Asia Pacific region (Figure 25). Among the 37 investments made by Canadian businesses in Taiwan, only four deals (totalling C$148M) fall under the category of R&D investments as defined in the Frascati Manual.[79] During this period, the most notable R&D deals in Taiwan were made by companies based in Ontario. For instance, Toronto-based telecommunications equipment manufacturer Nortel Networks invested C$32.4M to build an R&D centre in Taipei City in 2003. Taiwanese firms made only one R&D investment in Canada during this period. This single deal was made in 2020 by Taipei-based Bora Pharmaceuticals, which acquired GlaxoSmithKline Inc.'s R&D facilities in Mississauga for C$38.5M.

FIGURE 25

Bilateral R&D Investments between Canada and Taiwan by Sector, 2003-2021



Source: APF Canada Investment Monitor, fDi Markets (accessed May 2022)

Canadian outward FDI to Taiwan is spread across multiple sectors, including the technology and hardware equipment, pharmaceuticals, automobiles and parts, and leisure goods sectors. The inward FDI from Taiwan to Canada is focused on the pharmaceutical sector, reflecting the fact that the Bora Pharmaceuticals acquisition of GlaxoSmithKline Inc.'s facilities was the only acquisition made by Taiwanese firms in Canada. Although the two-way R&D investment between Canada and Taiwan is relatively small, the proposed FIPA may help Canada and Taiwan leverage each other's expertise to unlock new opportunities in sectors heavily reliant on R&D, such as fintech, internet of things (IoT), AI, digital health, ICT, automotive technology, smart manufacturing, smart transportation, and smart agriculture.[80]

Semiconductor and Cleantech Industries to Benefit From FIPA

Semiconductors may benefit from the increase in bilateral investment flows between Canada and Taiwan. On February 28, 2022, the government of Canada announced its plan to invest C$150M to accelerate the development and supply of Canadian semiconductors.[81] As Canada aspires to strengthen its position within the regional and international supply chain for ICT, a strategic partnership with Taiwan, the biggest semiconductor manufacturer in the world, would allow Canadian manufacturers to partner with Taiwanese companies with expanding R&D budgets. For instance, the Taiwan Semiconductor Manufacturing Company (TSMC), a global leader in the semiconductor industry, has committed to investing C$127B in R&D until 2023 to explore advanced semiconductor technologies.[82] Canada can leverage its existing partnerships with TSMC, which has a design centre in Ottawa.

Cleantech and renewables are other sectors that have the potential to benefit from an increase in bilateral investment flow between Canada and Taiwan. Taiwan and Canada have committed to investing heavily in cleantech and renewables to meet their shared net-zero goal by 2050.[83] Canada is home to many companies that are global leaders in clean and green power generation and many of these companies, such as Northland Power and Canadian Solar Inc., are already operational in Taiwan. Enhanced collaboration and exchange of innovation and ideas across the areas of cleantech might mobilize R&D investments in energy transitions in both countries. In January 2022, the Canadian Hydrogen and Fuel Cell Association and its Taiwanese counterpart signed a memorandum of understanding, signalling their interest in expanding their collaboration on zero-emission hydrogen and fuel cell technologies R&D.[84] The proposed FIPA, which is expected to reduce uncertainty regarding investment rules, safeguard intellectual property rights, guarantee non-discriminatory treatments, and enhance policy predictability, might promote further co-operation in the Canadian and Taiwanese cleantech sectors in undertaking R&D activities.

CONCLUSION:

Taking Stock of the Flows of FDI in R&D Between the Asia Pacific and Canada and Charting Novel Trends

Existing research shows that FDI in R&D grew between 2003 and 2017 and benefited several emerging economies that are increasingly expanding their role as recipients and senders of capital in this area.[85] Our findings suggest that Canadian investment in Asia Pacific R&D was more prominent prior to the 2010s. In contrast, Asia Pacific investment in Canada's R&D became more prominent in the latter half of the 2010s. However, starting in the 2020s both inward and outward investment in R&D has grown significantly. Despite this recent uptick, investment in R&D accounts for a relatively small percentage of total inward and outward FDI flows between Canada and the Asia Pacific (less than 5% in both directions). While we find that R&D still accounts for only a small percentage of Canadian FDI, it has the potential to experience significant growth in the future as countries on both sides adopt policies to encourage FDI in R&D.

Past Trends

Looking at FDI flows in R&D from the Asia Pacific to Canada, we find that investment picked up in 2013 and was led by well-established MNCs from Japan and South Korea, R&D-advanced regional economies. The investment flows experienced a peak in 2016 followed by relatively slow growth until 2020 and 2021. Japan, India, South Korea, and China are the largest investors in Canadian R&D, with India's and South Korea's investments increasing significantly in the last five years. The most attractive sectors for foreign investors in Canadian R&D for the 2003 to 2021 period have been ICTs (47%), biotechnology (28%), and pharmaceuticals (18%), with ICT becoming more dominant in the last several years. Japan has invested the most in the biotechnology and pharmaceuticals sectors, which together accounted for 84% of Japanese FDI in Canadian R&D. Indian companies invested predominantly in Canadian R&D activities in software and computer services, with 90% of investment going to this sector. South Korean firms have prioritized investments in the software and computer services and biotechnology sectors, which accounted for 48% and 45%, respectively, of South Korean FDI in Canadian R&D.

Canadian R&D in Asia Pacific economies was relatively high before the 2010s but experienced a steady decline in investment outflows until 2021. The largest outflow of FDI in R&D from Canada to the Asia Pacific was in 2008, with C$445M invested. China, Australia, India, Taiwan, and New Zealand were the largest recipients of Canadian cumulative FDI in R&D

from 2003 to 2021. In the last two years, Canadian R&D investment expanded in China, New Zealand, and South Korea, signalling the desire of Canadian companies to diversify their investment destinations. The majority of Canadian FDI in Asia Pacific R&D went to the technology, hardware, and equipment sector (33%), automobiles and parts sector (22%), and pharmaceuticals sector (8%), which jointly account for over 60% of Canadian R&D FDI in the region. China, the largest recipient of Canadian R&D FDI, has received C$943M, with the majority of this investment going to the technology hardware and equipment (43%) and automobiles and parts (21%) sectors. Australia, which is the second-largest recipient of Canadian R&D FDI, received C$795M between 2003 and 2021, with most of this investment going to the automobiles and parts (42%) and technology hardware and equipment sectors (28%). India, which is the third-largest destination of Canadian R&D FDI in the Asia Pacific, has received almost C$300M, with most of this investment going to the technology hardware and equipment (35%) and pharmaceuticals (16%) sectors.

Government-Sponsored Programs and Opportunities in Asia Pacific R&D for Canadians

The data suggest that Asia Pacific investors interested in Canada's R&D prefer investing in advanced sectors, such as ICTs, biotechnology, and pharmaceuticals. We observe a similar pattern in Canada's R&D FDI in the Asia Pacific, but with greater intensity in manufacturing industries, such as the technology and hardware equipment and automotive and parts sectors. The report also highlights the diversification in R&D destinations. The observed diversification in R&D partnerships between Asia Pacific economies and Canada follows Canada's strategy to set up closer collaborations with its partners in the region. For example, Canada's National Research Council (NRC) has become more actively involved in the region over the past 10 years.

Canada's research foothold in the Asia Pacific has been strengthened through a variety of initiatives. In 2016, the NRC signed a collaboration agreement with the Chinese Ministry of Science and Technology to foster and fund closer R&D collaboration between Chinese firms and Canadian SMEs.[86] In the following year, the NRC continued to strengthen its R&D partnerships by signing a memorandum of understanding with South Korea's Institute for Advancement to promote R&D collaboration between SMEs.[87] Then, in 2019, the NRC opened an office in Japan to promote collaboration between Canadian and Japanese businesses and researchers interested in R&D.[88] One may expect that these partnerships will attract more bilateral FDI in R&D between the partnering countries. Canada's NRC also supports Canadian SMEs in accessing Asia Pacific markets through collaborative industrial research and development calls for proposals designed to foster collaborative R&D projects, such as the 2020 call for India[89] and the more recent 2022 call for South Korea.[90] Canadian companies can take advantage of these calls to expand their presence in selected economies and gain a foothold in Asia Pacific R&D markets.

What Do the Data for 2022 Tell Us About R&D Investment?

Our data for the first quarter of 2022 indicate that Canadian investors are more active in R&D FDI in the Asia Pacific than Asia Pacific investors are in Canada. While Canadians have completed four deals worth C$583M, Asia Pacific investors have only made two deals worth C$26M during the same period. The data demonstrate the desire of Canadian firms to expand their R&D presence in the Asia Pacific, which is counterbalanced by a more cautious expansion of Asia Pacific investors, led by established regional economies, such as Japan and South Korea.

Canadian firms investing in Asia Pacific R&D have all flocked to a single destination economy – India. They have set roots in Karnataka, Andhra Pradesh, and Maharashtra by expanding their operations in the respective cities of Bengaluru, Hyderabad, and Pune. In Bengaluru, the Canada Pension Plan Investment Board, the Ontario Teacher's Pension Plan Board, and other international investors teamed up to invest in VerSe Innovation, which is India's biggest local language technology platform. In Hyderabad, Jamp Pharma Corporation, a Canadian company that produces generic drugs, invested C$46M in R&D manufacturing facilities. Additionally, Maharashtra became home to the R&D office of Next Pathway, a Canadian company specializing in automated cloud migration services. The investment pattern of Canadian companies in early 2022 signals an interest in tapping into India's IT and pharmaceutical sectors.

Asia Pacific investment in Canada's R&D sector in 2022 has so far been driven by Japan, with C$16M invested, and South Korea, with C$10M invested. They have set up operations in Ontario and Quebec. In Ontario, Lotte Group, a South Korean confectionery manufacturer, invested C$10M in Ontario-based Aspire Food Group, which produces sustainable food with a focus on R&D in developing natural wellness products and innovative materials. Quebec's Ventus Therapeutics, a Montreal-based drug developer, received financing from Softbank. Asia Pacific investors coming into Canada have thus showcased an interest in innovative technologies in food processing and biotechnology.

Charting the Future of FDI in R&D

As the race to be at the forefront of the Fourth Industrial Revolution accelerates, new partnerships will be forged among businesses and governments in support of R&D activities at home and abroad. The drive to resolve global challenges, such as climate change and food security, will continue to stimulate international partnerships in pursuit of the common good. As the nature of R&D evolves and governments and investors move to prioritize newer and greener areas of innovation, novel R&D sectors may become prominent in the coming years for both outward and inward FDI. For example, the Caisse de dépôt et placement du Québec, with its expertise in Asia Pacific investments, announced last year that it would halt FDI in the oil sector by the end of 2022 as part of an ambitious net-zero portfolio by 2050 strategy. Similarly, Innovation, Science, and Economic Development's Strategic Innovation Fund provides up to C$8B over seven years for R&D projects that expedite decarbonization from large emitters and advance clean technology through its Net Zero Accelerator initiative.

This report has highlighted that Canadians are increasingly interested in exploring R&D opportunities in new locations and sectors in the Asia Pacific. At the same time, our findings suggest that Asia Pacific investors are growing increasingly interested in expanding their presence in Canada with a focus on technologically advanced sectors. Investors from both sides will benefit from government policies that support new R&D opportunities that can assist SMEs interested in accessing new markets.

Canadian companies interested in pursuing R&D investment abroad should monitor government initiatives in support of R&D that can benefit their investment. For example, the Investment Monitor data for the first quarter of 2022 indicate that the majority of Canadian investment in India's R&D went to the rapidly evolving software and computer sector. Canadian investors will benefit from the rapid growth of India's software and computer sector, which is facilitated by several R&D initiatives supported by the Indian government, such as Digital India, Make in India, and Startup India.[91] Similarly, there will be opportunities for Canadian investors in R&D in other Asia Pacific economies, such as South Korea, Singapore, and Australia, as highlighted in the 2021 Investment Monitor Report.[92]

Asia Pacific investors may benefit from collaborations with companies present in Canadian superclusters. These superclusters will likely attract Asia Pacific investors as the government plans to allocate more funding over the next couple of years to support innovative R&D. While government support may create opportunities, investors should also be aware of the restrictions placed on R&D opportunities abroad in strategic sectors as illustrated by the restrictions placed on Huawei's operations in Canada. As the R&D landscape evolves, so too will the political and economic conditions surrounding it, fostering novel opportunities for Canadian and Asia Pacific investors alike.

ENDNOTES

[1] Hall, Bronwyn H. "Research and Development." (2nd ed.) *International Encyclopedia of the Social Science.* 2006. https://eml.berkeley.edu/~bhhall/papers/BHH06_IESS_R&D.pdf

[2] OECD. "Frascati Manual 2015. Guidelines for Collecting and Reporting Data on Research and Experimental Development." 2015. https://www.oecd.org/publications/frascati-manual-2015-9789264239012-en.htm

[3] OECD. "The Impact of R&D Investment on Economic Performance: A Review of Econometric Evidence." 2015. https://one.oecd.org/document/DSTI/EAS/STP/NESTI(2015)8/en/pdf#:~:text=R%26D%20investments%20of%20firms%20in,in%20production%20and%20output%20growth

[4] World Intellectual Property Organization (WIPO). "Global Innovation Index 2021: Tracking Innovation Through the COVID-19 Crisis." 2021. https://www.wipo.int/wipo_magazine/en/2021/03/article_0002.html

[5] McKinsey & Company. "Building an R&D strategy for modern times." 2020. https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/building-an-r-and-d-strategy-for-modern-times

[6] R&D World. "2021 Global R&D Funding Forecast Released." 2021. https://www.rdworldonline.com/2021-global-rd-funding-forecast-released/

[7] fDi Intelligence. "Global innovation leaders in 2020." April 21, 2020. https://www.fdiintelligence.com/content/data-trends/global-innovation-leaders-in-2020-79672?saveConsentPreferences=success

[8] WIPO. "Global Innovation Index 2020; Who Will Finance Innovation?" 2020. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf

[9] Government of Canada. "Innovation for a Better Canada." 2021. https://ised-isde.canada.ca/site/innovation-better-canada/en

[10] Kinoshita, Yuko. "R&D and Technology Spillovers via FDI: Innovation and Absorptive Capacity." 2000. https://deepblue.lib.umich.edu/bitstream/handle/2027.42/39733/wp349.pdf

[11] Guimon, Jose. "Government Strategies to Attract R&D-Intensive FDI." 2007. http://repositorio.colciencias.gov.co/bitstream/handle/11146/153/1024 -Government%20Strategies%20to%20Attract%20R&D%20Intensive%20FDI%20Jose%20Guimon.pdf?sequence=1

[12] Government of Canada. "Collaborative Opportunities." 2021. https://www.tradecommissioner.gc.ca/innovators-innovateurs/agreements-ententes.aspx?lang=eng

[13] Government of Canada. "Agreement for Scientific and Technological Cooperation between the Government of Canada and the Government of the People's Republic of China." 2007. https://www.treaty-accord.gc.ca/text-texte.aspx?id=105085&_ga=2.78197783.2033909706.1652915775-1240134073.1650565530

[14] Government of Canada. "Agreement for Scientific and Technological Cooperation Between the Government of Canada and the Government of the Republic of India." 2005. https://www.treaty-accord.gc.ca/text-texte.aspx?id=105057&_ga=2.186595937.999812755.1647896258-1032820264.1647896258

[15] Government of Canada. "Agreement Between the Government of Canada and the Government of Japan on Cooperation in Science and Technology." 1986. https://www.treaty-accord.gc.ca/text-texte.aspx?id=102070&_ga=2.11787063.2033909706.1652915775-1240134073.1650565530

[16] Government of Canada. "Korea / S&T and Innovation Coop; Agreement for Science, Technology and Innovation Cooperation between the Government of Canada and the Republic of Korea." 2016. https://publications.gc.ca/collections/collection_2017/amc-gac/FR4-2017-16.pdf

[17] Asia-Pacific Economic Cooperation (APEC). "Innovation, Competitiveness, and the Role of Fiscal Policies." 2014. https://www.apec.org/docs/default-source/publications/2014/11/innovation-competitiveness-and-the-role-of-fiscal-policies/innovation-competitiveness-and-the-role-of-fiscal-policiesfinal-report.pdf?sfvrsn=6057bc26_1

[18] Lai, Luna Ge, Nguyen Thu Quynh, and Akhmad Bayhaqi. "The FDI Network, Global Value Chain Participation and Economic Upgrading." APEC. 2022. https://www.apec.org/docs/default-source/publications/2022/5/the-fdi-network-global-value-chain-participation-and-economic-upgrading/222_psu_fdi-and-gvc-transformation.pdf?sfvrsn=cda431fb_2

[19] Crescenzi, Riccardo, Arnaud Dyevre, and Frank Neffke. "Making foreign direct investment work for innovation clusters." LSE. 2022. https://blogs.lse.ac.uk/businessreview/2022/05/09/making-foreign-direct-investment-work-for-innovation-clusters/

[20] UNCTAD. "World Investment Report 2019." 2019. https://unctad.org/system/files/official-document/wir2019_en.pdf

[21] OECD. "Frascati Manual 2015. Guidelines for Collecting and Reporting Data on Research and Experimental Development." 2015. https://read.oecd-ilibrary.org/science-and-technology/frascati-manual-2015_9789264239012-en#page47

[22] Ibid.

[23] OECD. "Foreign Direct Investment Flows in the Time of COVID-19." 2022. https://www.oecd.org/coronavirus/policy-responses/foreign-direct-investmentflowsin-the-time-of-covid-19-a2fa20c4/

[24] OECD. *International investment perspectives 2007: Freedom of investment in a changing world.* 2007.

[25] Amankwah-Amoah, Joseph, and Yaw A. Debrah. "Toward a Construct of Liability of Origin." *Industrial and Corporate Change.* 2016. https://doi.org/10.1093/icc/dtw021

[26] Ibid.

[27] Doern, G. Bruce, David Castle, and Peter W.B Phillips. *Canadian Science, Technology, and Innovation Policy: The Innovation Economy and Society Nexus.* McGill-Queen's University Press. 2016.

[28] OECD. "Main Science and Technology Indicators." 2022.

[29] Edler, Jakob. "A Costly Gap: The Neglect of the Demand Side in Canadian Innovation Policy." *IRPP Insights.* 2019. https://irpp.org/wp-content/uploads/2019/05/A-Costly-Gap-The-Neglect-of-the-Demand-Side-in-Canadian-Innovation-Policy.pdf

[30] Liberal Party of Canada. "A New Plan for a Strong Middle Class." 2015. https://liberal.ca/wp-content/uploads/sites/292/2020/09/New-plan-for-a-strong-middle-class.pdf

[31] Innovation, Science and Economic Development Canada. "Innovation for a better Canada." 2021. https://ised-isde.canada.ca/site/innovation-better-canada/en

[32] Engel, J. S. "Global Clusters of Innovation: Lessons from Silicon Valley." *California Management Review,* 57, no. 2 (2015): 36-65. https://homepages.tuni.fi/markku.sotarauta/H12/H12_engel

[33] Government of Canada. "Budget 2017: Building a Strong Middle Class." 2017. https://www.budget.gc.ca/2017/docs/plan/chap-01-en.html#Toc477707342

[34] Engel, Jerome S. "Global Clusters of Innovation: Lessons from Silicon Valley." *California Management Review,* 57, no. 2 (2015): 36-65. https://homepages.tuni.fi/markku.sotarauta/H12/H12_engel

[35] Innovation, Science and Economic Development Canada. "About Canada's Global Innovation Clusters." 2021. https://ised-isde.canada.ca/site/global-innovation-clusters/en/about-canadas-innovation-clusters-initiative#

[36] Innovation, Science and Economic Development Canada. "The Innovation and Competitiveness Imperative: Seizing Opportunities for Growth." 2018.

[37] Ocean Supercluster. "About – Canada's Ocean Supercluster." https://oceansupercluster.ca/about/

[38] Ocean Supercluster. "2020-2021 Annual Report." https://oceansupercluster.ca/wp-content/uploads/2021/08/2020-2021-Annual-Report-EN.pdf

[39] Scale AI. "About Us." 2022. https://www.scaleai.ca/about-us/

[40] Scale AI. "Strategic Plan." 2020. https://cdn.scaleai.ca/uploads/2020/05/scale-ai_strategic-plan_en.pdf

[41] Next Generation Manufacturing Canada. "About Us." 2021. https://www.ngen.ca/about-us

[42] Next Generation Manufacturing Canada. "Annual Report 2020-2021." 2021. https://www.ngen.ca/hubfs/20-21-Annual-Report/NGEN_(Annual-Report-2021)EN-v1.1.pdf

[43] Protein Industries Canada. "Who We Are." 2021. https://www.proteinindustriescanada.ca/who-we-are

[44] Protein Industries Canada. "Annual Report 2020-2021: The Art of the Possible." 2021. https://www.proteinindustriescanada.ca/uploads/2021-Annual-Report.pdf

[45] Digital Technology Supercluster. "About the Digital Technology Supercluster." 2021. https://www.digitalsupercluster.ca/who-we-are/about-us/

[46] Digital Technology Supercluster. "Canada's Digital Technology Supercluster Financial Statements." 2021. https://annualreport.digitalsupercluster.ca/2021/pdf/cdts_fs_auditor_report.pdf

[47] Digital Technology Supercluster. "Annual Report 2021-2022: Digital Transformation for All, Bold changes to drive a strong future for Canada." 2022. https://annualreport.digitalsupercluster.ca/cdts/pdf/Annual_Report_2021_EN

[48] Fujitsu. "Fujitsu Initiates Operations at 'Fujitsu Intelligence Technology,' a New Company Driving Its AI Business around the Globe." 2018. https://www.fujitsu.com/global/about/resources/news/press-releases/2018/1106-01.html

[49] Government of Canada. "Budget 2022: A Plan to Grow Our Economy and Make Life More Affordable." 2017. https://www.budget.gc.ca/2017/docs/plan/chap-01-en.html#Toc477707342

[50] Newswire. "Minister Wilkinson Highlights Innovation Cluster Investments in Budget 2022." 2022. https://www.newswire.ca/news-releases/minister-wilkinson-highlights-innovation-clusters-investments-in-budget-2022-837291105.html

[51] Sinha, Madhabendra, and Partha Pratim Sengupta. "FDI Inflow, ICT Expansion and Economic Growth: An Empirical Study on Asia-Pacific Developing Countries." *Global Business Review.* 23, no. 3 (2019): 804-821.

[52] Statistics Canada. "The Daily – Industrial research and development, 2019 (actual), 2020 (preliminary) and 2021 (intentions)." 2021. https://www150.statcan.gc.ca/n1/daily-quotidien/210824/dq210824b-eng.htm

[53] Innovation, Science and Economic Development Canada. "2020 Canadian ICT Sector Profile." 2021. https://ised-isde.canada.ca/site/digital-technologies-ict/sites/default/files/attachments/ICT_Sector_Profile2020_eng.pdf

[54] The Future is Unlimited. "Why Mississauga." https://www.thefutureisunlimited.ca/why-mississauga/

[55] Whitby. "Economic Development." https://www.whitby.ca/en/work/economic-development.aspx

[56] Government of Canada. "Summary of provincial and territorial research and development (R&D) tax credits." 2019. https://www.canada.ca/en/revenue-agency/services/scientific-research-experimental-development-tax-incentive-program/summary-provincial-territorial-research-development-tax-credits-december-31-2016.html

[57] Government of Canada. "Eligible research institutes." 2022. https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/corporations/provincial-territorial-corporation-tax/ontario-provincial-corporation-tax/eligible-research-institutes.html#ont_other

[58] The Future is Unlimited. "Talent & Workforce." https://www.thefutureisunlimited.ca/why-mississauga/talent/

[59] Invest Ontario. "Why Ontario." https://www.investontario.ca/why-ontario

[60] Ontario. "Taking life sciences to the next level – Ontario's strategy." https://www.ontario.ca/page/taking-life-sciences-next-level-ontarios-strategy

[61] The Corridor. "Toronto-Waterloo Region." https://thecorridor.ca/

[62] Ontario. "Regional Innovation Centre Locations." https://www.ontario.ca/page/regional-innovation-centre-locations

[63] Asia Pacific Foundation of Canada. "Investment Monitor Report 2021: Post-Covid Recovery and Foreign Direct Investment." 2021. https://investmentmonitor.ca/insights-reports/investment-monitor-2021-report-post-covid-recovery-and-foreign-direct-investment

[64] The WIPO measure of innovativeness (https://www.wipo.int/global_innovation_index/en/2021/) is based on approximately 80 indicators.

[65] World Economic Forum. "These are the Global Innovation Powerhouses of 2021." 2021. https://www.weforum.org/agenda/2021/10/global-innovation-powerhouses-2021/

[66] Lederman, Daniel, and William F. Maloney. "R&D and Development." *SSRN*. 2003. https://ssrn.com/abstract=402480; Lv, Lei, Yuchen Yin, and Yuanchang Wang. "The Impact of R&D Input on Technological Innovation: Evidence from South Asian and Southeast Asian Countries." *Discrete Dynamics of Nature and Society*. 2020. https://doi.org/10.1155/2020/6408654

[67] The South China Morning Post. "China's spending on research and development up 11.8 per cent to US$275 billion in 2018." September 1, 2019. https://www.scmp.com/economy/china-economy/article/3025268/chinas-spending-research-and-development-118-cent-us275

[68] The Diplomat. "Made in China 2025, Explained." February 1, 2019. https://thediplomat.com/2019/02/made-in-china-2025-explained/

[69] PBS. "Made in China 2025: The Industrial Plan that China Doesn't Want Anyone Talking About." 2019. https://www.pbs.org/wgbh/frontline/article/made-in-china-2025-the-industrial-plan-that-china-doesnt-want-anyone-talking-about/; The Wall Street Journal. "China Prepares Policy to Increase Access for Foreign Companies." May 7, 2018. https://www.wsj.com/articles/china-is-preparing-to-increase-access-for-foreign-companies-11544622331

[70] Asian Development Bank. "The 14th Five-Year Plan of the People's Republic of China – Fostering High-Quality Development." 2021. https://www.adb.org/publications/14th-five-year-plan-high-quality-development-prc

[71] Ibid.

[72] Government of Canada. "Canadian International Innovation Program." 2022. https://www.tradecommissioner.gc.ca/funding-financement/ciip-pcii/index.aspx?lang=eng

[73] fDi Intelligence. "China in R&D Boost to Lure Foreign Businesses." March 4, 2021. https://www.fdiintelligence.com/content/news/china-in-rd-boost-to-lure-foreign-businesses-79602

[74] Ibid.

[75] Global Affairs Canada. "Readout: Minister Ng speaks with Taiwan's Minister Deng." 2022. https://www.canada.ca/en/global-affairs/news/2022/01/readout-minister-ng-speaks-with-taiwans-minister-deng.html

[76] Global Affairs Canada. "Itinerary – Minister Ng heads to Southeast Asia." May 20, 2022. https://www.canada.ca/en/global-affairs/news/2022/05/itinerary---minister-ng-heads-to-southeast-asia.html

[77] The Globe and Mail. "Canada seeking deeper trade relations with Taiwan, as part of new China strategy." January 10, 2022. https://www.theglobeandmail.com/canada/article-canada-seeking-deeper-trade-relations-with-taiwan-as-part-of-new-china/

[78] Diplomat & International Canada. "Formalize Taiwan ties to boost Canadian exports." December 18, 2017. https://diplomatonline.com/mag/2017/12/formalize-taiwan-ties-to-boost-canadian-exports/

[79] OECD. "Frascati Manual 2015. Guidelines for Collecting and Reporting Data on Research and Experimental Development." https://www.oecd.org/sti/inno/frascati-manual.htm

[80] Stephens, Hugh. "A Canada-Taiwan FIPA: The Time Finally Seems Right." February 11, 2022. The School of Public Policy, University of Calgary. https://www.policyschool.ca/a-canada-taiwan-fipa-the-time-finally-seems-right/

[81] Government of Canada. "Government of Canada announces significant investment in the Canadian semiconductor and photonics industries." Innovation, Science and Economic Development Canada. 2022. https://www.canada.ca/en/innovation-science-economic-development/news/2022/02/government-of-canada-announces-significant-investment-in-the-canadian-semiconductor-and-photonics-industries.html

[82] Reuters. "TSMC to invest $100 billion over 3 years to meet chip demand." March 31, 2021. https://www.reuters.com/article/us-tsmc-investment-plan-idUSKBN2BO3ZJ

[83] Bloomberg. "Taiwan Vows $32 Billion Clean Energy Spree as It Lags on Targets." March 30, 2022. https://www.bloomberg.com/news/articles/2022-03-30/taiwan-vows-32-billion-clean-energy-spree-as-it-lags-on-targets

[84] Hydrogen Central. "Fuel Cell Sectors Announce MOU to Strengthen Collaboration." January 24, 2022. https://hydrogen-central.com/canada-taiwan-hydrogen-fuel-cell-collaboration/

[85] Dachs, Bernhard, and Georg Zahradnik. "From few to many: main trends in the internationalization of business R&D." UNCTAD. 2022. https://unctad.org/system/files/official-document/diaeia2022d2a4_en.pdf

[86] Government of Canada. "Chinese Ministry of Science and Technology and the National Research Council of Canada sign agreement to encourage innovative collaboration." 2016. https://nrc.canada.ca/en/stories/chinese-ministry-science-technology-national-research-council-canada-sign-agreement-encourage

[87] Government of Canada. "NRC opens R&D opportunities for Canadian SMEs in South Korea." 2017. https://nrc.canada.ca/en/stories/nrc-opens-rd-opportunities-canadian-smes-south-korea

[88] Government of Canada. "National Research Council Canada – Japan Office." 2019. https://nrc.canada.ca/en/research-development/nrc-facilities/national-research-council-canada-japan-office

[89] Government of Canada. "Canada-India 2020 collaborative industrial research and development call for proposals." 2020. https://nrc.canada.ca/en/irap/about/international/?action=view&id=54

[90] Government of Canada. "Canada-South Korea collaborative industrial research and development call for proposals." https://nrc.canada.ca/en/irap/about/international/?action=view&id=107

[91] Government of India, Ministry of Electronics & Information Technology. "R&D in Information Technology." https://www.meity.gov.in/content/r-d-information-technology

[92] Asia Pacific Foundation of Canada. "Investment Monitor 2021: Report on Post-COVID Recovery and Foreign Direct Investment between Canada and the Asia Pacific." 2021. https://investmentmonitor.ca/sites/default/files/2021-04/Investment%20Monitor%202021.pdf

ASIA PACIFIC FOUNDATION OF CANADA

FONDATION ASIE PACIFIQUE DU CANADA