



Comprendre l'écosystème de l'innovation en Israël.

Enseignements d'un leader mondial de l'innovation

Aperçu

- Ce rapport vise à donner aux cadres, aux décideurs et aux chefs de file canadiens en matière d'innovation une meilleure idée du contexte historique et culturel ainsi que des choix politiques qui ont contribué au succès d'Israël dans ce domaine.
- Pour améliorer sa propre capacité d'innovation et sa performance en la matière, le Canada devrait envisager d'adapter certains des programmes, des politiques, des pratiques et des institutions d'Israël à son propre contexte économique, social et politique.
- Entre autres principes et stratégies clés, le Canada doit trouver sa propre motivation en matière d'innovation, cerner des créneaux dans les chaînes de valeur mondiales, et définir des programmes et une politique axés sur les entreprises.

Une version anglaise exhaustive de cette publication suit ce résumé en français.

Résumé

Israël est réputé pour ses compétences et ses capacités de premier ordre en matière d'innovation. Les dépenses en recherche et développement de ses entreprises sont parmi les plus élevées des pays de l'OCDE, les entreprises de haute technologie y attirent massivement le capital-risque et bénéficient de l'intégration profonde dans les chaînes de valeur technologiques mondiales, et ses chercheurs hautement qualifiés sont des chefs de file dans un large éventail de technologies et de composants novateurs.

Résultat, Israël fait partie des pays qui comptent le plus d'entreprises en démarrage et d'entreprises en forte croissance. Israël fait également preuve d'une aptitude impressionnante à développer des capacités spécifiques dans son écosystème d'innovation et à en profiter. À titre d'exemple, son parc scientifique CyberSpark accueille des sociétés technologiques multinationales qui investissent dans la cybersécurité et en révolutionnent l'avenir.

Ce rapport est fondé sur des recherches ainsi que sur un voyage d'études d'une semaine sur l'innovation en Israël organisé en novembre-décembre 2016 par le Conseil pour l'innovation et la commercialisation du Conference Board du Canada pour des cadres canadiens. Il vise à aider les cadres, les décideurs et les chefs de file canadiens en matière d'innovation à tirer des leçons du contexte historique et culturel ainsi que des choix politiques qui expliquent en partie le succès d'Israël dans ce domaine.

Il examine comment Israël est devenu un chef de file mondial dans la recherche et l'innovation en se dotant d'une série de politiques, de pratiques et d'institutions propices à l'innovation, comme le YOZMA (son programme de capital-risque), le MAGNET (son programme de consortiums de recherche et développement technologique générique

Le besoin et la possibilité d'innover sont omniprésents dans la société israélienne, la nécessité étant souvent le moteur de l'invention.

à caractère préconcurrentiel), de nombreux programmes d'incubateurs d'entreprises, des initiatives relatives à l'achat de technologies liées à la défense, l'Autorité israélienne de l'innovation et la Fondation binationale de recherche et développement industriel. Parmi les principes et stratégies clés qui appuient ces activités dans l'écosystème israélien de l'innovation, l'accent est notamment mis sur le secteur privé, la souplesse et l'indépendance par rapport aux politiques, ainsi que la constitution de réseaux et de partenariats mondiaux solides.

Le besoin et la possibilité d'innover sont omniprésents dans de nombreux aspects de la société israélienne, la nécessité étant souvent le moteur de l'invention. En fait, la nécessité motive l'innovation israélienne dans différents secteurs. La culture, le secteur de la défense, le système éducatif et les partenariats stratégiques du pays sont structurés de manière à répondre à ces besoins, entre autres. La menace qui pesait sur l'existence même d'Israël dans les années 1960 a placé le pays sur sa trajectoire novatrice, la guerre des Six Jours en 1967 marquant un important tournant. Parmi les attributs culturels du pays, mentionnons l'appréciation de la curiosité et de la remise en question, le rejet de la hiérarchie et une attitude intrépide face à l'échec. Le secteur de la défense et l'enseignement supérieur israéliens représentent une source continue de capital humain qualifié doté de compétences en innovation et en résolution de problèmes.

On peut tirer de l'expérience israélienne de bonnes leçons et de bonnes idées pour le Canada, comme la nécessité de trouver sa propre motivation en matière d'innovation, de cerner des créneaux dans les chaînes de valeur mondiales, de définir des programmes et une politique autour des entreprises, d'apprendre des erreurs et des maladresses d'Israël, et d'avoir une vision mondiale. L'adaptation des principes, des stratégies, des institutions et des programmes d'Israël au contexte économique, social et politique du Canada pourrait aider à soutenir la performance canadienne en matière d'innovation.

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Lessons Learned From a World Innovation Leader.

Understanding Israel's Innovation Ecosystem



Lessons Learned From a World Innovation Leader: Understanding Israel's Innovation Ecosystem

Jessica Brichta, Daniel Munro, and Paul Preston

Preface

Israel boasts world-class innovation skills and capabilities. Based on research and a week-long Israel Innovation Study Tour organized by The Conference Board of Canada's Council for Innovation and Commercialization, this report gives Canadian innovation executives, policy-makers, and leaders a better understanding of the cultural and historical circumstances, and innovation-supporting policies, practices, programs, and institutions driving Israel's innovation success. Key principles and strategies Canada can adapt to support its own innovation capacity and performance include finding its own innovation motivation, identifying niche areas in global value chains, designing programs and policy with firms at the centre, learning from Israel's challenges, and thinking globally.

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EXECUTIVE SUMMARY

Understanding Israel's Innovation Ecosystem: Lessons Learned From a World Innovation Leader

At a Glance

- This report aims to give Canadian innovation executives, policy-makers, and leaders a better understanding of the cultural and historical circumstances, and policy choices that contributed to Israel's innovation success.
- To enhance its own innovation capacity and performance, Canada should consider adapting some of Israel's innovation-supporting policies, practices, programs, and institutions to its own social, economic, and political context.
- Key principles and strategies include finding Canada's own innovation motivation, identifying niche areas in global value chains, and designing programs and policy with firms at the centre.

Israel boasts world-class innovation skills and capabilities. The country's business research and development spending is among the highest of Organisation for Economic Co-operation and Development (OECD) countries, its high-tech firms attract massive amounts of venture capital and benefit from deep integration within global technology value chains, and its well-educated and skilled researchers are leaders in a wide range of innovative technologies and components.

As a result, Israel is among the top countries in the world for start-ups and rapid-growth firms. Israel also demonstrates an impressive ability to develop and benefit from niche capacities in its innovation ecosystem, such as its CyberSpark research park—home to multinational technology companies that are investing in and revolutionizing the future of cyber security.

Based on research and a week-long Israel Innovation Study Tour organized by The Conference Board of Canada's Council for Innovation and Commercialization (CIC) for Canadian executives in November/December 2016, this report aims to help Canadian innovation executives, policy-makers, and leaders learn from Israel's experiences by offering insights into the cultural and historical circumstances, and policy choices that help explain Israel's innovation success.

It explores how Israel became a global leader in research and innovation by developing a suite of innovation-supporting policies, practices, and institutions, such as YOZMA (its venture capital program), MAGNET (its generic, pre-competitive technological research and development consortia program), numerous business incubator programs, defence-related technology procurement initiatives, the Israel Innovation Authority, and the Bi-national Industrial Research and Development Foundation. Key principles and strategies that support these activities in Israel's innovation ecosystem include focusing on the private sector, flexibility and insulation from politics, and building strong global networks and partnerships.

Israel's
experiences
provide lessons
and insights for
Canada.

The need and opportunity to innovate permeate many aspects of Israeli society, with necessity often serving as the mother of invention. Necessity drives Israeli innovation in a range of sectors, and Israel's culture, defence sector, education system, and strategic partnerships have been structured to meet those and other needs. The existential threat Israel faced in the 1960s sparked Israel's innovation trajectory, with the 1967 Six-Day War acting as a key turning point. Cultural attributes include valuing curiosity and questioning, a rejection of hierarchy, and a fearless approach to failure. Israel's defence sector and higher education system provide a steady stream of highly qualified human capital with innovation and problem-solving skills.

Israel's experiences provide some good lessons and insights for Canada, such as the need to find our own innovation motivation, identify niche areas in global value chains, design programs and policy with firms at the centre, learn from Israel's mistakes and missteps, and think globally. Adapting Israel's principles, strategies, institutions, and programs to Canada's own social, economic, and political context could help support Canada's innovation performance.

CHAPTER 1

Introduction

Chapter Summary

- Between November and December 2016, The Conference Board of Canada organized a tour of important institutions and sites in the Israeli innovation ecosystem for a select group of Canadian leaders.
- Presentations by key individuals in the Israeli innovation ecosystem—in government, education, and industry—provided insights into how Israel and its firms have been able to innovate, grow, and compete in global markets.
- The need to quickly develop technological capacity at the outset of the 1967 war was a key event in Israel's innovation trajectory, and necessity continues to drive innovation in a number of sectors.
- Israel built a strong foundation for private sector technology development by pouring energy and resources into cutting-edge defence technologies.

Why Study Israel?

With the highest business research and development (R&D) spending among OECD countries, high-tech firms that attract massive amounts of venture capital and are deeply integrated in global technology value chains, and a large pool of well-educated and skilled researchers in a wide range of innovative technology and component areas, Israel has established itself as a global innovation leader.

A number of strategic, cultural, and historical circumstances contributed to this innovation success. This report aims to help Canadian innovation executives, policy-makers, and leaders understand how a specific suite of innovation-supporting policies, practices, and institutions helped Israel become a global research and innovation leader.

Given Israel's track record in cyber technology innovation and related economic development, Canada can learn important lessons from Israel's approach. By exploring Israel's knowledge and skills development, along with the role of innovation and science policy—critical priorities and challenges for Canada's federal and provincial governments—this report will offer strategic and policy recommendations that Canada might consider to enhance its own innovation capacity and performance.

Methodology

The insights presented in this report emerge from synthesis and analysis of those gained during the Conference Board's Israel Innovation Study Tour. (See "The Israel Innovation Study Tour.") It also includes an examination of relevant data from OECD and other organizations, a review of pertinent literature, and discussions with subject matter experts and practitioners.

The Israel Innovation Study Tour

In partnership with the Centre for Israel and Jewish Affairs (CIJA), the Conference Board's Council for Innovation and Commercialization (CIC) organized a tour of key institutions and sites in the Israeli innovation ecosystem for a select group of Canadian leaders from the federal government, provincial and regional innovation accelerators, academia (universities, colleges, and polytechnics), and the private sector from November 27, 2016, to December 2, 2016. (See Appendix B for the tour agenda and Appendix C for participating organizations). Through presentations by and discussions with key individuals in the Israeli innovation ecosystem—in government, education, and industry—the Conference Board and tour participants gained insights into how Israel and its firms have been able to innovate, grow, and compete in global markets.

Israeli experts in telecommunications, cyber-security, biotechnology, pharmaceuticals, renewable energy, and other sectors offered their insights about the conditions, resources, and other factors necessary to Israel's success, as well as accounts of the trajectories of their own companies and sectors' experiences. Guided tours of Jerusalem, the Old City, and historically significant sites such as Yad Vashem (Israel's National Holocaust Museum), provided study tour participants with a greater appreciation of the cultural and historical context of the region, as well as additional insights into how Israel's culture and history helped shape its innovation experience.

Factors Shaping Israel's Innovation Economy

Israel's strong innovation performance and history raise an interesting question: "How did this 'start-up' state not only survive but morph from a besieged backwater ... into one of the most dynamic, entrepreneurial economies in the world?"¹ From its founding and through the 1950s, Israel's economy was in large part a protectionist, agricultural economy. At the macro level, R&D was minimal and high levels of immigration from low-income countries kept the overall skills and education levels low in Israel.² However, the pressing need for water and other resources

1 Senor and Singer, *Start-Up Nation*, 15.

2 Breznitz, *Innovation and the State*; Senor and Singer, *Start-Up Nation*.

inspired early scientific advances in areas such as water technology. By the 1990s, Israel was leading the world in a number of innovation metrics and has become a frequently discussed and studied case of innovation success. Subsequent chapters explore how Israel moved from these challenging circumstances to become a world-leading innovation nation with a powerful innovation ecosystem. (See “An Innovation Ecosystem Defined.”)

An Innovation Ecosystem Defined

Dr. Deborah J. Jackson, the National Science Foundation's Engineering Research Centres' Program Director, provides the following definition: “An innovation ecosystem models the economic ... dynamics of the complex relationships that are formed between actors or entities whose functional goal is to enable technology development and innovation,” including the human capital (e.g., industry researchers and representatives, staff, faculty, students) and material resources (e.g., facilities, equipment, funds) making up the institutional entities comprising the ecosystem (e.g., policy-makers, private sector businesses, venture capitalists, funding agencies, universities, colleges, polytechnics and business schools, research institutes, Centers of Excellence supported by federal or industrial funding, state and local economic development organizations).³ The knowledge economy (driven by fundamental research) and the commercial economy (driven by the marketplace) are connected.⁴

³ Jackson, *What Is an Innovation Ecosystem?*, 2.

⁴ Ibid.

CHAPTER 2

Israel's Science, Innovation, and Commercialization Ecosystem

Chapter Summary

- Israel is a world leader in attracting venture capital, ranks among the world's top two countries in business R&D spending, and is among the top countries in the world for start-ups and rapid-growth firms.
- Critical institutions and programs contributed to success, including the YOZMA venture capital program, MAGNET, the Technological Incubators Program, procurement initiatives connected to Israel's need for military and defence technologies, the Israeli Innovation Authority, and the Bi-national Industrial Research and Development Foundation.
- Key principles and strategies provided motivation and guidance, including focusing on the private sector, flexibility and insulation from politics, and building strong networks.
- Israel's innovation experience has faced, and continues to face, some challenges, including persistent weaknesses in certain capacities, new and emerging risks to be managed, and inequities in the distribution of innovation activity and economic growth benefits.

Across a range of indicators, Israel's innovation capacity, activity, and outcomes are strong.

In many respects, Israel's innovation performance is spectacular. Israel is a world leader in attracting venture capital, ranks among the world's top two countries in business R&D spending, and is among the top countries in the world for start-ups (with the highest number of start-ups relative to its population size¹) and rapid-growth firms.

With its well-educated and highly skilled researchers, and a suite of programs to support business innovation, Israel has developed many globally competitive information technology products and components, exhibits great strength in cyber security, and continues to innovate in a range of other areas.

Recognizing the unique and non-reproducible geopolitical and historical circumstances that motivated Israel to become an innovation leader, the world nevertheless looks to Israel for lessons about how to create the right conditions for innovation to thrive in their own economies. How has Israel structured its innovation ecosystem to generate and sustain success? What are the key programs, investments, and characteristics that constitute the country's innovation environment?

This chapter offers a snapshot of how the country performs on key innovation indicators and a picture of the key principles, programs, and institutions that constitute the Israeli innovation ecosystem.

Some Key Metrics

Across a range of indicators, Israel's innovation capacity, activity, and outcomes are strong. The country's high level of business R&D spending is well known—outperforming OECD as a whole and jockeying with Korea for top spot in international comparisons. The steep rise in **business R&D spending** that began in the mid-1990s reflects a return on investment of Israel's early, consistent efforts to build innovation

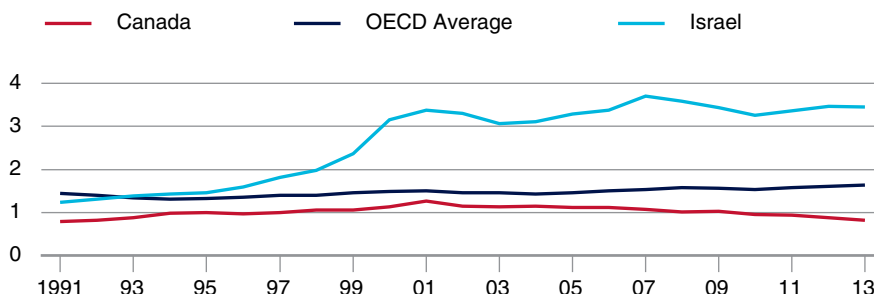
1 Chorev and Anderson, *Success in Israeli High-Tech Start-Ups*.

capacity and the introduction of programs to further support business innovation activities. (See Chart 1.)

Chart 1

Business Enterprise R&D, 1991–2013

(per cent of GDP)



Sources: OECD; Statistics Canada.

Similarly, Israel is a world leader in venture capital investment. (See “A Record-Breaking Venture Capital Year” and “Vintage Investment Partners.”) With investment at 0.335 per cent as a share of GDP, Israel attracts nearly twice as much **venture capital** as the U.S. (0.173 per cent) and more than three times as much as Canada (0.102). (See Chart 2.) If we look at California’s performance as a stand-alone jurisdiction (1.1 per cent), it dwarfs all other jurisdictions’ venture capital performance, including Israel. Still, Israel’s success in attracting investment provides another signal of its innovation achievements and future potential. As one speaker noted during the study tour, investment per capita in Israel is \$423, compared with \$186 in the U.S., \$16 in Europe, and \$14 in China—and over 85 per cent comes from non-Israeli sources.² Moreover, Israel has a high **business creation** rate—13.06 per cent in 2013. (See Chart 3.) As a percentage of existing firms, Israel’s start-up rate outpaces most comparator countries. (See Chart 4.)

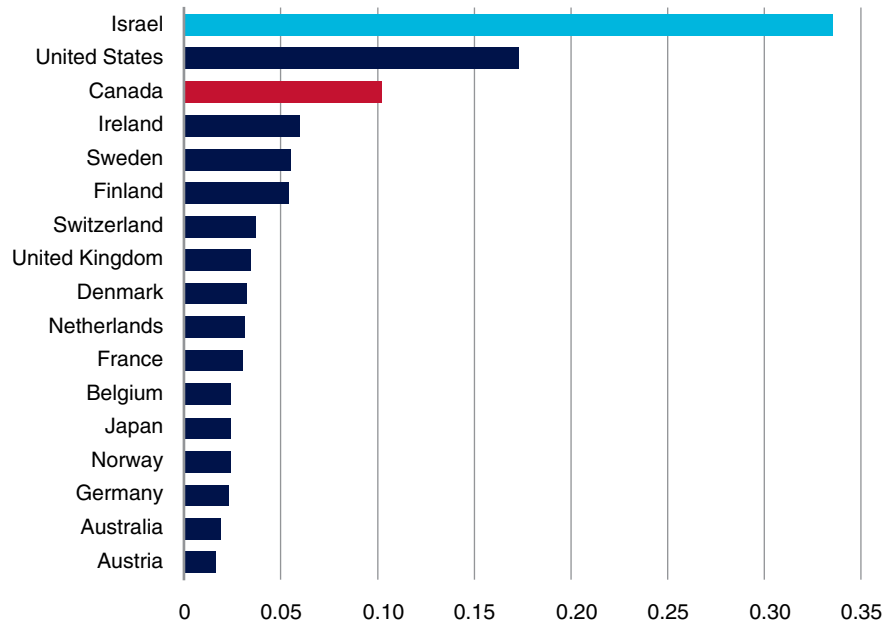
2 Uri Weinheber (CEO and Partner, Thetime Incubator), Israel Innovation Study Tour presentation, November 28, 2016.

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Chart 2

Venture Capital Investment, 2012–13 Average

(per cent of GDP)

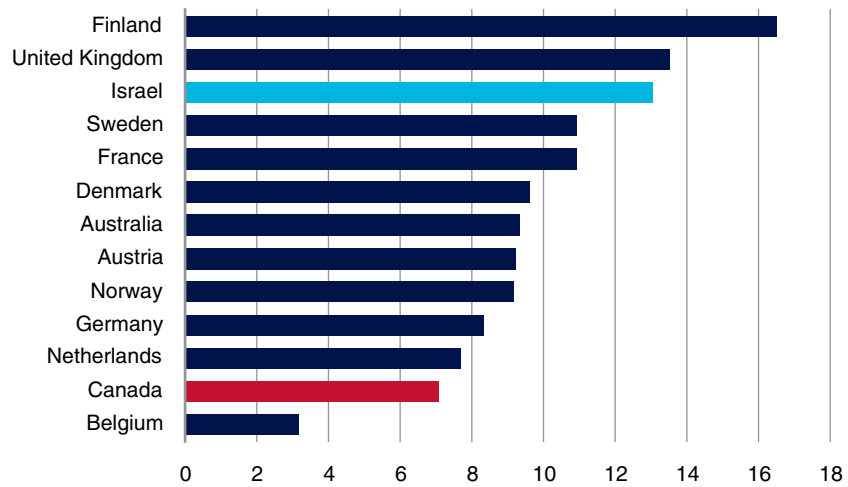


Source: OECD.

Chart 3

Business Creation, 2013

(new firms as a per cent of active firms)

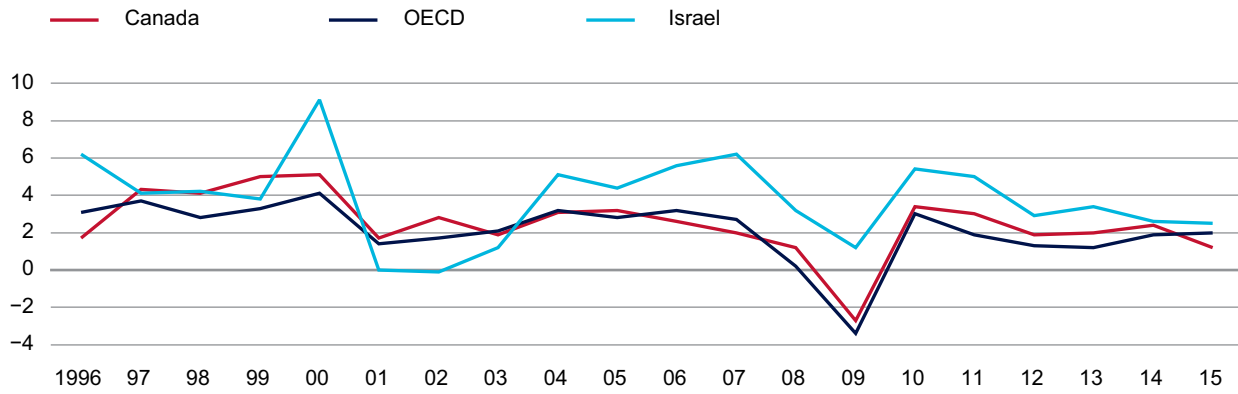


Note: Data for the U.S. were not available in comparable formats for these indicators.
Source: OECD.

Chart 4

Real GDP Growth, 1996–2015

(annual growth, per cent)



Source: OECD.

A Record-Breaking Venture Capital Year

The Israeli Venture Capital (IVC) Research Centre's 2016 report notes that 2016 Israeli venture capital fundraising activity reached \$1.4 billion over 23 venture capital funds and was expected to reach \$1.6 billion, surpassing the 2015 vintage year's \$1.5 billion raised by 19 funds and setting a new decade record.³ Four of these funds raised over \$100 million each, with \$307 million for OrbiMed Israel Partners' second fund, \$200 million for Vintage's ninth fund, \$180 million for Aleph's second fund, and \$150 for Red Dot Capital Partners' first-time growth fund. Of the \$3.5 billion available for Israeli venture capital fund investment at the start of 2017, over \$1.1 billion is reserved for first investments, with the remainder for follow-on investments.⁴

Sources: Weinheber; IVC Research Centre.

3 IVC Research Centre, *Israeli Venture Capital Fund Raising—2016*.

4 Ibid.

Vintage Investment Partners

Vintage Investment Partners is a secondary fund and leading late-stage co-investment group. With fund investments in Israel, Europe, and the U.S., Vintage manages roughly \$1.3 billion across eight funds and managed discretionary accounts.⁵ A leading technology investor, Vintage connects its companies to investors, customers, and strategic partners. Its secondary funds (approximately \$350 million) acquire limited partnership interests in Israel, Europe, and the U.S., direct portfolios of Israel-related venture or private equity-backed companies, and individual shareholdings of private Israel-related venture and private equity-backed companies. Its fund of funds (approximately \$620 million) invest in venture capital funds and “low-funded” or “early” secondary opportunities, and its co-invest funds (approximately \$210 million) invest in late-stage rounds alongside other leading funds and institutional investors.⁶

Vintage's Managing Partner and Co-Founder, Alan Feld, notes that a key element driving entrepreneurial and start-up success is strong support from the government and private sector. The Israeli government reduces risk by funding 80 to 85 per cent of the cost of many business ventures, and the private sector also provides substantial investments through local funds, mega and micro/small venture capital funds, as well as angels and incubators.⁷

Sources: Vintage Investment Partners; Alan Feld.

Israel's **labour productivity** lags comparator countries by a wide margin, which is a major concern for the country. At US\$34.70 per hour worked, Israel's labour productivity is 72 per cent of Canadian labour productivity, 56 per cent of U.S. productivity, and only 44 per cent of Norway's labour productivity.⁸ At the same time, **real GDP growth** in Israel is high and outpaced the OECD average in 17 of 20 years between 1996 and 2015. (See Chart 4.) Thus, while there is room for improvement in Israel's economy and innovation ecosystem, it performs very well on a number of key measures.

5 Vintage Investment Partners, *Who We Are*.

6 Ibid.

7 Alan Feld (Managing Partner/Co-Founder, Vintage Investment Partners), Israel Innovation Study Tour presentation, November 27, 2016.

8 Munro, *Learning From Israel's Innovation Experience*.

The Yozma Group directly invests in 50 portfolio companies.

Institutions and Programs

A number of institutions and programs have been critical to Israel's innovation success, including the YOZMA venture capital program (see "YOZMA"), MAGNET (a program to support consortia to develop generic, shared-use technologies (see "MAGNET"), the Technological Incubators Program (to provide funding and business expertise to technology entrepreneurs), and a host of procurement initiatives connected to Israel's need for military and defence technologies.⁹ One institution—the Office of the Chief Scientist (now the Israel Innovation Authority)—and one program—the Bi-national Industrial Research and Development (BIRD) Foundation—have been especially important.

YOZMA

The Yozma Group grew out of a government program specifically designed to attract experienced international venture capitalists to Israel. In 1992, the Israeli government gave Yigal Erlich, the Israeli Ministry of Industry and Trade's Chief Scientist, US\$100 million to create a venture capital firm called Yozma.¹⁰ In 1993, Erlich effectively created Israel's professionally managed venture capital market by forming Israel's first venture capital fund, Yozma I. To qualify for \$8 million in matching investments from Yozma, venture capitalists had to raise approximately \$12 million in private capital and team up with a local Israeli partner.¹¹ Key program elements included supporting many small funds, fostering relationships between international and Israeli venture capitalists, and not trying to pick winners.¹²

In its first three years, The Yozma Group established 10 drop-down funds (each with over \$20 million capitalized) and started funding start-up companies through direct investments.¹³ Today, The Yozma Group focuses on high-growth companies in the information technologies, communications, and life sciences

9 Ibid.

10 Tay, "Israel's VC Industry Thrived Because of Yozma."

11 Sorenson, "Israel's Yozma an Example for Canada."

12 Ibid.

13 The Yozma Group, *Overview*.

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sectors. Through its three funds (Yozma I, II, and III), it has managed over \$220 million and directly invests in approximately 50 portfolio companies.¹⁴

Sources: Tay; Sorenson; The Yozma Group.

MAGNET

In the early 1990s, Israel's leading research universities were largely operating independently from Israel's high-tech industrial sector. In 1994, the Office of the Chief Scientist therefore developed the MAGNET (the Hebrew acronym for Generic, Pre-Competitive Technological R&D)¹⁵ program to support academic, institution, and industrial firm consortia to develop generic, pre-competitive technologies.¹⁶ The MAGNET program manages partnerships between commercial R&D and academic programs by facilitating knowledge transfer. Multi-year R&D support is provided in the form of grants (up to 66 per cent of the approved R&D budget for an industrial company and 100 per cent of the approved budget for the research institutions—80 per cent of which is a grant and 20 per cent of which comes from the industrial companies in the consortium—for three to five years).¹⁷ In these partnerships, industry need is a prime motivator for post-secondary education-based research.

In February 2017, Canada's Ontario Centres of Excellence (OCE) partnered with the Israel Innovation Authority (IIA) to form a new \$20-million bilateral program for cybersecurity in the financial services sector called the Ontario-Israel Research Network Program—MAGNET (OIRNP—MAGNET).¹⁸ The \$5 million in funding provided by both OCE and IIA will be matched by \$10 million from participating small and medium-sized enterprises (SMEs). OCE will provide funding to successful Ontario SMEs and IIA will fund successful Israeli SMEs.¹⁹

Sources: Israel Innovation Authority; Trajtenberg; Ontario Centres of Excellence.

14 Ibid.

15 Israel Innovation Authority, *MAGNET Consortiums*.

16 Trajtenberg, *R&D Policy in Israel*.

17 Israel Innovation Authority, *MAGNET Consortiums*.

18 Ontario Centres of Excellence, *Ontario and Israel Partner on \$20-Million Research Network*.

19 Ontario Centres of Excellence, *Ontario-Israel Research Network Program—MAGNET*.

IIA is designed to help Israel's high-tech industry overcome a number of unique challenges.

Israel Innovation Authority (Office of the Chief Scientist)

The Israel Innovation Authority (IIA) is the central agency that manages the Israeli government's support for the country's innovation ecosystem. Replacing the Office of the Chief Scientist (OCS) of the Ministry of Economy & Industry, and the Israeli Industry Centre for R&D (MATIMOP), IIA is designed to help Israel's high-tech industry overcome a number of unique challenges, including a highly competitive global marketplace, external target market dependence, foreign world market financing fluctuations, dynamic and rapidly changing competition, and diverse technological demands. It does so through support systems, reduced restrictions, as well as new funds and financial instruments, guarantees, and creative lending programs.²⁰

Established in 1974, OCS began focusing its attention on firms, based on the assumption that firms are best positioned to conduct R&D and to select the most promising projects and technologies to drive innovation. OCS concentrated on addressing market failure in innovation R&D by lowering risk and supporting growth in technology-based exports through a variety of programs. In its most active years, OCS was characterized by substantial resources and freedom to operate without political pressure.²¹

In its current incarnation as IIA, the agency fosters public-private partnerships by working with entrepreneurs, universities, applied research organizations, growth-stage companies, and multinational corporations.²² IIA incents industry directly with grants, often industry-driven, and assesses based on merit rather than on government directives to support particular sectors. Incubator and venture capitalist programs match government support (between \$700,000 and \$800,000) with industry capital to help start-ups grow. Policy-makers should note

²⁰ Hasson, *National Authority for Innovation Established*.

²¹ Munro, *Learning From Israel's Innovation Experience*.

²² Israel Shamay (Executive Director, Head of the Americas Operations, Israel Innovation Authority); Les Abelson (Canada-Israel Industrial R&D Programs, Israel Innovation Authority), Israel Innovation Study Tour presentation, November 27, 2016.

that IIA has a very focused approach to growth. Its structure includes separate divisions that target companies by stage and that focus on specific issues relating to innovation. Its innovation divisions include Startup, Growth, Technological Infrastructure, International Collaboration, and Societal Challenges.²³

Bi-national Industrial Research and Development Foundation

In 1976, Israel and the U.S. created the Bi-national Industrial Research and Development (BIRD) Foundation whose purpose was to “encourage cooperation between firms in the U.S. and Israel to jointly develop and sell new products.”²⁴ BIRD funds up to half of joint R&D projects, involving at least one company from the U.S. and one from Israel, the revenues from which are shared by the two companies. It also plays an important role in mentoring Israeli firms on how to approach and work with larger American firms.

By the 1980s, BIRD was playing a key role in “luring MNCs [multinational corporations] to open R&D centres in Israel.”²⁵ BIRD focused its efforts on attracting U.S.-based Israeli R&D executives back to Israel, and on encouraging U.S. firms that had participated in previous BIRD-sponsored projects to expand their operations. In addition to offering a variety of incentives, including access to generous funding programs and tailored ownership and registration options, BIRD became very successful in using its contacts to encourage MNCs to establish R&D facilities in Israel. Of the 282 R&D centres in Israel, more than 250 are operated by foreign companies and MNCs. In many cases, a division of labour emerged whereby Israeli-owned firms would conduct much of the most technologically sophisticated R&D, while American MNCs would leverage their global production and supply chains, and use their advanced commercialization and marketing skills to bring products to global markets.²⁶

23 Israel Innovation Authority, *About*.

24 Breznitz, *Innovation and the State*, 58.

25 *Ibid.*, 59.

26 *Ibid.*

Israel's successful business incubator program is designed to address a lack of financial support for high-risk technology start-ups.

By 2015, BIRD had funded more than 930 projects, with total sales from those projects exceeding US\$10 billion. The Foundation has delivered \$329 million in grants, received \$104 million in repayments, and earned \$266 million in interest on its endowment. The 26 projects funded in 2015 were in the areas of energy and water (9 projects), agrotechnology (4), electronics (4), software (3), life sciences (2), communications (1), health care information technology (1), and other areas (2).²⁷

Business Incubators

Israel has also developed a rich ecosystem of business incubators. Recognizing that having a handful of large, globally competitive firms requires a base of thousands, Israel has encouraged start-up activity. Indeed, as Chart 3 revealed, Israel produces an extremely high number of new businesses—more than 10,000 in the last 15 years, according to the Bank of Israel's deputy governor.²⁸ But these start-ups need support. Israel's successful business incubator program is specifically designed to address a lack of financial support in the ecosystem for high-risk technology start-ups. (For example, see "The Trendlines Group" and "Thetime.") In 2015 alone, Israel created 1,400 new technology start-ups.²⁹ Israel's licensed incubators can acquire 85 per cent of the total start-up investment from the government, which lowers their risk and helps attract private industry funders and partners.³⁰ Israel's rich R&D and business incubator environment also attracts other MNCs to set up business incubators of their own in Israel. (See "Citi's Incubator.")

27 BIRD Foundation, *Annual Report 2015*.

28 Nadine Baudot-Trajtenberg (Deputy Governor, Bank of Israel), Israel Innovation Study Tour presentation, November 29, 2016.

29 Roland Berger, *Lessons From the Start-Up Nation*.

30 Ibid.

The Trendlines Group

The Trendlines Group is an intensely hands-on innovation commercialization company that invents, discovers, invests in, and incubates technologies in the medical and agricultural fields. Investing primarily through two Israeli government franchised incubators (Trendlines Medical and Trendlines Agtech) and their in-house innovation centre (Trendlines Labs), the company is involved in everything from technology development to business-building.³¹ Trendlines provides R&D, business development, finance, banking, law, communications, marketing, and media expertise.³²

CEO and Chairman of The Trendlines Group, and Chairman of the Mofet Venture Accelerator, Steve Rhodes, credits Israel's strong business incubator system for a large portion of Israel's high-tech start-up success. The capital provided by government-licensed incubators (through both government and private sector funding) allows entrepreneurs and inventors to take greater risks.³³ At Trendlines, initial government funding investments of \$700,000 (intended to last for two years) are matched by approximately \$100,000 to \$150,000 in funding from Trendlines. Trendlines also provides other support services, which can total approximately \$450,000 over two years. In exchange for these funds and services, Trendlines engages in a 50/50 partnership with its entrepreneurs. Once companies begin to make money, they take over more of the service costs and begin to pay back the initial investment. Trendlines only invests in companies that would not otherwise get started without Israel's incubator system.³⁴

Sources: Trendlines; Steve Rhodes.

31 Trendlines, *Our Story*.

32 Ibid.

33 Steve Rhodes (CEO and Chairman, The Trendlines Group; Chairman, Mofet Venture Accelerator), Israel Innovation Study Tour presentation, November 28, 2016.

34 Ibid.

The time

The leading early-stage investor in digital space technologies, Thetime group focuses on young innovative technology start-ups in digital life technologies (e.g., the Internet of things, wearable devices, smart homes and smart cities, connected vehicles, digital health and wellness, and digital media, among others) through two investment platforms—first-time seed-stage investments, and post-seed and “A-round” investments.³⁵ Thetime currently has over 50 active start-ups. From the venture capital perspective, Thetime only accepts companies that can show that the market accepts the technology (through actual revenue, partnerships, or agreements). Thetime typically starts with an investment of at least \$0.5 million in the seed stage and potentially adds another \$1 million through various subsequent stages for a 25 to 30 per cent share in the company.³⁶ Thetime has received the best Israeli incubator award three times and has partnerships with leading technology companies around the world.

Thetime’s CEO and Partner, Uri Weinheber, notes that investing in seed-stage companies in Israel provides a high return on investment because of the combination of strong government and venture capital funding, multiple investment vehicles, and a good network of partners around the world. His four keys to incubator success include identifying the most promising opportunities (understanding market trends to identify the most attractive, innovative companies to invest in), offering companies the necessary incubation services and providing hands-on support along the way (for everything beyond the actual technology development), creating win–win funding structures, and connecting companies with good international partners.³⁷

Sources: Thetime; Uri Weinheber.

35 Thetime, *About Time*.

36 Uri Weinheber (CEO and Partner, Thetime Incubator), Israel Innovation Study Tour presentation, November 28, 2016.

37 Ibid.

Citi's Incubator

Israel's FinTech sector has a high concentration and close proximity advantage (e.g., its FinTech ecosystem includes 450 start-ups and is rapidly growing). Citi is the largest foreign financial bank in Israel and focuses on innovation in four key areas—mobile technology,³⁸ big data, cyber security, and financial technology.³⁹ Citi's Israeli Innovation Centre includes the TLV Innovation Lab, the TLV Innovation Big Data Lab, the TLV Innovation Lab Accelerator, and the TLV Innovation Security Lab. Citi's high-end innovation labs and accelerator help Israeli start-ups develop proof of concept, work with mentors, successfully launch, and scale up to global markets. Created in 2013, Citi's successful accelerator program has already helped launch 53 start-ups, attract alumni investment of over \$200 million, produce award-winning companies, and facilitate business deals with other external financial companies.⁴⁰

Sources: Citi; Jeremy Bentley.

Principles and Strategies That Support the Israeli Innovation Ecosystem

The strong performance on key metrics noted above, and the ecosystem of innovation-supporting institutions and programs, are the result of deliberate design. Indeed, Israel's innovation ecosystem approach did not evolve by accident; rather, it is the product of intentional decisions and investments dating back to the 1960s and 1970s—including state-led efforts to produce a highly educated science, technology, engineering, and mathematics (STEM) workforce, substantial military procurement of technology from the private sector, and substantial state funding for R&D projects. The motivation and design of key features of the Israeli ecosystem have been guided by three core principles—a

38 Citi's foreign exchange mobile application is the largest trading platform for mobile phones.

39 Citi, *Citi at a Glance*.

40 Jeremy Bentley (Vice-President, Citigroup), Israel Innovation Study Tour presentation, November 20, 2016.

The number of patents reflects a deliberate investment strategy on the part of Israeli decision-makers.

focus on the private sector, flexibility and insulation from politics for innovation agencies and programs, and a recognition of the importance of networks.

Focus on the Private Sector

Israel has been keenly focused on identifying programs and strategies to stimulate innovation in the private sector. Even as the government invests in higher education and public research facilities, it seems almost always to have its eyes on how its investments and efforts link directly to sparking and supporting innovation in the private sector. R&D spending by the government has been heavily weighted toward the private, rather than the public, sector. When Israel required rapid development of military and defence technologies, it leaned toward supporting their development by, and procuring them from, the private sector.

While Israel performs very well on key indicators of business innovation, a close look at many indicators reflects its decision to focus on the private, rather than the public, sector for research and innovation. Although Israel is a laggard on public R&D spending, and its production of scientific articles is average among comparator countries, the number of Israeli patents on a per capita basis is one of the highest in the world.⁴¹ (See charts 5 and 6.) This reflects a deliberate investment strategy on the part of Israeli decision-makers. The country makes its major innovation investments in the business sector and, to the extent that it does invest in public research, it largely focuses on science and engineering, and other areas where the impact on innovation and technology development will be strongest. Moreover, Israel is home to more researchers per 1,000 population than comparator countries and the share employed in the private sector is unmatched by other countries. (See Chart 7.)

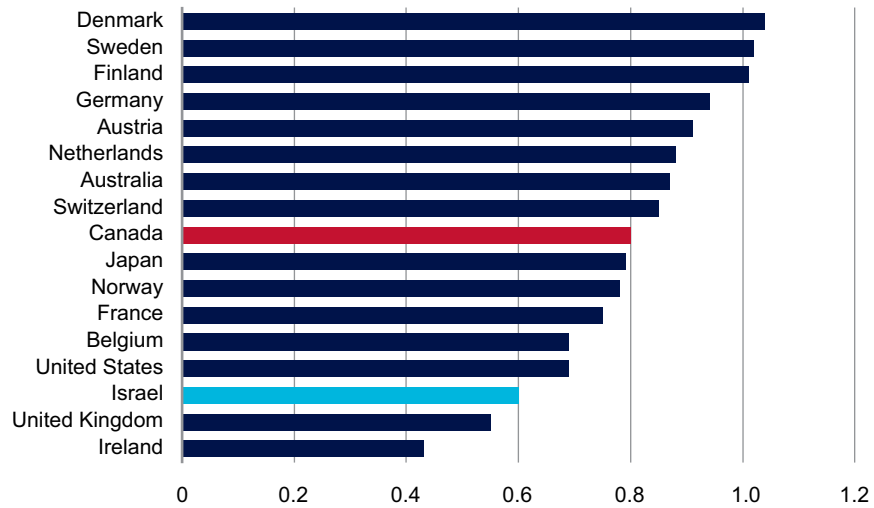
41 Israel ranked third in the number of patents per head in the most recent *World Economic Forum's Global Competitiveness Report 2015–16*.

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Chart 5

Public R&D Spending, 2013, or Most Recent Year

(per cent of GDP)

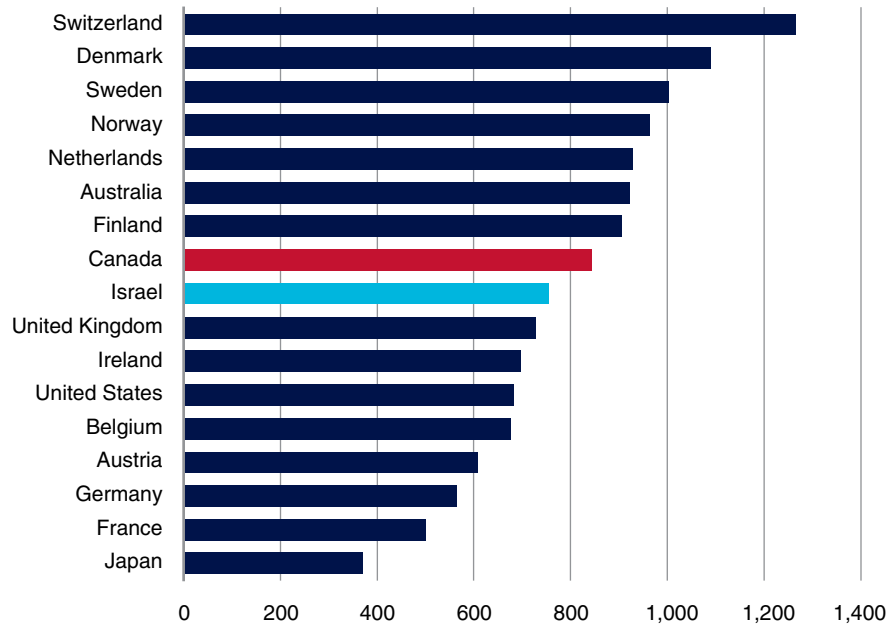


Sources: OECD; Statistics Canada; The Conference Board of Canada.

Chart 6

Scientific Articles, 2011

(number of science and engineering articles per million population)

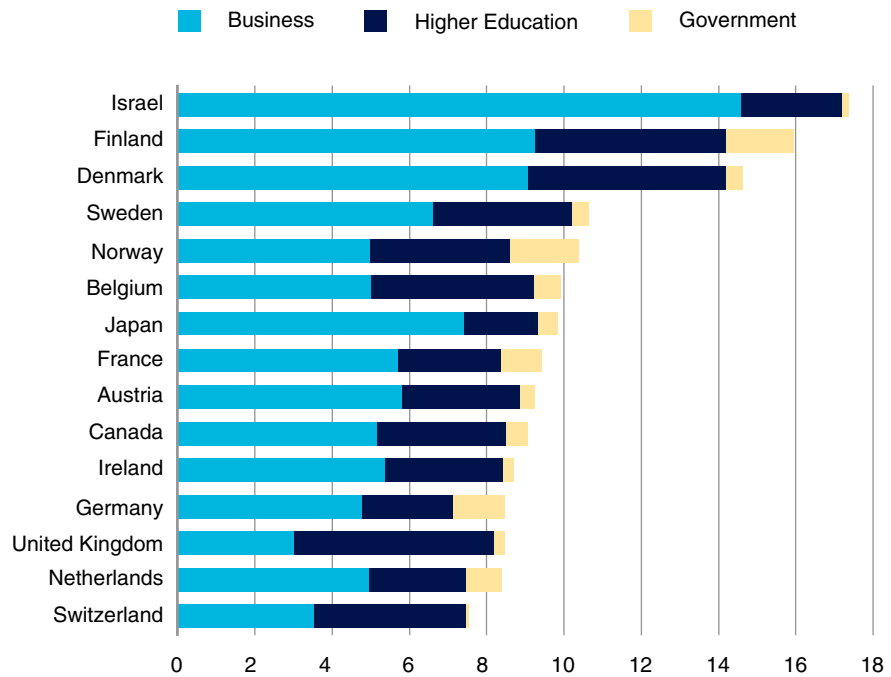


Sources: OECD; Statistics Canada; The Conference Board of Canada.

Chart 7

Researchers Engaged in R&D, 2014

(researchers per 1,000 employed)



Note: Data for the U.S. were not available in comparable formats for these indicators.
Source: OECD.

Flexibility and Insulation From Politics

Another prominent feature of Israel’s innovation ecosystem and success has been the attempt to insulate critical institutions and decisions from political pressures. Recognizing that innovation and technology capacity needed to be developed quickly and nimbly—and assuming conventional political processes and concerns would impede decisions and actions—a handful of key individuals were given resources and latitude to make investments and decisions with minimal bureaucratic or political interference. To be sure, this approach has raised questions about accountability and fairness, but it did produce results in the Israeli context.

In a recent talk in Canada, a senior official with the Israeli Innovation Agency (formerly the Office of the Chief Scientist) observed that this principle applied even to the name chosen for the Office of the Chief

Israel has been fearless in going out into the world and promoting its innovation economy.

Scientist. Although really an “innovation” investment agency, the institution was placed in the “science” camp to limit attention from politicians who were assumed to be much less interested in “science” than in “innovation.”⁴²

Build Networks

Israel has numerous innovation strengths, but recognizes that it is not perfect and needs to partner with others to be successful. Previous decision-makers have observed that management and marketing skills, and access to global markets and networks, would be important for success. Indeed, as trade opportunities with neighbouring countries are limited, Israel has had to look offshore—particularly to Europe and the U.S.—and build a global outlook into its innovation ecosystem. Thus, Israel has taken steps to build on relationships with the Jewish diaspora in the U.S.—many of whom had the skills and resources needed to support Israeli innovation—and continues to look for ways to build networks and connections with others who can help Israeli innovation thrive. Israel has not always explicitly created network-building initiatives or programs, but would identify *specific* Israelis and put them to work to find and reach agreements with specific people who could provide tangible benefits and opportunities.⁴³

As Deborah Lyons, the recently appointed Canadian Ambassador to Israel, noted on the study tour, Israel is focused, fearless, and not afraid of failure. Its *focus* on becoming an innovation start-up economy was a deliberate, unifying policy decision.⁴⁴ It has been *fearless* in going out into the world and promoting its innovation economy. And it exhibits *a high tolerance for failure and risk-taking*.⁴⁵ In many ways, these observations echo the principles and motivations that have underpinned the development and success of the Israeli innovation ecosystem.

42 Israeli Innovation Agency (presentation at the Munk School of Global Affairs, University of Toronto, February 2016).

43 Munro, *Learning From Israel's Innovation Experience*.

44 This policy decision helped to reinforce an already existing sense of community.

45 Deborah Lyons, Canadian Ambassador to Israel, Israel Innovation Study Tour presentation, November 27, 2016.

Challenges and Risks to Israel's Innovation Ecosystem

Israeli's innovation ecosystem is not without its challenges. There are some persistent weaknesses in parts of the innovation ecosystem, new risks to be managed, and inequities in the distribution of benefits from Israel's innovation activity and economic growth. Key actors in Israel have identified and are trying to address five challenges.

Heavy Reliance on MNCs

Although Israel has been successful in partnering with other countries and working with global firms, some have wondered whether they are too dependent on external firms. For example, more than 40 per cent of business R&D spending in Israel has foreign origins (versus 10 per cent in Canada), which leaves much of Israel's innovation economy susceptible to the effects of decisions made elsewhere.⁴⁶ There is also a concern that, because of the reliance on MNCs, a significant portion of the value produced by innovation is leaving the country.

Persistent Management and Marketing Weakness

Israel has developed and exploited strengths in R&D-intensive software and hardware activities and has carved itself a clear niche in global value chains. Its technical capacities are world-class. However, because Israel has long focused on R&D and technical engineering strength, it has not spent as much time developing capacity on the management, marketing, and business development parts of innovation. In fact, the BIRD program was designed in a way that allowed Israeli firms to focus on their technical strengths and partner with firms in the U.S. that had greater management and marketing strengths. Although that solution made sense at the time, experience with the program arguably has reinforced the problem by removing the need for many Israeli firms to develop those capacities themselves.⁴⁷

⁴⁶ Munro, *Learning From Israel's Innovation Experience*.

⁴⁷ Munro, *Learning From Israel's Innovation Experience*; Breznitz, *Innovation and the State*.

Israel's innovation miracle has not produced benefits for everyone.

Difficulty Growing Businesses to Scale

Israeli firms are good at developing new software and hardware technologies and components, and selling these to MNCs, but the country's track record of growing firms to global scale is mixed. According to an IIA official, pressure from venture capitalists for quick returns incentivizes entrepreneurs to start new companies and/or sell to MNCs, rather than focus on growth.⁴⁸ Moreover, the historical focus on R&D and technology development has left Israel with more STEM skills than managerial skills and experience to grow firms.

Low Productivity

As noted, there is also a concern about Israel's lagging productivity performance. Labour productivity growth over time is slightly better in Israel than in Canada, but both are well behind the U.S. and the G7. And despite slightly outpacing Canada on average annual productivity *growth*, Israel was so far behind international comparators that the productivity gap has not improved. Part of the challenge is that with a strong focus on high-tech innovation, much less attention has been paid to other industries. Israel's services sector in particular needs productivity-improving innovation, but until recently this was not on decision-makers' radar.⁴⁹

Unequal Distribution of Benefits

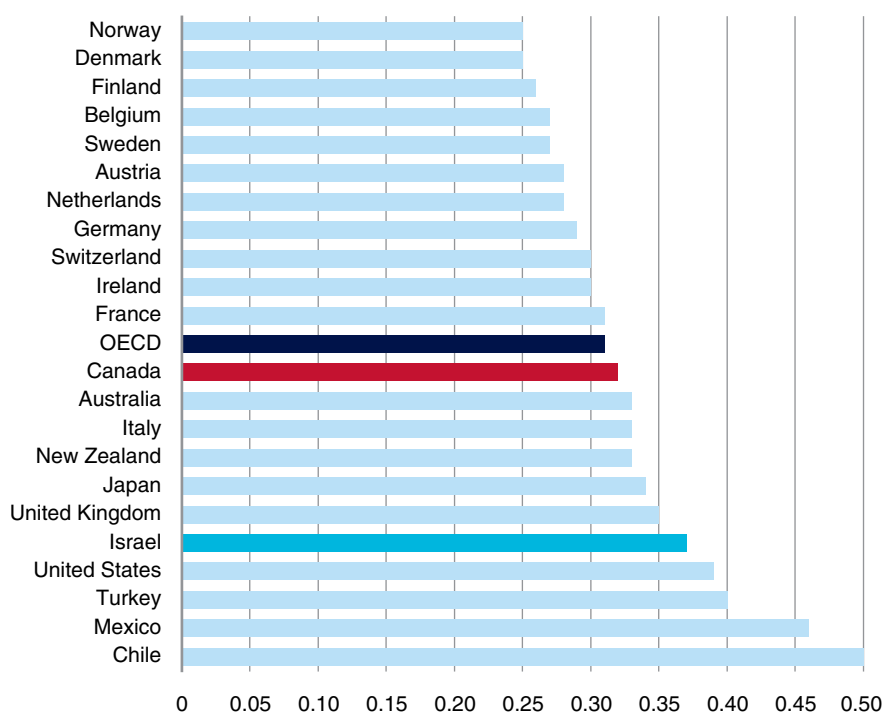
Israel's innovation success has been focused on high-tech sectors and workers, while other sectors and workers have been largely left out of the innovation miracle. As a result, Israel exhibits both higher levels of income inequality than most developed nations—the U.S. being the major exception—and higher levels of relative poverty. (See charts 8 and 9.) Although other factors besides innovation have played a role, Israel's innovation miracle has not produced benefits for everyone. As a number of study tour presenters noted, Israel needs to do a better job incorporating Arab and Ultra-Orthodox Jewish populations into the

48 Israeli Innovation Agency (presentation held at the Munk School of Global Affairs, University of Toronto, February 2016).

49 Munro, *Learning From Israel's Innovation Experience*; Israeli Innovation Agency.

innovation economy to reduce inequalities.⁵⁰ The concern is that the innovation miracle itself might be unsustainable in the face of persistent inequality and poverty.⁵¹ The Israeli government, through partnerships with industry and post-secondary education institutions, is taking steps to address this inequality. (See “The Ma’antech Project.”)

Chart 8
Income Inequality, 2012
 (Gini coefficient)



Sources: OECD; The Conference Board of Canada.

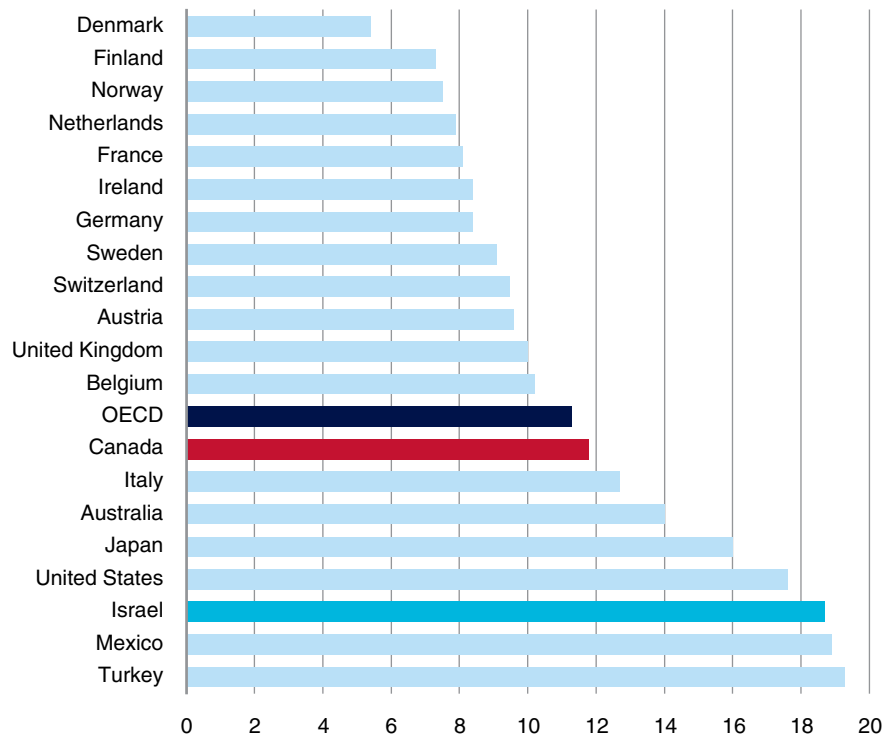
50 Israel Innovation Study Tour presenters; Paz-Frankel, "A Look Inside the Booming Startup Nation."

51 Taylor, *The Politics of Innovation*.

Chart 9

Relative Poverty, 2013

(percentage of population with less than half of median income)



Sources: OECD; The Conference Board of Canada.

The Ma'antech Project

In 2011, former Israeli President Shimon Peres and Cisco Chairman and CEO John Chambers launched Ma'antech, a coalition with over 40 high-tech companies, to integrate Arab-Israeli engineers into Israel's high-tech industry and strengthen their entrepreneurship opportunities.⁵² As a result of the program, the number of Arab engineers in the industry has doubled over the last three years. Over the last six years, programs and policies such as these have helped to increase the total number of Arab professionals in Israel's tech sector from 250 to 3,000, and employment rates for Arab-Israeli women to increase from 26 to 35 per cent.⁵³

Sources: The Peres Center for Peace; Matthew Godwin.

52 The Peres Center for Peace, *Ma'antech*; Godwin, "Inclusive Innovation."

53 Godwin, "Inclusive Innovation."

Recent and Future Developments

As these examples reveal, Israel's government plays a key role in driving innovation. In the early 1990s, it implemented a number of policy mechanisms and programs specifically designed to jump-start the dramatic growth of Israel's innovative sectors. In the coming year, Israel plans to strengthen its innovation capacity and performance and address many of the weaknesses and challenges that pose risks to its sustainability. OCS has transformed into the IIA and has added to its mandate the need to better address some of the challenges Israel faces, including maintaining Israel's R&D leadership, helping more technology firms grow to scale, and exploring how to link the innovation ecosystem to other (non-tech) parts of the economy (e.g., the large and growing services sector). Additionally, IIA and other key players will pursue actions and policies to include more workers in the innovation economy and to distribute benefits more equitably.⁵⁴

54 Munro, *Learning From Israel's Innovation Experience*; Israeli Innovation Agency (presentation held at the Munk School for Global Affairs, University of Toronto, February 2016).

CHAPTER 3

What Explains Israel's Innovation Success?

Chapter Summary

- Israel's innovation success is the product of its unique culture and history, as well as strategic investments in people and technologies to serve national needs.
- The existential threat faced in the 1960s and beyond sparked Israel's innovation trajectory, with the Six-Day War of 1967 marking a key turning point.
- Israel's outstanding higher education system supports technological development and commercial applications.
- Israel is particularly adept at establishing strategic partnerships among industry, academia, the military, government, and non-governmental organizations that support the innovation ecosystem and facilitate the flow of highly qualified human capital.

Israel's innovation success is a product of circumstance and choice. The challenges and opportunities provided by Israel's history and culture, as well as policy choices around education, partnerships, and other investments, combined to produce a highly innovative economy and society. The need and opportunity to innovate permeates many aspects of Israeli society.

An often-repeated theme, both during the study tour and in the literature, is the notion of necessity as *the mother of invention*. From defence requirements to natural resource scarcity, necessity drives Israeli innovation in a range of sectors, and Israel's culture, defence sector, education system, and strategic partnerships have been structured to meet those and other needs. (See, for example, "Water Technology and the Ashkelon Seawater Reverse Osmosis Plant.")

Water Technology and the Ashkelon Seawater Reverse Osmosis Plant

A key impetus for Israel's success is simple necessity. In response to the need for clean drinking water and sufficient water resources for a growing agricultural sector, Israel has invested considerable resources in water technology and infrastructure.¹ Israel's National Water Carrier (NWC) program² transfers water from the Sea of Galilee (Israel's only large freshwater body) in the north to the centre and south of the country. At peak capacity, 1.7 million m³ of water flow through NWC in a day (72,000 m³ per hour).³ Israel is also a global leader in drip irrigation technology, with Netafim selling its systems to over 100 countries around the world.⁴

1 Siegel, *Let There Be Water*.

2 A large-scale system of pumping stations, reservoirs, pipes, tunnels, and open canals.

3 Waldoks, "Inside the National Water Carrier."

4 Rosen, *Tiny Dynamo*.

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Israel has also become a world leader in water desalination. Its Ashkelon seawater reverse osmosis (SWRO) plant, located in the southern district of Israel on the Mediterranean coast, is a special-purpose joint-venture company (VID) consisting of IDE Technologies, Veolia, and Dankner-Ellern Infrastructure, which collectively built the plant. The \$223-million project was funded through a mixture of equity (23 per cent) and debt (77 per cent), and the revenue of the contracted period is expected to be around \$825 million. The largest SWRO plant in the world, the Ashkelon plant addresses the water needs of over 1 million people. It can produce up to 330,000 m³ of high-quality tap water per day—enough to meet approximately 13 per cent of Israel's domestic consumer demand (or 5 to 6 per cent of the country's water needs). The plant recently reached a world record for producing and delivering 1 billion m³ of water and has set a new benchmark for achieving one of the lowest prices for desalinated water in the world.⁵ Israel is also partnering with Jordan to build a joint venture Red Sea desalination plant that will supply water to Israelis, Palestinians, and Jordanians by 2020.⁶

Israel's path to innovation has advanced both as a result of—and despite—exceedingly challenging political and geographical conditions. On a site visit to the Ashkelon plant, tour delegates witnessed the political realities first-hand when they observed bomb shelters on site.

Sources: Siegel; Waldoks; Rosen; Water Technology; Jacobsen.

History

Modern-day Israel is the product of its unique historical, cultural, and political context. The land where Israel is situated today has been controlled by a succession of empires (Babylonian, Persian, Hellenistic, Roman, Byzantine, Arab, Crusaders, Mamluk, Ottoman, and British) and, throughout this time, many Jewish descendants dispersed throughout Europe and North America to avoid persecution. Yet, much of this diaspora⁷ yearned to return home and the early 20th century was marked by major waves of Jewish people fleeing persecution in neighbouring Arab

5 Water Technology, *Ashkelon, Israel*.

6 Jacobsen, "Israel Proves the Desalination Era Is Here."

7 Jewish people living outside of their homeland.

states and the Nazi regime in Germany and Europe during the Second World War, where more than 6 million Jews were killed in the Holocaust.⁸ (See “Yad Vashem, the World Holocaust Remembrance Centre.”)

Yad Vashem, the World Holocaust Remembrance Centre

Situated on the Mount of Remembrance in Jerusalem, Yad Vashem—the World Holocaust Remembrance Centre—is the world’s leading source for Holocaust education, documentation, and research. Yad Vashem accurately documents one of the darkest chapters in humanity’s history, safeguards and shares the memory of the Holocaust’s victims, and effectively grapples with ongoing challenges associated with ensuring that the Holocaust remains relevant to current and future generations, and that history is not repeated.⁹

Source: Yad Vashem.

Under British rule (1917–48), several important events occurred that set the stage for Israel’s independence. In 1917, the Balfour Declaration called for “the establishment in Palestine of a national home for the Jewish people,”¹⁰ and in 1922, Great Britain divided the land of Palestine between Israel (about 20 per cent of the land where the majority of Jewish residents of Mandate Palestine were living) and Transjordan (about 80 per cent of the land where the majority of the Arab Palestinians were living).¹¹ On May 14, 1948, Britain’s Palestinian mandate expired and it withdrew the last of its forces.

On the same day, the Jewish community, under the leadership of David Ben-Gurion, declared independence and announced the modern State of Israel.¹² Following this announcement, five Arab countries—Egypt, Syria, Transjordan, Lebanon, and Iraq—immediately invaded Israel in the War of Independence. The Sinai War (1956), Six-Day War (1967), and

8 Hanukoglu, *Israel: Brief History of Israel*.

9 Yad Vashem, *What Is Yad Vashem*.

10 Israel Science and Technology, *History of Israel: Balfour Declaration*.

11 Israel Science and Technology, *History of Israel: What Is Palestine and Palestinians?*

12 Israel Science and Technology, *History of Israel: Declaration of Independence*.

Yom Kippur War (1973) followed in short succession. Each time, Israel not only managed to defend itself against larger Arab armies, but also chose to withdraw from territory it had captured in an attempt to reach a peaceful conclusion.¹³ Israel voluntarily withdrew from the Gaza Strip in 2005 and no longer exercises sovereignty over the territory, which is now controlled by Hamas. (See “Key Elements Shaping Israel Today.”)

Key Elements Shaping Israel Today

- *Israel as an idea*: The State of Israel was a revolutionary innovation based on the Zionist dream of rejecting victimhood (based on centuries of discrimination and culminating in the Holocaust) and taking responsibility for creating a better future—of making the impossible possible, turning a dream into reality, and becoming one's own Messiah.
- *Israel as an immigrant society*: To create the State of Israel, Jewish people from around the world had to immigrate or “ascend” to Israel, which is a source of both energy and challenge.
- *Determining what Israel as a Jewish state means*: Theological and religious differences also mean that Israel is the one state in the world where people are still debating what being the Jewish state actually means.
- *The Israeli-Palestinian conflict*: Israel's population is 80 per cent Jewish and 20 per cent other (some Christian, but mostly Arabs who comprise the only Arab minority in the region). The division of land into Jewish and Arab states brought war with Arab countries. Arab Palestinians want a state of their own and the surrounding Arab states have always had issues with the Jewish people's right to live there. The Jewish and Arab populations must learn to co-exist—as no one is going anywhere, mutual exhaustion will hopefully eventually bring peace.¹⁴

Source: Wilf.

13 Hanukoglu, *Israel*.

14 Wilf, *Winning the War of Words*; Einat Wilf (Fellow, Jewish People Policy Institute), Israeli Innovation Study Tour presentation, November 28, 2016.

Curiosity-based research is strongly emphasized in the Israeli education system.

Culture

Many argue that Israeli culture plays a large role in its innovation success.¹⁵ A number of Israeli cultural traits are uniquely suited to support innovation ecosystems, including an emphasis on curiosity and questioning, an informal and non-hierarchical society, Israeli chutzpah (shameless audacity or impudence), and a unique approach to failure. Israeli children are taught to be inquisitive and creative—traits that enable entrepreneurs to seek innovative improvements and disruptive technologies that will transform industries.¹⁶ Israeli youth dream of becoming start-up entrepreneurs, and curiosity-based research is strongly emphasized in the Israeli education system.¹⁷

Curiosity and Questioning

Israeli author Amos Oz notes that this culture of questioning and debate can be traced back hundreds of years, as the Talmud (a religious book recording centuries of debates surrounding the interpretation of the Bible and its laws by rabbis) shaped Jewish religion and culture. Judaism and Israel have a long history of cultivating “a culture of doubt and argument, an open-ended game of interpretations, counter-interpretations, reinterpretations, opposing interpretations. From the very beginning of the existence of the Jewish civilization, it was recognized by its argumentativeness.”¹⁸

A Rejection of Hierarchy

Many Israel Innovation Study Tour speakers from the private sector, government, and academia emphasized the informal and non-hierarchical nature of Israeli society. They noted that students are encouraged to question their teachers, employees are encouraged to challenge their bosses, and new military recruits do not hesitate to speak

15 Numerous Israel Innovation Study Tour presenters emphasized this point.

16 Jeremy Bentley (Vice-President, Citigroup), Israel Innovation Study Tour, November 30, 2016.

17 Benny Geiger (President, Weizmann Institute of Science and the Israel Science Foundation), Israel Innovation Study Tour, November 30, 2016; Yuval Elovici and Oleg Brodt (Director and Senior R&D Director, respectively, Telekom Innovation Laboratories, Ben-Gurion University), Israel Innovation Study Tour, November 29, 2016.

18 Oz, untitled speech.

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up to superiors. This level of informality is often characterized by Israeli chutzpah, which Jewish scholar Leo Rosten describes as “gall, brazen nerve, effrontery, incredible ‘guts,’ presumption plus arrogance such as no other word and no other language can do justice to.”¹⁹ However, rather than standing out as offensive, frankness and assertiveness in Israel are cultural norms that are vital to ensuring that one is not left behind.²⁰ The level of informality present within different sectors of Israeli society is also reflected in the pervasive use of nicknames, which are regularly applied to Israel's most powerful and influential leaders.²¹

A Fearless Approach to Failure

The Israeli approach to failure is another powerful cultural factor. In Israel, failure is not feared, but is rather viewed as an educational opportunity—entrepreneurs learn from their mistakes and use this knowledge to improve the next round of start-ups. This approach helps foster an environment and appetite for risk.²² The terms some Israelis use—“constructive failures” or “intelligent failures”—reveal a commonly held belief of many local investors, that true innovation is impossible to achieve without tolerating a large number of failures.²³ This sentiment is supported by research showing that entrepreneurs who fail in a business venture have a much higher rate of success (one in five) in their next business venture.²⁴

Prominent Jewish scholars such as Dr. Einat Wilf have argued that these cultural aspects were in large part shaped by the 20th-century Jewish experience. Having survived centuries of discrimination and the horrors of the Holocaust, Jewish Israelis decided to reject victimhood and assert their right to self-determination by creating their own country and society—of being their own Messiah. Creating beautiful and wonderful things from

19 Rosten, *The Joys of Yiddish*, 5.

20 Senor and Singer, *Start-Up Nation*.

21 Ibid.

22 Nadine Baudot-Trajtenberg (Deputy Governor, Bank of Israel), Israel Innovation Study Tour presentation, November 29, 2016.

23 Senor and Singer, *Start-Up Nation*.

24 Gompers and others, *Skill vs. Luck*.

The State of Israel had to innovate or cease to exist.

such an unfathomable context required a rejection of existing norms; questioning; and assertiveness—cultural traits that continue to shape the modern labour force of Israeli society.²⁵ This “can do” culture and attitude is an important ingredient in Israel’s innovation ecosystem today.

Defence

The existential threat faced in the 1960s and beyond sparked Israel’s innovation trajectory, with the Six-Day War of 1967 marking a key turning point.²⁶ Before this war, France was a key ally of Israel. It served as the main supplier of Israel’s weapons, parts, and expertise; it provided Israel with technical assistance to develop nuclear capacity; and its aircrafts made up the core of Israel’s strong air force. But by 1962, France sought to repair relations with Arab nations in the region after its war with Algeria ended. As it could not be seen to be overly friendly with Israel, France’s relations with Israel deteriorated somewhat by the time the Six-Day War began. France’s condemnation of Israel’s strike on Egypt at the beginning of the War surprised almost everyone. And its series of arms embargos, although formally applying to the entire region, had the largest and most devastating effect on Israel.²⁷

Innovate or Die

Faced with enemies on all sides, and having been abandoned by its key ally, the State of Israel had to innovate or cease to exist. It was forced to shift resources and rapidly develop military technologies and capabilities in order to survive.²⁸ Israel’s military spending skyrocketed from 1966 to the early 1990s. (See Chart 10.) Although there is some variation in subsequent years, overall spending remained high. These high levels of military spending are a direct response to Israel’s existential crisis.²⁹

25 Wilf, Israel Innovation Study Tour presentation.

26 Munro, *Learning From Israel’s Innovation Experience*.

27 Breznitz, *Innovation and the State*.

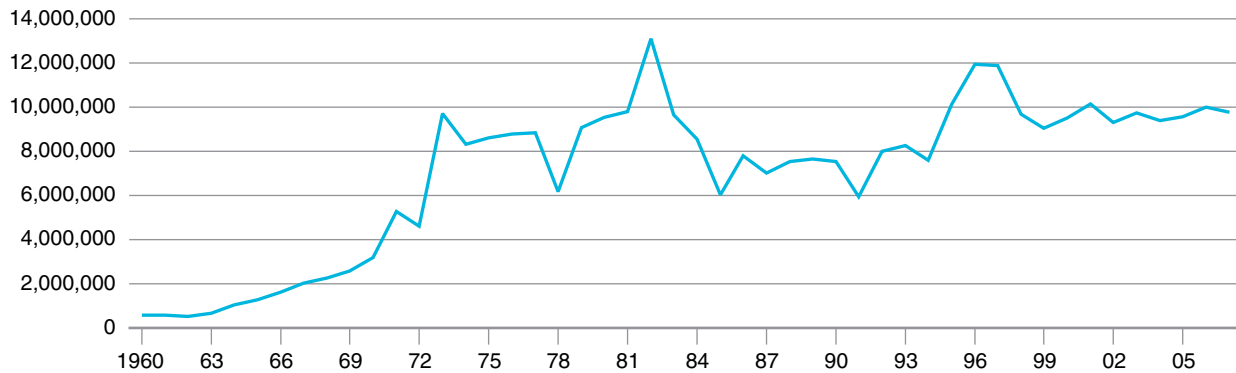
28 Munro, *Learning From Israel’s Innovation Experience*.

29 Ibid.

Chart 10

Israeli Military Spending, 1960–2007

(2000 US\$ 000s)



Source: Roser and Nagdy.

As of 2013, Israel was still spending a large amount on defence as a share of GDP. (See Chart 11). Although 5.9 per cent is much lower than the 20 to 25 per cent that Israel saw in the 1970s and 1980s, Israel's economy has grown—that is, although defence spending is still quite high, when calculated as a share of its now much larger economy, it appears proportionally smaller.³⁰

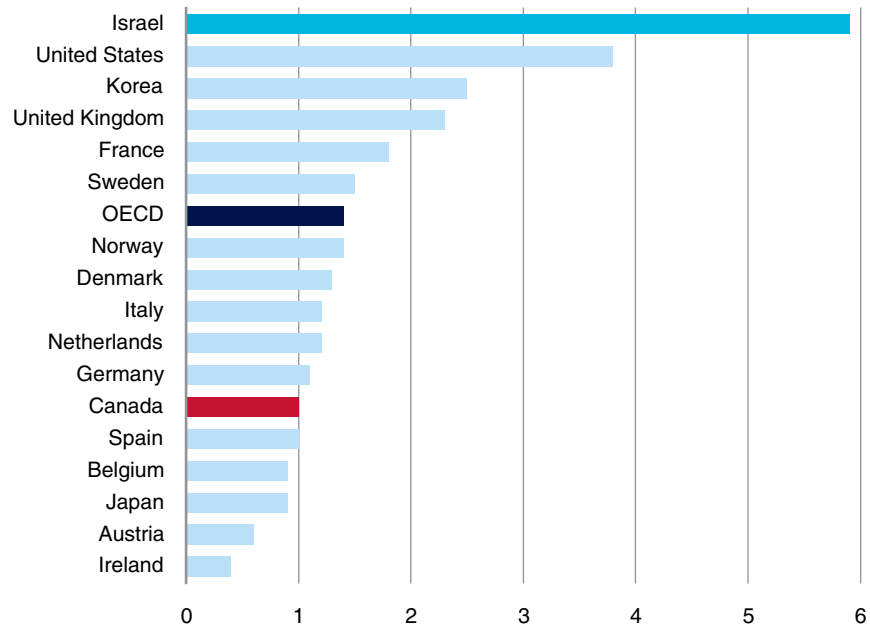
To meet its military needs, Israel invested massively in the education and training of technicians and engineers. Some were employed directly by the military, but many were employed by industry, working on technologies and equipment for the military. The period between 1967 and 1980 marked a 260 per cent growth in the number of scientists and engineers employed in industry—the highest growth in the world over that time frame.³¹ Israel has approximately 130 scientists and engineers for every 10,000 workers, compared with 80 in the U.S. and 75 in Japan.³² By pouring energy and resources into developing technological capacity for defence, Israel built a strong foundation for private sector technology development. Many of the technologies developed to address military needs were subsequently further developed and commercialized

30 Ibid.

31 Breznitz, *Innovation and the State*.

32 Cited in Chorev and Anderson, *Success in Israeli High-Tech Start-Ups*.

Chart 11
Military Spending, 2013
(per cent of GDP)



Source: World Bank.

by the private sector for other uses. Not surprisingly, Israel developed world-leading expertise in security software components.

The need to defend itself has had long-term effects for Israel's economy. It fundamentally re-shaped Israel's labour force and positioned it for long-term R&D-intensive activity. The research intensity of Israel's labour force is twice that of Canada.³³ This deliberate long-term transformation focused on creating R&D-intensive private sector technology and capabilities. Israel also implemented a series of key policies, institutions, and programs (discussed in the previous chapter) that were specifically designed to foster further private sector innovation.

In the 1970s and 1980s, key institutions and programs began to mature and expand; investment in R&D and innovation rose substantially; innovation skills, capabilities, and activities increased; and Israel did an

33 Munro, *Learning From Israel's Innovation Experience*.

Israel is a world leader in attracting venture capital, second only to Korea in business R&D spending.

excellent job of growing strong international networks.³⁴ These elements played a key role in its success in the 1990s and 2000s, where earlier and new investments and activities began to bear fruit. Today, Israel is made up of well-educated and skilled researchers who develop many information technology products and components, including anti-encryption and anti-virus software, and other cyber security technologies. It is a world leader in attracting venture capital, second only to Korea in business R&D spending, and among the top countries for start-ups and rapid growth firms.

As Dan Breznitz, author of *Innovation and the State* says, “There is no doubt that the structural transformation of Israel would never have happened so quickly without the thrust given by the defense sector.”³⁵ Innovation has become Israel's most important natural resource and strategic asset. Surrounded by states that are at best ambivalent about its existence and at times actively fighting to destroy it, the Israeli condition is in many ways one of constant existential threat. That existential threat has propelled its innovation ambitions. As such, the conditions creating Israel's innovation trajectory are non-reproducible and this specific context cannot be recreated. Recommendations and lessons learned from Israel's experience must therefore be taken with a measure of pragmatism.

Israel relies heavily on defence innovation for its very survival. Surrounded by countries that do not support it (and which have often waged war against it), Israel must continue to invest heavily in its military. Israel continues to be directly threatened by its neighbours, as evidenced by conflicts in 2006, 2009, 2011, and 2014. Israeli citizens continue to be targeted by missile attacks from outside Israel's territory and from terrorist attacks within. Israel's government continues to invest in innovation in spite of—and in response to—threats to its civilian population and to its very existence. This reality is an important component of Israel's innovation trajectory.

³⁴ Breznitz, *Innovation and the State*.

³⁵ *Ibid.*, 53.

These investments pay off in another important way, as Israel's military also serves as a powerful pipeline of highly trained human capital. Military service in the Israeli Defense Force (IDF) is mandatory in Israel for most Jewish citizens over the age of 18. Men between the ages of 18 and 26 are required to serve for 30 months (24 months for those between 26 and 29, and fewer for those arriving in Israel when older); and single women between 18 and 26 are required to serve for 24 months (18 months for those coming to Israel after the age of 27).³⁶ Service length is reduced with age and for physicians and dentists of both sexes. Married women are automatically exempt and other exemptions can be made under section 36 based on religious or other reasons.³⁷ Arab Israelis and Israel's large and growing Ultra-Orthodox citizenry are not obligated to serve.

Development of Innovation and Problem-Solving Skills

In Israel, technological development is highly entwined with warfare; intelligent youth are given large responsibility, are placed at the forefront of technological developments at a young age, and develop incredible technological skills that they can transfer to the civilian market.³⁸

Many Israel Innovation Study Tour presenters from private industry, the government, and academia emphasized that the military is known for identifying and training the best and the brightest in cutting-edge technology, and the most advanced cyber security technologies and techniques. The training and skills provided by the military provide a direct skill pipeline for the private sector.

Israel's military is also uniquely suited to developing innovation skills and responsibility. Unlike many other countries, tactical innovation in Israel's military often comes from the bottom up, with individual officers and tank commanders "taking responsibility for inventing, adopting, and disseminating new tactics in real time, on the fly."³⁹ This command decision latitude is a product of both Israeli culture and IDF structure.

36 Israel Ministry of Foreign Affairs, *Defence Service Law*.

37 Ibid.

38 Baudot-Trajtenberg, Israel Innovation Study Tour presentation.

39 Senor and Singer, *Start-Up Nation*, 44.

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Deliberate understaffing at senior levels means that fewer senior officers are available to issue commands, which requires individuals in the lower ranks to take initiative.⁴⁰ Israeli youth leave IDF with real-time, battle-front, problem-solving experience. They shoulder huge responsibility and learn to rely on themselves and their teams to identify innovative solutions to military problems. Upon completion of their military service, they carry this innovative mindset to problem-solving with them into the education system and private sector. Israel's post-secondary system and private sector both benefit tremendously from the innovation skill foundation provided by military service. As writer Shoshanna Solomon notes, "The symbiosis between the Israeli army, the nation's academia and its high-tech sector is intense, with each body feeding off and growing from the ideas, the knowledge and skills developed by others. This melting pot of initiatives and ideas and people is what has been behind the rise of the so-called Startup Nation."⁴¹ Those who do not serve in the military miss out on these specific benefits. (See "Exemption Implications.")

Exemption Implications

The real economic impact of not serving remains unknown. While most Israeli employers do not require it, military service does serve as an important point of connection and Israelis meeting each other often ask "Where did you serve?"⁴² Serving in the military also indicates mastery of skills that employers value, such as technological proficiency, responsibility, and problem-solving.⁴³ Those who do not serve therefore miss out on the networking, skill, and human capital development valued so highly in Israel's innovation economy.⁴⁴

Military service is also a key factor in building a national "sense of community." This sense of community plays a major role in the culture that supports the innovation ecosystem. Israelis support each other in their efforts to cultivate successful innovation outcomes. This includes the "badge of failure" attitude and

40 Luttwak, *The Pentagon and the Art of War*; Luttwak, *The Israeli Army*.

41 Solomon, "Techie Soldiers Program Chatbots for the Military."

42 Michael Bauer (Tour Guide, Bauer Trails), Israel Innovation Study Tour presentation, November 28, 2016.

43 Various Israel Innovation Study Tour presenters.

44 Ibid.

culture and the “abundance mentality” around opportunity that was prevalent in many conversations during the study tour.

Sources: Michael Bauer; various Innovation Study Tour presenters.

Education

Dr. Liat Maoz, Deputy Director General for Strategy and International Affairs for Israel’s Council for Higher Education, notes that five keys to Israel’s innovation success include its high-quality human capital, scientific strength, and technical skills; innovation and tech transfer at its universities; entrepreneurship and risk-taking; venture capital (both local and U.S.-based) investments; and government support for commercial R&D.⁴⁵ In addition, an important prerequisite of these innovation system elements is an outstanding higher education system for, without this, technological development is difficult.⁴⁶

Israel’s 63 higher education institutions comprise 9 public universities and 54 colleges⁴⁷ (41 of which are public and 13 private).⁴⁸ Shanghai’s global rankings place five of Israel’s universities in the top 500 and two in the top 100. Israel ranks highest in citations per publication in the fields of computer science (first overall), engineering (third overall), chemistry (fifth overall), and biochemistry/genetics/molecular biology (fifth overall).⁴⁹ Israel’s higher education system has produced 12 Nobel prize winners (six in chemistry and two in economics), three Turing awards, and one Fields medal.⁵⁰ Creativity and curiosity are important drivers of innovation, and Israel’s higher education system plays an important role in supporting the country’s innovation ecosystem through activities such as intellectual property/technology transfer (all higher education institutions have a technology transfer office), budget allocation models,

45 Liat Maoz (Deputy Director General for Strategy and International Affairs, Council for Higher Education in Israel), Israel Innovation Study Tour presentation, November 28, 2016.

46 Baudot-Trajtenberg, Israel Innovation Study Tour presentation.

47 All higher education institutions in Israel can award bachelor’s degrees and some can award master’s degrees, but only the research universities award doctoral degrees.

48 Colleges in Israel.

49 Maoz, Israel Innovation Study Tour presentation.

50 Ibid.

special initiatives (e.g., International Conference on Operations Research and Enterprise Systems [ICORES], research centres), and international research collaborations. A balance is therefore needed between supporting commercial activities and higher education. A full 4.1 per cent of Israel's GDP is spent on civilian R&D, which is more than double the 1.9 per cent average of the European Union.⁵¹

Israelis are particularly adept at facilitating partnerships and collaborations between the public (universities) and private sectors (industry), as most innovation happens at the borders of fields rather than in traditional silos. (See "Telekom Innovation Laboratories at Ben-Gurion University.") Many Israeli researchers see all scientific disciplines as quite connected and believe that state-of-the-art research requires knowledge of and collaboration with researchers in different fields.⁵²

Telekom Innovation Laboratories at Ben-Gurion University

Israel's leading universities and research institutes are experts at partnering with industry to create world-class innovation labs. One such example is the Telekom Innovation Laboratories at Ben-Gurion University, where some of the world's top research scientists partner with Deutsche Telekom AG innovation experts to develop new information and telecommunications technologies that provide a competitive advantage and create business opportunities for Deutsche Telekom.⁵³ The Telekom Innovation Laboratories focus on five key innovation strategy areas: intuitive usability, integrated communication, inherent security, intelligent access, and infrastructure development. The Telekom Innovation Laboratories act as a crystallization point, transforming cutting-edge knowledge into revolutionary technologies for the future. Using a multidisciplinary approach, the laboratories develop technologies based on social developments, customer requirements, and current market trends.⁵⁴ New technologies are used in the products and services offered by T-Labs.

51 Roland Berger, *Lessons From the Start-Up Nation*.

52 Liotz Etgar (Institute of Chemistry, Hebrew University), Israel Innovation Study Tour presentation, December 1, 2016.

53 Telekom Innovation Laboratories at Ben-Gurion University, *About Telekom Innovation Laboratories at Ben-Gurion University*.

54 Telekom Innovation Laboratories at Ben-Gurion University, *Areas of Innovation*.

Creative Israeli scientists bring great innovative ideas to their research because their minds are trained to jump around.

Laboratory researchers are encouraged to seek creative solutions to problems.⁵⁵ In addition to traditional research methods, Innovation Laboratories researchers engage in curiosity-driven research, observation, and play to get into cyber security researcher and hacker mindsets and identify potential conceptual vulnerabilities in areas people do not usually consider.⁵⁶ Established researchers and faculty members work with top students at all levels (high school through to post-doctorates) who are the best hackers. The Laboratories also collaborate with other companies and commercialize via start-ups and incubators, and intellectual property is shared in different ways. Rather than focusing on quick returns, Telekom Innovation Laboratories researchers also make long-term investments in technology development that may take several years to commercialize.⁵⁷

Sources: Telekom Innovation Laboratories at Ben-Gurion University; Yuval Elovici and Oleg Brodt.

The cultural factors outlined have helped Israeli scientists develop a strong creative spark. Professor Gad Yair's forthcoming book, *The Unruly Mind*, analyzes the culture of science in Israel, as well as how and why Israeli scientists approach their work in a different way from their international peers (e.g., Germany).⁵⁸ Yair argues that Israeli society lacks hierarchy and Israelis do not respect procedures, laws, and codes prohibiting them from speaking, telling them to wait, or limiting what they think they can accomplish. Whereas German scientists follow the rules and established scientific method, creative Israeli scientists bring great innovative ideas to their research because their minds are trained to jump around, to make associations and connections between unrelated domains.⁵⁹ When faced with difficult problems, German scientists evaluate and appreciate serious approaches to solving really tough questions, whereas Israelis specialize in creative questions and innovative elements. Scientific success is therefore often found

55 For example, analyzing battery consumption to identify whether a mobile phone GPS has been activated remotely.

56 For example, how microphones or fridges could be hacked.

57 Yuval Elovici and Oleg Brodt (Director and Senior R&D Director, respectively, Telekom Innovation Laboratories, Ben-Gurion University), Israel Innovation Study Tour presentation, November 29, 2016.

58 Yair, *The Unruly Mind*. Yair interviewed 125 accomplished Israeli scientists who have joint projects with German colleagues, as scientific approaches and thinking in these countries are very different.

59 Gad Yair (Department of Sociology, Hebrew University), Israel Innovation Study Tour presentation, November 30, 2016.

in the combination of cultures—with Germans bringing the power of patient scientific method and Israelis bringing innovative new ideas.⁶⁰ As collaboration between Israeli and other scientists often produces fruitful results, many leading academic and research institutions and MNCs partner with Israel to further their R&D capacity. (See “Hebrew University,” “Ben-Gurion University,” and “The Weizmann Institute of Science” for an overview of three of Israel’s leading academic and research institutions.)

Hebrew University

Founded in 1918 and officially opened in 1925, the Hebrew University of Jerusalem is a leading university and research institution. Ranking first in Israel and among the top 100 universities internationally, Hebrew University offers programs in a wide range of fields in the humanities, social sciences, exact sciences, and medicine, and plays a leading role in the scientific community. Part of its core mandate includes expanding the boundaries of knowledge for the benefit of humanity; training the public, scientific, educational, and professional leadership; and preserving and researching Jewish cultural, spiritual, and intellectual traditions.⁶¹ The university bridges academic, research, and social and industrial applications through multidisciplinary activities, both in Israel and internationally.

Yissum, Hebrew University’s technology transfer company, is responsible for marketing the knowledge and inventions generated by the university’s researchers and students in fields such as medicine and pharmaceuticals, nanotechnology, computer science, homeland security, agriculture and nutrition, and water and environmental technologies.⁶² By supporting research, education, and development, Yissum turns science into commercial products for society’s use and benefit by making technologies desirable and commercially viable in the marketplace. Yissum is one of the top technology transfer organizations in the world, with 9,325 patents and 2,625 inventions (averaging 150 to 170 new licensed inventions per year).⁶³ It has granted more than 880 technology

60 Ibid.

61 The Hebrew University of Jerusalem, *Welcome to The Hebrew University*.

62 Yissum, *Overview*.

63 Irena Abramzon-Shmueli (Vice-President, Intellectual Property, Safra Campus [Givat Ram site], Hebrew University), Israel Innovation Study Tour presentation, December 1, 2016.

licences in total and has commercialized a wide range of products that generate over \$2 billion in yearly sales (largely from the life sciences and biotech fields). More than 110 spin-off companies have started at Yissum, which maintains strong relationships with business communities (both in Israel and abroad) to advance the university's research and technologies.⁶⁴ Yissum provides an ecosystem of opportunities through research collaboration and technology licensing—it has its own accelerator, incubator, seed fund, investment funds, and start-ups. All university-generated intellectual property belongs to the university, but revenues are divided among the researchers (40 per cent), labs (20 per cent), and university (40 per cent). Yissum also assists with early-stage research by finding investors, incubators, and other partners who are able to move technologies to the next stage.⁶⁵

Sources: The Hebrew University of Jerusalem; Yissum; Irena Abramzon-Schmueli.

Ben Gurion University

With about 19,500 students and 4,000 faculty members, Ben-Gurion University of the Negev aspires to be a world-leading interdisciplinary research and applied sciences university. It aims to lead in scientific innovation, applied sciences, and interdisciplinary research that impacts daily life. Being committed to social and environmental responsibility and developing the Negev, Israel, and the world are some of its core values.⁶⁶ The university is known for its advanced, state-of-the-art laboratories and more than 60 interdisciplinary research centres.⁶⁷ BGN Technologies (the university's technology transfer company) manages the university's patent portfolio and facilitates collaborations with other institutions, companies, foundations, investors, and other partners.

A key part of the university's mandate is to develop Israel and the Negev region, formerly the most economically depressed region in Israel. The visionary partnership between the university and municipality has transformed the region and resulted in jointly owned world-class innovation hubs such as the Gav-Yam Negev Advanced Technology Park. Close connections with the

64 Ibid.

65 Ibid.

66 Ben-Gurion University of the Negev, *Vision Statement*.

67 Steve Rosen (Vice-President, External Affairs, Ben-Gurion University, Be'er-Sheva Campus), Israel Innovation Study Tour presentation, November 29, 2016.

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advanced technology park and other industry partners allow students to gain valuable industry experience before graduating (e.g., 50 per cent work on industry projects, 45 per cent get jobs within two to three weeks of finishing their degrees, and some work with professors who have their own start-ups).⁶⁸ As part of the university's strong social responsibility mandate, more than 6,000 students are involved in community outreach programs and hands-on research projects that impact communities, both in Israel and around the world,⁶⁹ and the university is among the top 20 greenest campuses globally. To increase opportunities and academic success for vulnerable populations, the University also created the Bedouin School, a three-month intensive program for high school students designed to upgrade skills, connect students with mentors, and decrease post-secondary dropout rates.

Sources: Ben-Gurion University of the Negev; Steve Rosen.

The Weizmann Institute of Science

Established in 1934, the Weizmann Institute of Science is a world-leading multidisciplinary basic research institution in the natural and exact sciences. The Institute's primary goal is to advance science for the benefit of humanity, and it plays a key role in educating a substantial proportion of Israel's scientific leadership and advancing science literacy in schools and among the public.⁷⁰ The Institute comprises 250 experimental and theoretical research groups across five faculties: biology, biochemistry, chemistry, mathematics and computer science, and physics. Insights developed at the Weizmann Institute lead advances in medicine, technology, and the environment, and further our understanding of the human body and universe.⁷¹ The Weizmann Institute focuses on curiosity-driven research for the betterment of humanity, which aligns well with Israeli cultural traits (such as not fearing failure and the ability to look at something in new and unexpected ways). Institute researchers look for good ideas that are multidisciplinary in nature and have strong partnerships with other

68 Ibid.

69 For example, the university's Community Action Unit advances programs such as Open Apartments (free rent in exchange for community volunteer hours) and Building the Street (refurbishing city blocks)

70 Weizmann Institute of Science, *About the Institute*.

71 Weizmann Institute of Science, *Research and Discovery*.

leading scientific research institutes and universities, both domestically and internationally.⁷²

The Institute receives over US\$400 million annually through government supports, scientific grants from other foundations, and its philanthropic endowment.⁷³ Many major industry advancements begin with basic scientific research, and the Institute has a long history of extracting applications from basic science and engaging in successful technology transfer. The Yeda Research and Development Company Ltd. is responsible for commercializing the unique intellectual property developed by Weizmann scientists today. Intellectual property is divided between the researchers (40 per cent) and Weizmann Institute (60 per cent). As technologies developed at the Weizmann Institute are primarily early technologies that need time to develop and market, the Institute sometimes partners with other companies that can license and develop them under strict technology transfer models. (See “TEVA Pharmaceuticals.”)

Sources: Weizmann Institute of Science; Benny Geiger.

TEVA Pharmaceuticals

With its global headquarters in Israel, TEVA is a leading pharmaceutical company created out of necessity. With Arab countries blocking other countries from dealing with Israel, Israeli companies needed to acquire licences to manufacture their own medicines.⁷⁴ Today, TEVA develops, produces, and markets affordable generic drugs, innovative and special pharmaceuticals, active pharmaceutical ingredients, and over-the-counter products.⁷⁵ Active in 60 countries and ranked among the top 10 pharmaceutical companies in the world, TEVA attributes its success to a business strategy of balanced therapeutic offerings, industry and market leadership (through strategic partnerships and acquisitions), global supply chains and facilities, global Centres of Excellence, and growing geographic presence. As the largest company in Israel, TEVA

72 Benny Geiger, Department of Molecular Cell Biology, Weizmann Institute of Science, and President, Israel Science Foundation), Israel Innovation Study Tour presentation, November 30, 2016.

73 Financial resources generated through commercialization go into the Institute's endowment fund to ensure long-term financial stability.

74 Michael Hayden (President, Global Research and Development, and Chief Scientific Officer, TEVA Pharmaceuticals Industries), Israel Innovation Study Tour presentation, November 28, 2016.

75 Teva, *About Teva*.

accounts for approximately 17 to 18 per cent of the country's exports and 1 to 2 per cent of its GDP.⁷⁶

Strategic Partnerships

As previous examples have shown, Israelis are particularly adept at establishing strategic public-private partnerships among industry, academia, the military, government, and non-governmental organizations in support of their innovation ecosystem. They also have a long history of working with other countries on investment and development projects. (See "Israel and Canada.") Partnerships between different sectors facilitate the flow of highly qualified human capital. Israel further benefits from an internationally mobile pool of innovators in the academic and business sectors. Israelis are globally minded and heavily immersed in sectoral networks, allowing them to remain at the heart of sectoral hubs and build important partnerships that open access to new markets and users. Rather than a "brain drain," Israelis refer to "brain circulation."

Israel and Canada

Canada traditionally had strong ties with Israel in the innovation, development, and security sectors.⁷⁷ To deepen this relationship, four key goals of the recently appointed Canadian Ambassador, Deborah Lyons, include "continuing a strong political relationship, fostering business and academic partnerships, creating a partnership of support to third countries, and sharing information between the two countries."⁷⁸ Many potential collaboration opportunities exist for Israel and Canada (e.g., engineering capacity, cyber security, water technology, energy, and oil and gas distribution), and Israel and Canada already work together on approximately 30 projects a year (primarily development projects in other countries).

Canada and Israel also have a strong collaborative R&D connection through the Canada–Israel Industrial Research & Development Foundation (CIIRDF).

⁷⁶ Ibid.

⁷⁷ Governor General of Canada, *Governor General to Undertake Visit to the Middle East*.

⁷⁸ MacLeod, "New Ambassador to Israel to Focus on Innovation, Co-operation."

By focusing on the commercialization of new technologies, CIIRDF facilitates R&D collaboration between private sector organizations in Israel and Canada.⁷⁹ Established in 1994, CIIRDF is institutionally connected to IIA, has engaged more than 200 Canadian and Israeli companies, and has financed more than 110 bilateral technology partnerships.⁸⁰ CIIRDF alliances have resulted in more than 50 technologically improved new products, created hundreds of jobs in both Canada and Israel, and generated approximately \$60 million in initial sales, with additional economic value of \$300 million to \$500 million for collaborating companies.⁸¹

Canada continues to build on its strong relationship with Israel. In July 2015, Canada and Israel announced the conclusion of an expanded and modernized Canada–Israel Free Trade Agreement that reduces technical barriers, enhances cooperation, increases transparency in regulatory matters, and reduces transaction costs for businesses. Under the updated agreement, all industrial products and some agreed-upon food and agricultural produce are tax exempt, Israeli tariffs will be reduced or eliminated on a large number of products, and Canada will have duty-free access to certain products under tariff rate quotas.⁸²

Ambassador Lyons further notes that in addition to being characterized by its *compact* economy, highly *competitive* environment, innovation *character* traits, and industry *concentration*, Israel wants other countries to *come prepared* to move partnerships and business deals forward.⁸³ Canadian organizations need to do their homework before going to Israel, so they arrive prepared to solidify and finalize business partnerships. Canada could work with Israel's new trade attaché to take delegations to regional industrial hubs and could encourage Israeli companies to seek out and bid on more Canadian tenders. Trade missions to Israel need targeted messages and promotion, and tour delegates can assist with branding and promoting Canada by identifying industry hotspots, areas of expertise, and specific business opportunities.

To further support its own innovation ecosystem, Canada could better leverage the flow of human capital between Israel and Canada. For example, it could look for opportunities to send more students to Israel for education and training in the Israeli innovation ecosystem (lots of scholarships are available for Canadians

79 CIIRDF, *About CIIRDF*.

80 Ibid.

81 CIIRDF, *2016 Impact Report*.

82 Consulate General of Israel in Toronto, *Canada–Israel Free Trade Agreement Expanded*.

83 Deborah Lyons (Canadian Ambassador to Israel), *Israel Innovation Study Tour presentation*, November 27, 2016.

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to study in Israel) and attract more Israeli students to study in Canada.⁸⁴ Canadian organizations could learn from extended exchanges, collaborations, and partnerships with Israeli firms in knowledge-based industries.⁸⁵ More links and memorandums of understanding could be made between Canadian and Israeli technology parks, as well as clear soft-landing paths for partnerships and investment. Canada could also make attracting immigrants from Israel a priority that is community-led but nationally supported. It could also do a better job of tracking and leveraging the technology and innovation skills of its Israeli immigrants.⁸⁶ Israel's innovation ecosystem represents a number of important lessons and opportunities that Canada can leverage in support of its own innovation agenda. In turn, Canada has a lot to offer Israel, but it must make these opportunities known.

Sources: Governor General of Canada; MacLeod; CIIRDF; Consulate General of Israel in Toronto; Deborah Lyons; Israel Innovation Study delegates.

Gav-Yam Negev Advanced Technologies Park

To create a new innovation hub and leading R&D centre, Ben-Gurion University of the Negev, Be'er-Sheva Municipality, KUD International, and the IDB Property & Building Group, with the support of the Israeli government, joined together to create the Gav-Yam Negev Advanced Technologies Park (ATP) in Be'er-Sheva.⁸⁷ ATP is specifically designed to develop innovative technologies, export the power of Ben-Gurion University's Centres of Excellence to industry, create mutually beneficial employment opportunities for Ben-Gurion University technology graduates, Israeli Defense Force (IDF) Technology campus veterans, and other tenants, and initiate cooperative activities with other neighbouring IDF elite technology units.⁸⁸ Twenty-four key ATP tenants have developed a wide variety of successful new companies. In doing so, it has turned an economically depressed region of the country

84 Israel Innovation Study Tour delegates.

85 Ibid.

86 Ibid.

87 Gav-Yam Negev, *The Partners*.

88 Gav-Yam Negev, *The Vision*; Gav-Yam Negev, *The Mission*.

into a leading R&D innovation hub that attracts both domestic and international investment.⁸⁹

CyberSpark

ATP's new Cyber Innovation Area, CyberSpark, is a joint venture between the Israel National Cyber Bureau (INCB) in the Prime Minister's Office, Be'er-Sheva Municipality, Ben-Gurion University of the Negev, and leading companies in the cyber security industry. At CyberSpark, leading cyber companies, multinational corporations, leading technology defence units, ground-breaking academic research, specialized education platforms, and the National Computer Emergency Response Team create a comprehensive innovation ecosystem based on shared interest, physical proximity, and collaboration opportunities.⁹⁰ A non-profit organization, the CyberSpark Industry Initiative is the central body that coordinates joint cyber security activities, promotes the City of Be'er-Sheva and the region as a global cyber centre, encourages partnerships between industry and academia, and attracts new companies and human resources talent.⁹¹

Israel has engaged with cyber security for more than 30 years as a strategic necessity, and mandatory military service trains Israeli youth in the most advanced cyber security technology and techniques. Approximately 400 cyber security companies generate about \$6 billion for Israel, and in 2016, Israel was home to approximately 22 per cent of the world's cyber security investment.⁹² The creation of ATP was a strategic decision made by the Israeli government to create a cyber innovation hub in Be'er-Sheva by engaging the National Cyber Bureau, re-locating its IDF military units, and attracting industry and academic partners. By drawing so many of the leading organizations working in cyber security together in a collaborative environment, CyberSpark leverages the power of the innovation ecosystem to create a higher level of operation through the synergistic collaboration of stakeholder

89 Steve Rosen (Vice-President, External Affairs, Ben-Gurion University, Be'er-Sheva Campus), Israel Innovation Study Tour presentation, November 29, 2016.

90 CyberSpark, *Israeli Cyber Innovation Area*.

91 Ibid.

92 Roni Zehavi (Chief Executive Officer, CyberSpark), Israel Innovation Study Tour presentation, November 29, 2016.

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experts in the field.⁹³ CyberSpark is specifically designed to appeal to younger talent, engage with the environment, and be user-friendly for private industry to partner with. CyberSpark attracts domestic and international companies through seven gateway programs, including the Landing-Pad service designed to help global companies make a smooth transition into the Israel Cyber Innovation Area with gradual, tailor-made, zero-risk entry paths that align with their own strategies.⁹⁴ CyberSpark has built a powerful innovation ecosystem in its own right by facilitating collaboration among business, academia, the military, and the government. Partnerships such as these are a key element of Israel's overall innovation success.

93 Ibid.

94 Ibid.

CHAPTER 4

Strategic Policy Recommendations for Canada

Chapter Summary

- The Israeli approach to innovation is an ecosystem approach—a powerful innovation policy lens that drives innovation, R&D, and start-up success.
- Working together, key sectors can generate an innovation ecosystem within which entrepreneurship can flourish.
- Israel's experience highlights a number of principles, institutions, and programs that can help other countries advance their own innovation agendas.
- The lessons and opportunities Israel presents must be adapted to Canada's own social, economic, and political context.

Many opportunities exist for Canada to partner with Israel and apply some of Israel's innovation approaches to the Canadian context. Study tour delegates were impressed with Israel's reality, creativity, direction, strategic policies and programs, and commitment to innovation. They saw strong synergies and coordination among the government, military, education, and private business sectors.

Representatives from these sectors demonstrated strong commitment to “getting things done” and were all able to clearly articulate Israel's innovation agenda and capabilities. They demonstrated a strong sense of community where everyone is on the same page. Working together, these sectors generate a powerful innovation ecosystem within which R&D and entrepreneurship flourishes.

Find Our Own Innovation Motivation

Canada needs to find its own innovation motivation. While important, a national dialogue about productivity is unlikely to inspire Canadians or generate the innovation motivation Canada needs to take action.¹ Israel faced an existential threat: develop innovation and technological capabilities or cease to exist. However, trying to foster an external existential threat such as the one Israel faced is, of course, both impractical and unadvisable. Although an external threat of some kind is a key factor in innovation performance in many other countries around the world, Canada needs to identify a burning platform of its own that does not require external enemies. As Taylor notes in *The Politics of Innovation*, “A far smarter strategy is to identify real long-run competitive and security threats, such as energy efficiency, climate change, aging, and disease.”² Threats such as these are real and align much better with national dialogues currently occurring in Canada. The challenge for

1 Munro, *Learning From Israel's IT Innovation Experience*.

2 Taylor, *The Politics of Innovation*, 21.

Innovation is complex, and care must therefore be taken in linking the effects of innovation performance to country benefits.

Canadian leaders is to generate a sense of urgency around these long-term threats and identify ways to turn them into innovation opportunities.

Like Israel, Canada's innovation motivation, and resulting policy lens, should be clearly articulated and supported by strategic policies, programs, and priorities. Canada might also benefit from its own compelling national brand and unified "pitch."³ Canada already has strong regional innovation hubs of its own, R&D capacity in key industries, and a great deal of leadership and management expertise from which new companies could benefit. Several tour participants also noted that although Canada has a number of regional innovation funding agencies, they differ, do not always align with each other, and are not always properly equipped to bring innovation to different industries.⁴ A clearly articulated national innovation agenda, with appropriate policy and program supports, would help Canada tell its own story, articulate what it is good at, and attract both domestic and international partners and investors. Canada also needs to create the conditions that generate a culture of curiosity and questioning, where debate is encouraged and fostered.

Canadian leaders should also note that innovation does not necessarily equate to productivity, and should therefore not expect that enhancing innovation will solve all our productivity issues. The Israeli experience shows that a strong link between the two does not necessarily exist. In contrast, the link between innovation and GDP growth is much stronger. Innovation is complex, and care must therefore be taken in linking the effects of innovation performance to country benefits. What is important is that we stop talking and take action. Canada can learn from Israeli culture, which allows for and encourages people to try and fail rather than avoiding risk. Canada needs to get on with the process of building and implementing a workable innovation strategy.

3 Several mission participants noted that, regardless of the sector, representatives often began with a similar pitch for Israel.

4 Israel Innovation Study Tour participants.

Identify Niche Areas in Global Value Chains

Rather than trying to excel in everything, Israel identified particular areas where it could become a global leader based on its own history, context, and innovation trajectory (e.g., computer science, engineering, chemistry, the life sciences). Excelling in specialized niche areas (e.g., cyber security, FinTech services) has fuelled Israel's start-up economy, helped Israel integrate into global supply chains, and improved its success in attracting MNC investment and R&D centres. Rather than giving small amounts of money to many different areas,⁵ Israel has empowered specific expert agencies and programs that choose how to allocate their funding.

In addition to having a highly educated workforce and a capacity to generate ideas, Canada has advanced expertise in a range of specific areas, such as resource extraction, fuels and clean energy, clean technology, ocean technology, medical devices and records, military upgrades, water security, financial cyber security, and agricultural innovation. Canada also has knowledge and expertise in research areas like life sciences, nanotechnology, and artificial intelligence.⁶ Determining how to build on these strengths, and finding good fits for them within global value chains, are key tasks for Canadian decision-makers in industry, government, and other organizations.

Design Programs and Policy With Firms at the Centre

Israel focuses mainly on private-firm R&D and innovation capabilities, and less on public R&D. Unlike Canada, it favours direct support to companies over funneling resources through the academic system. Putting firms at the centre of policy analyses provides a clearer picture of the innovation ecosystem's needs and opportunities and taps into firms' unique understanding of market demand and dynamics.⁷ Israel then procures the products and services it needs from firms that had been provided with support, rather than trying to develop these products

5 This is often viewed in Canada as being politically beneficial or "fair."

6 Israel Innovation Study Tour participants.

7 Ibid.

Canada provides substantially less direct R&D to support firms than Israel.

and services in its own labs and facilities. The Israeli technology industry in particular has benefited enormously from military procurement. This strategy could be explored in Canada as there are a variety of places within the Canadian economy where procurement could play a larger role.⁸

Israeli start-ups receive huge investments from government and industry through direct funding and loans for approved R&D projects, whereas Canada could benefit from increased private sector financing and funding through incubators and other R&D investments.⁹ Although Canada has one of the most generous indirect tax regimes in the world, it provides substantially less direct R&D to support firms than Israel.¹⁰ Canada could therefore potentially benefit from a new Foreign Direct Investment agency and programs that help companies grow and scale. Canada could also look at connecting its investment venture capital with Israeli venture capital companies. Policies and programs promoting industrial applications and greater collaboration among Canadian universities, colleges, polytechnics, and industry could also be considered. Many polytechnics and colleges already work closely with industry, and these institutes can not only help develop technical solutions, but also provide the soft and technical skills required by industry, supplementing and enhancing the capabilities offered by universities. Over time, a greater focus on the private rather than the public, and on direct rather than indirect, funding could help fuel Canada's own innovation economy.

Learn From Israel's Mistakes and Missteps

While Israel's approach to innovation has been largely successful, its experience provides a cautionary tale for Canada, which can learn from its mistakes and missteps. For example, Israel has strength in R&D-intensive tech, but gaps in management and marketing skills and experience. Its policy mix focuses on incenting firms to partner with MNCs to fill these gaps, with BIRD playing a large role. As Canada has similar management and marketing weaknesses, it might consider

8 Ibid.

9 Various Israel Innovation Study Tour delegates.

10 Munro, *Learning From Israel's IT Innovation Experience*.

a program similar to BIRD to fill those gaps.¹¹ However, this does not mean that Canada should neglect domestic management and marketing skills development.

Services also make up a large share of Canada's GDP but, like Israel, services have been in large part left out of Canada's innovation discussion to date, which will hurt Canada's labour productivity in the long term. Although Canada exhibits less inequality and poverty than Israel,¹² the extent to which innovation benefits are shared will determine the extent to which people are willing to support future investments in innovation.¹³ Willingness to invest in innovation is also a consequence of Israel's sense of community. There seems to be a unified enthusiasm for government and corporate investment in innovation. This enthusiasm is not so uniform in Canada, where some pundits often view government investment in innovation with distain, claiming that the government should not be picking winners, or that more "corporate welfare" is not needed. One of Israel's greatest challenges going forward will be to more fully incorporate its Arab and Ultra-Orthodox Jewish populations in its innovation economy to reduce growing inequality.¹⁴ Canada should also seek to ensure that vulnerable populations (e.g., Indigenous communities and others) are not left out of its own innovation agenda.

Think Globally

In Israel, global thinking, relationships, and networks developed out of necessity. Surrounded by countries that boycotted or actively sought its destruction, Israel was forced to look internationally for trading and business partners.¹⁵ Israel therefore developed a strong history of partnering with other nations and exporting internationally—a strategic necessity driven by its own small domestic market and geopolitical situation. Instead of manufacturing goods with high shipping costs, Israel identified a niche and integrated itself into global value chains

11 Ibid.

12 Although Israel is taking steps to address this inequality.

13 Ibid.

14 Wilf, Israel Innovation Study Tour presentation.

15 Senor and Singer, *Start-Up Nation*.

High-tech areas that leverage Canada's well-educated and skilled workforce are the most promising.

by attracting MNC technology labs.¹⁶ Canada needs to identify its own niche role in larger global value chains, as innovation and production in the 21st century rarely involves taking an idea all the way through to a finished product. Rather, finished products often involve components and services from numerous companies and countries. High-tech areas that leverage Canada's well-educated and skilled workforce are the most promising. While proximity to the U.S. market is beneficial, Canadian companies should also look further abroad for potential new business opportunities, forming partnerships with other global entities instead of just looking regionally or nationally.

Conclusion

Innovation connects disconnected areas, advances knowledge and technology, creates value by solving problems that many face, and often requires an element of risk. The Israeli approach to innovation is an ecosystem approach, where the IIA spans all ministries and all stakeholders (government, academia, the military, industry, venture capitalists, and entrepreneurs) work together to foster an environment in which innovation can flourish. This powerful innovation policy lens is a driving force behind Israel's innovation, R&D, and start-up success.

As previously noted, recommendations based on Israel's innovation experience should be taken with a measure of pragmatism, as the specific historical, political, and cultural conditions sparking Israel's innovation trajectory are non-reproducible. Nevertheless, Israel's experience still provides some good lessons and insights for Canada. It features a number of principles, institutions, and programs that Canada could adapt to better support its own innovation performance. While Israel does quite well on key innovation metrics, it also has its own challenges. Israel's innovation experiences must therefore be adapted to Canada's own social, economic, and political context.

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16 Munro, *Learning From Israel's IT Innovation Experience*.

APPENDIX A

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APPENDIX B

Study Tour Agenda

Executive Study Tour: Innovation and Cyber Tech Cluster

November 27–December 2, 2016

Tour Objectives

Explore strategic issues relating to policies, practices, and institutions within Israel's innovation ecosystem and gain an appreciation for the cultural and historical circumstances that help to explain Israel's innovation success.

Experience innovation in practice through site visits to high-tech firms, including those located within Be'er-Sheva's CyberSpark, in order to understand how Israel is building a world-class innovation ecosystem, and benefit from interacting with innovation leaders in industry, government, and academia.

Gain new insights about the Israeli innovation ecosystem, including how the country and its firms have been able to innovate, grow, and compete in global markets and integrate deeply within global technology value chains.

Network and learn with peers—share new approaches, insights, and challenges, and exchange ideas with leading innovation experts.

LESSONS LEARNED FROM A WORLD INNOVATION LEADER
Understanding Israel's Innovation Ecosystem

Agenda and Detailed Itinerary

Sunday, November 27, 2016

Dress: Casual attire

10:15—Arrival at Ben-Gurion International Airport

Flight AC 084 arrival

Airport assistance and meet with your tour guide Michael Bauer

11:15–12:15—Transfer to Tel Aviv

Those in Tel Aviv meet Paul Preston in hotel lobby at 12:00 p.m. (noon)

12:30–14:00—Lunch and Keynote Speaker

Location: Olive and Leaf Restaurant (located in the Sheraton Tel Aviv)

Guest Speaker: Deborah Lyons, Canadian Ambassador

14:15–15:30—Check-In at Hotel

Sheraton Tel Aviv, Ha-Yarkon St 115, Tel Aviv-Yafo, 6357303, 011-972 3-521-1111

15:30—Meet in Lobby for travel to Heseg House

16:00–16:30—Welcome and Overview: Heseg House

Speaker: Paul Preston, Associate Director, Science, Technology and Innovation Policy, The Conference Board of Canada

16:30–17:30—Presentations and Discussion

Guest Speakers:

Israel Shamay, Executive Director, Head of the Americas Operations,
Israel Innovation Authority

Les Abelson, Director, Canada–Israel Industrial R&D Programs,
Israel Innovation Authority

17:30–18:30—Tour of Yaffo neighbourhood

19:00—Opening Group Dinner and Keynote Presentation

Location: Deca Restaurant, htasia 10, Tel-Aviv

Guest Speaker: Alan Feld, Managing Partner/Co-Founder,
Vintage Investment Partners

21:30—Adjournment

Return to Hotel (approximately 15 minutes travel time)

Sheraton Tel Aviv, Ha-Yarkon St 115, Tel Aviv-Yafo, 6357303, 011-972 3-521-1111

Monday, November 28, 2016

Dress: Business casual attire—wear comfortable shoes for walking

Participants are to have breakfast on their own; restaurant opens at 6:30 a.m.

8:20—Meet in Lobby for travel to Heseg House

8:30—Depart for Heseg House

9:00–9:15—Welcome and Overview of the Day—Heseg House

Paul Preston, Associate Director, Science, Technology and Innovation Policy,
The Conference Board of Canada

**9:15–10:15—Presentation and Discussion: Israeli History/
Politics/Democracy**

Guest Speaker: Dr. Einat Wilf, Fellow, Jewish People Policy Institute and
former Labor-Independence MK

10:15–10:45—Break

10:45–11:45—Presentation and Discussion

Guest Speaker: Steve Rhodes, CEO and Chairman, The Trendlines Group;
Chairman, Mofet Venture Accelerator

11:45–12:00—Travel to Lunch

12:00–13:15—Lunch: Petrozilia Restaurant

LESSONS LEARNED FROM A WORLD INNOVATION LEADER
Understanding Israel's Innovation Ecosystem

13:30–14:30—Presentation and Discussion

Guest Speaker: Liat Maoz, Deputy DG for Strategy and International Affairs, Council for Higher Education (CHE) in Israel

14:30—Travel to Time Incubator

15:00–16:00—Site Visit and Presentation: Thetime Incubator

Guest speaker: Dr. Uri Weinheber, CEO and Partner, Thetime Incubator

The Time Incubator is an investment company focusing on young innovative technology startups in the areas of telecom, Internet, media and entertainment. <http://thetime.co.il/>

16:00–19:35—Return to Hotel and Free Time

Sheraton Tel Aviv, Ha-Yarkon St 115, Tel Aviv-Yafo, 6357303, 011-972 3-521-1111

19:35—Meet in Lobby

19:40—Group Departure to Dinner (approximately 20 minutes travel time)

20:00—Dinner and Keynote Presentation

Location: Kimmel Restaurant, Hashachar 6, Tel Aviv

Guest Speaker: Dr. Michael Hayden, President of Global Research and Development and Chief Scientific Officer, TEVA Pharmaceuticals Industries

22:00—Adjournment

Return to Hotel (approximate 20 minutes travel time)

Sheraton Tel Aviv, Ha-Yarkon St 115, Tel Aviv-Yafo, 6357303, 011-972 3-521-1111

Tuesday, November 29, 2016

Dress: Business casual attire—wear comfortable shoes for walking

Participants are to have breakfast on their own. Restaurant opens at 6:30 a.m.

07:20—Meet in Lobby for travel to Ashkelon

07:30—Departure for Ashkelon

Welcome and Overview of the Day (on the bus)

Paul Preston, Associate Director, Science, Technology and Innovation Policy, The Conference Board of Canada

08:30–10:00—Site Tour: Desalination Plant in Ashkelon

In common with other countries in this water-scarce region, Israel has chronic problems over water resources, which the Desalination Master Plan, launched in 2000, set out to address.

This called for the construction of a series of plants along the Mediterranean coast, to enable an annual total of 400 million m³ of desalinated water to be produced by 2005, chiefly for urban consumption. According to the plan, production is intended to rise to 750 million m³ by 2020.

10:00–11:00—Depart for Be'er-Sheva

11:00–11:30—Site Visit and Presentation: CyberSpark

Guest Speaker: Roni Zehavi, CEO, CyberSpark

CyberSpark is the Israeli Cyber Innovation Arena and was initiated by the Israel National Cyber Bureau to realize the potential of the unique developing ecosystem in Be'er-Sheva, which includes BGU, the Cyber Security Research Center. CyberSpark is the central coordinating body for joint cyber industry activities with government agencies, the Israeli Defense Force, the public, and academia.

www.cyberspark.org.il/#!about-cyberspark/c1a40

LESSONS LEARNED FROM A WORLD INNOVATION LEADER
Understanding Israel's Innovation Ecosystem

11:30–12:30—Presentation and Discussion

Guest Speakers:

Prof. Yuval Elovici, Director, Telekom Innovation Laboratories,
Ben-Gurion University

Oleg Brodt, Senior R&D Director, Telekom Innovation Laboratories,
Ben-Gurion University

12:30–13:00—Presentation and Discussion

Guest Speaker: Moti Elyashir, Co-Founder, NewRocket

13:00—Departure for Ben Gurion University

13:10–13:50 —Lunch at Ben-Gurion University

**14:00–16:00—Site Visit and Presentation: Ben-Gurion University,
Be'er-Sheva Campus**

Guest Speaker: Prof. Steve Rosen, Vice-President, External Affairs,
Ben-Gurion University

Ben-Gurion University was established in 1969 as the University of the Negev with the aim of promoting the development of the Negev desert that comprises more than 60 per cent of Israel. The University was later renamed after Israel's founder and first Prime Minister, David Ben-Gurion, who believed that the future of the country lay in this region. After Ben-Gurion's death in 1973, the University was renamed Ben-Gurion University of the Negev.

Today, Ben-Gurion University is a centre for teaching and research with about 20,000 students. Some of its research institutes include the National Institute for Biotechnology in the Negev, the Ilse Katz Institute for Nanoscale Science and Technology, the Jacob Blaustein Institutes for Desert Research with the Albert Katz International School for Desert Studies, and the Ben-Gurion Research Institute for the Study of Israel and Zionism.

<http://in.bgu.ac.il/en/Pages/default.aspx>

16:00–17:30—Travel to Tel Aviv and Study Tour Debrief

Paul Preston, Associate Director, Science, Technology and
Innovation Policy, The Conference Board of Canada

17:30–19:05—Arrival at Hotel and Free Time

Sheraton Tel Aviv, Ha-Yarkon St 115, Tel Aviv-Yafo, 6357303, 011-972 3-521-1111

19:05—Meet in Lobby

19:10—Group Departure to Dinner (approximate 20 minutes travel time)

19:30—Dinner and Keynote Presentation

Location: Goshen Restaurant, Nahalat Binyamin St 30, Tel Aviv-Yafo

Guest Speaker: Nadine Baudot-Trajtenberg, Deputy Governor, Bank of Israel

21:30—Adjournment

Return to Hotel (approximate 20 minutes travel time)

Sheraton Tel Aviv, Ha-Yarkon St 115, Tel Aviv-Yafo, 6357303, 011-972 3-521-1111

Please note: We will be checking out of the hotel in the morning for travel to Jerusalem; please pack your bags and be ready to check out in the morning. Meet in the Lobby for 8:30 a.m.

Wednesday, November 30, 2016

Dress: Business casual attire—wear comfortable shoes for walking

Participants are to have breakfast on their own. Restaurant opens at 6:30 a.m.

Please check out of hotel as we will be traveling to Jerusalem and will stay in Jerusalem until the end of the tour.

08:20—Meet in Lobby

08:30—Site Visit to the Citi Incubator

Guest Speaker: Jeremy Bentley, Vice-President, Citigroup

09:00–10:00—Presentation and Discussion

10:00–11:15—Travel to Weizman Institute of Science

LESSONS LEARNED FROM A WORLD INNOVATION LEADER
Understanding Israel's Innovation Ecosystem

11:15–12:45—Site Tour: Weizman Institute of Science

The Weizmann Institute of Science is one of the world's leading multidisciplinary basic research institutions in the natural and exact sciences. It is located in Rehovot, Israel, just south of Tel Aviv. It was initially established as the Daniel Sieff Institute in 1934, by Israel and Rebecca Sieff of London in memory of son Daniel. In 1949, it was renamed for Dr. Chaim Weizmann, the first President of the State of Israel and Founder of the Institute.

The Weizmann Institute has a long history of investigation and discovery rooted in a mission of advancing science for the benefit of humanity. In parallel, it educates a substantial proportion of Israel's scientific leadership and advances science literacy in schools and among the public.

www.weizmann.ac.il/pages/

12:45–13:45—Drive to Jerusalem

13:45–14:30—Lunch at Yad Vashem

14:30–17:00—Site Tour: Israel's National Holocaust Museum, Yad Vashem

As the Jewish people's living memorial to the Holocaust, Yad Vashem safeguards the memory of the past and imparts its meaning for future generations. Established in 1953 as the world centre for documentation, research, education, and commemoration of the Holocaust, Yad Vashem is today a dynamic and vital place of intergenerational and international encounter.

For over half a century, Yad Vashem has been committed to four pillars of remembrance: Commemoration, Documentation, Research, and Education.

www.yadvashem.org/

17:15–19:10—Check-In at Hotel and Free Time

Mamilla, Shlomo ha-Melekh St 11, Jerusalem, 94182, 011-972 2-548-2222

19:10—Meet in Lobby

19:15—Group Departure to Dinner (approximate 15-minute walk)

19:30—Group Dinner and Keynote Speaker

Location: Darna Restaurant, Yohanan Horkanos St 3, Jerusalem

Guest Speaker: Professor Benny Geiger, Department of Molecular Cell Biology, Weizmann Institute; and President, Israel Science Foundation

21:30—Adjournment

Return to Hotel (approximate 15-minute walk)

Mamilla, Shlomo ha-Melekh St 11, Jerusalem, 94182, 011-972 2-548-2222

Thursday, December 1, 2016

Dress: Business casual attire—wear comfortable shoes for walking

Participants are to have breakfast on their own. Breakfast at 6:30 a.m. (one floor below)

08:20—Meet in Lobby for group travel to the Old City

08:30–11:00—Site Visit and Tour: Jerusalem’s Old City, Jewish and Christian Sites

The core of Jerusalem, Old City, has a history that stretches back more than 3,000 years. The present street plan dates largely from Byzantine times, with the walls and ramparts dating back to the 16th century. The crossroad of three continents, Jerusalem has been one of the most fought-over cities in human history. Within the walls, the Old City is divided into four vaguely defined quarters: Christian, Armenian, Jewish, and Muslim.

You do not need to be Jewish, Christian, or Muslim, or even overly concerned with religion, to be overwhelmed. Anyone with a sense of history, spirituality, or the human species would be absorbed by the tremendous weight of human civilization that cloaks nearly every part of the city.

11:00–11:30—Travel to Hebrew University

LESSONS LEARNED FROM A WORLD INNOVATION LEADER
Understanding Israel's Innovation Ecosystem

11:30–14:00—Site Visit and Tour: Hebrew University (Mount Scopus Site)

Presentation: The Unruly Mind: An Invitation to Israeli Science

Professor Gad Yair, Department of Sociology, Hebrew University

Presentation: Clean Energy—Hebrew University Initiatives

Dr. Lioz Etgar, Institute of Chemistry, Hebrew University

The Hebrew University of Jerusalem, founded in 1918 and opened officially in 1925, is Israel's premier university as well as its leading research institution. The Hebrew University is ranked internationally among the 100 leading universities in the world and first among Israeli universities.

The recognition the Hebrew University has attained confirms its reputation for excellence and its leading role in the scientific community. It stresses excellence and offers a wide array of study opportunities in the humanities, social sciences, exact sciences, and medicine. The University encourages multidisciplinary activities in Israel and overseas and serves as a bridge between academic research and its social and industrial applications.

The Hebrew University has set as its goals the training of public, scientific, educational, and professional leadership; the preservation of and research into Jewish, cultural, spiritual, and intellectual traditions; and the expansion of the boundaries of knowledge for the benefit of all humanity.

Lunch at University

14:00–14:30—Travel to Yissum Research Development Company

**14:30–15:30—Site Visit and Tour: Yissum Research
Development Company**

(A technology transfer company of the Hebrew University of Jerusalem)

Guest Speaker: Irina Abramzon-Shmueli, Vice-President, Intellectual Property,
Safra Campus (Givat Ram Site), Hebrew University

Yissum Research Development Company of the Hebrew University of Jerusalem Ltd., was founded in 1964 to protect and commercialize the Hebrew University's intellectual property. Ranked among the top technology transfer companies, Yissum has registered over 9,300 patents covering 2,600 inventions, has licensed out 800 technologies, and has spun off 110 companies. Products that are based on Hebrew University technologies, and were commercialized by Yissum generate today over \$2 billion in annual sales.

www.yissum.co.il/

15:30–16:45—Study Tour Debrief

Paul Preston, Associate Director, Science, Technology and Innovation Policy,
The Conference Board of Canada

Deborah Lyons, Canadian Ambassador to Israel

16:45–19:10—Return to Hotel and Free Time

Mamilla, Shlomo ha-Melekh St 11, Jerusalem, 94182, 011-972 2-548-2222

19:10—Meet in Lobby

19:15—Group Departure to Dinner (approximate 15-minute walk)

19:30—Closing dinner with Ministry of Foreign Affairs

Representatives:

Shlomi Kofman, Policy Advisor to the Deputy Minister, Ministry of Foreign Affairs

Elad Strohmayer, Canada Desk, North America Division,
Ministry of Foreign Affairs

Location: La Guta Restaurant, Yosef Rivlin St 18, Jerusalem

LESSONS LEARNED FROM A WORLD INNOVATION LEADER
Understanding Israel's Innovation Ecosystem

21:30—Adjournment

Return to Hotel (approximate-15 minute walk)

Mamilla, Shlomo ha-Melekh St 11, Jerusalem, 94182, 011-972 2-548-2222

For those of you departing Israel Friday, please pack your bags and be ready to meet in the Lobby for 8:15 a.m.

Friday, December 2, 2016

Dress: Casual Attire

Participants are to have breakfast on their own. Breakfast at 6:30 a.m.
(one floor below)

Check out of hotel.

For those of you leaving on AC085 departing at 11:55, transportation will be provided to the airport.

8:15—Meet in Lobby for departure to airport

8:30–09:30—Transfer to airport

11:55—Flight to Toronto on AC085

Safe Travels

APPENDIX C

Participating Organizations

- Alberta Innovates Tech Futures
- Business Development Bank of Canada
- BridgePoint Effect
- Celero Solutions
- Centre for Israel and Jewish Affairs
- Communitech
- Dalhousie University
- Humber College Institute of Technology & Advanced Learning
- INO
- Innovation, Science and Economic Development Canada
- Lark Group
- McMaster University
- Red River College
- Springboard Atlantic Inc.
- TEC Edmonton
- The Conference Board of Canada
- University of Ottawa

APPENDIX D

About the Council for Innovation and Commercialization

According to the 2015 Conference Board report, *How Canada Performs*, Canada receives a “C” grade and ranks 9th out of 16 peer countries on innovation performance. Our economy remains a below-average performer on its capacity to innovate, and a country’s capacity to innovate is linked directly to productivity and economic prosperity. The Council for Innovation and Commercialization (CIC) works to better understand and address these challenges, providing innovation executives in Canadian firms with the contacts, concepts, tools, and learning experience to improve innovation performance. Canada’s lagging performance is, in large part, a story of inaction on innovation—particularly, poor commercialization efforts. However, the reason for this is complex and involves elements of the innovation ecosystem, cultural influences, the degree of regulation in specific industries, and other macro-economic forces.

Through networking with peers and facilitated discussion, CIC members share experiences, best practices, and methodologies, thus strengthening their innovation capacity. The Council is a broad-based membership spanning innovation infrastructure in Canada, including small and medium-sized enterprises, large businesses, non-profit organizations, academia, and governments. This ensures that members have the opportunity to explore different facets of innovation in Canada while achieving focus on the needs of their own organization.



About The Conference Board of Canada

We are:

- The foremost independent, not-for-profit, applied research organization in Canada.
- Objective and non-partisan. We do not lobby for specific interests.
- Funded exclusively through the fees we charge for services to the private and public sectors.
- Experts in running conferences but also at conducting, publishing, and disseminating research; helping people network; developing individual leadership skills; and building organizational capacity.
- Specialists in economic trends, as well as organizational performance and public policy issues.
- Not a government department or agency, although we are often hired to provide services for all levels of government.
- Independent from, but affiliated with, The Conference Board, Inc. of New York, which serves nearly 2,000 companies in 60 nations and has offices in Brussels and Hong Kong.

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