



PISM

POLSKI INSTYTUT SPRAW MIĘDZYNARODOWYCH
THE POLISH INSTITUTE OF INTERNATIONAL AFFAIRS

STRATEGIC FILE

NO. 4 (112), MAY 2022 © PISM

Editors: Sławomir Dębski, Patrycja Sasnal, Wojciech Lorenz

Israel's High-Tech Economy

Michał Wojnarowicz

The high-tech sector is the most important element of the Israeli economy. It is the main source of foreign investment in Israel and generates more than half of the country's exports. The sector's development is driven by the growing global demand for digital products and services, partly the impact of the COVID-19 pandemic, and for new solutions in areas like artificial intelligence (AI) or climate protection. Israel uses its technological potential to strengthen its international position and as a tool in relations with other states. At the same time, Israel's high-tech sector model strengthens social inequalities, benefitting only a part of the citizenry.

PISM STRATEGIC FILE

Origins and System

The development of the Israeli high-tech sector is a result of reforms initiated in the 1980s to stimulate the crisis-ridden and resource-shy economy. The key action was the introduction of “The Law for the Encouragement of Industrial Research and Development”, which facilitated the employment of ex-workers from the defence industry, which was the main source of technical innovation in Israel in that time. In 1991, the authorities started creating high-tech clusters¹ combined with a programme of incubators² for new companies.³ In 1993, the government programme Yozma (eng. *Initiative*) was launched, the aim of which was to attract foreign investors and secure financing for high-risk but high-growth investments (venture capital, VC). Building conditions for the inflow of external capital was a key factor guaranteeing the stability of the newly established enterprises. From the 1990s, the start-up⁴ became the main organisational and business model for companies operating in the Israeli high-tech sector.⁵ An important impulse for the industry was also the mass immigration from the former USSR of about 900,000 Jews, many of whom were scientists and engineers, as well as the support from the U.S. diaspora. Development of the sector was slowed down by the popping of the global “dotcom bubble” (2000-2001) and the economic recession caused by the second *intifada* (2000-2005). Strengthening the high-tech sector was also the goal of the neoliberal economic reforms initiated at the beginning of the 21st century (e.g., privatisation of technology incubators).

Building conditions for the inflow of external capital was a key factor guaranteeing the stability of the newly established enterprises.

The state is active in supporting its high-tech sector and is a leader among the OECD countries in spending on research and development (R&D) as a percent of GDP—4.9% in 2021.⁶ At the institutional level, the Israel Innovation Authority plays the most important role by managing programmes and funds for entrepreneurs and researchers, as well as consulting and supporting other public institutions. For the high-tech sector, private capital remains the primary source of financing, amounting to 85% of total investments by value. Although budget expenditures strictly on innovation remain lower than in other highly developed countries at 0.5% of Israel’s GDP⁷, public funds are still an important support tool, especially at the initial stage of a company’s activity or commercialisation. Government, through various programmes, provides grants of up to 50% of the cost of the research or even up to 85% in priority areas (e.g., medicine). The government also allocates funds to programmes that increase the potential in the most promising technologies. In 2019, for example, it allocated \$400 million to the National Quantum Initiative, under which the first Israeli quantum computer is to be built.⁸ Fiscal instruments are an element of the incentive system for foreign capital (e.g., tax exemptions), as well as financial and advisory support for individual investors and companies establishing cooperation with Israeli counterparts. To protect Israel’s interests and acquired know-how, a company that benefits from state grants at any stage is

¹ Geographical aggregation of interconnected companies, suppliers, service providers, and related institutions operating in similar sectors.

² An entity supporting the development of an enterprise at its initial stage of activity.

³ J. Dyduch, K. Olszewska, “Israeli Innovation Policy: an Important Instrument of Perusing Political Interest at the Global Stage,” *Polish Political Science Yearbook*, July 2018.

⁴ Start-ups are most often characterised by a short period of activity (up to 5 years), offering products or services connected to high-technologies, operating in the conditions of investment risk, striving for rapid growth, a profitable business model, and capitalisation of value.

⁵ D. Rosenberg, *Israel’s Technology Economy*, 2018, Efrat, Palgrave Macmillan, p. 7.

⁶ Data from the Organisation for Economic Cooperation and Development, (OECD), www.oecd-ilibrary.org.

⁷ “Israel Innovation Authority’s 2021 Innovation Report,” IAV, August 2021, innovationisrael.org.il.

⁸ “Israel has become a powerhouse in quantum technologies,” *Physics Today* 74, December 2021.

PISM STRATEGIC FILE

subjected to restrictions regarding know-how transfer and production rights, as well as licensing and reporting requirements.⁹

Israel also uses monetary policy tools to strengthen its high-tech sector. In 2020, the central bank bought \$15 billion from the market to prevent appreciation of the currency, the shekel, which could have weakened the competitiveness of the Israeli labour market and could encourage investors to consider other locations for investments.¹⁰

An integral part of the Israeli support system for innovation is the high spending on science and education. Israel is at the forefront of OECD countries in terms of the percent of GDP allocated to education (6.2% in 2018 compared to the OECD average of 4.8%) and leads in total expenditures, public and private, on primary and secondary education (4.8% of GDP; OECD average is 3.4%).¹¹ Israeli universities and faculties (e.g., maths, aerospace engineering, science) are at high positions in the world rankings.¹² Universities also play a very important role in the implementation of research

According to the World Intellectual Property Organisation (WIPO), the Israeli model of cooperation between the academic world and business in the field of R&D is rated the highest in the world.

and in supporting graduates, for example, through an advanced system of academic incubators and accelerators. According to the World Intellectual Property Organisation (WIPO), the Israeli model of cooperation between the academic world and business in the field of R&D is rated the highest in the world.¹³ The system also includes non-governmental organisations (for example, networking platforms) and centres for basic research (non-commercial), such as in hospitals.

When assessing the Israeli innovation potential, apart from the institutional infrastructure and the government's policy, the experts also take into account the characteristics of human capital. They indicate high risk acceptance among Israeli entrepreneurs, tolerance of failure, as well as the ability of companies to adapt to new conditions (important in a sector operating on rapid technological progress). Israel's obligatory military service plays a very important role as a place for networking through social contacts and training staff in modern technologies later used by business (e.g., autonomous systems in the automotive industry were based on solutions for drones). A significant role in this particular process is played by Unit 8200, the military intelligence section responsible for signals intelligence (SIGINT) that also deals with offensive and defensive operations in cyberspace. At the same time, from the perspective of the Israeli military (and state-owned defence companies), the development of the high-tech sector is paradoxically a challenge as it results in a quick outflow of the best-trained soldiers to business. Military service has become less important for Israelis as an element of building a national identity in favour of treating it as part of a professional career. In addition, the conscription period (32 months for men; 24 months for women) delays the entry of new workers to the labour market. To bring Israel closer to other OECD economies, reforms are being considered to make the army more professionalised.

Military service has become less important for Israelis as an element of building a national identity in favour of treating it as part of a professional career.

⁹ M. Wrzesińska, „Kluczowe elementy narodowego systemu innowacji Izraela,” in: *Wydanie jubileuszowe ITwiz: 30 lat transformacji branży IT w Polsce*, 2019.

¹⁰ “Israel: a social report 2021,” Adva Center, 21 March 2021, adva.org.

¹¹ Data from the OECD, www.oecd-ilibrary.org.

¹² The Hebrew University, Weizmann Institute of Science (natural and technical profile), and Technion are 90th, 92nd, and 94th, respectively, on the Shanghai list, Tel Aviv University is in the 151st-200th range, and Ben Gurion and Bar Ilan universities are in the 400th to 500th range. The mathematics departments of the Hebrew and Tel Aviv universities rank 24th and 37th, respectively, the communications departments of Hebrew University and Haifa University are ranked 25th and 37th, respectively, while Technion aerospace engineering is 16th, and most physics, chemistry, computer science, and biology departments rank in the top 100. See: www.shanghairanking.com.

¹³ “Global Innovation Index 2021,” World Intellectual Property Organization, 20 September 2021, www.wipo.int.

PISM STRATEGIC FILE

Macroeconomic indicators are conducive to a good investment climate for the Israeli high-tech sector. Except for 2020, the Israeli economy has been steadily growing for 20 years, reaching 6.3% growth in 2021.¹⁴ According to WIPO, the Israeli economy is currently 15th in the world in terms of innovation, although this is a decline from 10th place in 2019. Israel is in the top ten in terms of “market and business sophistication” and “knowledge and technology outputs”.¹⁵ In the Bloomberg Innovation Index 2021, Israel came in 7th (Poland 23rd).¹⁶ From the investors’ perspective, the concentration of most of the technology companies in the densely populated centre of the country (“Silicon Wadi”) is an incentive, as is their advancement—according to data from 2018, Israel is 3rd in the number of startups using AI (at 10.5 %; U.S. 40%; China 11%). At the same time, Israel is also facing problems with its national digital infrastructure. Delayed political decisions slowed its expansion, which translated into a reduction in internet speed in 2019, among other issues. It was not until December 2020 that appropriate regulations regarding the installation of fibreoptic connections were introduced, and 5G network frequencies were distributed only in August 2020. The inability to pass a budget due to the political crisis in 2019-2021¹⁷ also contributed to delays in financing R&D programmes.

High-Tech’s Role in Israel’s Economy

With continuous development over the last two decades, the high-tech industry has become a key element of the Israeli economy, comprising 15% of the GDP. In 2020, exports of products and services from the high-tech sector accounted for 52% of all Israeli exports and amounted to about \$57 billion, which was 10% more than in the previous year.¹⁸ Israel focuses more on providing technological solutions than mass production for the consumer market, hence the majority of exports are IT services (including system solutions, software, mobile applications), altogether worth \$37 billion (a doubling in value from 2014).¹⁹ High-tech goods worth \$21 billion accounted for 45% of all industrial exports in 2020.²⁰ The COVID-19 pandemic and the related extended demand for digital products and services additionally increased the turnover of the high-tech sector and, for the first time, the export of services outpaced that of products. In 2020, the sector employed 334,600 people (about 50% more than in 2012), of which 70% were technical positions. High-tech workers generate 25% of Israel’s income taxes.²¹ About 400 companies have R&D centres that in total employ about 57,000 Israelis. Israeli high-tech companies are also trying to operate outside the country by opening branches in Europe (88 entities with more than 300 employees), North America (105 companies), and Asia (65 firms).²² Since 2014, these companies’ foreign investments have increased from \$1.7 billion to \$6.2 billion.

The most common entities in the high-tech sector in Israel are start-ups. According to various estimates, there are from 5,000 (Israeli Central Bureau of Statistics) to 7,000 (Start-Up Nation Central) of them. A specificity of start-ups in Israel is the high variability in their activity—out of 6,326 companies established in 2011-2019, almost 46% have ceased operations.²³ Since the middle of the last decade, the number of start-ups established every year has been falling. In 2014,

¹⁴ Data from the OECD, www.oecd-ilibrary.org.

¹⁵ “Global Innovation Index 2021,” *op. cit.*

¹⁶ “Bloomberg Innovation Index 2021,” 3 February 2021, www.bloomberg.com.

¹⁷ M. Wojnarowicz, “The Israeli Political Scene and the Next Parliamentary Elections,” *PISM Bulletin* no 12 (1708), 25 January 2021.

¹⁸ Data from the Israel Export Institute, www.export.gov.il.

¹⁹ D. Zaken, “Technology dominates Israel’s exports more than ever,” *Globes Financial*, 26 January 2021, www.globes.co.il.

²⁰ Data from the Israel Export Institute, www.export.gov.il.

²¹ “High-tech Human Capital Report 2020,” IAV, 22 April 2020, innovationisrael.org.il.

²² “Report IVC Research Center 2020,” IVC, 30 June 2021, www.ivc-online.com.

²³ Data from the Israel Central Bureau of Statistics, www.cbs.gov.il.

PISM STRATEGIC FILE

1,400 companies were created, while in 2020 there were only 520.²⁴ At the same time, the value of investments obtained by the high-tech sector is gradually increasing, mainly thanks to VC funds (about 280 operating in Israel). In 2019, investments amounted to \$9.7 billion, and in 2020 to \$11.5 billion, reaching a record \$25.6 billion in 2021.²⁵ The value of start-ups acquired by other companies alone amounted to \$9.5 billion. The number of Israeli start-ups with “unicorn” status (an entity with a capitalisation of more than \$1 billion), was 79, with 41 added just last year.²⁶

The industries that attract the most capital are IT solutions for companies (software, hardware, data infrastructure), cybersecurity, and financial technologies (fintech), which attracted about 65% of the total investments (compared to 52% in 2020). Investments are also growing in other future-oriented technologies, such as AI (\$4 billion in investments in 2020), the Internet of Things (IoT, \$2.9 billion in 2020), and transport technologies (\$1.3 billion in 2020, including autonomous systems and electromobility). Entities from the life sciences sector also play an important role as they employed about 84,000 people in 2020²⁷ and focus on biotechnology, medical equipment (e.g., solutions in elderly care), pharmacy, and digitisation of healthcare—a priority area due to the COVID-19

In 2018-2020, the authorities allocated \$280 million for research related to new food sources, such as alternative proteins (e.g., artificial meat).

pandemic. The closely related food technology sector is also booming. In 2018-2020, the authorities allocated \$280 million for research related to new food sources, such as alternative proteins (e.g., artificial meat).²⁸

Traditionally, Israel has been strong in the development and promotion of solutions related to climate technologies (agrotech, water management) and clean energy (photovoltaics, energy storage). Some \$3 billion was invested in 2018-2020 into climate-tech startups, of which 10% came from the government,²⁹ which also actively supports investments in nanotechnology and the space-tech sector.

Although the vast majority of high-tech companies in the country remain Israeli in terms of ownership, foreign capital plays a key role. The sector remains strictly dependent on the inflow of foreign investments (most of which are allocated to R&D) and the recipients of its products and services are external markets. The largest corporations present in Israel have the strongest position on the labour market—start-ups taken over by foreign companies often become their local R&D offices. In 2020, about 390 multinational corporations (MNC) employing about 68,000 employees in total were operating in Israel, a third of which were in the field of IT and software solutions for business. Among MNCs with branches and R&D centres in Israel are Intel (14,000 employees), Hewlett-Packard (3,000), IBM (2,000), Google, Cisco, Microsoft, Amazon, and Apple.³⁰ Foreign companies are responsible for the largest acquisitions on the Israeli market, including the purchase of Mobileye (autonomous systems for cars) for \$15.3 billion in 2017 by Intel or Mellanox (manufacturer of microchips) by Nvidia for \$6.9 billion.

Cooperation with MNCs allows Israel to maintain a strong position as a producer of software and computer hardware. Their presence has a strategic dimension for Israel, hence the government supports their activities through grants and co-financing of investments.³¹ The global chip supply crisis³² has further increased Israel’s importance as a chip manufacturing hub. Intel announced an

²⁴ “Israel Innovation Authority’s 2021 Innovation Report,” IAV, August 2021, innovationisrael.org.il.

²⁵ M. Orbach, “Israeli startups raise record \$25.4 billion in first 11 months of 2021,” *CTech*, 13 December 2021, www.calcalistech.com.

²⁶ R. Ben-David, “33 unicorns and \$25b in funding: Israeli tech sector sets new records in 2021,” *Times of Israel*, 13 December 2021, www.timesofisrael.com.

²⁷ “IATI Israel’s Life Science Annual Industry Report 2021,” IATI, 5 July 2021, www.iati.co.il.

²⁸ “Israel’s State of Climate Tech 2021,” IAV, 21 October 2021, innovationisrael.org.il.

²⁹ J. Marks, “Can Israel become the Climate Innovation Nation?,” 15 November 2021, www.i24news.tv.

³⁰ “Report IVC Research Centre 2020”, *op. cit.*

³¹ “Israel, Information Technology Report,” Fitch, February 2021, www.fitchsolutions.com.

³² O. Szydłowski, “A Technological Arms Race: Chip Manufacturing”, *PISM Bulletin* no 135 (1831), 16 July 2021.

PISM STRATEGIC FILE

investment of around \$10 billion in the construction of another microprocessor factory in Israel (besides the Kiryat Gat plant) and an additional \$600 million on R&D. Other corporations also plan to develop chip production in Israel (e.g., Amazon) or create new server and data processing centres (e.g., Google).

High Tech's Importance in Foreign Policy

Israel's technological potential is one of its most important instruments in relations with other states, and strengthening it is one of the main goals of Israeli foreign policy. Promotion of the innovation

Israeli public diplomacy's main objective in the last two decades has been the promotion of the brand "Start-up Nation".

industry by the government is one of the key elements of its image policy aimed at breaking the prism of Israel and armed conflict. Israeli public diplomacy's main objective in the last two decades has been the promotion of the brand "Start-up Nation".³³ Emphasising the country's technological potential is a constant element of Israeli politicians' messaging at the multilateral level (e.g., at the UN) and in bilateral relations,

especially in partnerships with Arab states via the normalisation process³⁴ or in deepening cooperation in Africa³⁵ and Asia³⁶. Israel also participates in initiatives and platforms concerning the development of innovation and adaptation to technological changes. Among others, it is a member of the Global Partnership for Artificial Intelligence (since November 2021), Artemis Accords³⁷, DiGitNations, and Cybersecurity Multi-Donor Trust Fund (through the World Bank). Israel is also involved in regulating the activities of social platforms and in the WTO Joint Statement Initiative on E-commerce.

Business and scientific cooperation in innovation is a major component of building Israel's relationships with other highly developed economies. Israel has five joint industrial funds, one each with the U.S., Canada, Singapore, India, and South Korea, that provide resources for joint R&D projects. It is also party to around 40 bilateral R&D programmes. The most important partner in this respect is the United States. American companies are the largest investors in the Israeli high-tech sector, as they comprise the largest number of start-up acquisitions, and about 60% of MNCs operating in Israel are based in the U.S.³⁸ The American high-tech market is a benchmark for Israeli companies and their strategies. Israel is third after the U.S. and China in terms of the number of entities listed on the NASDAQ—in 2020, it had 75 companies (China had 91 companies).³⁹ Of the foreign Israeli R&D centres, 16% operate in the U.S. For the high-tech sector, cooperation with American technology centres remains crucial and often is facilitated through the Israeli "technical diaspora" in Silicon Valley, estimated at tens of thousands.

The American high-tech market is a benchmark for Israeli companies and their strategies.

Scientific and technological cooperation with the EU remains very important for the Israeli innovation industry. In the EU and the UK alone, 912 Israeli start-ups operate, employing about

³³ The catchphrase was promoted by the book *Start-up Nation: The Story of Israel's Economic Miracle* by Senor Dan and Singer Saul in 2009. Promotion of the book was actively supported by the Israeli authorities.

³⁴ M. Wojnarowicz, "Consequences of the Normalisation of Relations between Israel and Gulf States", *PISM Bulletin* no 204 (1634), 6 October 2020.

³⁵ M. Wojnarowicz, "Sub-Saharan Africa in Israel's Foreign Policy", *Bulletin PISM* no 113 (1053), 20 November 2017.

³⁶ M. Wojnarowicz, "Israel's Pivot to Asia", *Bulletin PISM* no 58 (998), 14 June 2017.

³⁷ M. Piotrowski, Sz. Zaręba, "Artemis Accords: Towards New Rules for the Exploitation of Space", *PISM Bulletin* no 47 (1743), 4 March 2021.

³⁸ A. Aharonovich, "Rising tech salaries and exchange rate pushing multinationals to reconsider Israeli R&D," *CTech*, 8 July 2021, www.calcalistech.com.

³⁹ Data from the Israel Export Institute, www.export.gov.il.

PISM STRATEGIC FILE

24,000 people.⁴⁰ In 2020, there was also a noticeable increase in the level of investments from Europe in Israeli high-tech companies (by 63%).⁴¹ In December 2021, Israel officially joined the next edition of the Horizon Europe programme, the previous edition of which brought a total of €1.28 billion in grants for Israeli researchers.⁴² In the face of tensions in political relations between Israel and both the EU and some Member States (resulting from divergences on the Palestinian issue or policy towards Iran), cooperation in the field of science and innovation acquires a strategic dimension. Participation in European programmes is such a significant incentive that the Israeli government accepts the exclusion of entities from Jewish settlements in the West Bank⁴³ and the Golan Heights⁴⁴, not recognised by the EU as Israeli territory. The adoption of this formula is significant because in the political dimension all attempts to differentiate the status of Israeli citizens and their activities in the West Bank and the Golan Heights (e.g., calls for boycotts, the issue of labelling products from these areas⁴⁵) are strongly opposed and criticised by the Israeli authorities. The EU also remains an important point of reference when it comes to legal solutions, such as personal data protection under the GDPR.

In the context of economic relations with Poland, the direct involvement of Israeli high-tech companies remains low. According to Israeli data, there are 59 high-tech companies employing 400 people in Poland (compared to 240 companies and 3,125 employees in Germany, data from April 2021),⁴⁶ most of them from the IT and communication industry. At the same time, cooperation in the field of innovation is an important component of Polish-Israeli relations, especially due to the diplomatic crisis initiated in 2018 and the deterioration of political relations. The 2018 visits of then Deputy Prime Minister Jarosław Gowin and Minister of Entrepreneurship Jadwiga Emiliewicz to Israel were devoted to cooperation in the high-tech economy. Joint projects in the field of innovation are coordinated by government agencies responsible for supporting startups (e.g., Poland's National Centre for Research and Development and the Israel Innovation Authority). Diplomatic missions and local governments⁴⁷ are also active (trainings, promotion of good practices, economic missions). Cooperation in the innovation sector is also an element of the V4+Israel format⁴⁸: for example, in 2018, agreements were signed between Israel and the V4 countries regarding these issues.

⁴⁰ S. Salomon, "912 Israeli start-ups in EU employ 24,223 local workers, data shows," Times of Israel 22 April 2021, www.timesofisrael.com.

⁴¹ "Israel: a social report 2021," *op. cit.*

⁴² With humanities sciences.

⁴³ M. Wojnarowicz, Sz. Zaręba, "Settlement Annexation on the West Bank: Legal and Political Context", *PISM Bulletin* no 114 (1360), 9 August 2019.

⁴⁴ M. Wojnarowicz, Sz. Zaręba, "U.S. Recognition of Israeli Sovereignty over the Golan Heights", *PISM Bulletin* no 47 (1293), 18 April 2019.

⁴⁵ M. Wojnarowicz, Sz. Zaręba, "Court of Justice of the EU Ruling on Products from Territories Occupied by Israel", *PISM Bulletin* no 4 (1434), 14 January 2020.

⁴⁶ "Israeli Tech Companies in Europe," EIT Health, April 2021, www.eithealth.eu.

⁴⁷ M. Wojnarowicz, "Cooperation between Polish and Israeli Local Governments", *PISM Bulletin* no 159 (1230), 28 November 2018.

⁴⁸ Ł. Ogrodnik, M. Wojnarowicz, "V4+Israel Summit in Budapest", *PISM Spotlight* 42/2017, 20 July 2017.

PISM STRATEGIC FILE

The demand for advanced technologies was the most important factor behind the intensification of Chinese-Israeli relations in the last decade. Since March 2017, their cooperation was designated as an innovative comprehensive partnership⁴⁹, formally coordinated by a Joint Committee. The last meeting of the panel took place in January 2022 under the chairmanship of the Israeli Minister of Foreign Affairs Yair Lapid and the Vice President of the China, Wang Qishan. At the same time, the level of Chinese involvement in the Israeli innovation industry remains limited. Chinese capital has

Now, as normalisation has begun Israel benefits from the official opening of new markets and the inflow of capital.

acquired a total of only 15 companies since 2015 (for comparison, American entities made an average of 57 acquisitions annually in 2015-2020⁵⁰), and in Israel alone there are only 12 large MNCs from China. The issue of Israeli-Chinese technological cooperation remains a political burden due to the rivalry between China and the

U.S., resulting in significant contention between Israel and the United States under both the presidencies of Donald Trump and Joe Biden. Access to Israeli technologies was also one of the main incentives for Arab states to develop covert cooperation⁵¹ with Israel in the last decade. Now, as normalisation has begun⁵², Israel benefits from the official opening of new markets and the inflow of capital. Persian Gulf Arab states are given particular attention: for example, the UAE authorities have initially announced \$2 billion worth of new investments in the Israeli high-tech sector within a decade. India is another prospective partner for Israel due to its needs and market growth. Israel develops projects for a joint R&D fund and about 10% of all foreign Israeli research centres operate in India.

An important element of external relations stems from issues related to the use of foreign labour by Israel, both through outsourcing and the influx of foreign specialists. In the first case, there is great interest by Israeli companies in subcontracting in countries with lower labour costs and a prospective IT market. In 2018, about 25% of Israeli enterprises employed foreign subcontractors, most of which operated in Ukraine where, according to recent data, up to 20,000 positions were located.⁵³ In Ukraine, 45% of all Israeli foreign R&D centres were operated, compared to 10% in Russia.⁵⁴ Prior to the Russian invasion and just after it, some companies and their employees were relocated (e.g., to Poland, Romania). For people employed in high-tech Israeli enterprises in Russia and Ukraine who wished to migrate to Israel, facilitations were introduced. In turn, the liberalisation of the labour market for foreign workers, which had been limited in the first decade of the 21st century⁵⁵—encountered obstacles of a political (priority for Jewish migration) and global nature (COVID-19 pandemic). Currently, the number of foreign specialists employed by the Israeli high-tech sector is estimated at about 5,600.⁵⁶ The inflow of highly skilled labour might serve as a counterbalance to the challenges related to the emigration of Israelis. Although this movement may be perceived as conducive to building new foreign partnerships (e.g., through the thousands in the Silicon Valley diaspora), the Israeli authorities fear that in the long term such immigration will weaken the state's potential.

⁴⁹ M. Przychodniak, "Israel in Chinese Policy: Innovation and Strategic Importance", *PISM Bulletin* no 4 (1250), 11 January 2019.

⁵⁰ "Report IVC Research Center 2020," op. cit.

⁵¹ M. Wojnarowicz, "Israel and the Gulf States—the Nature of Secret Cooperation", *PISM Bulletin* no 80 (1020), 25 August 2017.

⁵² M. Wojnarowicz, "A Year Later: Status and Perspectives on Israeli-Arab Normalisation", *Bulletin PISM* no 170 (1866), 28 September 2021.

⁵³ A. Gilead, "Ukrainian techies: Is Israel being short-sighted?," *Globes Financial*, 27 February 2022, www.globes.co.il.

⁵⁴ S. Salomon, "15,000 tech worker shortfall pushing firms to seek talent offshore," *Times of Israel*, 16 December 2018, www.timesofisrael.com.

⁵⁵ M. Wojnarowicz, "The Role of Non-Jewish Migration in Israeli Policy", *PISM Bulletin* no. 88 (1661), 6 July 2018.

⁵⁶ S. A. Cohen, A Gilead, "Israel to bring foreign professionals to fill tech vacancies," *Globes Financial*, 19 October 2021, www.globes.co.il.

PISM STRATEGIC FILE

The Challenges, and Attempts to Address Them

Despite the favourable economic situation, the high-tech sector and its operating model generate numerous problems and challenges in Israeli domestic and foreign policy. In the external dimension, image and political problems in the cybersecurity sector (in 2021, Israeli cybersecurity startups received 41% of global investments in this field⁵⁷) and for the government come from the misuse of sold technologies and products. A recent example are the numerous disclosures by media and activists of the use of the highly sophisticated Pegasus surveillance system created by Israeli company NSO Group and the scale it has been used against

The software, initially designed to fight crime and terrorism, has been used by entities in relation to human rights violations and espionage.

political and other rivals. The software, initially designed to fight crime and terrorism, has been used by entities in relation to human rights violations and espionage. The surveillance system was used to track and investigate members of various states' political opposition, journalists (including the murdered Jamal Khashoggi⁵⁸), civil activists,

as well as political leaders and diplomats around the world. The Israeli Ministry of Defence consented to the export of Pegasus as a cybersecurity product and it was promoted (according to media reports) by Prime Minister Benjamin Netanyahu during his diplomatic visits. The disclosure of misuse of the software (and similar products by other Israeli cyber companies) has resulted in accusations against Israel of facilitating human rights violations and a lack of reliable supervision of cyberweapons exports. The NSO Group itself was placed on the sanctions list by the U.S. Department of Commerce. The crisis related to Pegasus misuse, including in Israel, was one of the most serious challenges for the government led by Naftali Bennett and Yair Lapid that was established in June 2021⁵⁹. The new government undertook diplomatic steps to minimise the repercussions of the scandal, including meetings with the French authorities (President Emmanuel Macron was reported to be the subject of surveillance) and others. The list of countries to which exports of this type of product was allowed has been narrowed and sales temporarily suspended.⁶⁰ However, the issue remains a serious image problem for the Israeli authorities, especially after the European Parliament's commission of an inquiry into the use of Pegasus and other spyware was launched and media reports surfaced about Israel's refusal to sell Pegasus to Ukraine and Estonia for fear of antagonising Russia.⁶¹

The ongoing Israeli-Palestinian conflict remains a constant challenge. Although attempts to activate a global boycott of Israel (including trade), which is the aim of the pro-Palestinian Boycott, Divestment, Sanctions movement (BDS), have affected Israel's economy to a marginal extent, criticism of Israeli policy towards the Palestinians in world public opinion plays an important role. Cooperation with Israeli high-tech entities may generate greater opposition from consumers, especially if their activities are directly or indirectly related to the conflict (e.g., the use of technologies seen as human rights violations). On the other hand, the need for skilled labour in the Israeli high-tech sector opens up new areas for Israeli-Palestinian cooperation. There is a growing number of business links between startups in Israel and the Palestinian Authority (PA). Israel sees the rapidly growing number of Palestinian specialists (3,000 graduates annually from technical

⁵⁷ Sh. Salomon, "Israel cybersecurity firms raise record \$3.4b, 41% of global sector investment," *Times of Israel*, 1 July 2021, [timesofisrael.com](https://www.timesofisrael.com).

⁵⁸ K. Wasilewski, "Turkey and Saudi Arabia: A Dangerous Rivalry", *PISM Bulletin* no 171 (1242) 17 December 2018.

⁵⁹ M. Wojnarowicz, "United Opposition: The "Government of Change" Against Netanyahu", *PISM Bulletin* no 119 (1815), 18 June 2021.

⁶⁰ R. Bassist, "Israel freezes spyware exports," *Al-Monitor*, 10 February 2022, www.al-monitor.com.

⁶¹ R. Bergman, M. Mazzetti, "Israel, Fearing Russian Reaction, Blocked Spyware for Ukraine and Estonia," *New York Times*, 23 March 2022, www.nytimes.com.

PISM STRATEGIC FILE

faculties⁶²) as support for this labour market. In November 2021, a preliminary programme was approved to provide Palestinian tech experts with 500 permits to work in Israel.

Israel's economic model for the high-tech sector has its limitations and internal policy implications. A system focused on the quick sale of a product, patent, or start-up does not create conditions for

A downward trend is visible in the number of new start-ups and research centres and in the participation of Israeli enterprises in acquisitions and mergers.

the development of larger entities and expansion of domestic enterprises. A downward trend is visible in the number of new start-ups and research centres and in the participation of Israeli enterprises in acquisitions and mergers. Although employment in the high-tech sector in 2012-2020 increased from 216,000 to 334,600 people (from 7.4% to 11.7% as a percentage of all employees; the state's goal is to achieve 15%), the industry's input to the

rest of economy is insufficient to ensure wider access to well-paid jobs for most Israeli workers. Gender inequality persists in the sector, as only 34% of the employees are women, even lower than the pre-pandemic 36% in 2020.⁶³ The problem remains the activation of the two economically weakest social groups in Israel—the Arab minority (about 20% of the population) and ultra-Orthodox Jews (about 13% of the population). Employment growth in these groups remains modest despite the initiation of specific pilot programmes, and in the high-tech sector it amounts to only 2.3% of Israeli Arabs (of which 30% are women) and only 3.3% of ultra-Orthodox (of which 70% are women).⁶⁴ This is a reflection of both structural neglect (e.g., lower-quality education in the Arab sector, concentration on religious studies at the expense of science subjects by ultra-Orthodox males) and identity aspects (e.g., contestation of military service and thus a weaker network of social contacts, limited use of modern technologies by the ultra-Orthodox). Increasing the participation of these groups in the high-tech sector would not only address social problems that are important from the state's perspective but also have a measurable economic dimension because the shortage of workers remains a constant problem for the high-tech sector. Despite the constantly growing number of science students, the Israel Innovation Authority indicated that at the end of 2020, there were 13,000 vacancies in the high-tech sector. The actual number may be higher including in non-technical positions (e.g., marketing, sales).⁶⁵

The rapid development of the high-tech sector increases social inequalities. High competition for employees, especially from foreign companies, pushes up wages in the sector, which contributes to even deeper income stratification. According to data from Israel's Central Bureau of Statistics, wages in the industry increased by 44% in 2010-2019, while the average wage increased by 28% during this period. The average monthly wage in the high-tech sector in October 2021 was \$8,200, while the average national salary was \$3,500. This makes situations like the housing crisis worse. Housing prices, mostly in the central, densely urbanised part of Israel where 73% of the start-ups and 60% of the high-tech workers are concentrated, exceed the purchasing power of most Israelis.⁶⁶ Given the rapid population growth, this creates a serious social problem. Additionally, costs of living are rising, for example, Tel-Aviv last year was the most expensive city to live in the world.⁶⁷ Thus, the development gap between the main centres and the periphery continues to widen. The government and its agencies are trying to counteract these phenomena by decentralising the innovation business, launching development programmes in smaller cities, and subsidising new investments in the southern regions (e.g., by establishing a cybersecurity technology park in Beer Sheva).

⁶² M. Al-Kassim, "Palestinian High-Tech Sector Is Bright Spot in Otherwise Ailing Economy," *TheMediaLine*, 11 January 2022, www.themedialine.org.

⁶³ "Israel Innovation Authority's 2021 Innovation Report," *op. cit.*

⁶⁴ "High-tech Human Capital Report 2020," *op. cit.*

⁶⁵ "Israel Innovation Authority's 2021 Innovation Report," *op. cit.*

⁶⁶ Data from Israel's Central Bureau of Statistics, www.cbs.gov.il.

⁶⁷ "Tel Aviv is the world's most expensive city," *The Economist*, 30 November 2021, www.economist.com.

PISM STRATEGIC FILE

Conclusions

Israel's innovation potential, along with the alliance with the U.S. and military strength, determines the country's international position to a great extent. The strong high-tech sector was one of the reasons why the pandemic's effects on the Israeli economy were relatively mild. Israel's role in the sector will increase due to global trends and the growing demand for its technological offer, especially in the area of digital transformation and industry 4.0. However, the current economic model places Israel more in the role of a solutions provider and subcontractor than the creator of trends or regulations. It is also likely that the government will try to strengthen the sustainability of enterprises ("scale up"), so that start-ups function for longer as stronger entities on the market, while also increasing expenditures on infrastructure in neglected areas, such as on energy due to the growing demand for electricity (e.g., by data centres).

The strong high-tech sector was one of the reasons why the pandemic's effects on the Israeli economy were relatively mild.

An additional challenge for the current Israeli tech model is the need for the government to maintain constant investment attractiveness. The market advantage of MNCs is visible and Israeli enterprises have a harder time competing with them. Despite the record inflow of capital, the rising costs and fierce competition on the labour market, especially in the face of announcements of large investments,, may eventually induce companies to reduce employment and relocate investments. To counteract this, the government will increase its support for foreign entities to maintain their presence in Israel. However, such steps may be treated as weakening Israeli investors and entrepreneurs, generating opposition from them and a demand for greater protection of domestic capital.⁶⁸ It cannot be ruled out that the growth rates in the innovation sector will slow due to the growing challenges.

Israel's high-tech sector remains too small to be effective in influencing socio-economic indicators and the welfare of society as a whole. The adopted model also fosters social stratification and unfavourable phenomena affecting society (e.g., the housing crisis). The authorities are trying to counteract these tendencies so that the most economically weakest groups of citizens—the Arab and ultra-Orthodox populations—will benefit from the development of the most promising branch of services and industry. The increased participation of these groups is therefore closely related to progress on deep internal and systemic reforms (e.g., regarding army service). Ultimately, the high-tech sector is to serve more as a tool of social integration and constitute a response to Israel's internal problems.

The role of foreign cooperation in the area of innovation, such as joint R&D projects, securing financing, and scientific and technical cooperation, will grow. Israel is especially interested in forging strong ties with highly developed economies and new markets in Asia and the Middle East. However, this will not weaken relations with Israel's main partners and the world leaders in innovation, namely the U.S. and the EU. Scientific and high-tech cooperation is currently the basis of EU-Israeli relations despite political divergences. These ties will largely position Israel on the side of Western states in the face of increasing technological

Scientific and high-tech cooperation is currently the basis of EU-Israeli relations despite political divergences.

⁶⁸ U. Berkovitz, "It's not right that Israeli high tech is foreign owned," *Globes Financial*, 21 December 2020, www.globes.co.il.

PISM STRATEGIC FILE

protectionism and global rivalry between those states and China and Russia—a process that has only deepened following Russia’s invasion of Ukraine⁶⁹.

Israel has so far refrained from joining the Western sanctions against Russia, a decision that remains problematic because it generates the risk of attempts by sanctioned entities, or those threatened with them, to invest in Israeli technology companies. At the same time, the ongoing Russia-Ukraine crisis results in restrictions on or need to withdraw from operations in Russia and Ukraine by Israeli technology companies. With respect to Russia, this process is seen as beneficial from the point of view of Western states, but in the context of the critical situation of the Ukrainian economy⁷⁰, it is necessary to maintain the existing economic ties between Israel and Ukraine. Hence, the issues of maintaining cooperation in the prospective high-tech sector and involvement in the reconstruction of the Ukrainian economy should be part of the talks with the Israeli side conducted by the EU and U.S. diplomacy.

Israel will try to prevent economic issues from being tied to its conflict with the Palestinians, and also will work to minimise the losses caused by scandals such as the Pegasus case. However, subsequent escalations or disclosures of abuse of cybertech solutions may mean that even purely commercial cooperation with Israel will generate greater image costs for Western companies than desired. At the same time, the high-tech sector can be used to create promising and mutually beneficial economic ties between the PA and Israel at the bilateral level.

In the context of Polish-Israeli relations, the area of innovation will remain one of the stable elements of the bilateral cooperation, even in the face of tensions at the political level. The further development of the Polish modern technology sector will naturally encourage entities from Israel to deepen cooperation and conclude new partnerships. It is also probable that some Israeli enterprises and R&D centres previously operating in Ukraine, Russia, and Belarus will be transferred to Poland.

⁶⁹ M. Makowska, O. Szydłowski, “Reaction of Tech Companies to Russia's Invasion of Ukraine”, PISM Spotlight no 46/2022, 7 march 2022.

⁷⁰ D. Szeligowski, “The Economic Impact of the Russian Invasion on Ukraine”, PISM Spotlight no 74/2022, 31 march 2022.