



רשות החדשנות
Israel Innovation
Authority



2023 Annual Report
**The State
of High-Tech**

Chairman and CEO - Opening Remarks

Last year (2022) and the beginning of 2023 have been a complex and challenging period for the global economy, for the Israeli economy and, consequently, for Israeli high-tech. As 2023 began, the cheap state-funded capital provided worldwide to contend with the Covid pandemic “disappeared”, the Russia-Ukraine war broke out triggering extensive economic sanctions against Russia, supply chains became clogged, inflation increased, and central banks began raising interest rates worldwide as global stock markets declined sharply. All these generated a process of a marked downturn in venture capital investments both globally and in Israel. Towards the end of 2022, and with the onset of 2023, the global crisis was exacerbated on a local level by the uncertainty resulting from Israeli political circumstances.

The global crisis and local uncertainty are a cause for concern with regard to the Israeli innovation industry and its continued position as a world leader. This report – that relates to data for 2022 and initial figures for Q1 2023 – seeks to sketch an updated situation report of the innovation industry.

The first section of the report looks at high-tech's importance for the Israeli economy – almost one fifth of Israeli GDP (18%) – by far the fastest growing sector over the past decade, total exports that doubled in the same period, productivity that is 90% higher than the economy's average, and a rapidly growing number of employees (401,900 salaried employees in high-tech in 2022, a figure that is growing at an annual rate triple that of the economy's average). This and other data presented in the report leads to a clear conclusion: an underperforming Israeli high-tech sector will lead to severe consequences for the Israeli economy.

On a global level, the Israeli innovation hub competes directly with other tech hubs around the world for investments, human capital, and knowledge – and, in practice, to be the place where solutions for the toughest global challenges will be found. It is in this light that the report examines the performance of the Israeli high-tech sector in relation to other innovation hubs to which Israel compares itself, in addition to comparisons with the other sectors of the local economy.

Data presented in the report reveals that while Israel has competed head-on with the world's largest hubs for investments in startups (95 billion dollars over the past decade, 6th in the world) and for opening new startups (9,093 companies – 3rd in the world). The growth of European hubs such as those in Paris and London, which constitute direct competitors for investment and talent, has significantly intensified their competition over the past two years.

Another issue addressed by the report is the cornerstones on which Israeli high-tech is based. The data presented in the report indicates that Israeli high-tech depends almost entirely on the private sector and on foreign investors. In practice, a unique situation exists in Israel relative to the rest of the world as far as distribution of investments in R&D between local and foreign entities is concerned. According to OECD data, Israel is the only member country in which entities outside the country fund more than half of all R&D performed in the private sector. Moreover, the small share of the state in R&D investments is especially prominent with only 9% of the national expenditure on R&D being funded by the government – the lowest ratio of all OECD countries.

Furthermore, an Innovation Authority evaluation of IVC data pertaining to the venture capital field in Israel that funds the lion's share of high-tech, reveals that the share of foreign investors between 2018-2022 was at least 75%-80%.

The report also addresses the concern that high-tech is digressing from the global trend (a concern that is addressed in detail in a position paper published by the Authority), high-tech's thematic concentration (in three main fields – organizational software, fintech and cyber), the decline in the number of new startups and the drop in the scope of their fundraising, changes in the labor market, ramifications of technological changes such as the flourishing of generative AI, and more.

In light of this analysis, the State of Israel must compose a strategic plan based on four areas of activity to maintain its position as a global leader of innovation and to expand innovation's impact on the local economy.

First, it must identify the future of innovation trends that can constitute new growth engines. To do so, Israel must incentivize high-tech's thematic diversification. In other words, it must channel resources to new markets in which there will be a demand for new technologies. One of these areas is climate-tech. The climate chapters in the report provide a glimpse of Israel's great potential to become an exporter of global solutions in this field. It is important to note that investment in this area is not defined solely in terms of financial investment, but also by actions that can help these areas to develop, among others by removing regulatory barriers.

Second, Israel must also strive to increase the demographic and geographic diversification of its high-tech that can no longer remain exclusively in the center of the country where it relies on homogeneous human capital that has limited scope for expansion. It must expand to other areas around the country where Israel has comparative advantages it can utilize (e.g., climate and agriculture), and must increase integration of sectors of the population that are currently significantly underrepresented in local high-tech.

Third, Israel must create incentives that will further encourage entrepreneurship, the opening of additional companies characterized by large innovation potential and high-risk, and the provision of a supportive framework for those companies to enable them to grow as Israeli companies and to succeed globally.

Fourth, Israel must develop a facilitating regulatory approach that will lead to the assimilation of innovation in the local market's public and private sectors to improve productivity in all sectors of the economy on the one hand, while, on the other hand, creating "sandboxes" that will accord local high-tech a competitive advantage.

We are pleased to note that the steps we have mentioned are not theoretical. The Innovation Authority is already promoting them in conjunction with other government departments, academia, and the defense system. The Authority currently leads four national programs in verticals that could be "the technologies of the future" – artificial intelligence, bio-convergence (a technology that combines biology and engineering), quantum, and climate-tech. The Authority is also striving, and will strive even more this year, to grow startups and promote high-tech initiatives and diversification – thematic, geographic, and demographic.

We wish to thank the Innovation Authority's Economy and Research Department for preparing this impressive report portraying a complex situation report of today's innovation industry. We wish to thank all the Innovation Authority employees for their high-quality and devoted work throughout the year, the team of professional experts and members of the research committees, especially the public representatives, for their dedication and professionalism. We also thank the Innovation Authority's Board for its important work in delineating policy and all the many partners of the Authority from within and outside government for their endeavor in advancing innovation in Israel.

Dr. Amiram Applebaum

Chief Innovation Scientist at the Ministry of
Innovation, Science and Technology
Chairman of the Board of the Israel Innovation Authority

Dror Bin

CEO of the Israel Innovation Authority

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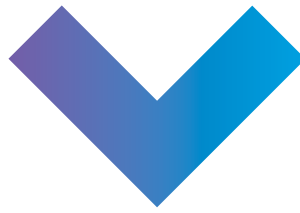
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Introduction and Highlights: **A Turning Point for Israeli High-Tech or Just a Slight Blow?**



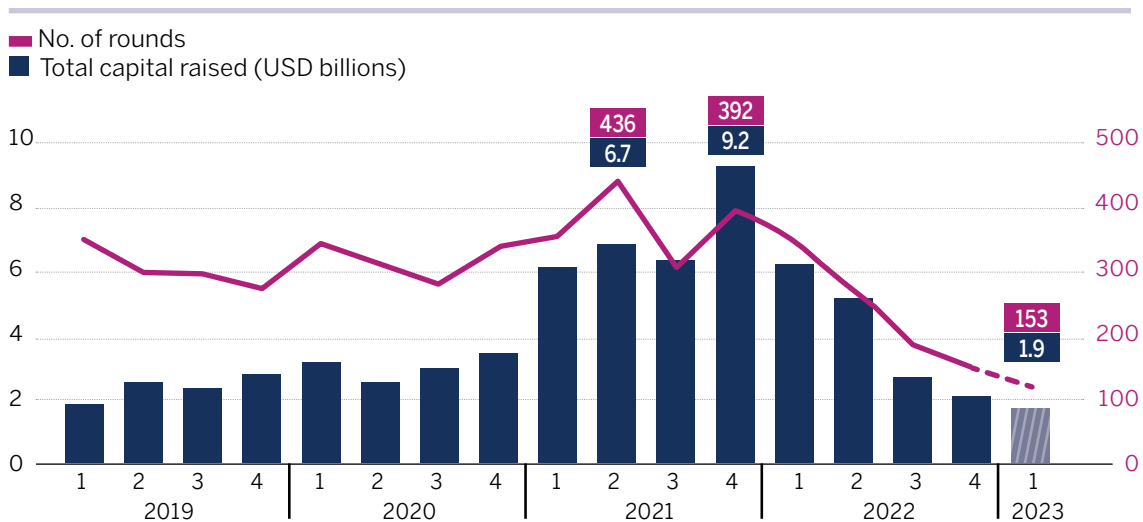
A Turning Point for Israeli High-Tech or Just a Slight Blow?

Following more than a decade of growth and prosperity in Israeli high-tech, this year's annual Innovation Authority report is being published during a challenging period, one characterized by uncertainty for the Israeli high-tech industry. During the previous quarters, the positive trend that typified the industry over recent years was replaced by a decline in important metrics, including a downturn in startups' fundraising and increased layoffs in high-tech companies that led to a decline in the number of employees in the industry. The central question currently facing the industry is whether it will fall in line with the signs of recovery that can already be seen in the US or whether there is cause for concern of a deep ongoing crisis with uniquely Israeli characteristics.

After a record year for global high-tech in 2021, the subsequent year signaled a cooling-off of the economy. Funding of startups declined in 2022 in innovation hubs around the world compared to the previous year. The record quarter for Israeli high-tech fundraising was the fourth quarter of 2021 when local technology companies – primarily the growth companies – raised more than 9 billion dollars. The positive trend continued into 2022, and the level of investments during the first two quarters of that year were similar to the corresponding quarters of 2021. This trend changed during the second half of 2022 however, and total quarterly investments were cut by more than half. In total, investments in startups in Israel shrunk during 2022 by almost 50% compared to the previous year, totaling 16 billion dollars. Nevertheless, this sum is still more than 30% higher than startups' fundraising in 2020 that was then considered a record year for capital raised by startups.

01 A Drop in Startups' Fundraising in Israel from Second Half of 2022

No. of funding rounds and total capital raised by Israeli technology companies (by quarter, in USD billions)



Data relevant for May 2023 and is expected to be updated

Source: Innovation Authority adaptation of IVC data

According to initial data published regarding startups' fundraising in 2023, it seems that the negative trend has continued during the first two quarters of the year (the data is still expected to update). If this trend is not significantly reversed, we can expect continued decline in investments in Israeli startups compared to the growth trend that characterized recent years. If this scenario materializes, it would be a warning sign for Israeli high-tech, one that would require an appropriate response.

As will be presented [below](#), most of the decline in fundraising during 2022 stemmed from the drop in large funding rounds (over 50 million dollars) that are intended to support the continued growth of mature startups in Israel. It is important to pay attention to the decline in funding of companies that belong to this group, and which facilitate a diversity of jobs in high-tech. An Innovation Authority analysis reveals that complete software companies employ an average of 2.55 employees in non-technology jobs for every employee in a technology job such as engineering or development. In other words, these companies make an important contribution to high salary employment and productivity levels in non-technology jobs. These companies constitute a significant cornerstone of Israeli high-tech and contribute significantly to the economy. It is important therefore to continue monitoring the way they contend with the present situation and to consider proposing relevant solutions.

At the same time, it is worthwhile continuing the monitoring of trends related to young companies in their early stages that constitute the next generation of Israeli high-tech, and the difficulties with which they are currently contending. This is especially true against the backdrop of the ongoing multiyear declining trend of new startups. In the "Decline in the Establishment of Startups" Chapter in this report, we analyze this phenomenon – not unique to Israel but which definitely impacts the sector's future.

It is important to note in this context that crises are a good period for growing startups, and that there are successful companies which were established specifically in such periods – for example, JFrog and IronSource that were established in 2009 and 2008 respectively. Furthermore, the long-term effects of the 2008 global crisis were positive for Israeli high-tech and were among the factors that caused the sector's maturation we have witnessed in recent years with the growth of unicorns and complete companies in Israel

Is Israeli High-tech Detaching from the Global Trend?

The state of Israeli high-tech is primarily a result of global and local macro-economic factors that influence the sector. Among these are the ongoing war in Ukraine, the instability of financial markets and the surge in inflation. Furthermore, increased interest rates have contributed to a reality whereby after long years of negligible interest rates, investors can now enjoy a return on their deposits without risking their capital in high-risk startup investments. The result is a lower incentive to invest in startups compared to previous years when there were fewer investment alternatives.

Nevertheless, there are also local factors unique to Israel that may impact the entire Israeli economy. Senior figures in the Israeli high-tech industry have warned in recent months against the ramifications on the industry of the legal reform that the government is attempting to lead, among others, expressing foreign investors' concerns about continued investment in Israel.¹

A position paper published in April by the Innovation Authority highlighted two main phenomena identified in Israeli high-tech since the beginning of the year. First, a decline in the listing of new startups in Israel that can already be noticed – the ratio of new startups registered overseas increased from 50% to 80%, compared to 20% the previous year. This phenomenon signifies a decline in the trust in the Israeli business environment's stability on the part of entrepreneurs who prefer to register companies overseas despite the tax advantages enjoyed by companies registered in Israel.² The second phenomenon is the concern of Israel's imminent detachment from global capital trends and of a decline in Israeli high-tech's share in international venture capital investments. This concern stems from the ongoing decline in investments in Israel whereas other locations have already witnessed the reversal of this trend.

¹ See for example: Amnon Shashua – News – [TheMarker](#) (Hebrew).

² For example, corporate tax in Israel for a R&D-oriented company is 12% (under the definition of "a preferred technological enterprise") and dividend taxation stands at 20%, whereas the corresponding tax rates in the US are 21% and 30% respectively.

These and other phenomena reinforce even further the need to minimize the prevailing legal uncertainty in Israel, alongside the expansion of supportive tools for startups currently being established in order to register them in Israel. It is important that the state act in the short-term to reduce the phenomenon of new Israeli startups being registered overseas. This is due to the fact that the Israeli high-tech sector is responsible for 30% of the growth in Israeli GDP over the past five years (2018-2022).³ This growth stems from the success of startups established during the previous decade to become growth companies operating in Israel, to maintain their intellectual property here, record their sales in Israel, and to employ a wide range of employees – technological and non-technological – at high salary levels.

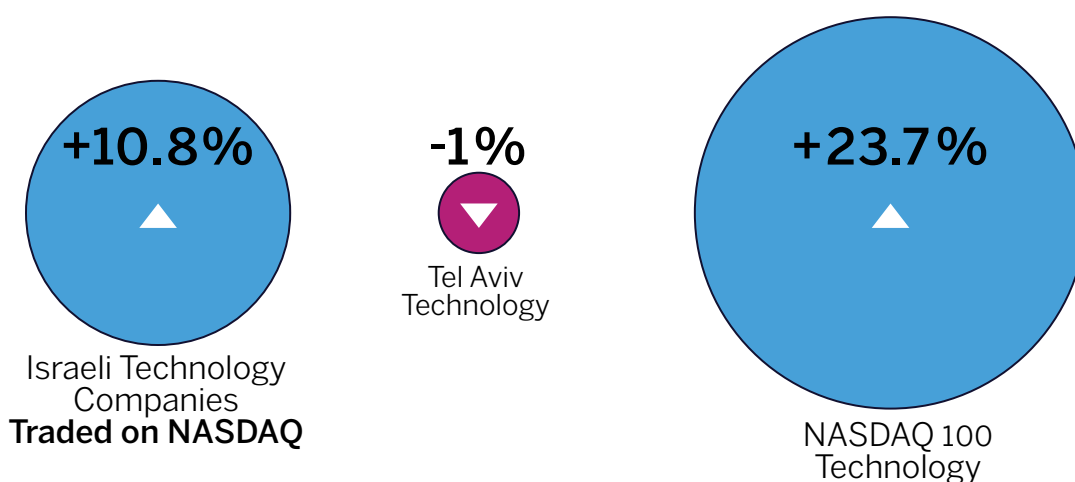
It is still too early to determine that internal Israeli issues are those which lead to the different results of the Israeli high-tech sector compared to those observed in other innovation hubs around the world. However, regardless of the reason for this difference, there are several worrisome metrics that indicate discrepancies in recent months between the situation in Israel and that in other hubs.

The first of these discrepancies relates to the underperformance of the technology companies listed on the Tel Aviv Stock Exchange: in the first quarter of the year (January 1-March 30), the index of the 100 largest technology companies traded on the NASDAQ rose by 24%. In contrast, the Tel Aviv Technology Index declined during the same period by 1%.⁴ In other words, while the NASDAQ had already begun its recovery with technology shares on the rise, no such similar trend was recorded in Tel Aviv.

A further analysis conducted for the report assessed the performance of the Israeli technology companies traded on NASDAQ.⁵ This analysis revealed that these companies' shares yielded a return of 10.8% during the first quarter, a higher return than that recorded by the technology companies traded on the TASE but lower than that of the NASDAQ 100 Technology Index. This would seem to indicate that Israeli companies have underperformed since the beginning of the year, with Israeli companies traded in Israel being "punished" by the market with especially low yields. By comparison, from the beginning of 2019 to the end of 2022, the index of Israeli technology companies traded on the NASDAQ rose more than the NASDAQ 100 Index.

02 The NASDAQ Recovers While Israeli Technology Stocks in Tel Aviv Stagnate

Changes in Stock Indices, Q1 2023



Source: Innovation Authority adaptation of NASDAQ and TASE data

³ Based on an Innovation Authority adaptation of CBS data.

⁴ The yields of the TA Technology and NASDAQ 100 Technology indices did not change significantly before final preparation of the report during Q2 2023.

⁵ The Innovation Authority monitors changes in the value of more than 100 Israeli technology companies traded on the NASDAQ to create a synthetic index.

Another worrisome metric is that of fundraising by Israeli startups during the first quarter. While some global markets had begun a slow recovery, even reversing the negative trend, investments in Israel declined by more than 70% compared to the corresponding quarter the previous year.⁶ This is a sharper decline than that recorded in other markets assessed with which Israel compares itself. In comparison to the previous quarter, the decline in investments in Israel was more moderate – a decline of 14%. However, this figure is still enough to indicate a sharper decline than that recorded in the US during the same period.

03 Q1 Investments in Israel Declined Over 70% vs Last Year - More Than Other Markets

Change in technology companies' fundraising in Q1 2023 vs same quarter last year and previous quarter

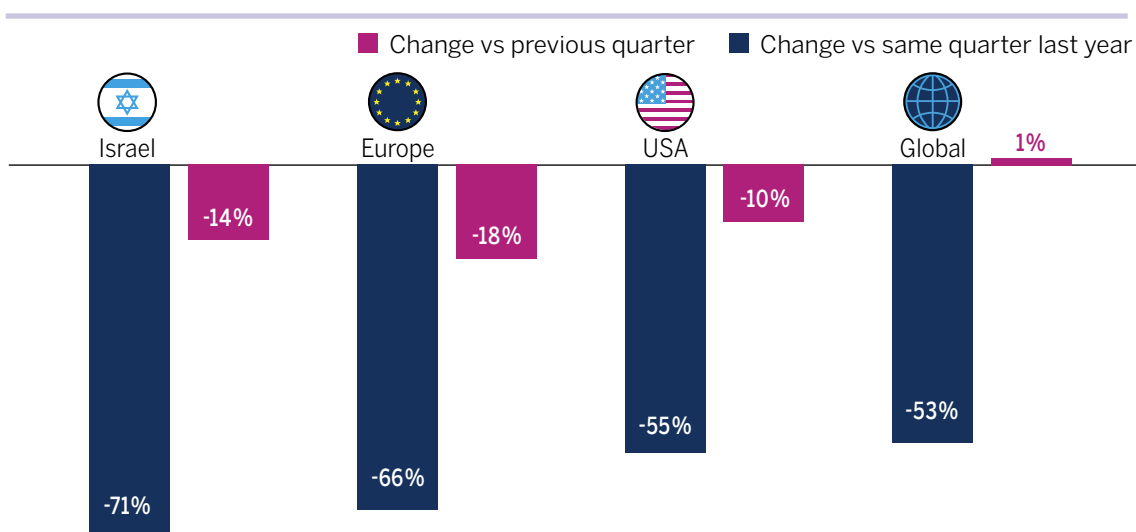


Diagram presents data as of April 2023

Source: Innovation Authority adaptation of NVCA, IVC, Pitchbook and Crunchbase data

As far as hiring employees in high-tech companies in Israel is concerned, a change in this trend – expressed by employee layoffs – has been noted since the beginning of the year, one that may impact the entire Israeli economy following years of growth. An analysis of the changes in the number of employees in subsectors of high-tech services (primarily including the software companies in Israel which are the main and growing section of Israeli high-tech) in recent years reveals a significant growth in high-tech employment. For most of 2017-2018 there was a quarterly increase of 1,000-8,000 employees in the high-tech services subsectors. In 2019, the largest increase in hiring employees reached a peak of 9,700 employees in the fourth quarter of that year. During the first half of 2020, with the uncertainty that accompanied the outbreak of the Covid pandemic, a wave of layoffs was noted in high-tech companies and the number of employees in high-tech services sectors shrunk by more than 10,000. Furthermore, the companies slowed the pace of their recruitments and in the first quarter of the year the number of available jobs declined sharply. However, during the second half of the year, with a higher degree of certainty, high-tech companies began hiring and growing again.

The increase in hiring employees and the growth of the industry peaked with the number of employees joining high-tech each quarter growing significantly until, in the second quarter of 2022 alone, the number of high-tech employees grew by 15,000. A turning point occurred shortly afterwards: during the second half of the year, the companies slowed their recruitment, and the number of available jobs declined every quarter. The crisis deepened with the onset of 2023. Data reveals that not only were fewer job opportunities

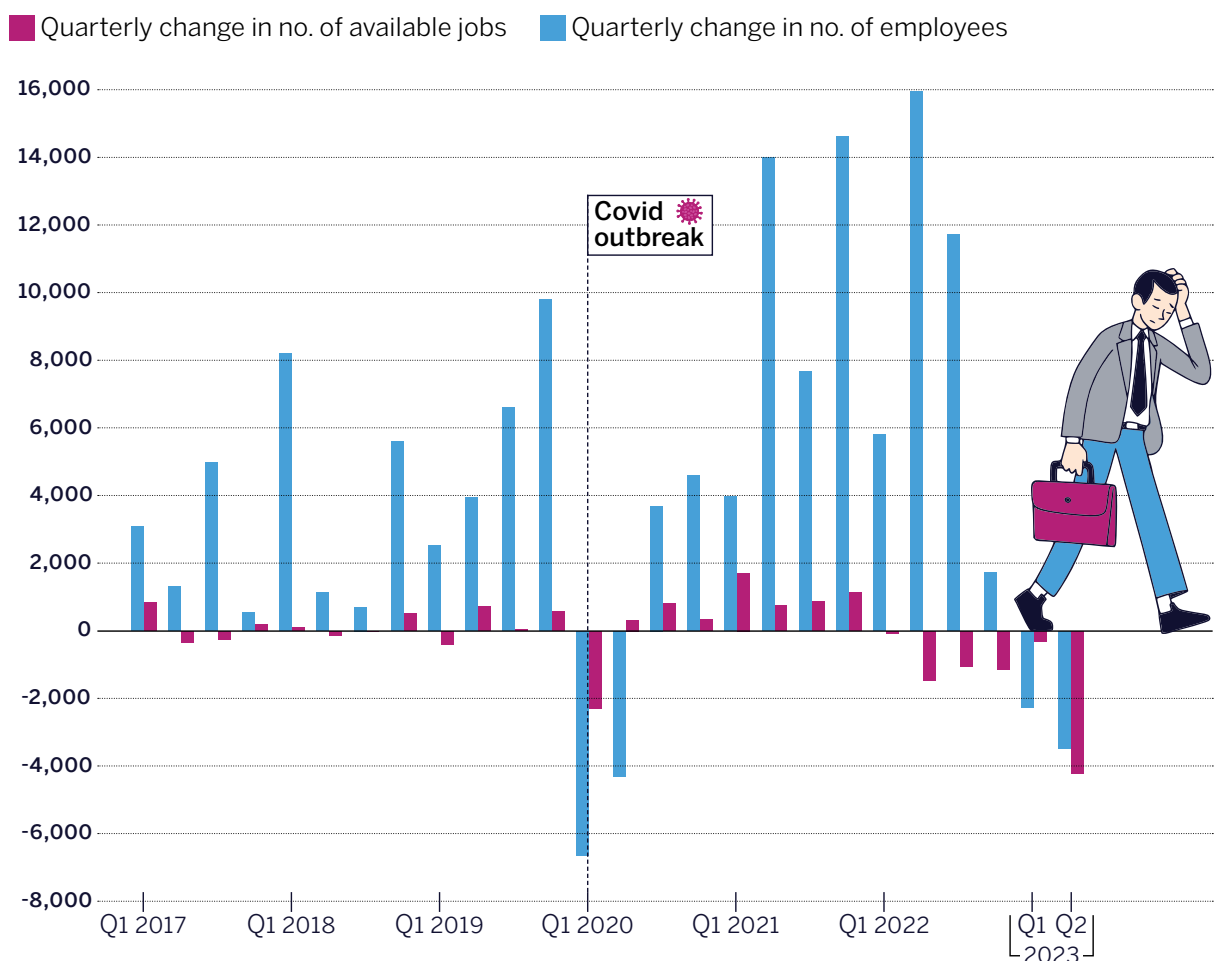
⁶ This assessment is based on data published in the middle of April 2023.

made available by the companies compared to the second half of 2022 – but, that the increasing layoffs wave led to a decline in the number of high-tech employees. In other words, the industry stopped hiring and subsequently began to reduce the number of their employees. In the first quarter of 2023, the number of employees in the high-tech services sectors declined by 2,500 and, in April, subsequently declined by another 3,400.

Looking ahead, Israel must monitor developments in high-tech employment that have implications for the entire local economy. A drop in the number of high-tech employees is expected to lead to a decline in income tax collected in Israel and a resultant lowering of the technology companies' expenditure on purchasing auxiliary services such as real estate, restaurants, and service providers like lawyers and others. Combined with the figure presented in this report relating to the decline in high-tech companies' fundraising, it can be assumed that startups will hire fewer employees and that they will also be compelled to dismiss some of the existing employees as a significant part of the fundraising is directed at hiring employees and payment of salaries.

04 Layoffs Followed the Decline in Open High-Tech Services Positions

Quarterly change in no. of employees and available jobs in the high-tech services sector



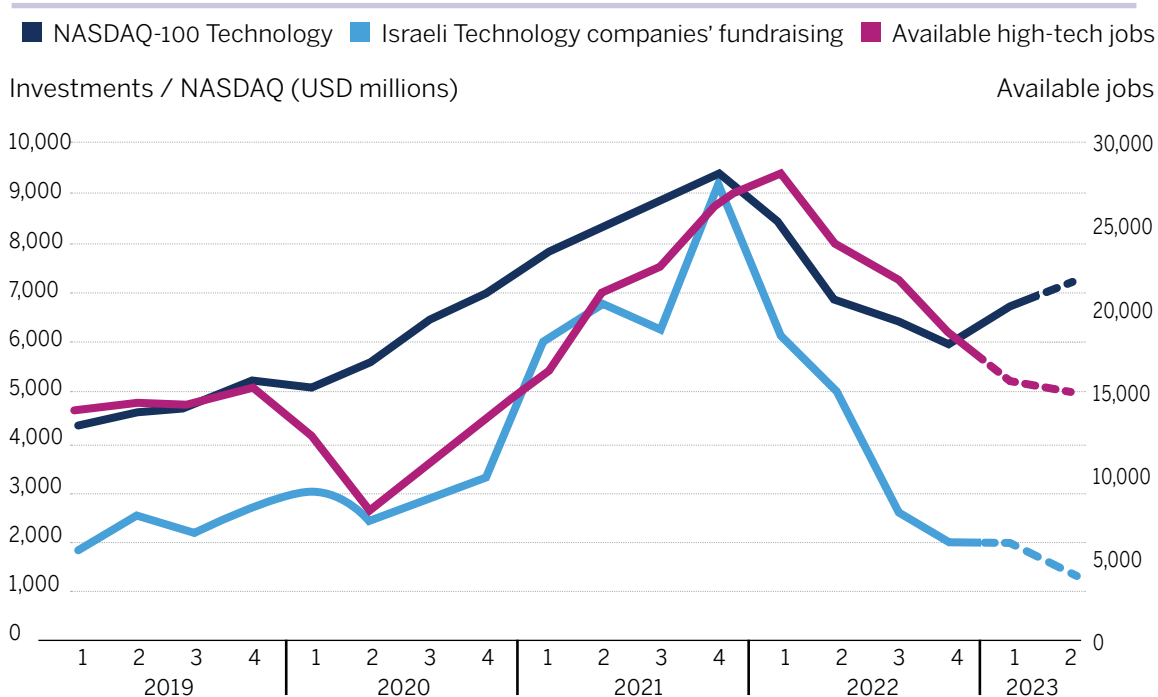
Source: Innovation Authority adaptation of CBS data

Q2 2023 data refers to April only.

The coming months will be critical for Israeli high-tech. Experience teaches that, in general, two quarters after the beginning of a recovery on Wall Street, expressed by an increase in the NASDAQ Index, there is also an increase in recruitment of capital and employees in Israeli high-tech.⁷ In light of the increase in the NASDAQ since the beginning of the year, we would normally expect to see an increase in fundraising and employee recruitment in Israel already during the summer months of 2023. However, according to indicators presented so far, and which are reinforced by data for April and May, there is a genuine concern that Israeli high-tech will become detached from global trends.

05 Gains on the NASDAQ Usually Precede Gains in Israeli High-Tech - What Will Happen This Time?

Total quarterly fundraising of Israeli technology companies, average quarterly no. of available high-tech jobs in Israel, NASDAQ-100 Technology Index



Q2 2023 data is partial. The available jobs data refers to April. NASDAQ data refers to end of May and VC data to 28.5.23. Data was adapted to represent a quarterly estimate. VC data is expected to update upwards.

Source: Innovation Authority adaptation of CBS, NASDAQ and IVC data

These trends are worrisome, especially considering data presented in this report that indicates the significant dependence created on the high-tech sector in Israel as a central and growing industry that contributes to the economy, and in light of this sector's substantial dependence on foreign investors – more than other innovation hubs. A combination of phenomena explains the possible negative impact on the Israeli economy should the declining trend of investment in Israeli high-tech and of personnel recruitment indeed continue. In other words, a situation whereby unique local circumstances lead to the continued decline of fundraising by Israeli high-tech companies, in contrast to the global trend of recovery, would be a genuine cause for concern.

⁷ In 2019, the Chief Economist in the Ministry of Finance pointed out that “there is an almost perfect correlation between the growth of the NASDAQ and the total scope of investments in Israel”. See: “The Synergy between the Private and Public Sectors in Funding Innovation in Israel”, Chief Economist’s Division, Ministry of Finance, December 2019, [Link to article](#) (Hebrew).

Israeli high-tech was responsible for 18% of Israeli GDP in 2022 and for 48% of the country's exports. High-tech output more than doubled in size within a decade. In relative terms, high-tech's share of Israeli GDP more than doubled compared to the corresponding figure in the US. These figures indicate the importance of high-tech to the Israeli economy – an importance that has grown increasingly over the past decade.

At the same time, the data we present in this report illustrates the unique and high degree of dependency of Israeli high-tech on foreign investors. First, 91% of Research and Development (R&D) in Israel is conducted by the private sector – the highest ratio of all OECD countries. On the other hand, as shown in last year's ["2022 High-Tech Situation Report"](#), the level of state funding for R&D in Israel is the lowest in the OECD and stands at merely 9%.

A further characteristic unique to Israel is the high level of R&D funding by foreign entities compared to that of the local private market. On the one hand, this testifies to the significant attractiveness of Israeli high-tech for foreign investors and technology companies and to the quality of the human capital and technological excellence. On the other hand, this also means a high level of dependence on external factors and the Israeli market's exposure to the fluctuations that stem from a change in the preferences of these external entities.

Annual Report 2023 – Main Points

In addition to the challenges related to the current period in Israeli high-tech against the backdrop of the economic downturn, this year's report also presents new analyses and highlights important trends impacting the high-tech sector. Among others, this year we present a new analysis of high-tech employees in Israel that, for the first time, also includes a reference to employees in technology jobs outside the high-tech sector, e.g., a programmer in a supermarket or a software engineer in a bank. The number of salaried employees in the high-tech sector and in technology jobs in other sectors stood at 508,400 in 2022. This figure comprises 14% of all salaried employees in Israel – an increase of 10.6% since 2014. For more on this subject, see ["How many Israelis really work in high-tech"](#).

Against the background of the accelerated growth in the number of employees in the high-tech sector, it is impossible to ignore the fact that despite the significant resources and efforts invested in diversification, the disparities between the various groups in high-tech have endured over time. Over a period of almost a decade, there have been only minimal changes in the composition of the high-tech population. Women – the largest group underrepresented in high-tech – have maintained their relative share of one third of the salaried employees in the high-tech sector and in technology jobs in other sectors. Progress in integrating Arabs and ultra-Orthodox into high-tech has also been very slow. In 2022, only 2% of high-tech employees were from the Arab society and 3% from the ultra-Orthodox society.

A further significant social disparity relates to the salaries in high-tech. In 2022, the average monthly salary in high-tech – that amounted to 28,385 shekels – was 2.7 times higher than the average salary in the rest of the economy (10,452 shekels). Over the past decade, with the major investments in and the growing global demand for technological solutions, high-tech salaries rose as did the disparity between them and the average salary in Israel. High-tech employees' salaries increased by 9,465 shekels between 2012-2022, compared to an employee in the other sectors of the economy where salaries rose over the same period by 2,290 shekels.

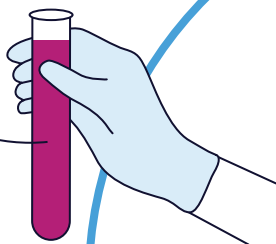
We also compared high-tech with other sectors of the economy while analyzing different trends and evaluating their contribution to the economy: the accelerated growth transformed high-tech into the sector with the economy's largest and fastest growing output, responsible for the largest share of Israeli exports, with the fastest growth in the number of employees, and with the fastest growth in the rate of salary increase. Further details about the other sectors can be found in the chapter ["A Macro Look at Israeli High-Tech"](#).

06 Israeli High-Tech in Numbers

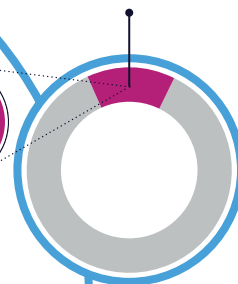
18%
of Israeli GDP comes from high-tech,
the sector with the highest share of GDP



91%
of R&D in Israel is
performed by the private
sector - the highest rate
in the OECD



14%
of all employees work
in the high-tech sector
and in technology jobs
in other sectors



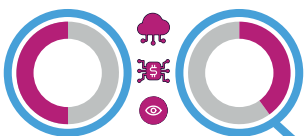
400,000
employees in the
high-tech sector

100,000
employees in tech
jobs in other sectors

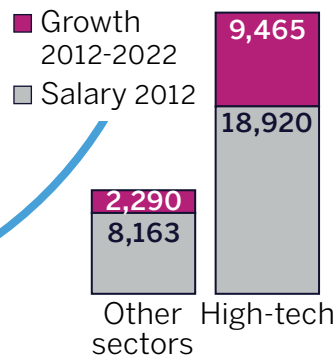
**Organizational software, fintech
and cyber companies**

attract **50%**
of annual
investments

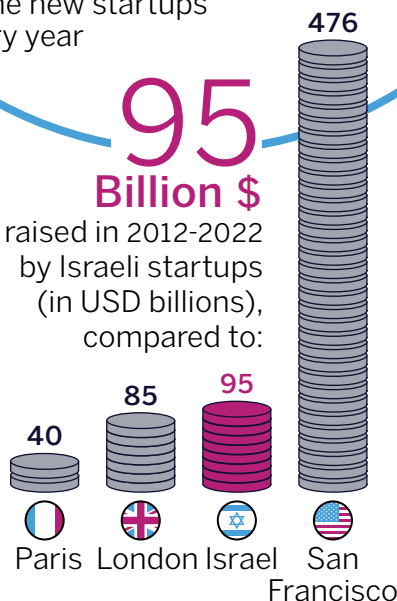
constitute **40%**
of the new startups
every year



Growth in monthly salary



95 Billion \$
raised in 2012-2022
by Israeli startups
(in USD billions),
compared to:



An analysis of productivity shows that the output per work hour of high-tech employees stood at 337 shekels per hour in 2022 – almost double the output per work hour in the economy at large (178 shekels). Although high-tech productivity is 90% higher than that of the general economy, it still trails the sector of electricity and water supply and sewage services, and the finance and insurance sector.

Alongside the challenges faced by Israeli high-tech, this period witnessed the emergence of a new technology that may influence the sector and the economy in general and constitute a seminal development. Use of generative AI technology has recently become widespread, and the assimilation of tools launched for public use is progressing rapidly. The significant breakthrough in tools in this field is expected, already in the near future, to influence the activity and efficiency of Israeli companies introducing these technologies via a variety of processes. Furthermore, the demand for solutions in this field also constitutes a commercial opportunity for Israeli startups developing relevant technologies.

Another opportunity we identified is the development and assimilation of Israeli technologies aimed at contending with the climate crisis. According to an analysis presented in detail in this chapter, in the section addressing [climate-tech in Israel](#), Israel is in a promising position, as a player developing revolutionary solutions in the field of climate-tech. Israel's long history of contending with challenges in the fields of water and agriculture, and the extensive knowledge accumulated in its research institutions contribute to the Israeli reputation and experience and constitute a comparative advantage of the Israeli ecosystem in this field. According to an analysis presented in this report, there are over 500 companies operating in Israel in the field of climate-tech, with the prominent areas of activity being energy, food-tech, and water.

In addition to the growing opportunity in the field of climate-tech, we show how three central fields have become the spearhead of Israeli high-tech: organizational software, fintech and cyber. According to the analysis presented in the report, over 40% of the new startups established each year operate in these fields, more than half of all investments are directed to these fields, and most of the specialist funds that made more than ten investments in a specific field, operate in these areas.

An examination of the composition of investments in Israel and in the US reveals several differences between the two markets. As will be detailed below, it is clear that investments in Israel in technology companies in the fields of health and biotechnology are relatively lower than those in the US, especially private market investments. It is interesting to check why Israel does not fully utilize its entrepreneurial and technological potential in this important field. Especially prominent in relation to the US market are the investments in the fields of software and cyber in which Israel has a comparative advantage that is based, among others, on the knowledge produced in the IDF. The Innovation Authority closely monitors global investment trends in sectors of the high-tech industry to identify trend changes and reinforce Israel's readiness to contend with them.

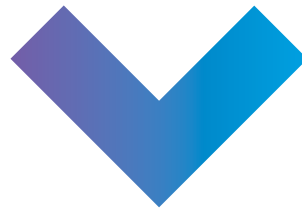
At the same time, Israel must not descend into complacency. In comparisons to other global innovation hubs, Israel stands out as the third largest ecosystem in terms of the number of startups – over 9,000 – and in terms of startups' fundraising that totaled 95 billion dollars between 2013-2022, positioning Israel in 6th place among the large hubs in terms of fundraising. Additional data is presented in detail in the chapter addressing [global comparisons](#). Although Israel currently stands out on a global level, it is important to note that many countries and regions around the world invest in developing innovation and entrepreneurship and attain significant achievements (London and Paris are prominent examples of this) so that Israel's competition is only growing.

It is therefore imperative to continue investing in high-quality education from a young age that will enable young people to join the global high-tech industry. Furthermore, the Innovation Authority will continue to closely monitor trends in the high-tech industry and will propose relevant solutions as needed. As a growing and extremely important economic sector, Israel must continue to cultivate this national resource for the benefit of the entire Israeli economy and society.



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Part 1 High-Tech's Contribution to the Israeli Economy and a Global Comparison



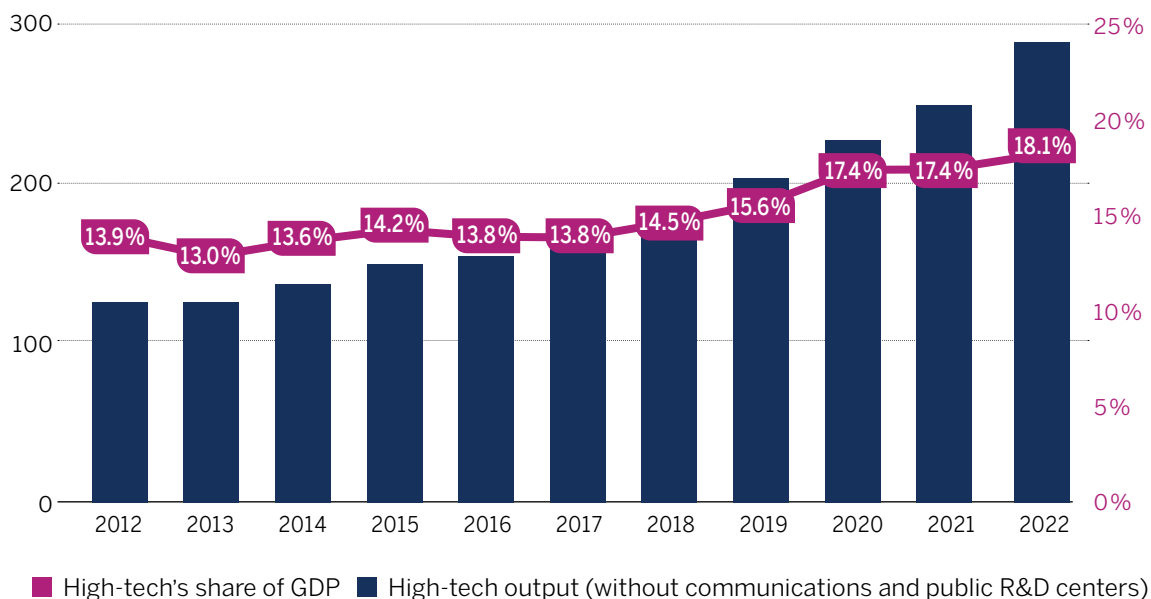
Israeli High-Tech 2023 – A Situation Report

The past decade has witnessed an increase in the importance of the high-tech sector to the Israeli economy. Even prior to that, high-tech was regarded as “the growth engine” of the Israeli economy, however an analysis of data from the last decade reveals that the sector has grown at an accelerated rate, especially during the past five years. This accelerated growth has transformed high-tech into the sector with the economy’s largest output and growth, responsible for the largest ratio of Israeli exports, and with the most rapid growth in the number of employees and salaries.

As high-tech grows, so too has the Israeli economy’s dependence on it. Furthermore, more than other countries, in Israel this sector is based almost entirely on the private market and is therefore exposed to global fluctuations that impact investors and multinational technology companies. The resultant ramifications of this situation threaten the continued growth of Israeli high-tech, especially in periods such as the present, that are characterized by declining levels of startups’ funding rounds.

07 High-Tech Output More Than Doubled Over the Past Decade and is Nearly a Fifth of Israeli GDP

Annual high-tech output (in NIS billions) and its share of GDP



According to CBS recommendations, from this publication, reference to GDP is in base prices (total added value to economy) and there may be some inconsistencies with past data.

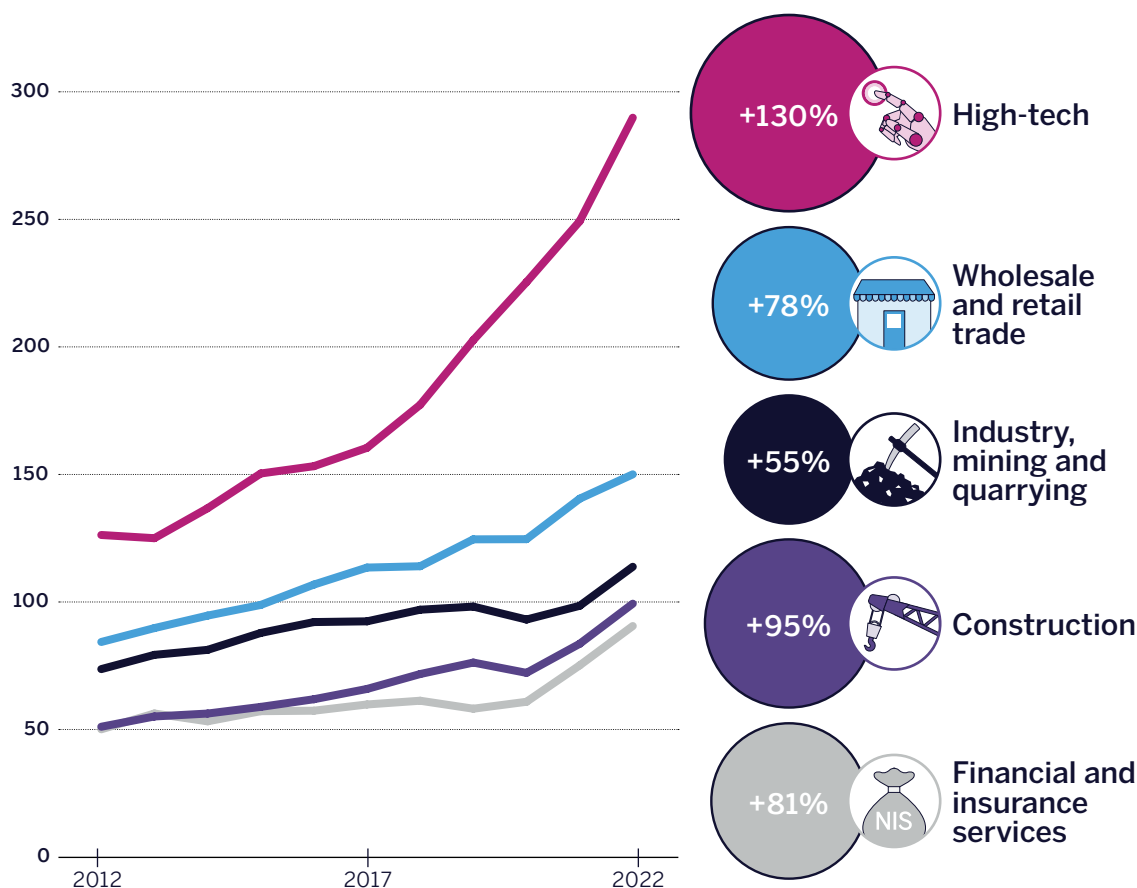
Source: Innovation Authority adaptation of CBS data

High-tech constituted 18.1% of Israel's GDP in 2022 – a figure that positions it as the sector with the largest output in the economy.⁸ From 2012, high-tech's share of GDP increased by more than four percent (from 13.9%). In comparison, in the US, which has a large and developed high-tech sector alongside a more diverse economy, high-tech's share of GDP in 2021 stood at 9.3%.⁹ In other words, high-tech's relative share of Israeli GDP is almost double that in the US, a figure that dramatically illustrates Israel's high dependency on this sector.

Output of the high-tech sector has doubled nominally within a decade. In 2012, high-tech output stood at 126 billion shekels, a figure that increased to 290 billion shekels in 2022. If this trend of growth continues at the rate typical of recent years, in just a few short years, high-tech will account for a fifth of the State of Israel's GDP. This will only further heighten Israel's dependence on high-tech and, accordingly, the sensitivity of the entire Israeli economy to upheavals in this sector.

08 High-Tech Output Grew More Than Any Other Sector Over The Past Decade

Output of selected sectors (in NIS billions) and their growth rate between 2012-2022



Source: Innovation Authority adaptation of CBS data

High-tech data does not include the communications sector and public R&D centers. Industry sector data does not include high-tech.

⁸ According to CBS recommendations, from this publication, reference to GDP is in base prices (total added value to economy) and there may be some inconsistencies with past data.

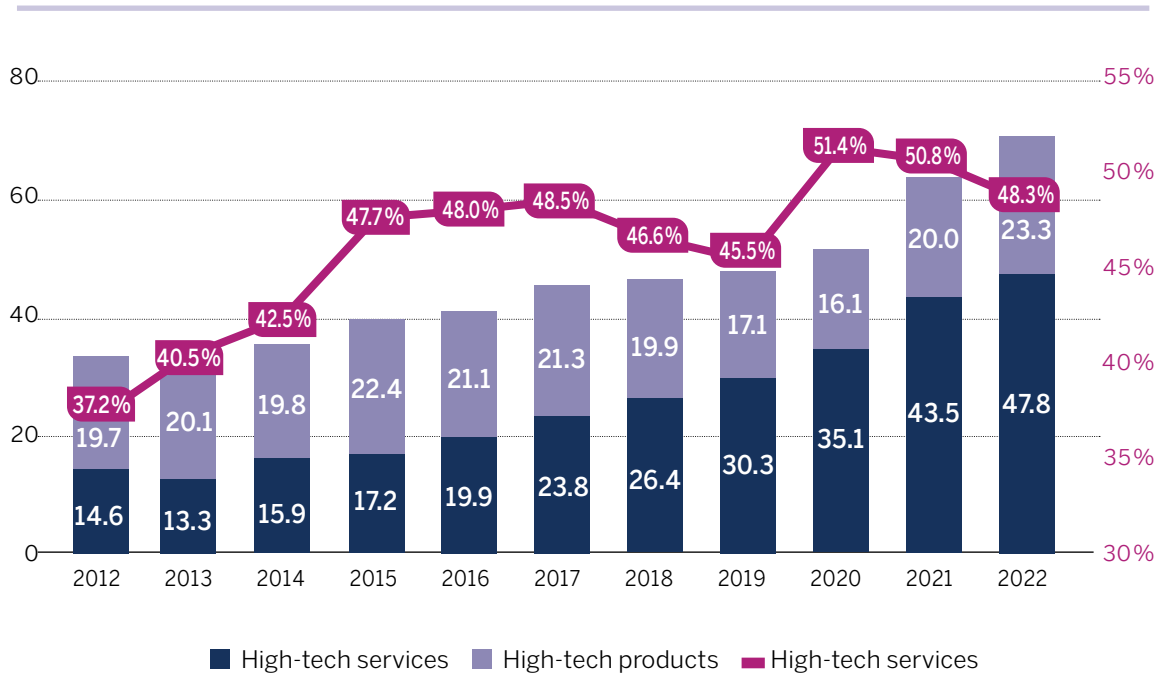
⁹ Source: [Tech GDP as a percent of total U.S. GDP 2021 | Statista](https://www.statista.com/statistics/1111111/tech-gdp-us/).

The growth in high-tech output is especially marked when compared to the growth in outputs of other sectors in the Israeli economy over the past decade. For example, the output of the high-tech sector in 2012 was 50% higher than that of the trade and retail sector – the next sector in size after high-tech. A decade later in 2022, the gap between the two sectors stood at more than 90%, i.e., high-tech output is becoming increasingly dominant in comparison to the other sectors in the private market. Of the economy's main sectors, high-tech output is the only one to have doubled, or more, over the past decade.

The Israeli high-tech sector was responsible for 48.3% of all Israeli exports in 2022, totaling 71 billion dollars, more than doubling over the last decade and growing by 107%. This growth stemmed almost entirely from the increase in exports of high-tech services that include, among others, software services. This export more than tripled from the 2012 level of 14.6 billion dollars to 47.8 billion dollars in 2022. During the same period, exports of high-tech commodities that include the microchips sector, grew by only 18%. Between 2016-2020, exports of high-tech commodities declined but increased again over the last two years. After the ratio of high-tech exports out of total Israeli exports crossed the 50% threshold during the Covid crisis, its relative share declined in 2022 due to the general recovery of the economy and the increase in other sectors such as tourism that were negatively impacted during the pandemic.

09 High-Tech Exports Doubled Over the Past Decade

High-tech exports by sector, in USD billions, and its share of total Israeli exports



Excluding exports of startups, trade and processing of diamonds

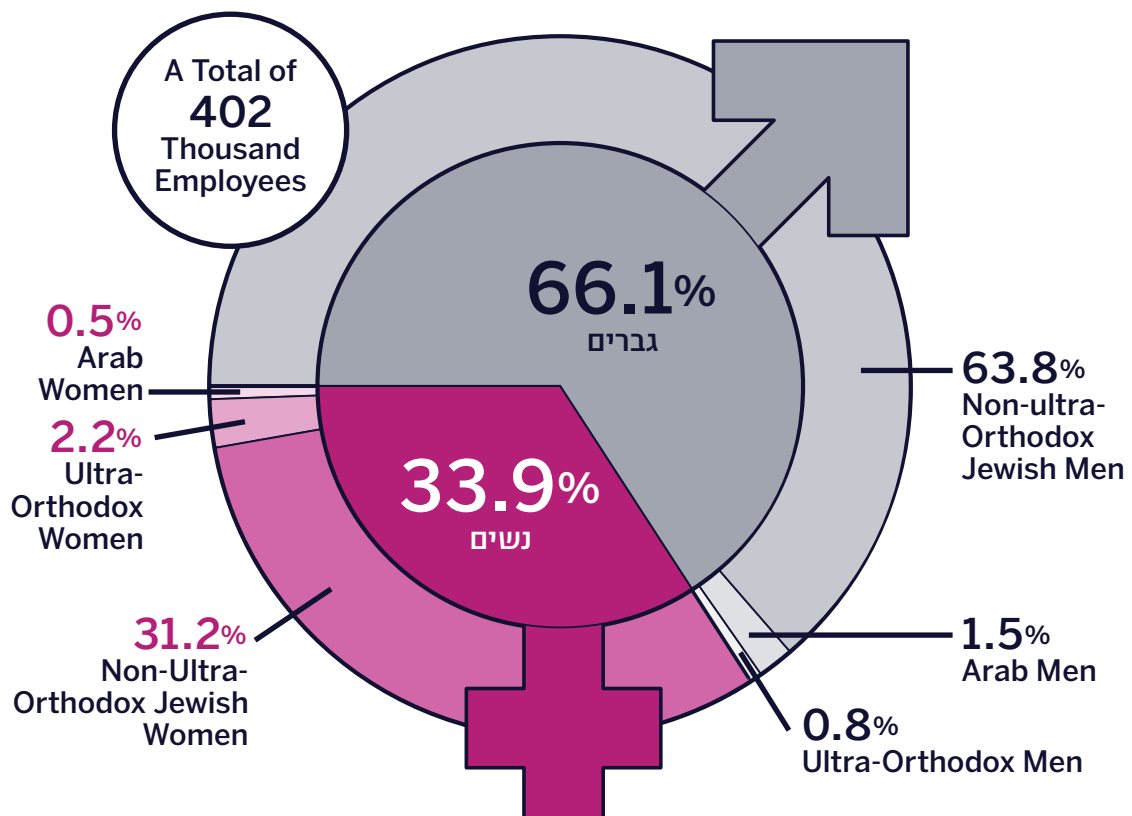
Source: Innovation Authority adaptation of CBS data

High-tech has established itself over the past decade as the fastest growing sector in Israel in terms of employees.

Human capital is the primary resource of Israeli high-tech and the one which attracts technology companies and investors from around the world to Israel. In total, 401,900 salaried employees worked in the Israeli high-tech sector in 2022.¹⁰ Although significant resources were invested in diversification and inclusion, and despite an increase in the rate of diverse population groups integrating into a variety of roles in the sector ([see details below](#)), Israeli high-tech still largely consists of (non-ultra-Orthodox) Jewish men. 66% of salaried high-tech employees are men and 34% are women.

10 Two Thirds of High-Tech Employees Are Men

Distribution of employees in Israeli high-tech sector by gender and population, 2022.



Source: Innovation Authority adaptation of CBS data

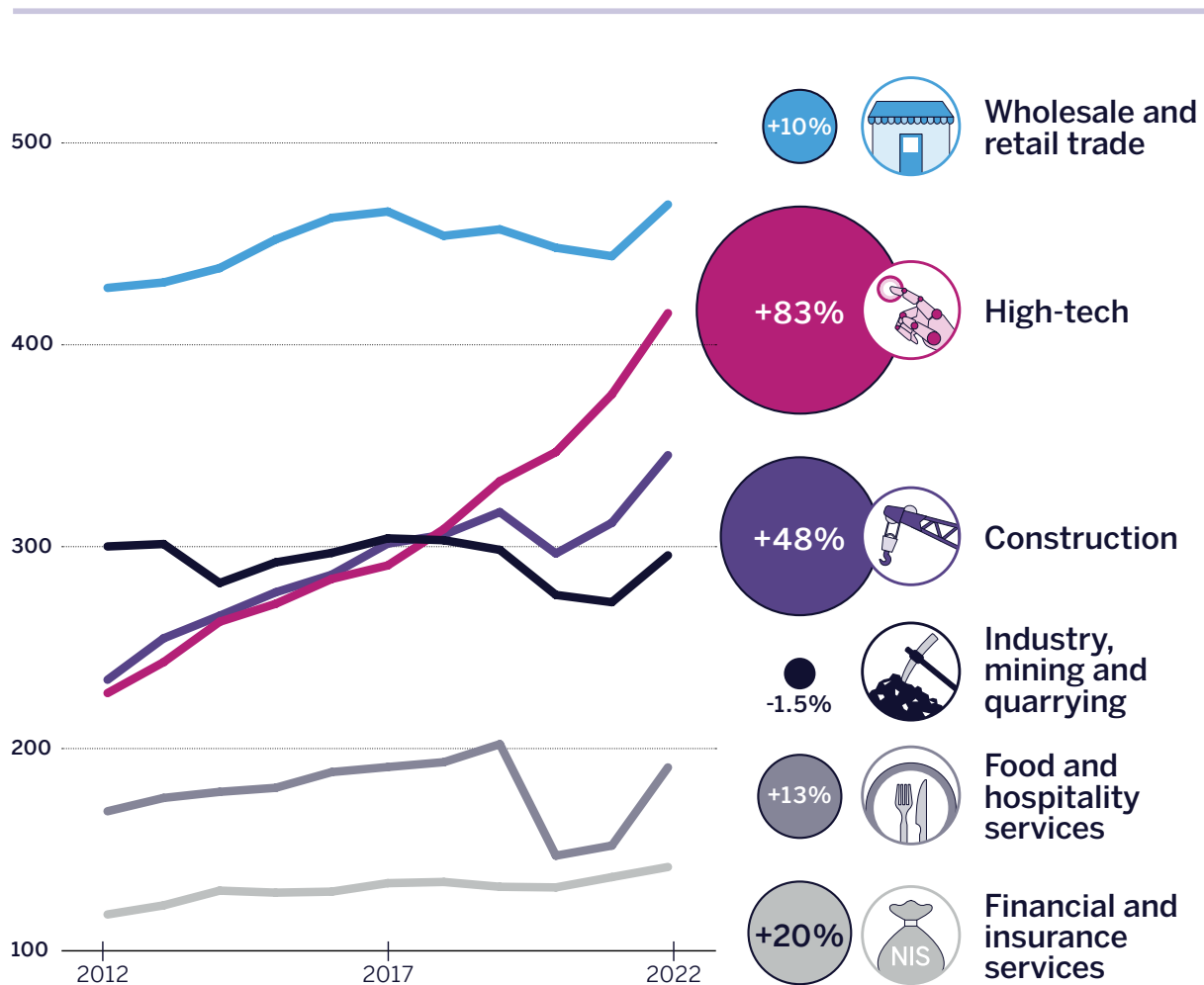
¹⁰ The recommendations of the National High-Tech Human Capital Committee (the Perlmutter Committee) include a new definition of "tech jobs" – people employed in high-tech and in technology jobs in other sectors. See: [The Committee's Recommendations](#) (in Hebrew). In this section, we examine the high-tech sector according to its previous definition which refers exclusively to employees in this sector. A "tech jobs" based analysis is presented in a [separate text box](#).

One of the prominent trends over the past decade is the rapid rate of growth in the number of salaried high-tech employees, especially in comparison to other sectors of the economy. Within a decade, high-tech has established itself as the fastest growing sector in terms of salaried employees out of all Israel's private market sectors and as one of its largest. A more in-depth analysis of the types of population and roles responsible for most of this growth is presented [below](#). The average yearly growth rate in the number of salaried high-tech employees between 2012-2022 was 6.3%, compared to a yearly rate of 2.2% in the economy's overall number of salaried employees. In other words, the growth in high-tech employees was three times that of the overall number of the economy's employees, with the growth rate in high-tech increasing even further in recent years (an average yearly growth rate of 7.5% between 2017-2022).

Moreover, high-tech is almost the only industry in the private sector in which the growth in employees was not impacted by the Covid pandemic, in contrast to most of the private sector industries that witnessed a downturn and a decline in the number of employees.

11 The No. of High-Tech Employees Grew Three Times More Than The General Economy

No. of employees in selected sectors (in hundreds of thousands) and growth in no. of employees 2012-2022



Source: Innovation Authority adaptation of CBS data

High-tech data does not include the communications sector and public R&D centers.
The industrial sector does not include high-tech.
Wholesale and retail trade includes motor vehicle repairs.

It is interesting to examine the trends associated with the integration of new employees into high-tech when compared to other private market sectors. The sector employing the highest number of employees in the Israeli private market is commerce and retail that includes stores and shopping malls,¹¹ and which employed 469 thousand people in 2022. This sector is however growing relatively slowly – only 9.64% throughout the entire decade. Another major private market sector in which the number of employees is stagnating is the industrial sector. In 2012, the number of employees in this sector was higher than that of high-tech: 299 thousand compared to 227 thousand in high-tech. A decade later, the number of employees in the industrial sector declined by 4,000 and was overtaken by the high-tech sector that employed more than 400 thousand workers. In other words, almost 190 thousand people joined high-tech during this period. Part of the growth in high-tech stemmed from the transition of workers in non-technology roles from other sectors such as bookkeepers, marketing personnel, lawyers, and others.

A further significant sector in the Israeli economy is construction,¹² which had 233 thousand employees in 2012. This figure is slightly higher than the number of high-tech employees in the same year (227 thousand). Both sectors grew significantly over the past decade but the momentum of growth in high-tech was greater. As of 2022, the number of high-tech employees stood at 415 thousand, a total increase of 83% over the past decade.¹³ In contrast, the number of employees in the construction sector stood at 344 thousand, representing a growth of 48%. Both sectors demonstrated a similar growth rate until 2017, however from this year onwards high-tech growth constantly outstripped that of the construction sector.

Two other central sectors in the Israeli economy that demonstrated relatively low growth over the past decade are the hospitality and food sector that were severely affected during the pandemic but recovered in 2022, growing by a total of 13% over the decade; and the financial and insurance services sector that grew by 20% over the same period (from 117 thousand employees in 2012 to 141 thousand in 2022).

¹¹ The wholesale and retail commerce and motor vehicle repairs sector.

¹² This sector includes the construction of buildings and civil engineering as detailed in the economic sectors categorization.

¹³ For a distinction between the definition of "employed" and "salaried employee", see the "labor market" tab in the [CBS glossary of terms](#).

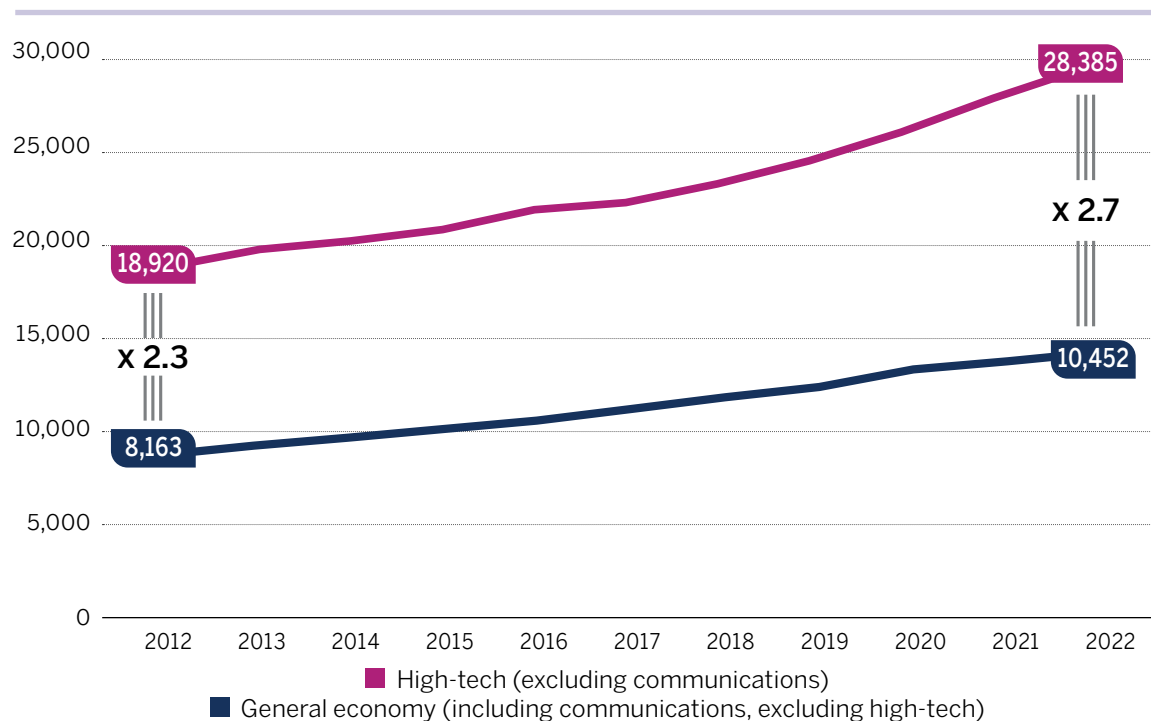
The disparities are growing: high-tech salaries are almost three times higher than the general economy's average

For several decades, the average salary in high-tech has been (at least) double that of the economy's average salary. In 2012, high-tech salaries were 2.3 times higher than the general economy's average salary. Together with sector's accelerated growth described above during the past decade, and the fierce competition between the companies over human capital – the primary factor in attracting the world's leading technology companies to Israel – salaries in this sector also surged. The average yearly growth rate of high-tech salaries between 2012-2022 stood at 4.14% compared to 2.5% in the rest of the economy. In recent years, the yearly salary growth rate accelerated and stood at an average of 5% a year between 2018-2022.

This situation led to increased salary disparities in Israel and in 2022, the average high-tech salary – that stood at 28,385 shekels – was 2.7 times higher than the average salary in the rest of the economy (10,452 shekels). Another perspective of this is the nominal growth in high-tech employees' salaries that have increased by 9,465 shekels since 2012, compared to the salary of an employee in the economy's other sectors which increased by 2,290 shekels over the same period. The figures relate to the salary of all employees in the high-tech sector, both in technology and non-technological jobs. In other words, high-tech employees' salary increased by 50% over a period in which the average salary of employees in all the other sectors increased by just 28%.

12 The Average High-Tech Salary Grew By 50% in a Decade

Average monthly salary for high-tech employee and in other sectors (NIS)



In current prices

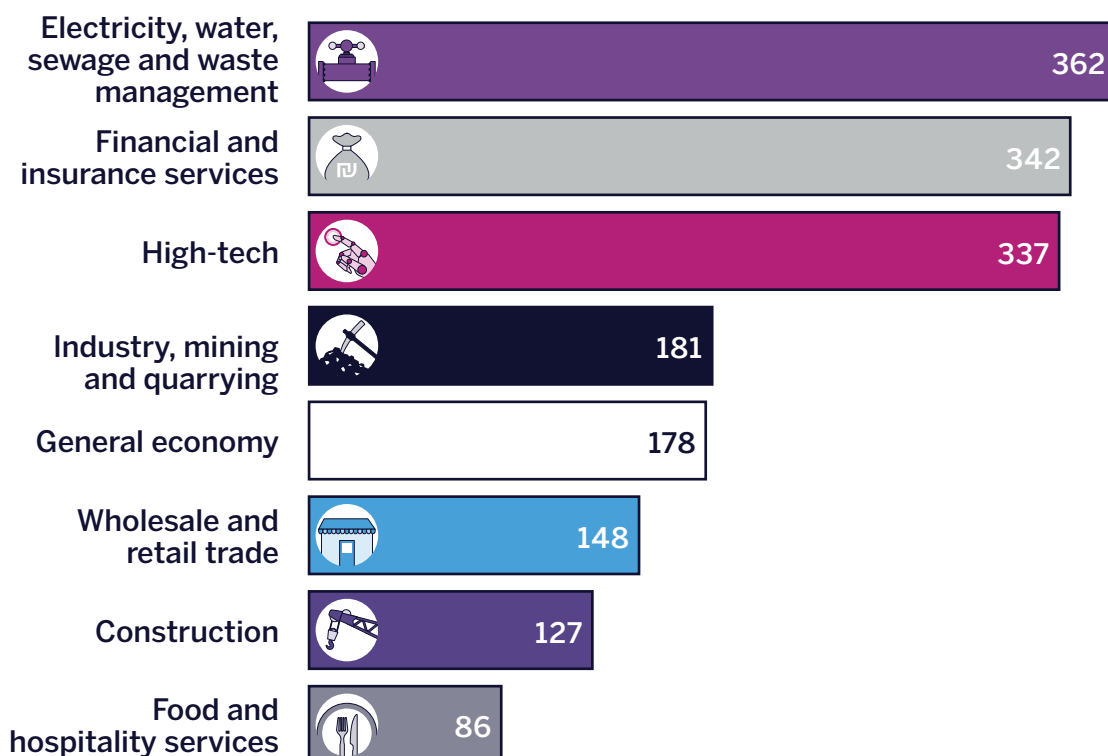
Source: Innovation Authority adaptation of CBS data

Bank employees' productivity overtook high-tech productivity for the first time in 2022

Another comparison we conducted was that between the productivity of high-tech employees and that of employees in the other sectors, with the aim of assessing the disparities between the contribution of high-tech and that of other sectors. Work productivity in high-tech, that was calculated as the hourly output per employee in the sector, stood at 337 shekels per hour in 2022 – almost double that of an employee in the general economy (178 shekels). During the past decade – from 2012 to 2022 – high-tech employees' productivity increased by 29%, while the parallel growth in the general economy was more rapid and stood at 42%. As a result, the disparity between the hourly productivity in high-tech and that in the general economy also slightly narrowed. It should be noted that the rapid rate of salary growth in high-tech, alongside a more moderate increase in this sector's productivity, indicates that the high-tech sector represents a more competitive employment market than the rest of the economy. In other words, employees in this sector possess greater negotiation power than those in other sectors.

13 Productivity Per Work Hour in High-Tech is 90% Higher Than the Economy's Average

Productivity per work hour in NIS, 2022



Source: Innovation Authority adaptation of CBS data

High-tech data does not include the communications sector and public R&D centers.
Industry sector data does not include high-tech.
Wholesale and retail trade includes motor vehicle repairs.

Although high-tech productivity is 90% higher than the economy in general, it is not the sector with the highest productivity in Israel. Two other sectors are characterized by productivity higher than that of high-tech. The first of these is the electricity and water supply and sewage services sector where hourly productivity stood at 362 shekels in 2022. This is a relatively small sector where most of the operational tariffs are supervised by various regulators, and which employs about 40 thousand people – less than a tenth the number of high-tech employees. Although productivity in this sector suffered from a high level of volatility over the past decade, it still ranked in first place in this metric throughout the entire period. At its peak in 2019, the productivity of electricity and water supply services reached 434 shekels per hour.

The second largest sector in terms of hourly work productivity is financial and insurance services which, for the first time, overtook high-tech productivity in 2022, reaching 343 shekels last year. This figure stems primarily from the banks' profits, the sector's high degree of centralization, and a lack of competition. Nevertheless, in recent years, as part of economization processes in the financial sector, there has been a marked growth in the number of technology workers hired in this sector who also have contributed to the increased productivity. Over the past decade, the productivity of financial services employees increased by more than 50%, compared to 29% in high-tech. If the growth rate of the financial services sector over the last three years is maintained, we may see this gap in productivity increase even further.



How Many Israelis Work in High-Tech?

For the first time, this year's report presents data that reveals the number of Israelis working as salaried employees in technology positions in Israel, both in the high-tech sector and in other sectors. The data relates to salaried employees in the high-tech sector, both in technology and non-technology jobs, and in technology jobs in other sectors. In other words, in addition to the accepted definition of salaried employees in different roles in the high-tech sector that is published every year, this report also includes further data pertaining to those employed in roles of a technological nature in other sectors of the economy e.g., a programmer in a bank or a retail chain.

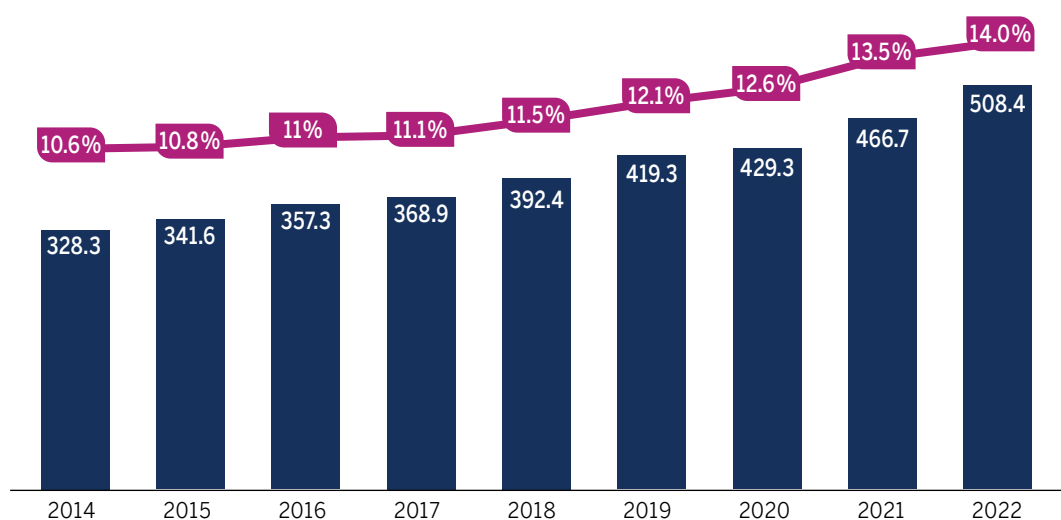
This broader definition of jobs, that includes salaried employees in technology roles across the economy as well as all those employed in the high-tech sector is called "tech jobs". The change in the data published stems from implementation of the recommendations issued by the National High-Tech Human Capital Committee (the Perlmutter Committee) that emphasized the importance of technology employees throughout the economy, including those outside the high-tech sector, as an engine for increasing productivity and the standard of living in Israel.¹⁴

According to the new and expanded definition,¹⁵ there were 508,400 salaried employees in high-tech and technology roles in 2022 – comprising 14% of all salaried employees in Israel. In 2014, this figure stood at 10.6% (a total of 328,300 employees) i.e., the relative share of salaried employees in tech jobs recorded a significant increase of 32%. These figures highlight the importance of high-tech jobs in their broader definition to the economy, as they increasingly attract more and more employees.

14 14% of Employees in Israel Work in Tech Jobs

No. of high-tech employees in tech jobs and their ratio of all employees

- Ratio of employees in tech jobs
- Total no. of employees in tech jobs



Source: Innovation Authority adaptation of CBS data

¹⁴ See the report of the National High-Tech Human Capital Committee (in Hebrew): [nov2022.pdf \(www.gov.il\)](https://www.gov.il/nov2022.pdf)

¹⁵ The data presented here differs slightly compared to the definition adopted by the Perlmutter Committee and relates to salaried employees of all ages, and not just to employees aged 25-64.

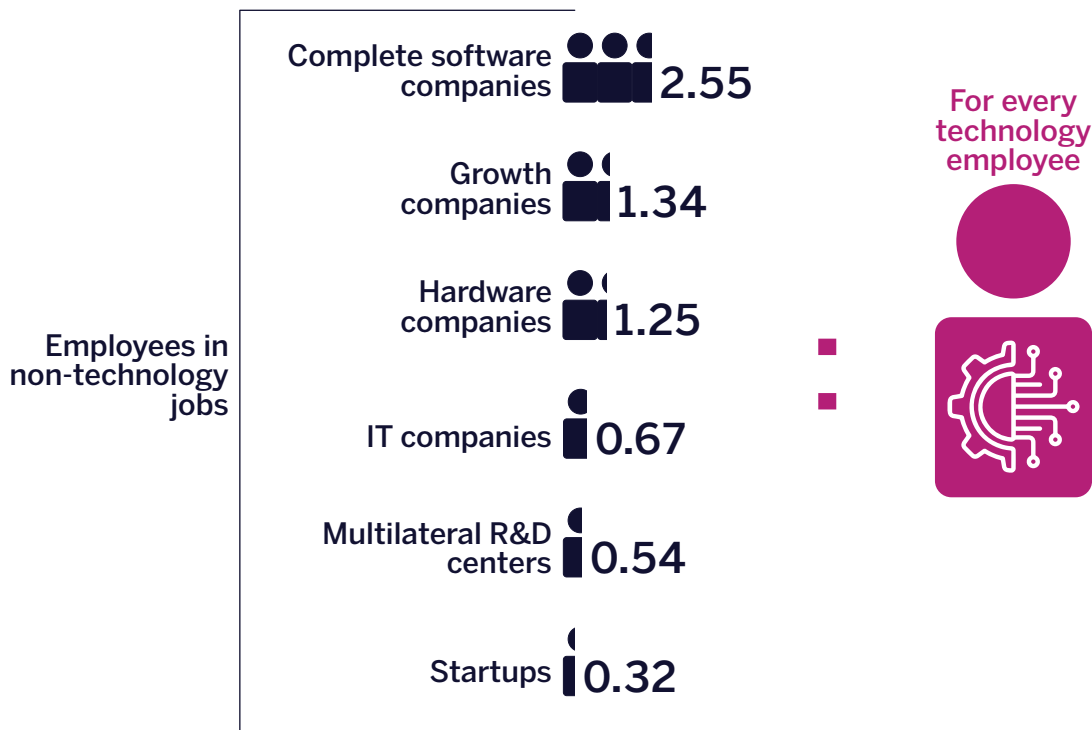
Recent years have seen the emergence of complete companies – startups established in Israel that continued growing and expanding here – on a greater scale than seen previously. The common perception is that these companies also employ workers in roles other than core technology roles for example, in marketing, sales, human resources and others. Furthermore, according to this perception, these companies are a more significant cornerstone of employment in Israel than the multinational companies' development centers where the main emphasis is on the development departments and on employment in technology jobs.

An analysis conducted by the Innovation Authority reveals that complete software companies employ an average of 2.55 employees in non-technology jobs for each employee in a technology job such as engineering or development. This ratio of non-technology employees per technology employees is called an “employment multiplier” and of all the types of high-tech companies operating in Israel, the “employment multiplier” is highest among complete software companies. In contrast, in startups, companies open for less than 10 years, that employ up to 80 employees and with revenue of less than 20 million shekels, only 0.32 non-technology employees are employed for each person in a technology job. Startups therefore have the lowest employment multiplier of all technology companies in Israel.

Approximately 60% of the employees in the high-tech sector, work in companies with a medium-low employment multiplier that are part of multinational development centers, IT companies, and high-tech companies that manufacture tangible products (hardware). The growth companies, which employ over 20% of the sector's personnel, employ an average of 1.34 non-technology employees for every engineer and constitute high-tech's primary employment engine as they progress to becoming complete companies.¹⁶

15 Growth Companies are an Employment Engine for Non-Tech Employees

Ratio of employees in non-technology jobs vs employees in technology jobs



Source: Innovation Authority adaptation of CBS, IVC, TASE and STKI IT Market Study data

¹⁶ An analysis of the employment multiplier was conducted within the framework of the Perlmutter Committee. Data of complete software companies was based on a closed list of companies that were found to conform to the accepted global standard. Subsequent definitions of startup companies, multinational development centers, and hardware companies were based on CBS definitions. Data for the IT companies was based on the detailed survey in the diagram and on Innovation Authority estimates, and the growth companies' data was obtained by analyzing all the sector's data and excluding all the other companies.

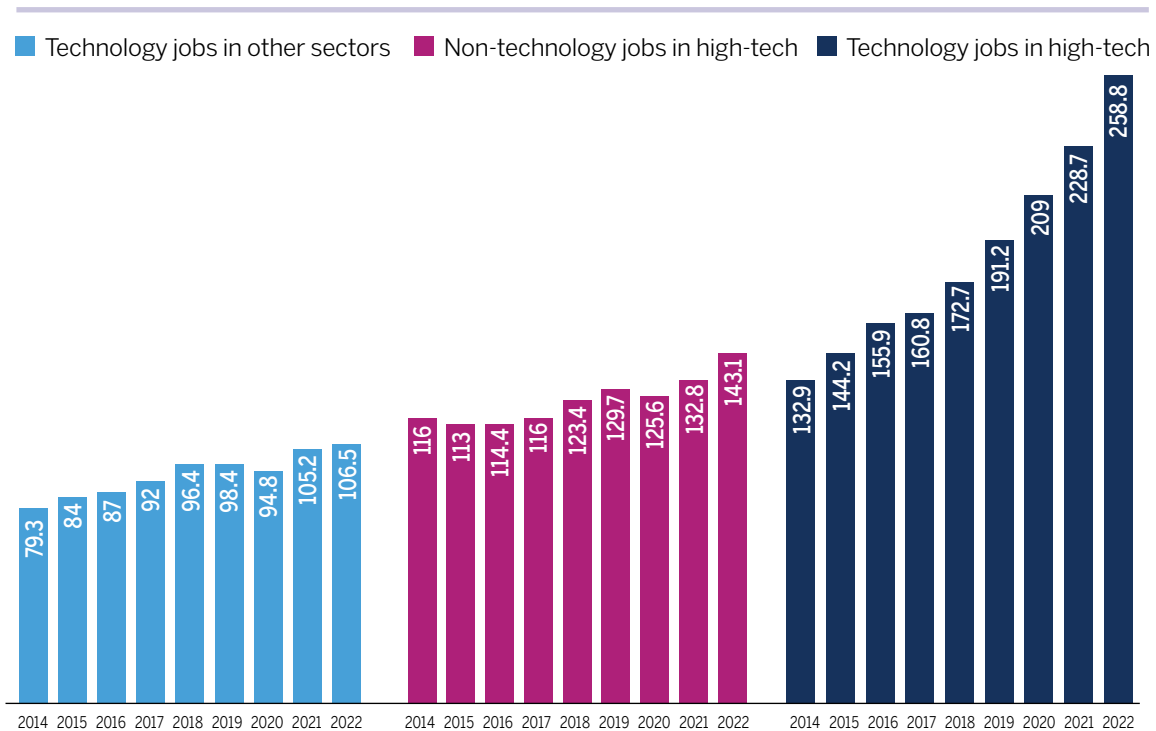
An analysis of employees according to job type reveals a clear picture: most of the growth in the number of high-tech employees in recent years stemmed from the growth in technology jobs and not in the (non-technology) growth jobs. While in 2014 the number of salaried employees in technology jobs in the high-tech sector stood at 133,000, the number of employees in non-technology jobs was 116,000. In other words, there was an employee in a non-technology job for nearly every employee in a technology job. In 2022, the number of employees in technology jobs in the high-tech sector had almost doubled and stood at 259,000. During the same period, the number of employees in non-technology jobs in the high-tech sector increased by only 23%. In other words, in 2022, there was only half an employee in a non-technology job for every employee in a technology job – a decline of 50% in the multiplier in less than a decade.

In technology jobs in the other sectors of the economy, the growth between 2014-2022 stood at 34% i.e., nearly a third of the growth rate of technology jobs in the high-tech sector. In other words, business in Israel realize that as part of their growth and adjustment to the competitive digital era, they must undergo a digital transformation and include more technology employees among their personnel. At the same time, the growth rate of these employees is not as high as that of technology jobs in technology companies whose core of activity is the development of technology-based services or products.

Non-technology companies accelerated the rate at which they hired employees for technology jobs in 2021, apparently due to the Covid pandemic and an acceleration in digital transformation processes. Nevertheless, the signs of the economic downturn, higher inflation and interest rates, led to a decline in the hiring rate of employees in technology jobs (these positions generally constitute an infrastructure for economic growth) in 2022. The integration of employees in technology jobs enables companies to improve their productivity, as has happened, for example, over the past two years in the financial sector.

16 The No. of High-Tech Employees in Technology Jobs Doubled While Growth in Other Tech Jobs Grew Slower

Yearly no. of employees in tech jobs by type of job and area of activity (in thousands)

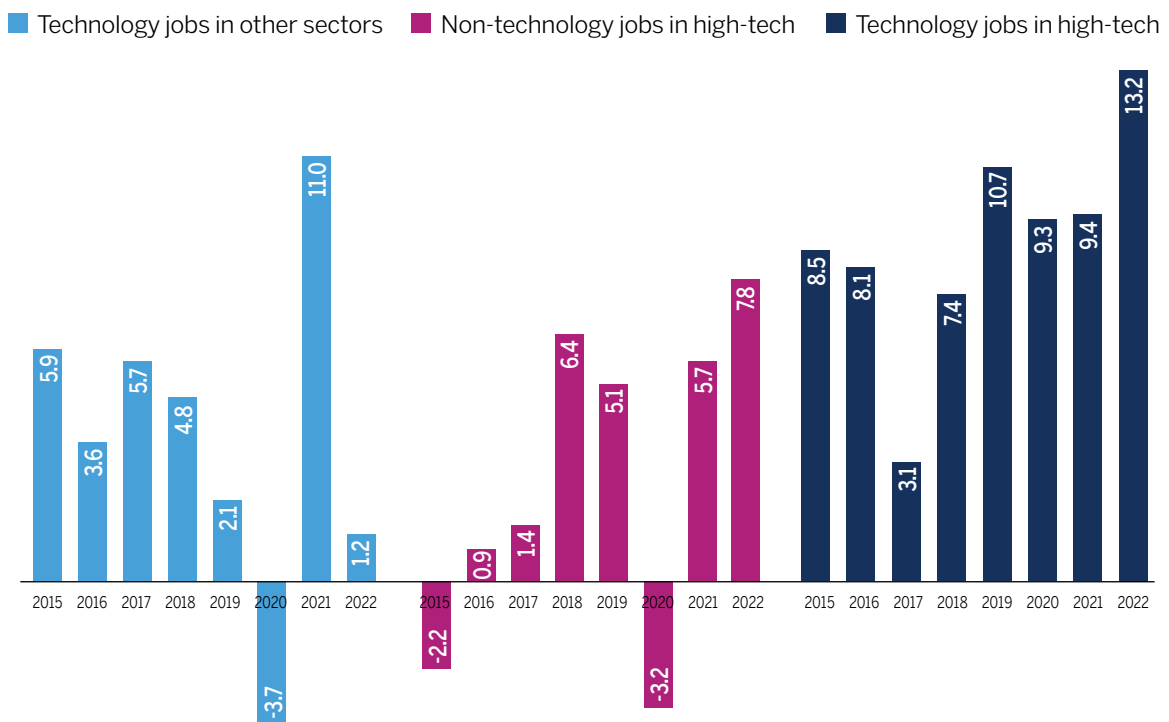


Source: Innovation Authority adaptation of CBS data

Furthermore, an analysis of the annual growth rate according to each of the job types and sectors shows that there was positive growth in the number of salaried employees in technology jobs in high-tech in each of the years examined (2014-2022). In contrast, the (non-technology) growth jobs in high-tech and the technology jobs in the general economy fluctuated and, in some of these years, even declined. For example, in the Covid pandemic year of 2020, there was a decline in the number of employees in these jobs. In other words, these jobs are more sensitive to market turbulence. Moreover, of the three job categories, the fastest growing category is that of technology jobs in high-tech which is growing faster than technology jobs in the rest of the economy and non-technology jobs in high-tech. In recent years (2019-2022), the growth rate of technology jobs in high-tech was four times higher than that of technology jobs in the economy at large, and 2.5 times higher than growth jobs in high-tech.

17 Most of the Growth is in Technology Jobs in High-Tech

Annual rate of change in no. of employees, by type of job (in %)



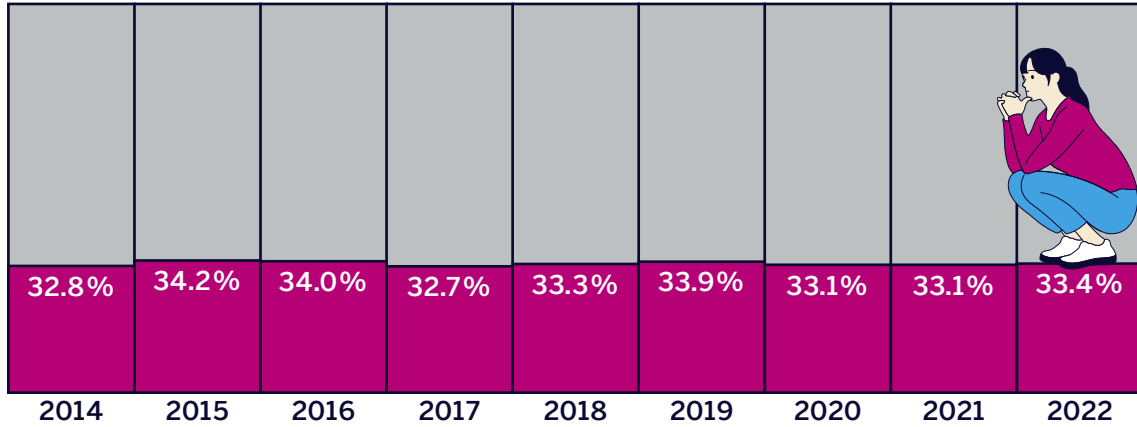
Source: Innovation Authority adaptation of CBS data

Women are still only a third of the industry, Arab and ultra-Orthodox societies only 5%

Another analysis we conducted relates to the employment trends of different sectors of the population in technology jobs in high-tech. The clear conclusion arising from the data is that despite the significant resources and efforts invested in diversification, and despite the accelerated growth of high-tech employment, a multi-year view shows that the disparities between the different population groups in high-tech have been maintained. During a period of almost a decade, there were only minor fluctuations in the composition of the high-tech population. For example, women – the largest group underrepresented in high-tech – maintained their relative share of one third of the salaried employees in the high-tech sector and in technology jobs in the general economy. Throughout this period, the ratio of women remained almost unchanged, fluctuating between 32.8% and 34.2%. In 2022, this ratio was 33.4%. In other words, throughout this period, men continued to constitute two thirds of all high-tech employees.

18 The Ratio of Women is Stable and Remains One Third of Tech Jobs

Ratio of female employees in tech jobs out of all tech job employees per year

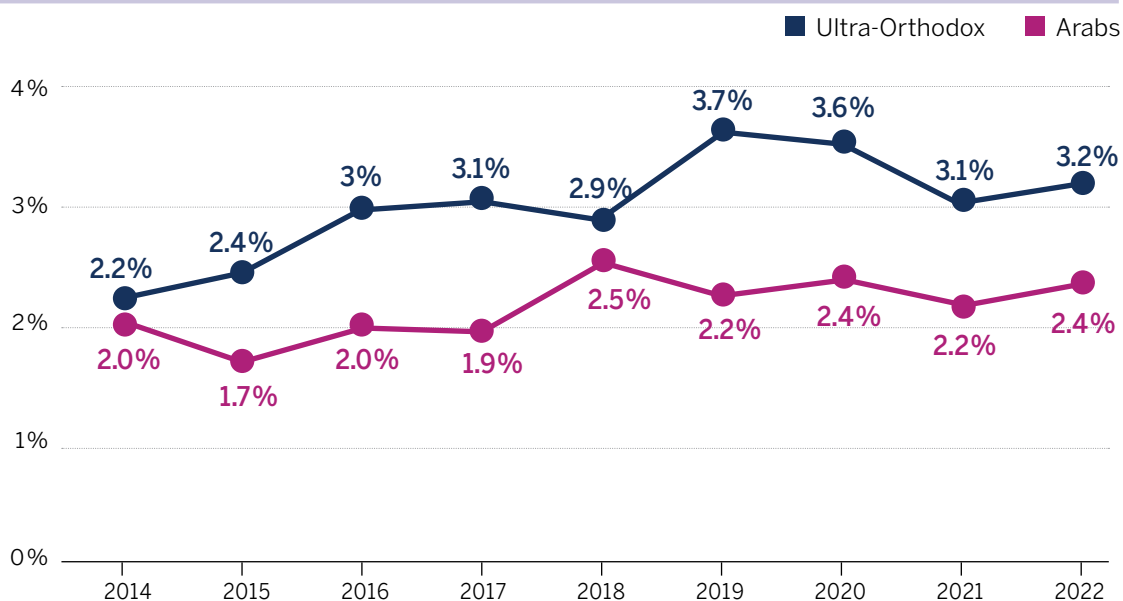


Source: Innovation Authority adaptation of CBS data

Progress in integrating Arabs and the ultra-Orthodox into high-tech is very slow. In 2014, 2% of the salaried employees in high-tech were from Arab society and 2.2% from ultra-Orthodox society. In 2022, the Arab sector's representation in high-tech had risen by just 0.4% to 2.4%. In contrast, the ultra-Orthodox society is still underrepresented in high-tech but is growing at a quicker rate and its share of all salaried employees in high-tech and in technology jobs in the economy at large had increased to 3.2%. The growth was naturally led by ultra-Orthodox women who are joining high-tech at a rapid rate although their number is still relatively low and in 2022 totaled less than 11,500, after having tripled since 2014. In comparison, the number of (non-ultra-Orthodox) Jewish women was 149,000 in 2022. The number of ultra-Orthodox men in all jobs in high-tech was 5,000, and their growth rate since 2014 was about a quarter of that of ultra-Orthodox women.

19 Arabs and Ultra-Orthodox - Yet To Integrate

Ratio of employees in tech jobs by population group



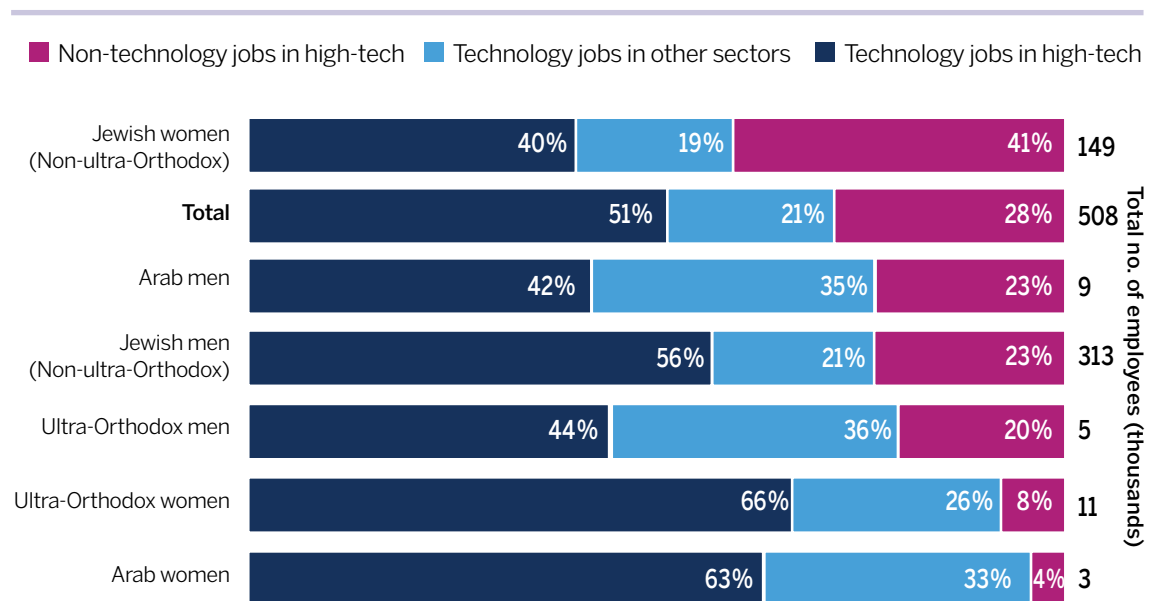
Source: Innovation Authority adaptation of CBS data

The final analysis relates to the different roles filled by high-tech personnel from the various groups. This analysis reveals disparities in the distribution of jobs between women and men and between different populations within the high-tech industry. As noted, the largest group in high-tech and in technology jobs is (non-ultra-Orthodox) Jews. The gender distribution of this group reveals a clear tendency of men to work more in technology jobs, compared to women who are the group with the largest representation among those working in jobs not at the core of technological activity. Among (non-ultra-Orthodox) Jewish men, 51% work in technology jobs in high-tech and another 20% work in technology jobs in other sectors. 29% of the men working as salaried employees in tech jobs work in non-technological jobs. In contrast, among (non-ultra-Orthodox) Jewish women approximately 40% work in technology jobs in high-tech and 19% work in technology jobs in other sectors. 41% of the women employed in tech jobs work in non-technology jobs.

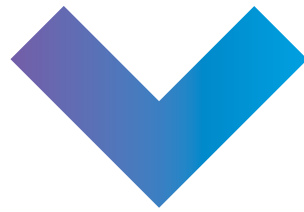
In contrast, ultra-Orthodox and Arab women have extremely low representation in non-technology jobs. Only 4% of Arab women in high-tech are salaried employees working in non-technology jobs. The parallel figure for ultra-Orthodox women stands at 8%. In other words, in both these groups, there is a marked bias towards working in technology jobs.

20 The Ratio of Women Working in Non-Technology Jobs is Nearly Double That of Men

Distribution of employees in tech jobs, by type of job and population group, 2022



Source: Innovation Authority adaptation of CBS data



A Global Comparison: High-tech in Israel Relies Almost Entirely on the Private Sector, and Primarily on Foreign Investors

The Israeli innovation ecosystem is in direct competition with other hubs around the world for human resources, investments, and innovation infrastructures. It is important therefore to examine high-tech's contribution to the Israeli economy not just in comparison to other sectors of the local economy but also in relation to other hubs of innovation that Israel compares itself to. The importance stems from the need to prevent the erosion of Israel's comparative advantage and of its leading position in this field that has solidified in recent decades, and out of an understanding for high-tech's critical role in the growth of the Israeli economy.

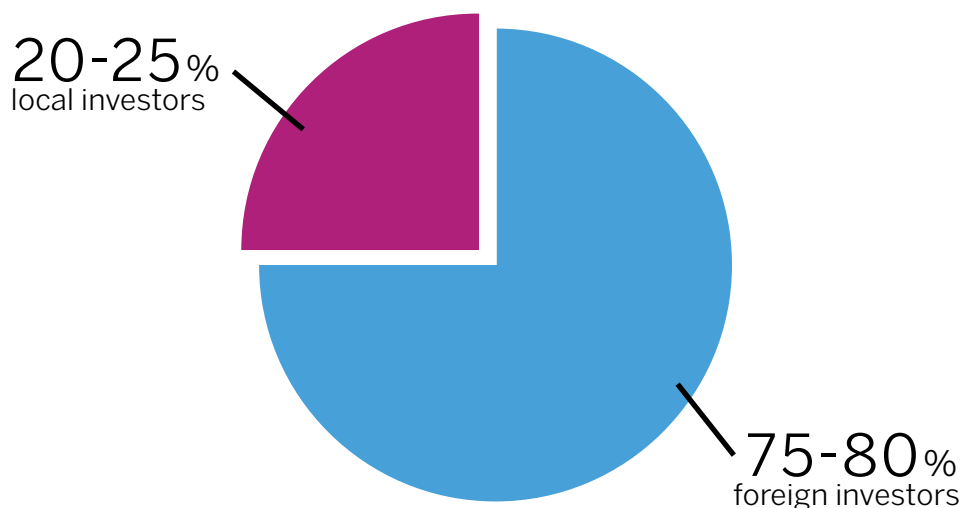
The importance of the high-tech sector and the innovation ecosystem to the Israeli economy stands out on a global level. In 2021, the level of national expenditure on R&D as a percentage of GDP stood at 5.6% - a total of 88 billion shekels – the highest level of national expenditure on R&D in the OECD. 91% of R&D in Israel is conducted by the private sector – the highest such ratio of all OECD countries. Furthermore, as we presented in the 2022 Annual Report, Israel recorded the lowest level of state funding of R&D among the OECD countries – only 9% of the national expenditure is funded by the state, including R&D conducted in academic institutions or with funding from the Innovation Authority, the various security bodies, and other government entities. State funding of R&D is particularly intended to provide a solution for high-risk R&D investments that constitute the basis for disruptive innovation and in which the private sector underinvests.

On the one hand, these figures testify to the maturity of the local market and the high level of trust it enjoys from investors, however it also means that Israel is especially dependent on the private sector to fund and conduct R&D. The result is that during periods of global crises and declines in private sector investments, Israeli startups that have less access to alternative funding channels and are thus more exposed to upheavals.

The situation in Israel is unique compared to the rest of the world with regard to the distribution of investments in innovation development between foreign and local entities. According to OECD data, Israel is the only country among the organization's members in which foreign entities fund more than 50% of the R&D conducted by the private sector. At the same time, the local private sector is responsible for funding 40% of the R&D – the lowest level of all OECD countries, and a unique characteristic of Israeli high-tech. In the other OECD countries, local private investors primarily fund R&D in their local market and in some of the countries, mainly in Europe, state funding also plays a significant role.

21 Over 75% of Total Venture Capital Investments in Israel Are By Foreign Funds

Distribution of venture capital investments in Israel by origin of funding entity



Source: Innovation Authority adaptation of IVC data

When examining the situation of venture capital investments in startups that constitute a significant part of the Israeli business sector's R&D activity,¹⁷ the foreign investors' share is even greater. According to an Innovation Authority evaluation based on IVC data, foreign investors' share of Israeli venture capital in 2021-2022 was at least 75%-80%.¹⁸ It is important to note that even among the local entities responsible for investments in startups, primarily Israeli venture capital funds, most of the capital is raised overseas. In practice therefore, a higher ratio of R&D in Israel is funded by foreign investors than is reflected in the global comparison.

Israeli high-tech's dependence on investors from the private market, especially on foreign investors, poses a significant risk factor for Israel. The more foreign investors are deterred by the political instability in Israel, or by other possible changes in the country, the greater the danger that investments in Israeli high-tech may be suspended or slowed. This could lead to the establishment of less new technology companies and, consequently, to the creation of less high-paying jobs and lower demand for services in Israel (e.g., office space, restaurants, service providers such as lawyers or accountants etc.). A decline in foreign investments in high-tech may therefore have a negative impact on broader circles outside high-tech, leading to a wider impact on the medium and long-term growth of the entire Israeli economy.

Israel continues to decline in the Global Innovation Index

Israel's ranking dropped a further notch in the 2022 Global Innovation Index to number 16.¹⁹ Since 2015, Israel climbed up the ranking until 2019 when, for the first time since the index was published over a decade ago, it was included in the world's ten leading countries. Since 2019 however, Israel's ranking is on the decline.

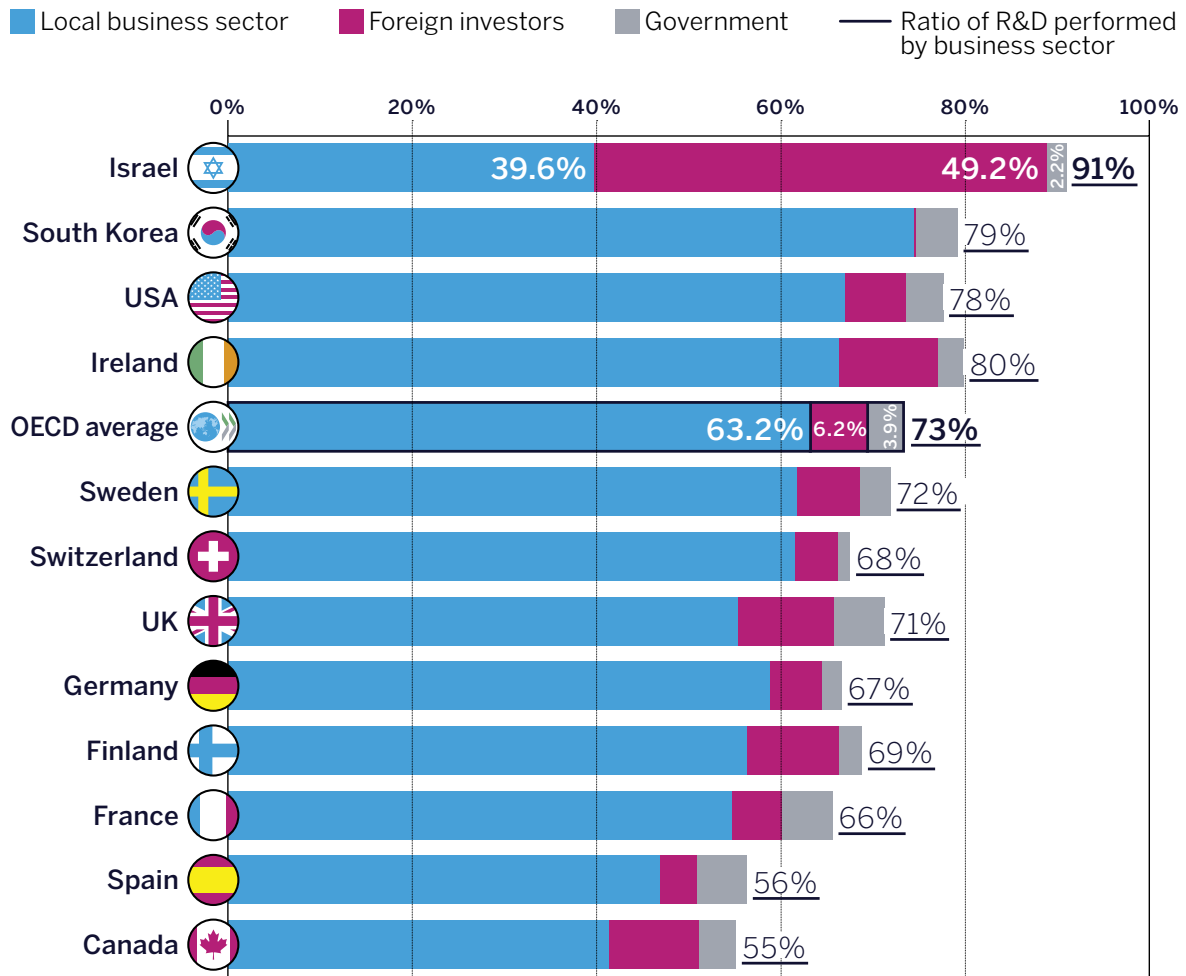
¹⁷ Some of the R&D activity in the business sector is funded directly from the companies' income.

¹⁸ In light of this, it is impossible to arrive at a precise evaluation as to the level of foreign capital funding Israeli R&D activity, but this figure nevertheless stands at more than half of all R&D activity.

¹⁹ [Global Innovation Index 2022 - ISRAEL](#)

22 Israel's Dependence on the Business Sector and Foreign Capital for R&D is the Highest in the OECD

Ratio of R&D performed by business sector and distribution of funding entity out of national R&D expenditure



Source: Innovation Authority adaptation of OECD data

2021 data except for the UK and Switzerland for which the data is from 2020 and 2019 respectively.

Another prominent worrisome feature in the Global Innovation Index decline is in the international ranking of Israeli universities. This metric may impact the international prestige of Israeli researchers, the quality of research produced in Israel, and the quality of university graduates' training. Today, Israel's three leading universities rank 32nd in the global rankings, compared to the 22nd place achieved in 2015.

Israel stands out among the group of countries with the highest income in four central areas: human capital and research, market sophistication, maturity of the business sector, and output of knowledge and technology. While human capital is one of the primary resources attracting global technology companies, Israel is only ranked 24th (the composers of the index note that Israel produces relatively higher innovation outputs in relation to the level of investment in innovation). In contrast, areas that constitute weak points for Israel, and in which it has a relatively low ranking, are creative outputs, institutions, and infrastructures.

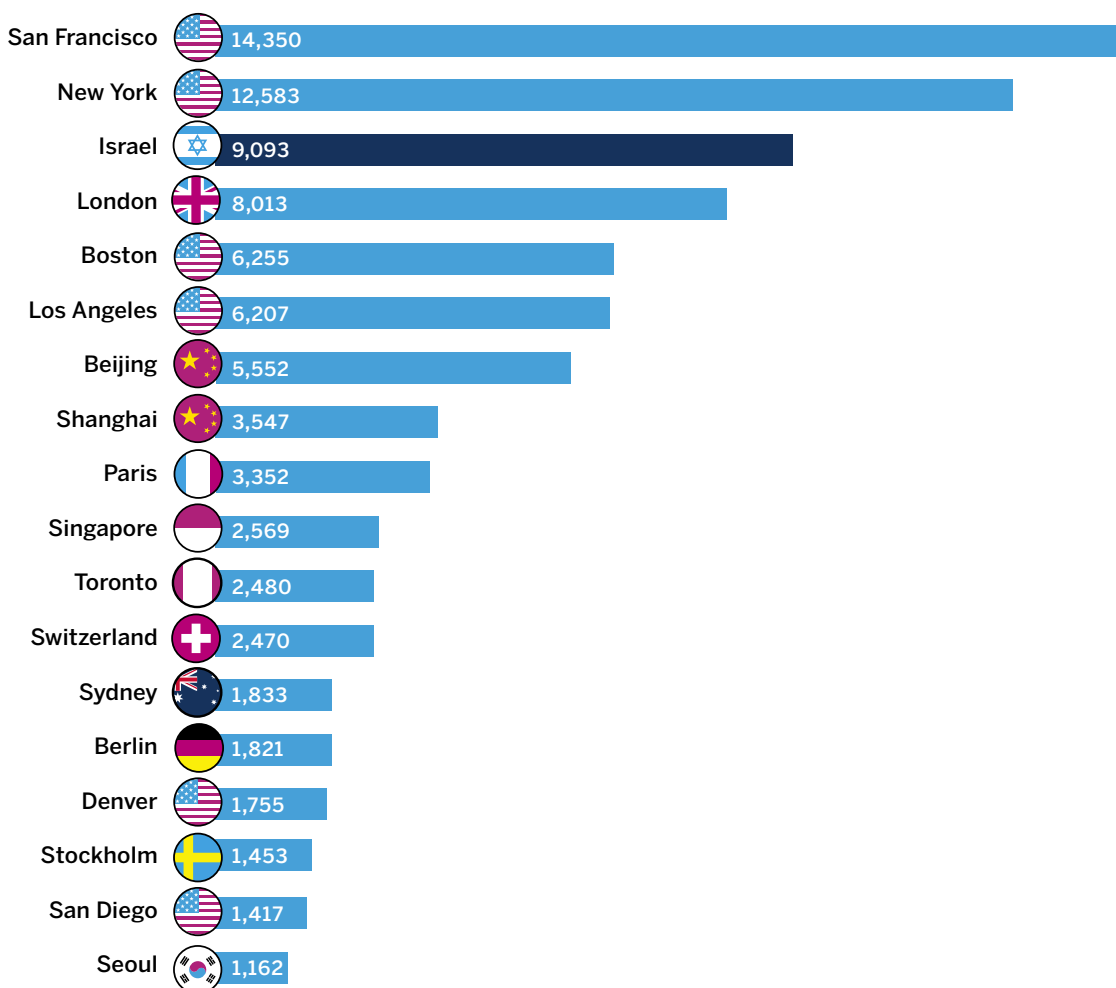
Startups in Israel have raised significant sums in the past decade but should not be complacent

Israel has stood out in relation to other hubs worldwide in its number of active startups which raised funding from investors. As of April 2023, there were 9,093 technology companies that had, at some stage of their operation, raised funding from investors. This figure ranks the Israeli hub as third in the world in this metric and positions Israel as a prominent startup hub on a global level. San Francisco is the largest hub in the world according to this metric with 14,300 technology companies that raised funding, followed by New York with 12,600. The next largest hubs in the ranking are London, Boston, and Los Angeles.

Entrepreneurial activity in Israel has been especially prominent over the past decade during which 11,865 companies that raised funding from investors were established in Israel. Some of these companies have since closed or become inactive. The fields in which the Israeli ecosystem's comparative global advantage in concentrating fund raising came to the fore were privacy and information security (cyber), agricultural technology (agri-tech), content and media, and information technologies. In relative terms, Israeli cyber companies' share of the total capital raised locally is 2.85 times higher than the global average.

23 The Israeli Hub - Third in the World in No. of Active Startups

No. of active technology companies that raised capital in prominent hubs



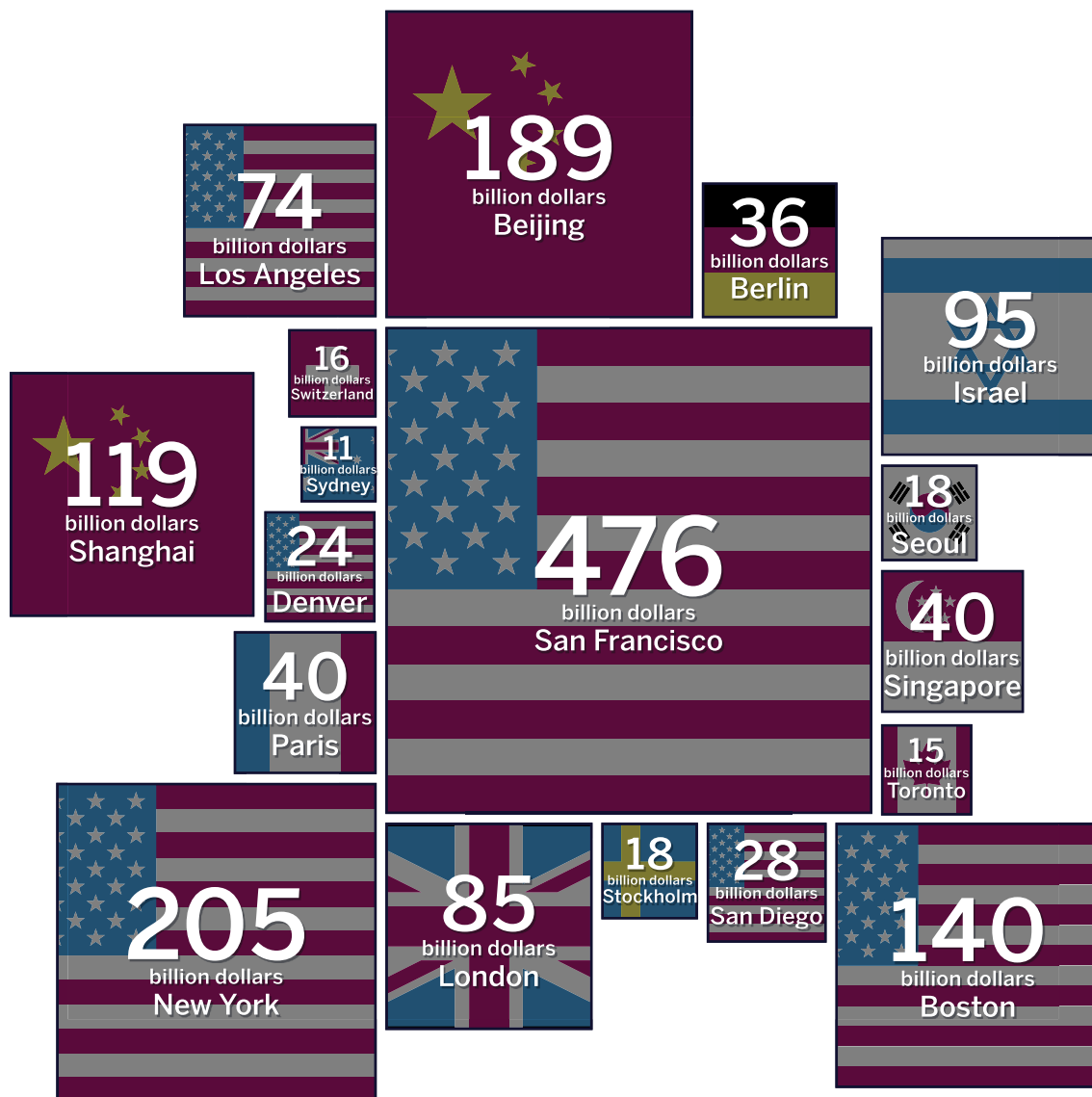
The data relates to the city and nearby surroundings

Source: Innovation Authority adaptation of CrunchBase and IVC data

Israel has enjoyed phenomenal growth in startups' fundraising over the past decade. An unprecedented sum of 95 billion dollars was raised by Israeli technology companies between 2013-2022, a figure which positions the Israeli innovation hub in 6th place in the world in terms of startups' fundraising during this period. This is an especially impressive achievement considering the largest hubs that are ranked ahead of Israel and which are located in economic superpowers – the US and China.

24 Israel is Among the Six Hubs in Which Startups Raised The Most Capital in the Past Decade

Total funds raised in USD billions between 2013-2022



Source: Innovation Authority adaptations of CrunchBase and IVC data.

The data relates to the city and nearby surroundings

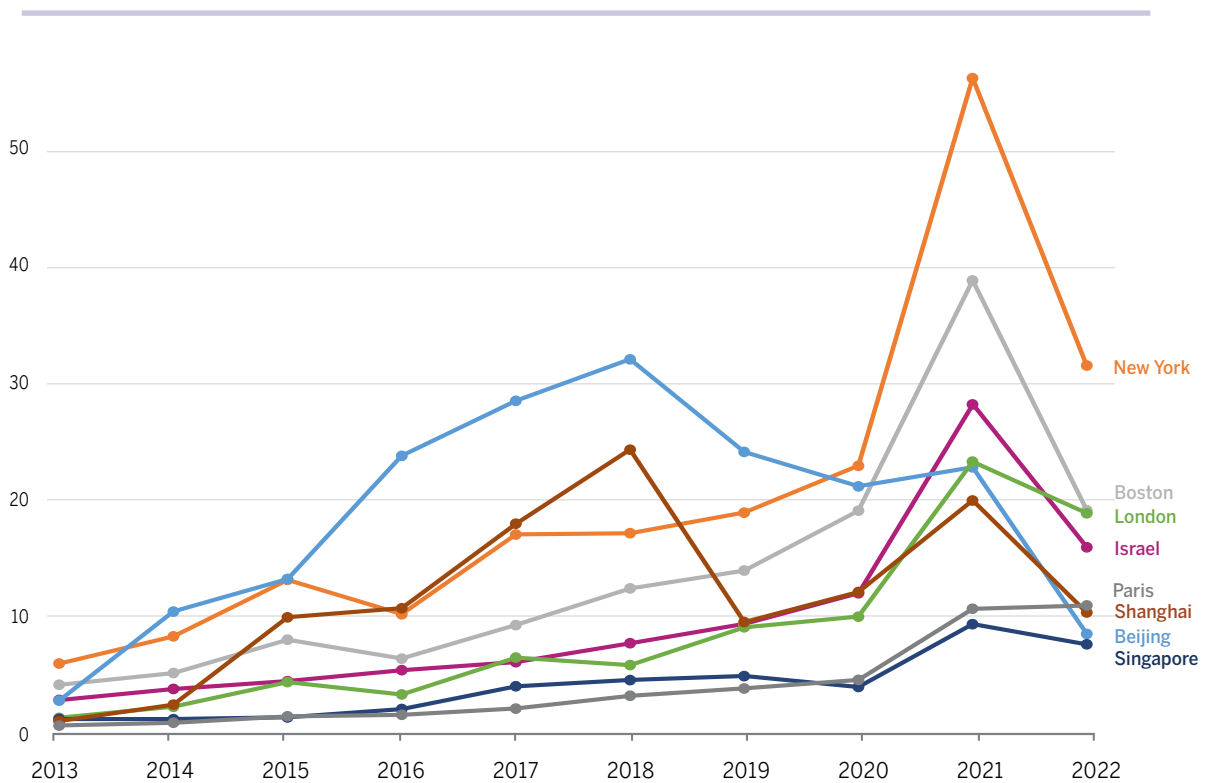
Nevertheless, Israel must not be complacent, and it is important to be aware of global trends and other factors that exert a long-term influence on innovation, as noted above. Firstly, the accelerated growth in startups' fundraising is not unique to Israel. In most of the hubs examined there was a significant growth in startups' fundraising during this period, including a record in total investments in 2021 followed by a decline in 2022. Some of the hubs enjoyed growth similar to that of Israel, including Singapore, Switzerland, Berlin, New York, and Los Angeles. In other places, it was double, and even higher, that of Israel.

It is important to mention London and Paris – two hubs with the most noteworthy growth in funds raised by startups. At the beginning of the period under examination in 2013, startups' fundraising in Israel (2.8 billion dollars) was five times higher than in Paris and double that in London. Thanks to the rapid development of the innovation ecosystems in both cities, by the end of the relevant period in 2022, London had overtaken Israel in the sum raised by startups in the city: almost 19 billion dollars were raised in London in 2022 compared to almost 16 billion dollars in Israel. The sum raised in Israel was still higher than that raised in Paris (10.9 billion dollars), however if the rapid growth typifying Paris in recent years is sustained, this situation may change within a few years.

The significance for the startups and innovation hubs in Israel is that its competition is increasing, and not just with the major hubs with which it regularly competes for funding and personnel, primarily San Francisco – the largest ecosystem in terms of the number of companies and funding. The fiercest competition today is with smaller and rapidly growing ecosystems, mainly in Europe.

25 Growth in Startups' Fundraising is Typical of Innovation Hubs Worldwide

Technology companies' yearly fundraising in selected global hubs (USD billions)



The data relates to the city and nearby surroundings

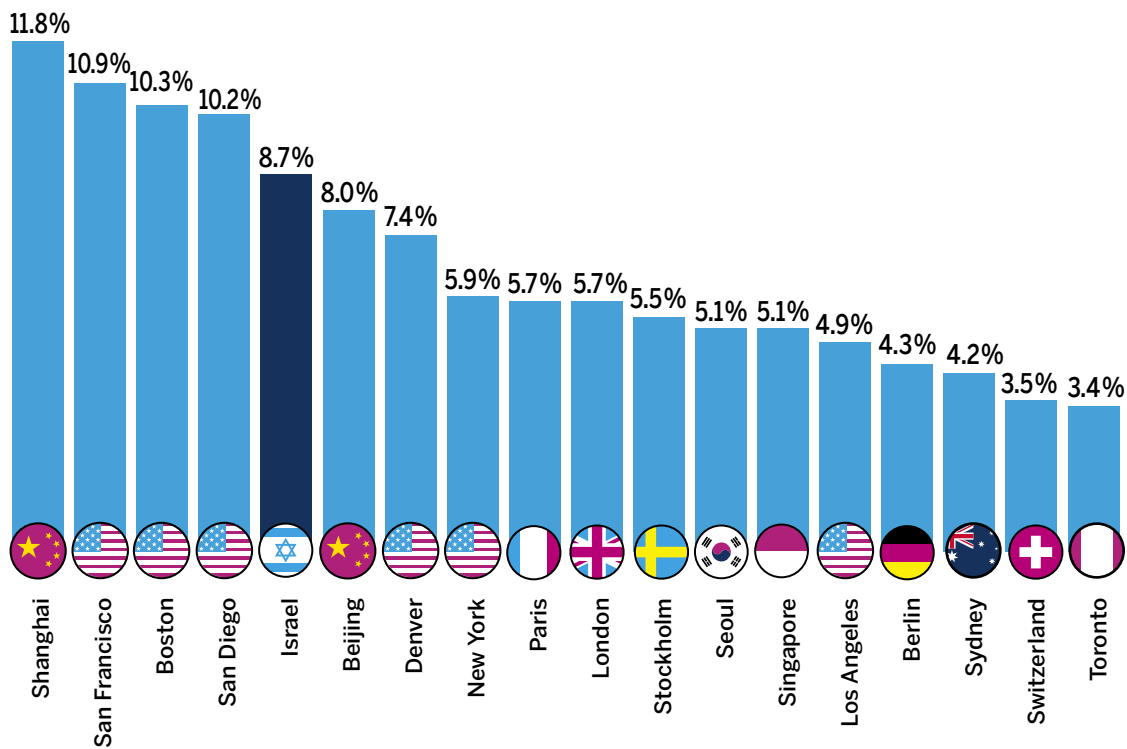
Source: Innovation Authority adaptations of CrunchBase and IVC data

In relative terms, Israeli startups' funding rounds of more than 50 million dollars constitute a high ratio of all funding rounds. The areas with larger shares of the funding rounds of this scope are large mature hubs: Shanghai, San Francisco, Boston, and San Diego. This figure testifies to the maturity level achieved by the Israeli innovation ecosystem in recent years that position it among the world's leading ecosystems that are located in significantly larger countries than Israel – the US and China. Furthermore, in the period under examination (2013-2022), Israel witnessed the sharpest increase in its share of funding rounds of this scope (at least 50 million dollars) compared to the other large hubs and has thus almost closed the gap with these hubs within just a decade.

At the same time, it is important to note that this phenomenon is not unique to Israel. As of 2022, in most of the hubs examined and to which Israel compares itself, the majority of funding raised by startups was in funding rounds larger than 50 million dollars. Funding raised in the large-scale funding rounds also increased significantly in London, New York, and Switzerland.

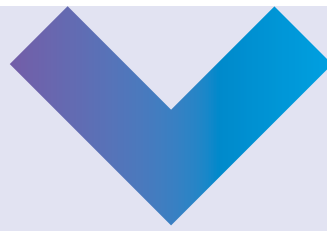
26 The Israeli Ecosystem Demonstrates Maturity in the Rate of Large Funding Rounds

Ratio of funding rounds of over 50 millions dollars in selected hubs (2022)



The data relates to the city and nearby surroundings.

Source: Innovation Authority adaptations of CrunchBase and IVC data

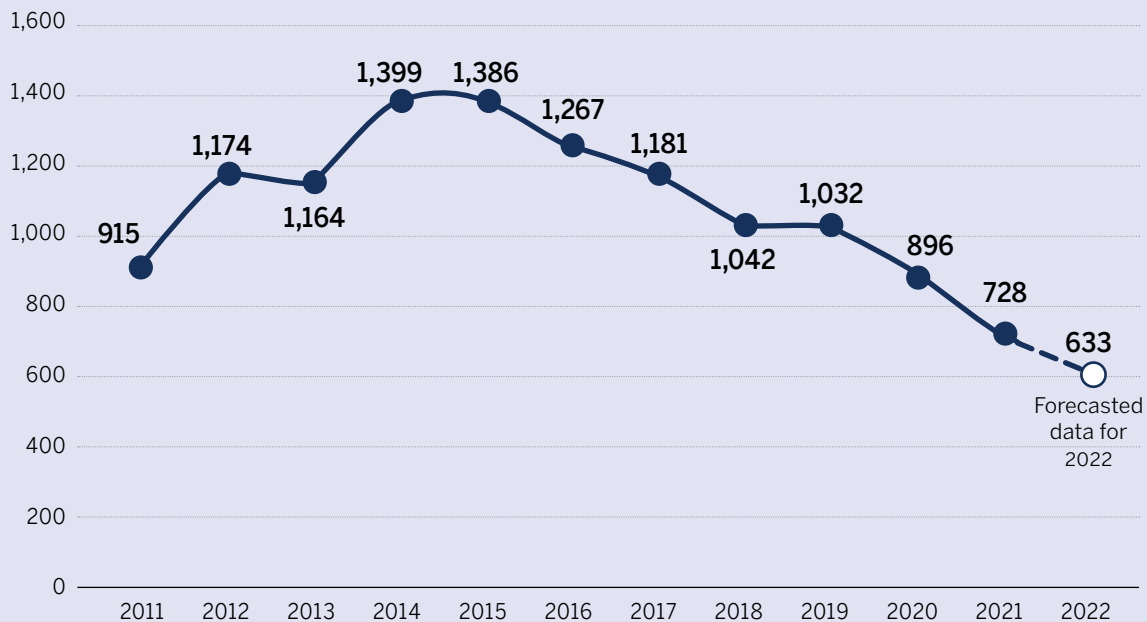


Is the Decline in the Number of New Startups Creating a Problem for the Israeli Economy?

The introduction of the iPhone in 2007, the lower prices of cloud services, and further technological and economic changes, brought about a global growth in the rate at which new startups have been opened. Until approximately 2015, there was a surge in the number of new startups opened every year both in Israel and in other prominent hubs. Since then, the number of new companies opened in most of the hubs has declined. Why did this happen and does this trend constitute a problem for the continued growth of the Israeli innovation hub?

27 No. of New Startups a Year Has Been Slashed By Over 50% in Less Than a Decade

No. of new technology companies established in Israel per year



Actual figure is 432 companies.

Source: IVC - Israeli Tech Review Q1/2023, Israeli Entrepreneurial VC Ecosystem 2020

In 2014, the number of new startups established in Israel stood at 1,400 companies, a figure that has steadily declined ever since. According to an Innovation Authority estimate, only 600-700 companies were opened in 2022.²⁰ The figure relating to the number of new startups established during the past two years is still expected to rise due to the occasional delay in the reporting of data on the

²⁰ The Innovation Authority's estimation is based on estimates of IVC and SNC publications.

establishment of new companies. It is nevertheless clear that there has been a decline in the number of new companies established since the record years. As of 2015, Israel was the second largest innovation hub in terms of the number of new companies established that year. The other large hubs experienced a similar phenomenon of fewer new companies opened after the record years of 2014-2015, including those in San Francisco (the largest hub) and New York. In other hubs, such as London and Boston, the decline was more moderate than that recorded in Israel.

The Innovation Authority and SNPI conducted a joint study to examine the reasons that led to the decline in entrepreneurial activity in Israel.²¹ The study revealed that since 2017, the number of new startups established each year dropped by 12%.²²

One of the assumptions examined in the study is whether the decline in the number of new startups was accompanied by a rise in the quality of the companies opened. However, in terms of capital raised by early-stage companies, there was no increase in the ratio of companies that successfully raise capital each year. Nevertheless, the study reveals that despite the decline in the number of new companies, the number of active investors and the average number of investors who participated in each funding round actually increased.

Two central questions arise from the decline in the number of new companies: first – what caused this decline and why did it occur? Second – does this situation constitute a problem in terms of the Israeli economy?

An in-depth analysis of the decline in the number of new startups established reveals that in recent years, this trend stems primarily from a downturn in the field of social media and advertising that had flourished and prospered a decade earlier. The entry barriers to establishing startups in these fields decreased because of the introduction of cloud technology and accessibility of the social platforms, including Facebook and Twitter, and the transformation of mobile devices into major computer products. Now however, only a limited number of entrepreneurs establish companies in this field. In practice, a comparison of the new companies established in 2019 with the companies established in 2014 reveals that the decline in the companies established in the social media and advertising sector explains approximately 70% of the drop in the number of new startups established.

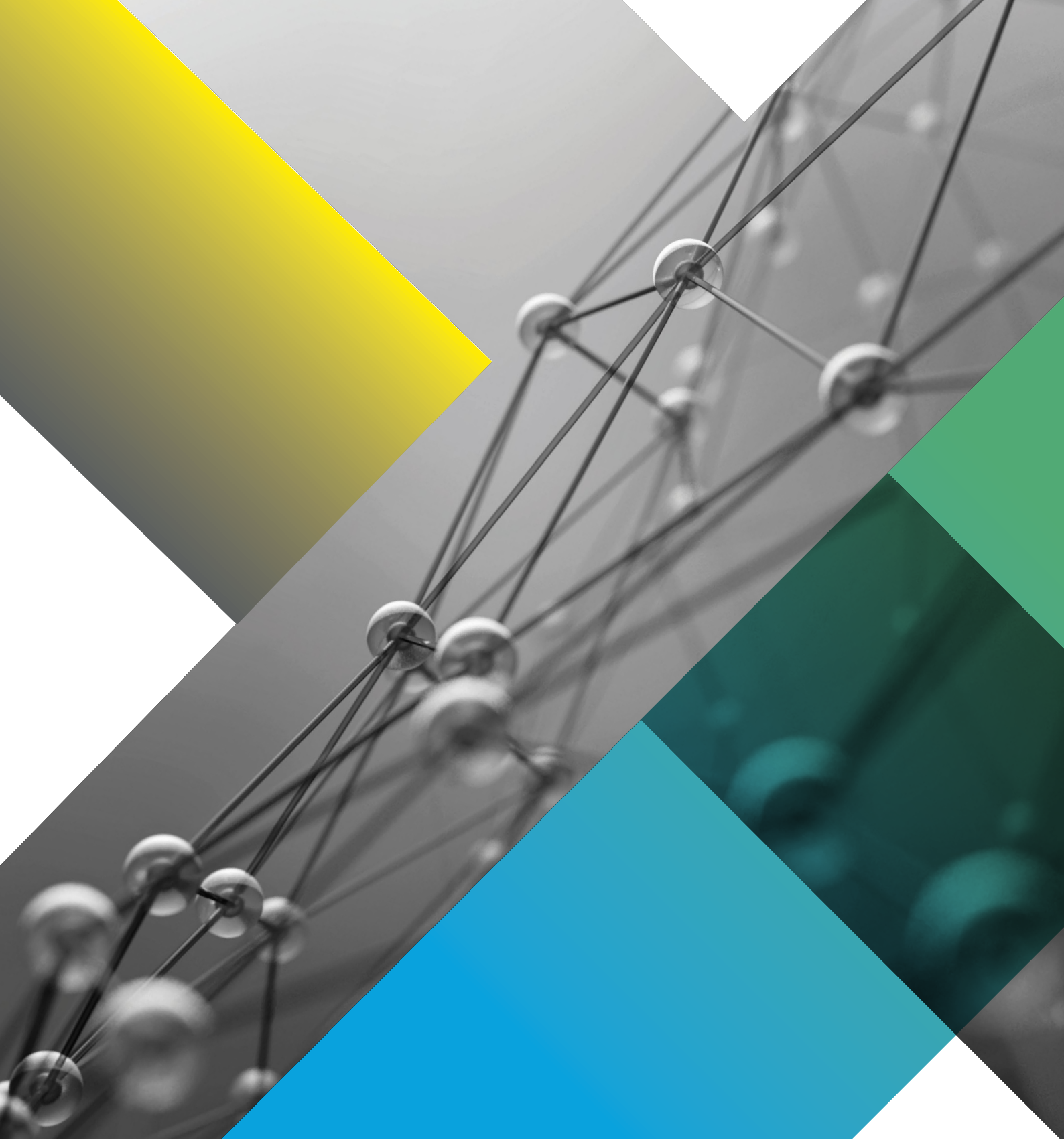
Another explanation for the decline in the establishment of new startups is the shortage of quality personnel and startups' difficulty in competing with the large established companies in paying high salaries. With the increase in salaries paid by high-tech companies in Israel, led by multinational technology companies, startups encountered increased difficulty, certainly those in their initial stages which have yet to raise significant capital, in recruiting experienced employees who demand high salaries. This presents a significant obstacle to establishing startups. Furthermore, there is low incentive for entrepreneurs to take a risk and establish a startup in an environment characterized by high salaries, safe jobs, and well-established companies.

Although the decline in the number of companies stemmed mainly from fewer new companies in the social media and advertising field, this is a worrisome trend. The significance of the decline in number of new companies is that it results in a drop in the number of growth companies because it hasn't been proved that the companies established in recent years succeed more. In other words, there is a need to increase the pace of establishing new technology companies in Israel to create the next generation of growth companies, that will become significant employers in the market. The Innovation Authority closely monitors the entrepreneurial situation in Israel and employs various tools to promote it.

This worrisome trend joins a new phenomenon indicated in a position paper published by the Innovation Authority in May 2023: new Israeli startups, some of which are expected to become growth companies, choose to incorporate outside Israel in a way that could limit the future number of jobs that will be available to Israelis.

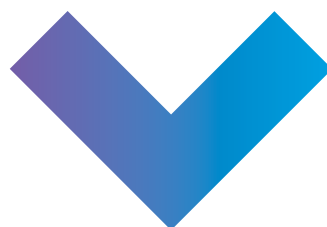
²¹ [A decline in the number of new startups: a worrying sign or natural maturation?](#) (Hebrew).

²² According to a calculation that refers to an estimated figure from 2022.



רשות החדשנות
Israel Innovation
Authority

Part 2:
**Investments and
Recruitments:
From Fintech to Climate**



A Spotlight on Startups' Funding in Israel

Israeli high-tech has enjoyed phenomenal growth in startups' funding over the past decade. Looking at the entire decade, the investments in Israeli startups grew five-fold between 2013-2023, totaling 95 billion dollars. These investments enabled the startups to remain independent over time without the need to perform a quick exit, to establish and develop sustainable businesses, and to employ large numbers of employees in roles that are not exclusively technological (in nature) and which facilitated the companies' growth. Furthermore, the startups became a significant economic cornerstone when they purchased services from peripheral businesses: restaurants that provide meals for employees, real-estate rental space, and service providers such as lawyers, accountants etc.

According to a Tech Aviv estimation,²³ as of May 2023, there were 98 unicorns operating in Israel i.e., private technology companies (that reflected an estimated value of at least 1 billion dollars in their last funding round. According to Tech Aviv, these companies alone raised a total of more than 44 billion dollars – at least part of which is still in the companies' coffers and allows them to continue to develop and hire employees.

The emergence of the Israeli unicorns is a significant part of the Israeli high-tech story over the last decade. Previously, Israeli companies were generally oriented towards technology development and were sold at a relatively early stage before investing significant resources in marketing, sales, and global expansion. These acquisitions led multinational companies to rapidly open hundreds of development centers in Israel, primarily between 2005-2018.

As the unicorns established themselves as complete companies, the pace of opening development centers slowed from 2019, declining to a pace similar to that of the early 2000s. As noted, over the years, most of the development centers were opened as the result of a M&A transaction and the startup becoming a development center of the purchasing corporation. Between 2010-2015, an average of 14 new development centers were opened each year.

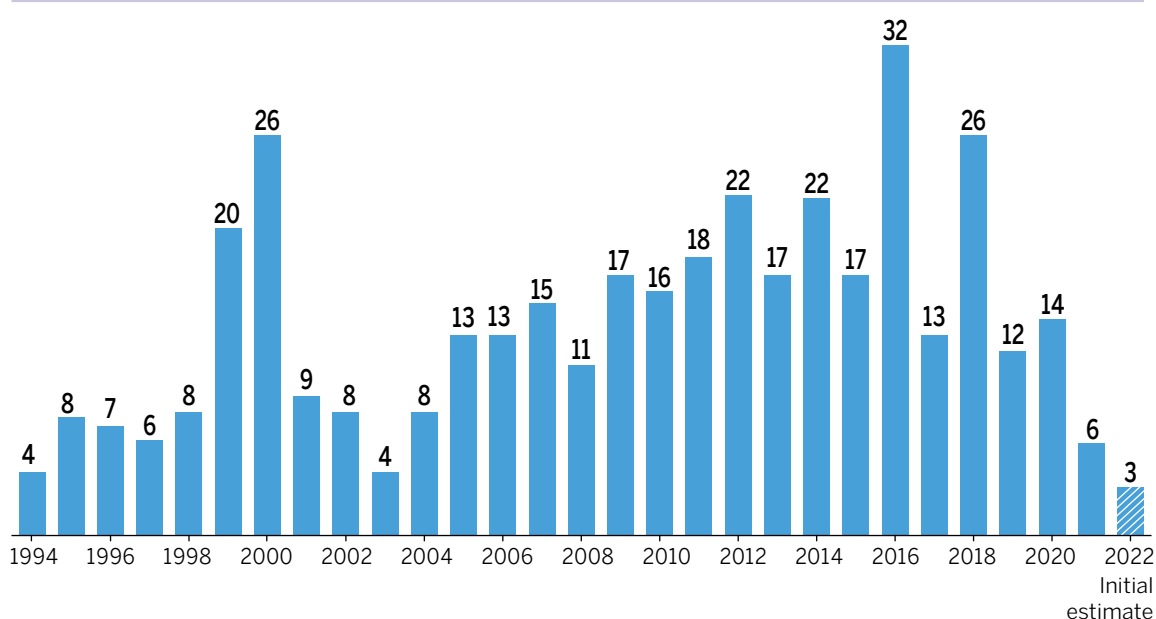
At the height of the acquisitions period between 2016-2018, the rate rose to 24 new development centers on average every year, while between 2019-2022, this declined to a low point of 8 new development centers on average each year. Recently, against the backdrop of the global economic crisis, we have witnessed a phenomenon of closure of development centers operating in Israel. Among the centers closed were those of EA, Dropbox, and others. Considering the importance of multinational companies' development centers for the stability of the high-tech sector, it is important to monitor the development of this trend.

²³ <https://www.techaviv.com/unicorns>

Together with the decline in development centers in recent years, the number of IPOs during this period increased dramatically: according to IVC data, 117 Israeli technology companies issued stock between 2019-2022 – an average of 29 a year. Furthermore, over this period, there were 595 M&A (merger and acquisition) transactions – an average of 149 per year. Some of the acquisitions over the past decade were by Israeli entities – a development that testifies to a maturation of the local industry that is also enjoying non-organic growth.

28 A Drop in the No. of New Development Centers Opened in Israel Each Year

No. of new development centers opened in Israel every year



Source: Innovation Authority adaptation of IVC data

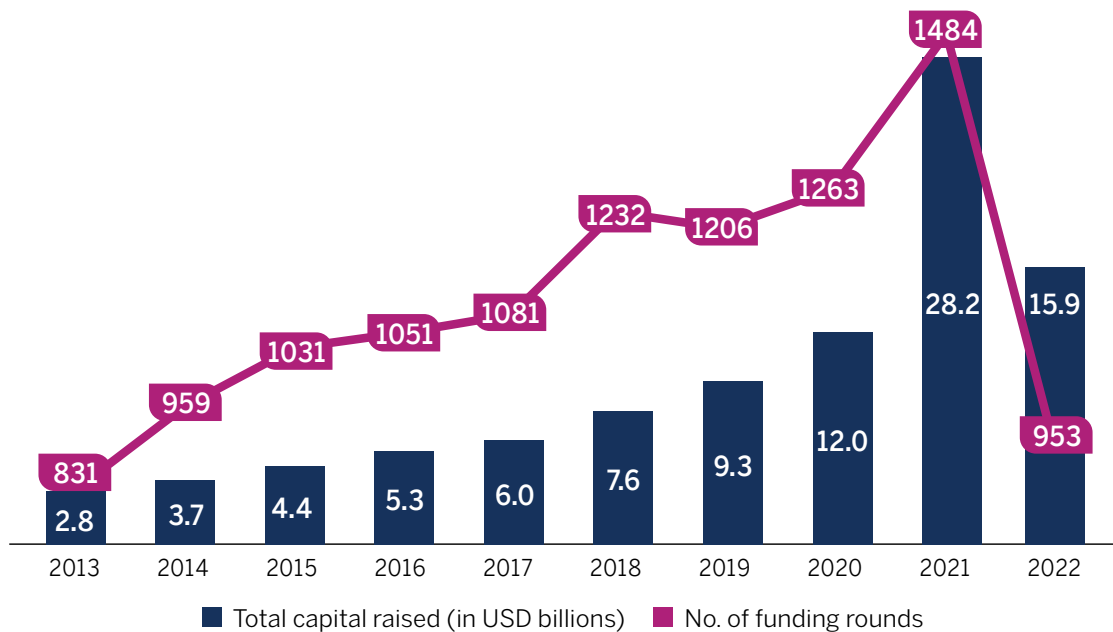
The increase in the number of large-scale funding rounds of the mature technology companies bolstered the total funding raised by startups in Israel in recent years during which there has been an acceleration in the rate of funding raised by startups. However, recently this rate has slowed, with growth companies and unicorns seemingly most adversely affected from the slowed rate of investments during this period.

In 2022, Israeli startups raised 15.9 billion dollars in 953 funding rounds. This represents a decline of almost 45% in total investments compared to 2021. At the same time, 2021 was an unusual year in the scope of investments in startups: 28 billion dollars – more than double the previous year. Excluding the jump in investments in 2021, the following year (2022) actually continued the trend of growth in investments typical of recent years.

Considering the global economic downturn expressed, among other things, by interest rate hikes and a global deceleration in the rate of funding rounds, and given the ongoing political instability in Israel, it would seem that we can expect a continued decline in investments this year compared to the growth trend of recent years.

29 Following Over a Decade of Multi-Year Investments' Growth - What Will Happen to Startups' Fundraising?

Total capital raised by Israeli technology companies and the no. of funding rounds per year



The 2022 data is incomplete and expected to update

Source: Innovation Authority adaptation of IVC data

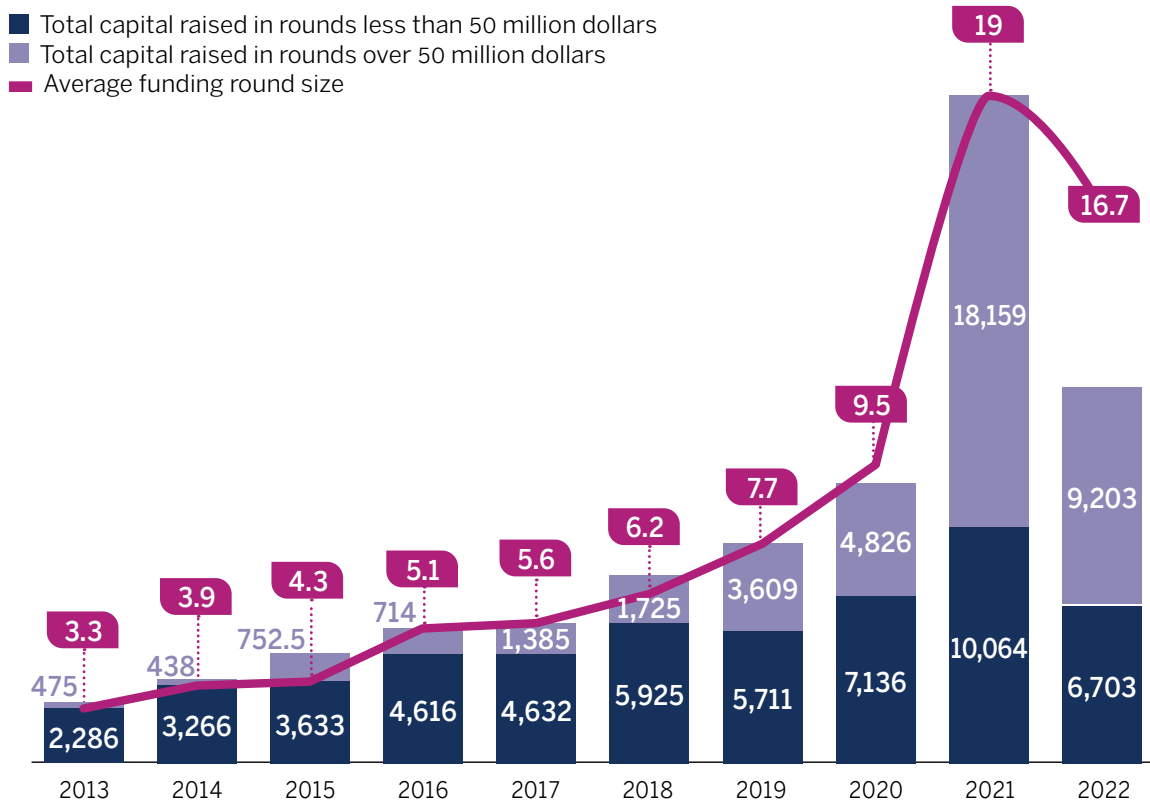
The industry's maturation and the consolidation of the complete companies in Israel over the past decade was expressed in an important metric that improved significantly during this period: the size of the average funding round. In 2013, this metric stood at 3.3 million dollars for a startup in Israel and had, by 2022, grown five-fold to reach 16.7 million dollars. Between 2013-2018, the size of the average funding round doubled and three years later, almost tripled.

The primary factor contributing to the significant growth in the total capital raised was especially large funding rounds of 50 million and, even, of more than 100 million dollars. Until recent years, technology companies raised such sums on the capital market. In comparison, just a decade ago in 2013, the Israeli company WIX raised 127 million dollars in an IPO, reflecting a market value of 765 million dollars. At the time, this was one of the largest stock issues in the history of Israeli high-tech. In other words, the accepted scales of private sector investments in high-tech changed within just a decade.

In 2013, only 0.6% of startups' funding rounds were of 50 million dollars or more – five of all the funding rounds conducted that year. In 2022, their relative share grew more than 14-fold to nearly 9% of the funding rounds. These rounds raised 58% of all total capital raised i.e., 6.7 times their relative share of the number of rounds. In 2013, only 17% of the total capital was raised in funding rounds larger than 50 million dollars whereas since 2019, 55% of the capital raised by Israeli startups was in funding rounds larger than 50 million dollars.

30 Most of the Decline in Israeli Startups' Investments in 2022 was in Large Funding Rounds Over USD 50 Million

Startups' yearly fundraising by size and average yearly funding round size (in USD millions)



The 2022 data is not final and is expected to update

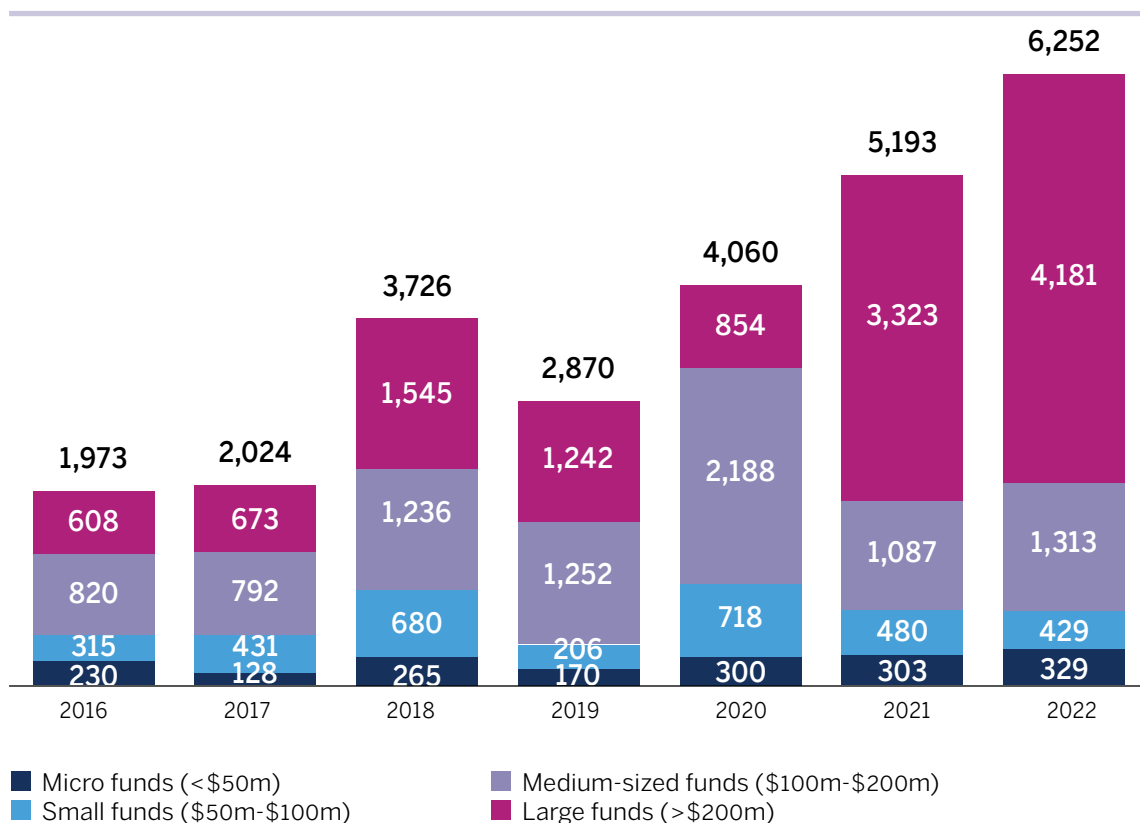
Source: Innovation Authority adaptation of IVC data

The growth and flourishing of Israeli startups were also expressed in the growth in capital raised by Israeli venture capital funds, especially in sums intended for relatively large funds that can generally write larger checks and invest in companies at advanced stages. Between 2016-2022, Israeli venture capital funds raised a total of 24 billion dollars. The total capital raised in 2022 tripled compared to the level of 2016 and reached 6.2 billion dollars. As noted above, most of the investments in Israeli startups are by foreign investment entities such that the capital raised by Israeli investment funds represents only part of the investment potential for Israeli startups in the visible future.

The sum raised by Israeli venture capital funds that manage over 200 million dollars grew seven-fold during this period – from 608 million dollars in 2016 to 4.2 billion dollars in 2022. In total, the funds which manage over 200 million dollars raised 12.5 billion dollars throughout this period – approximately half the total capital raised. In relative terms, the large funds have the highest growth out of all the funds that raised capital in Israel during this period.

31 Capital Raised by Large Israeli Venture Capital Funds Grew Seven-Fold In 6 Years

Total yearly capital raised by Israeli VC funds by fund size, in USD millions



The 2022 data is not final and is expected to update

Source: Innovation Authority adaptation of IVC data



Israel: A Superpower of Organizational Software, Fintech, and Cyber

The technology companies established over the past decade operate primarily in three prominent fields: organizational software, fintech, and cyber. These three fields seem to spearhead Israel's high-tech and are of main interest in terms of entrepreneurship and investments in Israeli high-tech, as detailed later in this chapter.

In short, the findings of studies we've conducted revealed that with regard to the sectors of organizational software, fintech and cyber, Israel has a comparative advantage both in entrepreneurship and startups' funding. Over 40% of the new startups established every year operate in these areas, more than half the investments are in these areas, and most of the specialist venture capital funds that implemented over 10 investments in a specific sector, operate in these fields. International comparisons show that Israel has a global comparative advantage in the cyber sector and attracts more investments than any other innovation hub except San Francisco, New York, and Boston.

The transformation of the organizational software, fintech and cyber sectors into central cornerstones of Israeli high-tech is part of a broader trend of software's increased dominance within Israeli high-tech. While in the past the high-tech sector was based primarily on companies in the field of hardware (e.g., microchips and communications), most of the companies that raised capital over the past decade were software companies.

It is important to note that a large proportion of the software-oriented companies operating in Israel develop and use infrastructures and tools that are based on Artificial Intelligence which enable them to offer innovative and competitive solutions.²⁵ In other words, although AI is not defined as a separate area of activity, it is used by many technology companies and constitutes a comparative advantage both for them and for Israeli high-tech in general.

Approximately 65% of the 12,000 companies established between 2012-2022 operate in software-oriented fields while the remainder operate in hardware-oriented fields.²⁶ This ratio remained stable throughout the decade. When examining the different areas of activity, it is clear that entrepreneurs tended to establish companies in the fields of organizational software, fintech, and cyber. As a result, the relative share of companies in these fields out of all companies established each year increased from 29.4% in 2013 to 42% in 2021 i.e., a relative increase of almost 50%.²⁷ In contrast, the share of companies in the communications

²⁵ In this context, it is worth noting that the recent improvements in fields of AI, especially in Generative AI, may lead to a new wave of initiatives in different fields and worlds of content that will reinforce investment and entrepreneurial trends in the software fields we mention. At the same time, it is important to emphasize that the new tools still lack a stable business model and that the companies operating in this field report heavy losses. Moreover, the processing resources required to run these algorithms are significantly higher than those that currently exist, to an extent that raises questions relating to the environment and sustainability should they ever be adopted on a wide scale. There are also parallel ethical and regulatory questions pertaining to operation of these tools.

²⁶ The fields included in the category of software: cyber, fintech, organizational software, e-commerce, content and media, digital health, and government. The fields included in the category of hardware: life sciences, pharma, medical devices, energy, agri-tech, food-tech and water, advanced manufacturing, communications, smart transportation, and security. The range of values stems from the fact that some of the companies are classified under more than one field.

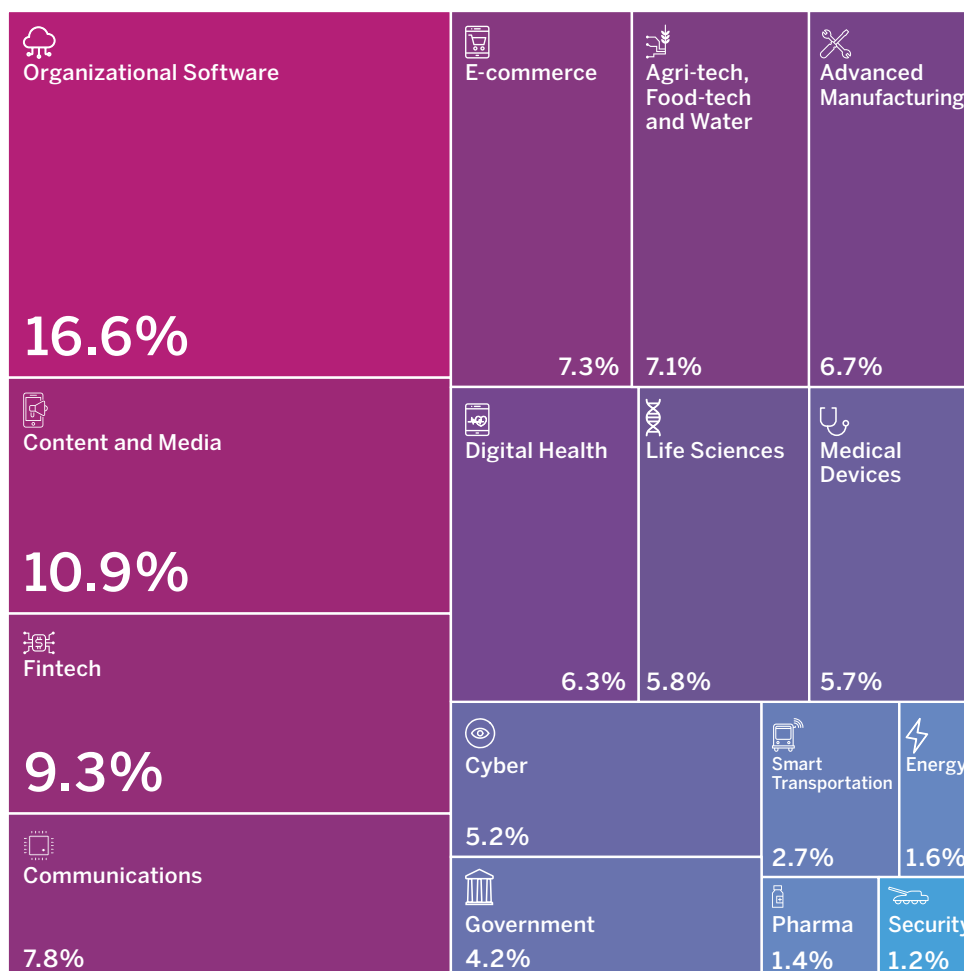
²⁷ The number of new companies established in recent years is still expected to increase. When examining the partial data for 2022, the figure remains almost identical – 41.4%.

sector, that mainly develop hardware communications infrastructures and microchips, and that belong to the hardware sector, declined from 8% of all new companies in 2013 to only 1.7% of all companies established in 2022. In software categories too, not all the areas of activity grew during the period under discussion. The share of e-commerce, content and media companies declined from 32% of all new companies established in 2013 to less than 20% of new companies in 2022.

Approximately 57% of the high-tech companies operating in Israel today belong to software fields,²⁸ with a third of all technology companies in Israel operating in fields of organizational software, fintech, and cyber.²⁹ It is worth noting that agri-tech, food-tech and water companies already comprise 7.1% of all Israeli high-tech companies. This is in light of the increase in the relative share of these companies out of all new companies established, from 4.6% in 2013 to 9% in 2022. In general, companies that provide solutions for climate challenges are part of a growing category in Israel. For more details see the “Climate-Tech opportunity Chapter”.

32 A Third of Israeli High-Tech Companies Operate in Organizational Software, Fintech and Cyber

Distribution of high-tech companies operating in Israel, by sector, February 2023 (in %)



Source: Innovation Authority adaptation of IVC data

²⁸ This figure relates to the situation as reflected in IVC data from February 2023.

²⁹ It should be emphasized that a specific company may belong to more than one sector and may therefore be counted twice (e.g., a company that develops a platform for managing agricultural produce may be classified under both the agri-tech and the organizational software sectors).

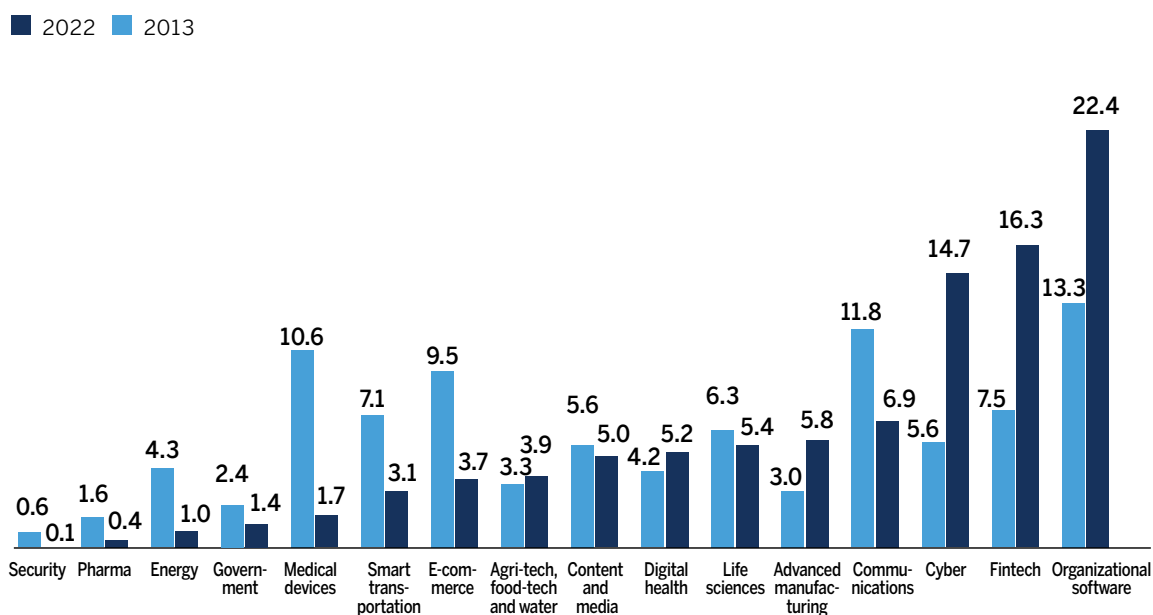
More Than Half the Investments in Israeli Startups are in Organizational Software, Fintech and Cyber Companies

The popularity of entrepreneurial activity, expressed in the establishment of companies in the field of software, was also accompanied by an increase in capital raised in these areas. The share of venture capital investments in companies in the fields of software in Israel reached 70% in 2022 while the parallel figure for 2013 was less than half of all investments (48%) i.e., the rate of increase in entrepreneurial activity in these fields grew at a similar pace to the growth in investments in them. It is important to note that because the investments in Israel grew on a significant scale, the growth in the various fields is expressed not only in their relative share of the investments in Israeli startups, but also in the total capital they attracted in absolute terms.

Parallel to the increase in entrepreneurial activity in organizational software, fintech and cyber, there was also a significant increase in the flow of capital to these areas that is indicative of a change in the distribution of investments in the high-tech sector over the past decade. In 2013, each of these three fields concentrated a similar share of the total investments in Israel to those of fields such as communications (11.8% of total investments in 2013), medical devices (10.6%), and e-commerce (9.5%). In total in 2013, the three fields – organizational software, fintech and cyber – were responsible for only a quarter of all investments (26.4%). The growing popularity of organizational software, fintech and cyber led to a situation whereby in 2021 and 2022 these three fields already attracted more than half the investments in Israel, with their share reaching 53.4% of total investments in 2022.

33 Organizational Software, Fintech and Cyber Account for Over Half of Private Investments in High-Tech

Distribution of investments in technology companies in Israel by sector, as a % of total capital raised a year



The figures do not total 100% because approx. 3% of investments are uncategorized

Source: Innovation Authority adaptations of IVC data

Alongside the increased popularity of organizational software, fintech and cyber, there was also a sharp decline in the share of investments in the field of medical devices, from 10.6% of total investments in 2013 to 1.7% in 2022. Other fields to suffer a significant decline in their share of the investments pie are e-commerce, communications, and smart transportation.

The Investment Funds Accumulated Expertise in Fields in which Israel has a Comparative Advantage

Thus far, we have examined the distribution of the investments as expressed in the flow of capital to the companies. In this section, we aim to examine the number and characteristics of the funds investing in the various fields and especially, any disparities between the areas of activity pertaining to the existence of “specialist funds”. This refers to venture capital funds with in-depth knowledge of a specific area of activity and which have added value – both professional and business – when investing in a company, beyond the funding itself. Accordingly, when a specific field has a larger number of “specialist funds”, it could be expected that companies with high success potential would receive funding whereas companies with lower success potential will not receive funding.³⁰ This is because the funds’ specialist expertise is expected to lead to a better sorting of investment opportunities they encounter. For the study we conducted, a fund (VC or CVC) was defined as a “specialist investor” in a specific field if it implemented at least 10 investments in this field for five years, between 2018-2022. We identified 384 such specialist funds operating in Israel.³¹

Diagram 34 shows that the fields of organizational software, fintech, and cyber lead not only in the total investments and the number of new companies, but also in the number of funds operating in their fields, both specialist and general funds. 767 venture capital funds in Israel implemented at least one investment in the field of organizational software during the period examined (2018-2022), 600 funds implemented an investment in the fintech field and 500 companies in the field of cyber. About 15% of the funds which invested in one of these fields, made at least 10 investments over the past five years, while in the other fields the average stands at only 3%. In other words, the funds’ ratio of specialist expertise in these fields is relatively very high. As a result, the specialist funds’ share of these fields out of all the specialist investments operating in Israel is very high and constitutes 73% of all the specialist funds operating in Israel.

A broader look at all software fields reveals that 62% of all the funds examined and 82% of the specialist funds invest in these fields. Furthermore, another 6% of the specialist funds operate in the field of communications such that all the communications and information (ICT) sectors in Israel comprise almost 90% of the specialist funds’ activity.

An examination of the funds’ areas of specialty in other fields shows that the funds’ specialty does not conform to trends in the field of investments. In other words, the fields that have attracted most of the investments do not necessarily concentrate the specialty of the funds and vice versa – some fields are no longer popular for establishing a company or for investments but have a large number of specialist funds. This is apparently because it takes time for funds to acquire expertise in certain fields. On the one hand, the fields of advanced manufacturing, agri-tech, food-tech, and water displayed relatively high growth in terms of fundraising for startups and are fields in which a significant number of venture capital funds operate.

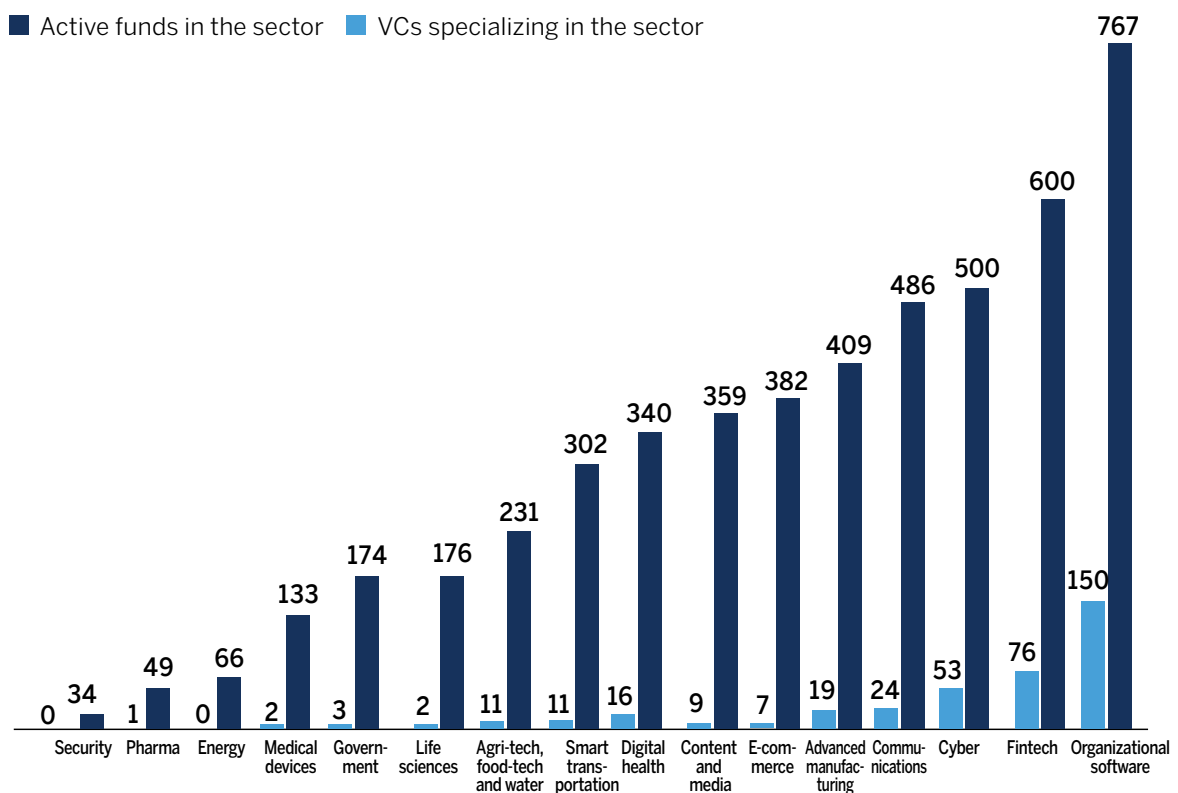
³⁰ The existence of “specialist funds” contribute more to a perfect capital market as the result of transfer of more high-quality information between the different market players – investors and entrepreneurs. The importance of a perfect market stems from the fact that such a market features the most efficient allocation of capital. It is important to emphasize that the existence of a large number of specialist funds does not guarantee that the capital market in a specific area will be conducted perfectly because restrictions sometimes exist that stem from the characteristics of the funds themselves. For example, venture capital funds’ investment timeframe is generally limited and is not suitable to investments in companies with significant potential but long time to market. Alternatively, there is sometimes restrictive regulation or a lack of regulation that creates uncertainty regarding the field’s development.

³¹ The data includes both Israeli and foreign funds. It should be noted that the ratio of foreign funds out of all funds stands at 63% and their share of the specialist funds stands at 53%. These figures are relatively consistent between the different fields. The choice to focus on VC and CVC funds stems from the fact that these funds are responsible for 90% of total investments during these years.

Nevertheless, the number of specialist funds is still relatively low. In contrast, the e-commerce, smart transportation, and communications sectors displayed lower than average growth of startups' fundraising however, considering their significant and central past role in the Israeli high-tech sector, it seems there is still a large number of specialist funds operating in these fields.

34 Most Specialist VC Funds in Israel Specialize in Investments in Organizational Software, Fintech and Cyber

No. of active unique VC funds specializing in the high-tech sector in Israel, 2018-2022



A fund is defined as specialist in a specific sector if it made at least 10 investments in this sector between 2018-2022.

Source: Innovation Authority adaptation of IVC data



The Climate Crisis: Israel's Opportunity to Become an Exporter of Global Climate-tech Solutions?

The climate crisis is one of the largest challenges threatening our planet's future and the future of mankind. The UNFCCC – the United Nations Framework Convention on Climate Change – designated national goals for reducing greenhouse gas emissions and preventing man-made damage to the atmosphere. To meet these goals, the different countries and the corporate world must adopt different measures that will, in turn, increase the demand for innovative solutions in this field. Technology companies undoubtedly have a role to play in addressing the global climate crisis by developing tools, services and products aimed at contending with greenhouse gas emissions (mitigation) or with the impacts of global warming (adaptation) such as extreme weather events, a change in the precipitation regime etc.

As a small country, Israel does not significantly influence the climate crisis as far as greenhouse gas emissions or its ability to eliminate the global crisis are concerned. But can Israel become a world leader in the development of technological climate-tech solutions and in assisting other countries?

To answer this question, the Innovation Authority conducted a preliminary study in an attempt to characterize the companies active in this field in Israel,³² the problems to which they offer solution, and the trends of entrepreneurial activity in this area. The study revealed that 516 technology companies were active in Israel in the field of climate-tech as of Mar 2023. Furthermore, during the same period, 26 climate-tech companies were acquired or merged with other companies.³³ One example is the startup company Breezometer that engaged in the monitoring of environmental hazards and was acquired by Google in September 2022. During the last five years, 64 climate-tech companies operating in Israel closed.

The Israeli climate-tech companies are active in a diverse range of fields. 24% of Israeli climate-tech companies operate in the field of energy, developing solutions for energy storage, renewable energy, energy efficiency and others; 37% of the Israeli climate-tech companies operate in the fields of agriculture, food, and water (approx. 16% in the field of food-tech – alternative proteins, food waste etc.); 11% of the companies operate in the field of water – desalinization, water resource management etc.; and 10% in the field of agri-tech – vertical farming, urban farming, agricultural biotech etc.

³² An extensive mapping of this area is expected to be published by the Innovation Authority towards the end of 2023, that will include tools for measuring different ecosystems in climate-tech fields.

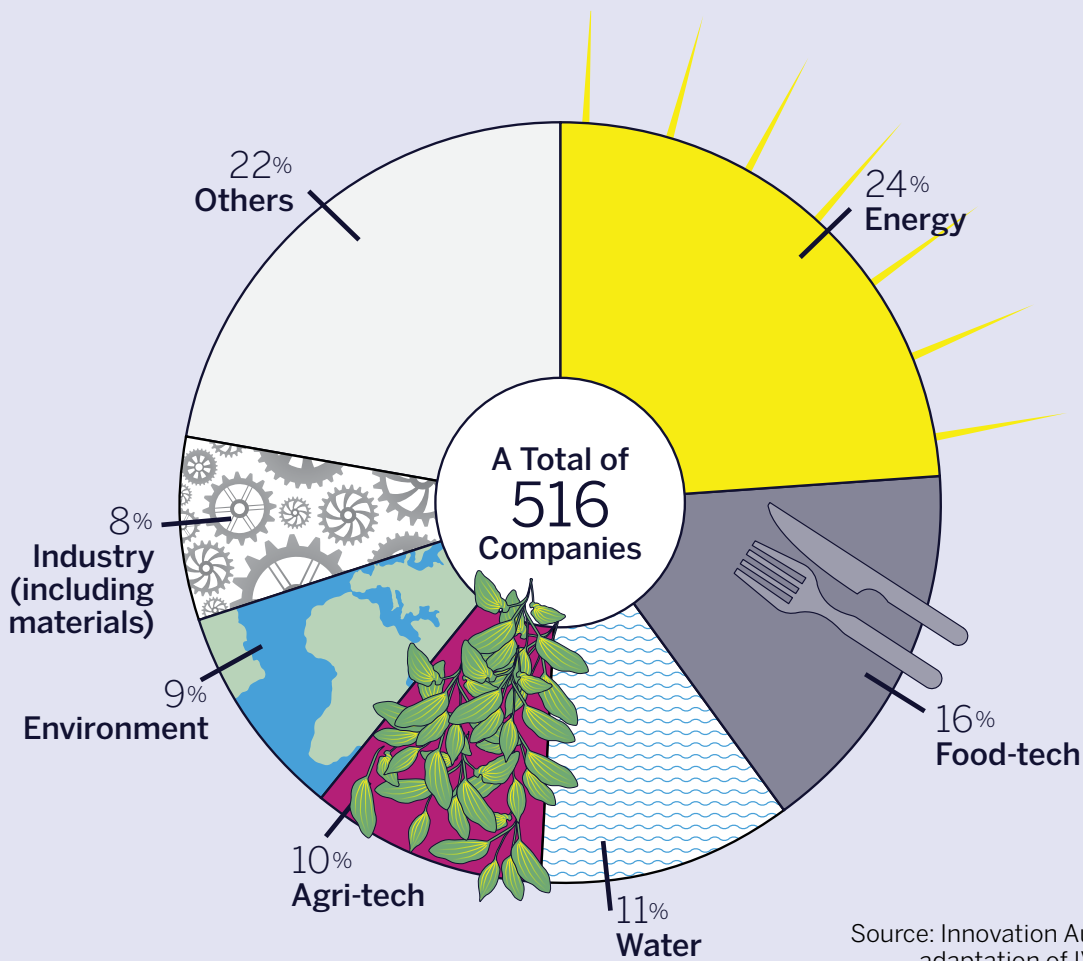
³³ Methodology: fields of activity for technology companies in the field of climate-tech were defined for the purposes of the study presented in this report, including seven sectors that belong to the field of climate-tech and 30 subsectors. The various sectors were determined according to the accepted fields in Israel and around the world. The expanded/extended list of sectors identified key words that describe companies which operate in each of them. The list of key words was checked by the startup databases of SNC and IVC on the list of Israeli technology companies that were active between 2018-2023. Based on this data, a list was created of 615 climate-tech companies that operated in the defined period, of which 516 are active, 64 have closed, 26 were acquired or merged with another company, and 9 companies whose status was unclear.

Together, these four fields represent over 60% of the technological activity in the field of climate-tech in Israel. The main fields in which the other companies operate are: 9% in environmental fields,³⁴ and 8% in industrial fields, including the segment of materials.³⁵ In addition to the fields detailed above, climate-tech companies in Israel also operate in areas such as carbon trade, circular economy, smart transportation, and others.

Although climate-tech is generally regarded as a new category that grows as the climate crisis increasingly becomes the focus of international discussion, in some of the subsectors of this category, Israel is an established, veteran player. These include, among others, the fields of water, farming, agriculture, and energy. Because of the weather and geographical conditions that characterize Israel, technologies that solve problems in these areas have been at the center of local development for decades. The success stories exported from Israel in these subsectors include Netafim that developed drip-irrigation solutions, the solar energy company SolarEdge, and the veteran Ormat Technologies in the field of geothermal energy.

35 40% of the Climate-Tech Companies Operate in the Energy and Food-tech Fields

Distribution of climate-tech companies operating in Israel by sector, 2023 (% of the companies)



³⁴ Environmental fields – anything related to measurement of the current situation of the planet such as the weather, atmosphere etc.

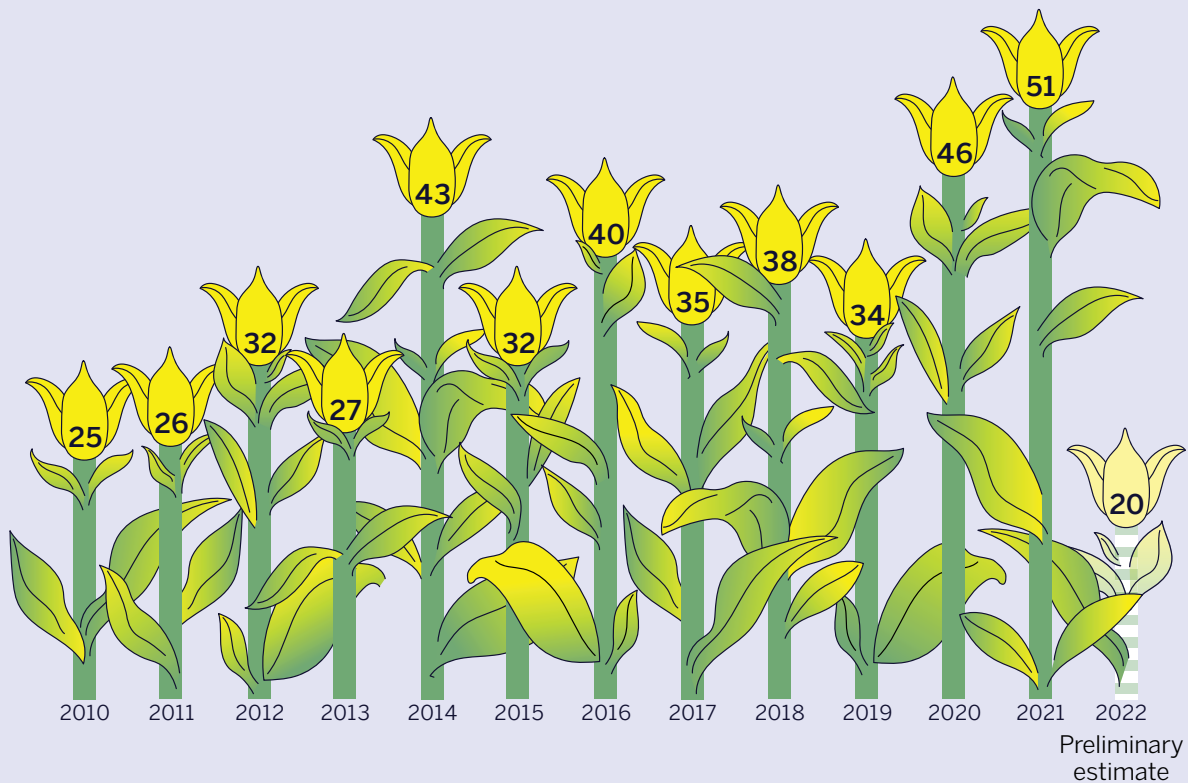
³⁵ Industry and materials – anything related to recycling, energy efficiency, manufacturing of new materials for construction etc.

Furthermore, Israel is home to leading global research institutes in this field, including the Volcani Institute, the Soreq Nuclear Research Center, and the Weizmann Institute. These institutes and their researchers are responsible, among other things, for the development of innovative climate-tech solutions. A significant proportion of the climate-tech companies operating in Israel today, many of which have been established in recent years, is concentrated in fields to which government resources and efforts have been dedicated and where incentives have been given, including in the fields of energy (fuel substitutes), agriculture, and water.

Several metrics related to fluctuations in the entrepreneurial activity in this field were examined to assess whether the Israeli innovation ecosystem is responding to the growing global interest in the climate issue. As far as entrepreneurial activity evident in the establishment of new technology companies in this field is concerned, we can discern a growth trend in the number of new companies: from 2010, the number of new companies in the field increased from 25 a year to 51 new climate-tech companies in 2021. In other words, the number of new companies opened each year in the field of climate-tech more than doubled within a decade. The figures for 2022 are still a preliminary estimate and it is therefore too early to understand from them whether we are witnessing a change in this trend and whether they indicate a decline in entrepreneurial activity in this field.

36 The No. of Climate-Tech Companies Opened Each Year Doubled in a Decade

No. of new climate-tech companies opened per year in Israel

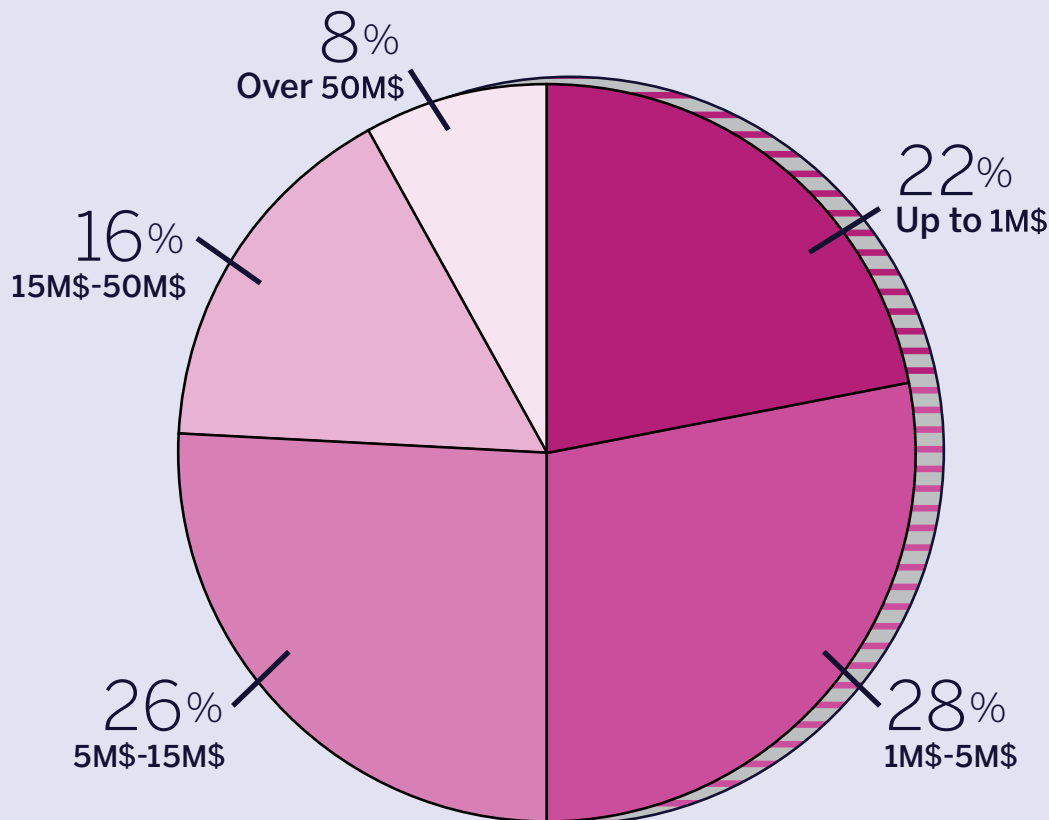


Source: Innovation Authority adaptation of IVC data

Alongside the increased rate of new climate-tech companies, the capital raised by climate-tech companies also increased significantly. According to the study, in the five years between 2018-2022, a total of 7.2 billion dollars was raised by 344 companies in the fields of climate-tech, 24% of which was by food-tech companies that raised 1.7 billion dollars. Of all the funding rounds in the various fields of climate-tech, half were by companies in early stages, with less than 5 million dollars raised in each round.

37 Half the Investment Rounds in Climate-Tech Companies Are Less Than 5 Million Dollars

Distribution of climate-tech companies' funding rounds by round size (total deals between 2018-2022)



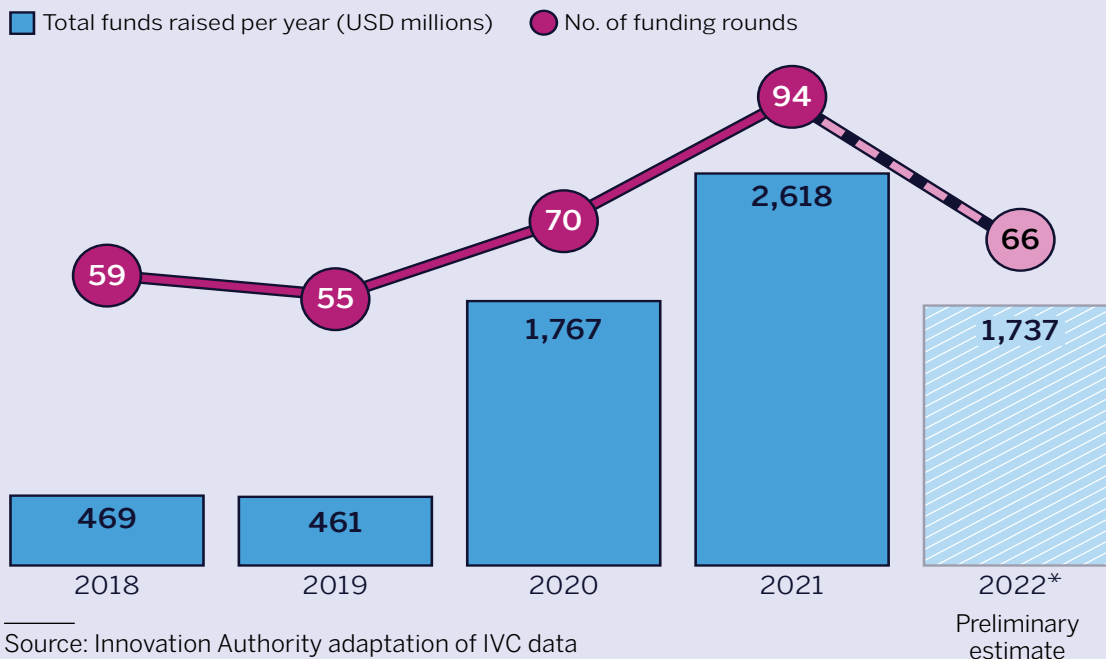
Source: Innovation Authority adaptation of IVC data

Furthermore, the scope of fundraising tripled during this period: from less than half a billion dollars in 2018-2019, to more than 2.5 billion dollars in 2021. The combination of these two metrics indicates an increase in interest in this field and the attractiveness of Israeli companies engaged in climate-tech. The average size of each funding round also more than tripled – from 8 million dollars in 2018 to 26 million dollars in 2022. This metric indicates a maturation of the Israeli climate-tech companies.

Among the prominent recent funding rounds in the Israeli climate-tech field were H2Pro that develops a green hydrogen technology and raised 75 million dollars in 2022; Beewise which raised 80 million dollars in 2022; and Remilk that raised 120 million dollars in 2022, a figure which, according to reports, reflected a total company value of 325 million dollars.

38 Investments in Climate-Tech Companies More Than Tripled in Five Years

Total funds raised by climate-tech technology companies (USD millions) and no. of funding rounds a year in Israel



The rise in climate-tech investments in Israel is consistent with the increasing global interest among venture capital investors. Moreover, it is clear that international funds are starting to formulate investment strategies in this field. The increased interest is also reflected in investors' desire to collaborate with organizations that will be recognized as climate-tech investors. In Israel for example, over 40 investors joined the Investor Alliance list created by PLANETech that promotes climate-related innovations.

The increased interest in investments in the field of climate-tech is not unique. Evidence of this can be found in a Pitchbook survey conducted among 58 venture capital funds in April 2023. The survey reveals that investors regard climate-tech as a field characterized by high innovation and one that is expected to continue to prosper as clients adopt new technologies. The field of climate-tech is ranked second only to Artificial Intelligence in these two metrics.³⁶

The bottom line is that Israel enjoys a promising position as a key player in the development of revolutionary climate-tech solutions. This is, in part, thanks to the decades during which the young state was required to develop solutions in areas related to water, agriculture, and solar energy. Israel enjoys a positive worldwide reputation as one of the countries contributing to the global effort to develop technological solutions for the climate crisis. Today, Israel's rich store of research knowledge and experience in this field constitutes a comparative advantage of the Israeli ecosystem in the climate-tech field over other countries. The rate of new companies being opened in Israel and of their fundraising has also grown significantly in recent years.

To preserve its relative advantage in climate-tech, Israel must continue developing high-quality training of skilled personnel with relevant expertise and to continue investing in research to stand at the forefront of global knowledge in this field. On the national level, effort must be made to develop infrastructures for research and its application in the local market so that it too can benefit from the fruits of the technology. Furthermore, as a field that requires relatively long years of development, in contrast to software solutions for example, there is a need to examine the demand for unique funding solutions to advance climate-tech.

³⁶ EMERGING TECH RESEARCH H1 2023 VC Tech Survey, see [here](#).



Does the State Take More Risk with Investments in Startups Than the Private Sector?

The decline recorded over recent years in investments in startups in Israel stems, among other things, from them being fields that are characterized by long and expensive development processes until products or services are released onto the market and by high risk levels. To continue supporting the development of innovative and breakthrough technologies in more risky fields, the Innovation Authority has decided to invest in breakthrough technologies and in high-risk projects that investors in the private market shy away from investing in.

High risk in a project or company can stem from the fact that the investment prospects are too long-term and not suitable for investors seeking rapid return, as happens in some of the hardware fields in which the entrepreneurs are required to develop tangible products, or for example, in places where regulation extends the time to market, such as the pharmaceutical sector or, alternatively, where it makes development of the field more difficult due to a lack of clear standards e.g., in the food-tech sector. In the last case, the Innovation Authority is also working with regulators to adopt advanced regulation that supports the sector's development in Israel. One prominent example of this is the field of alternative proteins in which Israel was the third country (after Singapore and the US) to approve a protein alternative created via a process of fermentation.

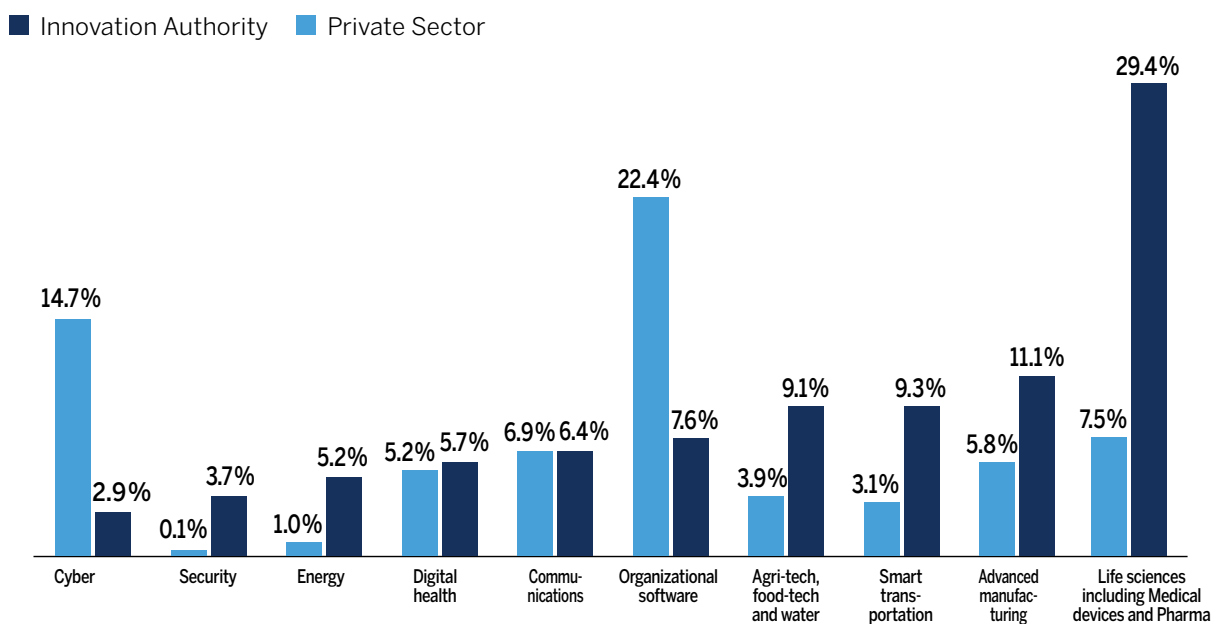
A study conducted confirms that the Authority's investments are indeed channeled to the high-risk fields in which the private sector rarely invests.³⁷ A prominent example of this is the fields of life sciences that include the pharma, medical devices, and biotechnology sectors to which only 7.5% of private market investments are directed. In comparison, in the leading US hubs (San Francisco, New York, and Boston), 15% of investments are directed to these sectors. The Innovation Authority channels a significant portion of its resources to investments in companies in these sectors in which, as noted above, the private sector invests only sparingly, with the goal of assisting the Israeli hub attain a leading global position. The Authority's investments enable to showcase the extensive experience accumulated in Israel in these areas, among others, in research institutes and hospitals. Other noteworthy fields of significant Innovation Authority investment include advanced manufacturing, agri-tech, food-tech and water, smart transportation, and energy. The share of these fields in the Innovation Authority's investment pie is double, triple, or even five-fold in relation to the share of private sector investments.

³⁷ The level of correlation between the private sector's areas of investment and those of the Innovation Authority stands at 0.008.

At the same time, the Authority's investments in the fields of cyber and organizational software stand at 10.5% compared to 37.1% of private market investments.³⁸ As noted above, these fields are characterized by a perfect capital market and numerous venture capital investors that specialize in them. If so, why does the Innovation Authority invest in them at all? This is the place to mention that reality is, as always, complex. A narrow view of a company's area of activity generally fails to tell the whole story, and there may be companies that develop innovative high-risk technologies specifically in fields typified by significant capital. For example, the Authority may receive requests from cyber companies developing quantum technology-based solutions – a new and high-risk field. In addition, although startups developing technologies in the field of Generative AI that is directed, for example, at the field of organizational software, operate in a field popular with investors, the disruptive technology they develop is still high-risk. In this reality, whereby a new technology is on the cusp of breakthrough, it is important to preserve Israel's comparative advantage in the fields of software.

39 Innovation Authority Investments Complement Private Sector Activity

Distribution of Innovation Authority and private sector investments by field 2022 (in %)



Source: Innovation Authority adaptations of IVC and Authority data

³⁸ The Authority has difficulty in classifying fintech companies, and we therefore refrain from presenting a comparison in relation to this field. Nevertheless, it is worth noting that the experience accumulated by the Innovation Authority indicates that the Authority's investments in this field are negligible.



Appendix:
**Israel Innovation
Authority Activities**



Israel Innovation Authority Activities in 2022

The Israel Innovation Authority endeavors to provide a solution to the different challenges facing the Israeli innovation hub via three operational units called “divisions”. Each division is mission oriented and offers a unique toolbox that is adapted to the different challenges inherent in the various stages of the technological lifecycle.

The Innovation Authority's divisions undertook a variety of initiatives during 2022 with the aim of advancing the growth of the Israeli innovation hub. The table below details the different divisions' activity last year, according to the programs they operate:¹

Division	Area of Activity	Program/Track	No. of Requests Submitted in 2022 ²	No. of Approvals Granted in 2022 ²	No. of New Companies Approved ³	Total Grants Approved (NIS millions)
Growth	High-tech Industry	R&D Fund	433	236	61	535.89
		Pilots	185	79	27	85.53
		Coordinated Initiatives	28	16	10	63.54
		International Collaboration	63	27	2	21.35
		TOTAL ⁴	710	359		707.97
	Production Oriented Industry	MOFET (Industrial R&D)	150	107	29	94.71
		From Development to Manufacturing	42	29	2	57.88
		R&D Preparatory Program	81	81	44	5.79
		TOTAL	273	217		158.38
	Startup	High-tech Industry	Incubators	98	94	64
Seed			32	20	13	45.26
Technology Innovation Labs			15	12	7	12.03
Encouraging High-tech Ideation and Entrepreneurship			6	6	5	11.90
Haifa Entrepreneurship ⁵			1	1	0	5.00
Beer Sheva Entrepreneurship ⁵			1	1	1	7.50
Tnufa (Ideation)			301	131	106	13.53
Advancing Growth Engines Initiative ⁵			1	1	0	4.51
Young Entrepreneurship ⁵			1	1	0	2.00
TOTAL			456	267		269.25
Human Capital		Human Capital for High-tech Fund	108	39	16	46.09
TOTAL		108	39		46.09	

Division	Area of Activity	Program/Track	No. of Requests Submitted in 2022 ²	No. of Approvals Granted in 2022 ²	No. of New Companies Approved ³	Total Grants Approved (NIS millions)
Innovation Infrastructures	Research	Applied Research in Academia	185	107	N/A ⁶	77.40
		Knowledge Commercialization	70	53	N/A ⁶	32.16
		Consortiums within the Framework of the Horizon Europe Program (KDT)	10	10	0	15.90
		MAGNET Consortiums	213	161	14 ⁶	210.55
		Applied Research in Industry	46	34	0	48.27
		Dual Usage R&D ²	54	54	7	52.32
		TOTAL	578	419		436.60
	Infrastructures	Infrastructures and Equipment for R&D	46	27	9	72.57
		TOTAL	46	27		72.57
International		Bilateral Funds	48	18	3	31.65
		Europe Horizon Assistance Fund	10	9	4	0.27
		TOTAL	58	27		31.92
TOTAL – Direct Authority Funding			2,229	1,355		1,722.78
Horizon Europe – EU's R&D & Innovation Framework Program			The Authority's share of the annual payment to the EU, that is allocated to funding local industry ⁷			493.09
TOTAL – Including the EU R&D program						2,215.87

- 1 A description of the various tracks and programs appears on the Innovation Authority website and in previous reports published by the Authority.
- 2 8-12 weeks elapse in most requests between the time a request is submitted and the time it is brought to the committee for approval. Accordingly, the figures for 2022 approvals also include requests submitted at the end of 2021, and some of the submissions for 2022 (those submitted at the end of the year) were only discussed by committees in 2023. This is particularly relevant in the Dual R&D Program that was suspended during most of 2021 and was reopened towards the end of the year and where, of the total number of approvals in 2022, more than 30 were of requests submitted at the end of 2021, while the number of requests submitted at the end of 2022 that were discussed in 2023 is significantly lower.
- 3 The requests and approvals are presented according to files submitted. Some companies have several submissions and even several approvals in the same program or in several programs. Accordingly, companies that first received grants from the Authority in 2022 and which received more than one grant in the same program, are counted once under the definition "new companies in the same program". Companies that first received grants from the Authority in 2022 in two different programs, are counted in each of the programs as "new companies". Accordingly, a total of 419 new companies were approved in 2022.
- 4 The total activity in the Growth Division – in addition to the programs detailed here, the high-tech industry also includes 1.6 million shekels that were allocated to medical and biotechnology R&D centers – Program 35.
- 5 The Haifa Entrepreneurship, Beer Sheva Entrepreneurship, Advancing Growth Engines, and Young Entrepreneurship programs in the Startup Division are initiatives in which a franchisee is chosen to run the initiative for several years. During each year of the franchise, the franchisee is required to submit a yearly work plan before approval of the grant.
- 6 In the Innovations Infrastructures Division, the grants in the Applied Research in Academia and Knowledge Commercialization Programs as well as some of the grants in the MAGNET Consortiums are awarded to researchers in academia. The number of submissions and approvals in these programs relates to all those submitting requests, however the number of new companies approved relates exclusively to companies (and does not include researchers).
- 7 The Authority pools resources from the participating government entities – The Committee for Budget and Planning, The Ministry of Innovation, Science and Technology, and the Innovation Authority – and transfers the annual participation payment to the EU. The total participation payment in 2022 was NIS 1,233 million – approximately EUR 341 million.

רשות החדשנות
Israel Innovation
Authority