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Abraham García-Torres

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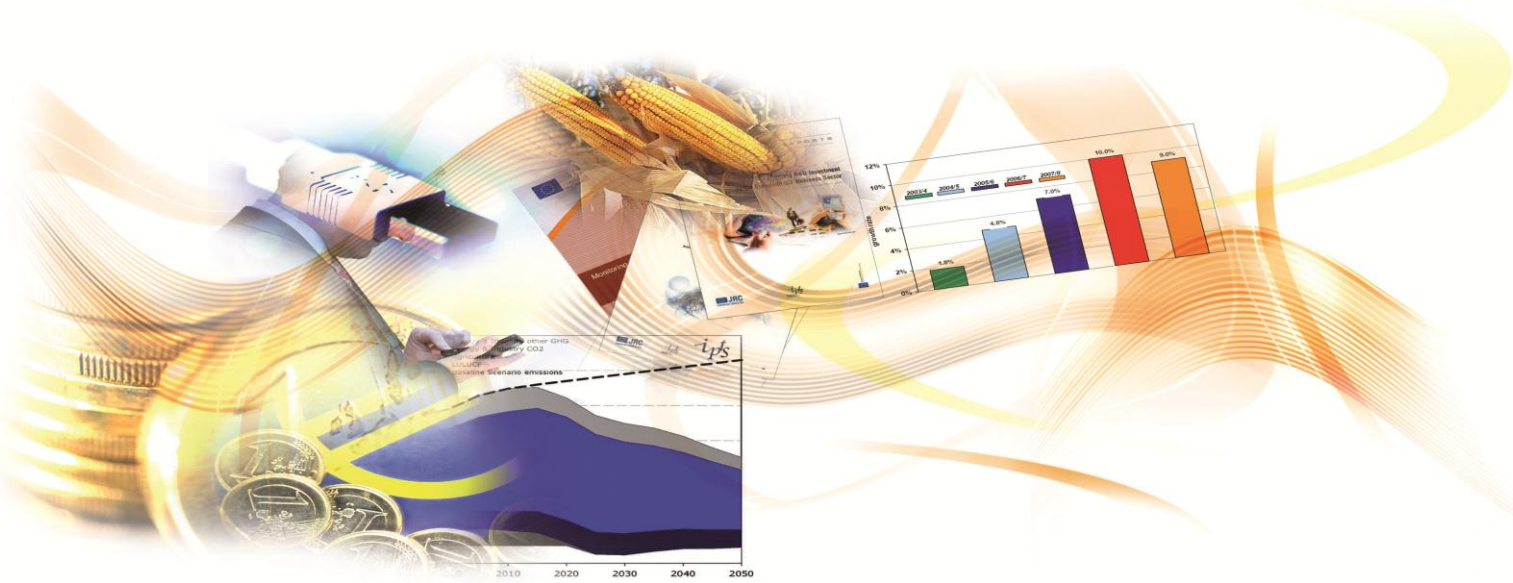

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Joint Research Centre

European Commission
Joint Research Centre
Institute for Prospective Technological Studies

Contact information
Address: Edificio Expo. c/ Inca Garcilaso, 3. E-41092 Seville (Spain)
E-mail: jrc-ipts-secretariat@ec.europa.eu
Tel.: +34 954488318
Fax: +34 954488300

https://ec.europa.eu/jrc
https://ec.europa.eu/jrc/en/institutes/ipts

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Abstract

The Analytical Country Reports analyse and assess in a structured manner the evolution of the national policy research and innovation in the perspective of the wider EU strategy and goals, with a particular focus on the performance of the national research and innovation (R&I) system, their broader policy mix and governance. The 2013 edition of the Country Reports highlight national policy and system developments occurring since late 2012 and assess, through dedicated sections:

- national progress in addressing Research and Innovation system challenges;
- national progress in addressing the 5 ERA priorities;
- the progress at Member State level towards achieving the Innovation Union;
- the status and relevant features of Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3);
- as far relevant, country Specific Research and Innovation (R&I) Recommendations.

Detailed annexes in tabular form provide access to country information in a concise and synthetic manner.
The reports were originally produced in December 2013, focusing on policy developments occurring over the preceding twelve months.

ACKNOWLEDGMENTS AND FURTHER INFORMATION

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). ERAWATCH is a joint initiative of the European Commission's Directorate General for Research and Innovation and Joint Research Centre.

The Country Report 2013 builds on and updates the 2012 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

The first draft of this report was produced in December 2013 and was focused on developments taking place in the previous twelve months. In particular, it has benefitted from the comments and suggestions of Mark Boden from JRC-IPTS. The contributions and comments from Marcel Shaton, Uri Gabai, Shlomi Nezri, Nava Brener, Michael Bostein and Saul Lach are also gratefully acknowledged.

The report is currently only published in electronic format and is available on the ERAWATCH website. Comments on this report are welcome and should be addressed to jrc-ipts-erawatch-helpdesk@ec.europa.eu.

EXECUTIVE SUMMARY

The political context in Israel in 2013, has been marked by the early elections for the 19th Knesset (Israeli parliament), held in Israel on 22nd of January 2013. The results of the elections showed that Israeli population voted for change in government. For the first time since 1999, Shah, the ultra-orthodox religious party, is not part of the coalition.

During the summer of 2013 negotiations started in relation to Israel's participation in Horizon 2020. The main issue was the guideline for the eligibility of Israeli entities and their activities in areas outside the 1967 line.[1] The decisions concerned grants, prizes and financial instruments funded by EU from 2014 onwards. After months of intense negotiations, the EU High Commissioner Catherine Ashton and Israeli Justice Minister Tzipi Livni reached an agreement. This agreement fully respects the EU's financial requirements while at the same time respecting Israel's political sensitivities and preserving its principled positions.

Israel has been less affected by the crisis, and during 2012 continued growing at a 3.4%. However during 2012, the economy's growth rate has slowed in comparison with 4.6% reached in 2011. This slow down derives from the global crisis, which impacted Israeli exports, raised fuel prices and a moderation in the expansion of the construction industry. The unemployment rate remained stable at low levels (6.85%).

Israel is a highly innovative country, and is situated well above the EU average for the majority of the R&I indicators. Indeed, its level of innovation performance places it among the group of European "innovation leaders". Only Sweden, Switzerland and Finland show higher levels of innovation performance. Israel is ranked second (to the United States) worldwide in terms of venture capital availability, thus ensuring the right conditions for highly innovative small companies across all sectors. (European Commission 2013).

Despite its high level of R&D investments, the global economic crisis has had a mild impact on R&D funding in Israel. GERD, measured as a percentage of GDP, has been in constant decline, falling from 4.17% in 2009 to 3.93% in 2012, notwithstanding a marked increase in government expenditure (GBOARD). This highlights the very high exposure of the research and innovation system to global financial conditions, which stems from the very high share of business in funding R&D. The contribution of the business sector to the funding of R&D, keeps on rising, with its share of GERD reaching 84.5% in 2012.

There were no major changes in the governance of the government-funded RDI system, but there were strong indications of increased involvement of the Finance Ministry as a coordinator and driver of links between research and innovation policy. The two main RDI bodies -- the Council of Higher Education (CHE), through its Planning and Budgetary Committee (Vatat), and the Office of the Chief Scientist (OCS) in the Ministry of Industry, Trade and Employment – charged with making and executing research and innovation policy respectively have different missions and traditionally cooperated only on an ad hoc basis. However, an increasing number of programmes are being launched in tandem by both agencies or by the OCS and the Finance Ministry.

[1] The 1967 line refers to the demarcation lines set out in the 1949 Armistice Agreements between Israel and its neighbours (Egypt, Jordan, Lebanon and Syria) after the 1948 Arab–Israeli War. The 1967 Line is also used to mark the line between Israel and the territories captured in the Six-Day War, including the West Bank, Gaza Strip, Golan Heights and Sinai Peninsula

The Israeli RDI system faces the following three major structural challenges that require systematic solutions:
Reviving research in Israeli universities: Budgets for Israeli universities essentially stagnated during the first decade of the century despite a growth in student numbers, leading to a decline in bibliometric scores.
Over-reliance on ICT: Companies dealing with computing and communications technologies are one of the mainstays of the Israeli economy. However, the period of explosive growth for ICT is over globally and policymakers have been trying for a number of years through several instruments to find new engines of growth.
Precarious state of Venture Capital: Returns on VC investments in Israel by and large match returns in the US, where results have been disappointing compared to other financial investments during the past decade.
Israeli RDI governance does not have a tradition of formally articulating priorities as part of an open policy making process. Nevertheless, the new Vatat six-year plan does lay out a clear vision, and by implication, of a set of priorities chiefly calling both for a higher degree of excellence and a higher degree of specialisation in university research.

The priorities of the OCS are reflected in the changing nature of measures issued over the years. A major shift during the past few years has been the inclusion of priorities with a societal/economic slant beyond the traditional OCS approach of encouraging technological excellence wherever it happens. These priorities range from measures to improve innovation in traditional industries to measures to encourage technology firms to set up operations in peripheral parts of the country.

In terms of venture capital in 2011, the Finance Ministry's decision to insure a quarter of the risk of Israeli institutional investors, who join funds as limited partners, is a direct reaction to this priority. During 2013 high-tech companies attracted €1,78 bn. the highest amount in the past 10 years. This fact can be interpreted as a positive reaction toward the government policy from the Israeli VC industry. However, the effectiveness of the response depends on so many extraneous factors that it is hard to judge on its own merits

Looking at the match between the challenges, priorities and means used to address the needs of the RDI system, Vatat's six year plan, coupled with the I-CORE project, seems to be a comprehensive approach that looks towards creating foci of research excellence while reviving the entire academic research sector.

The need to diversify beyond ICT is a far more complex challenge because it involves creating an infrastructure not only of research but also of human skills and the financial means to realize commercial potential. The creation of the government backed biotech VC fund is a step in the right direction as are a number of OCS measures intended to stimulate non-ICT innovation issued during the past few years. But the challenge is deeper because of the breadth of the scientific and technological infrastructure needed to create new areas of high added value for Israel's knowledge intensive industries.

In terms of ERA objectives the areas that received the most emphasis during 2013 were largely unchanged: the major tasks of research institutions and the closely related fields of research infrastructures and the labour market for researchers

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1. BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

Israel is a small country with a population of population of 8.05 million as of August 2013. In 2012, GDP per capita reached € 24,900[2] and GDP growth 3.4%. Also during 2012 the economy's growth rate moderated as compared to 4.6 % in 2011. This slowdown in growth began in the middle of 2011 and a further slowdown was recorded at the end of 2012. This moderation in growth derives primarily from the global slowdown in growth, which negatively impacted Israeli exports, and was also the result of an increase in the cost of fuel imports. Also, the moderation in the rate of expansion of the construction industry explains about one-fifth of the slowdown in growth this year (Bank of Israel 2012a)

Research and innovation are central pillars of the economy. GERD reached 4.0% of GDP in 2012 compared to the EU average of 2.06% in 2012, with the business sector playing a major part in funding R&D. BERD accounted for 84.5% of GERD compared to the EU average of 63% in 2012 and for 3.93% of GDP compared to the EU average of 2.06%. The government's role in funding university-based research is commensurately smaller, with R&D performed by HEIs reaching 12.6%, compared to the EU average of 24%

Research input in terms of human skills is satisfactory in relation to other OECD countries. The average number of years of schooling among the population in the principal working age range (25–64), which is an indicator of the stock of human capital in the economy, grew in Israel from 10.1 years in 1974 to 13.4 years in 2011. In 2012, Israel ranked 16th among advanced economies (OECD). During 2012, 11,200 new doctorates were granted for students in the age range 25-35, which makes a proportion of 1,4 new doctorates for every 1000 people. However, the OECD and the Bank of Israel forecast a less promising situation for the future due to the lower levels of educational attainment among Arabs and ultra-orthodox Jews that make up to 20% of the population(Bank of Israel 2013).

Israel is well above the EU average for the majority of the R&I indicators (European Commission 2013). Indeed, Israel's overall level of innovation performance places it among the group of European "innovation leaders". PCT patent applications per billion GDP are three times higher than the EU average, a remarkable difference (despite an average annual decrease of 1.43% over the period 2000-2010).

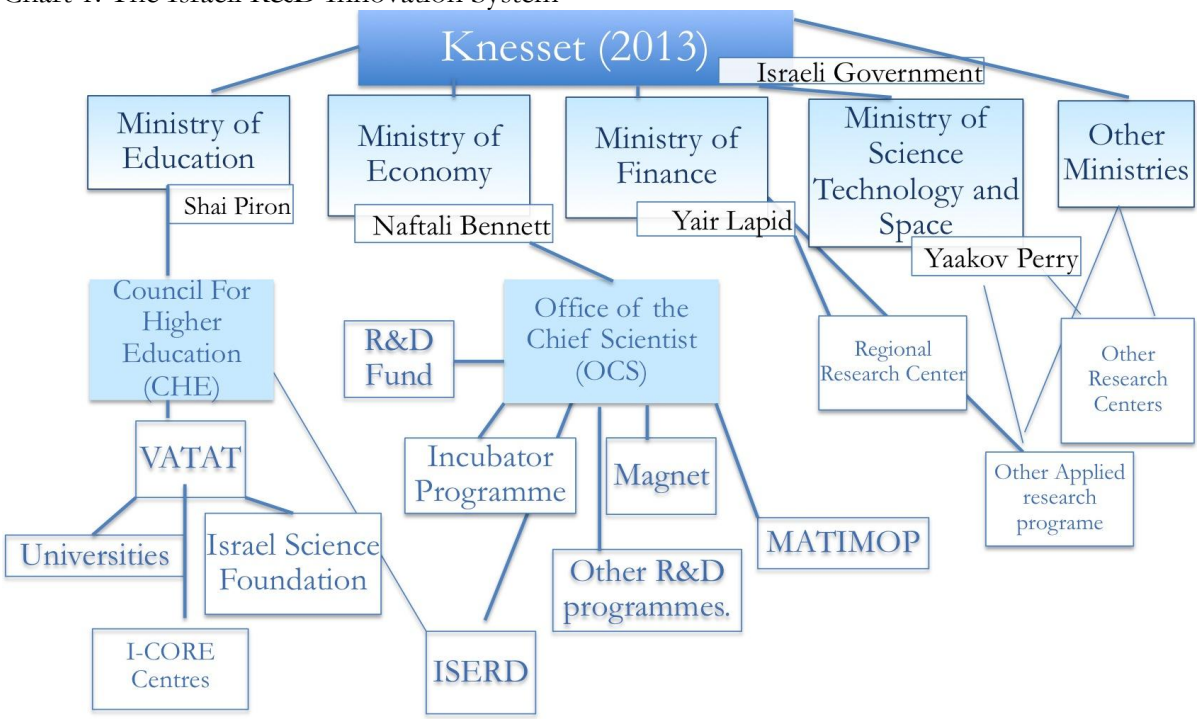
Although the supply of human resources for science and technology is below the EU average for new science and technology graduates and new doctoral graduates per thousand population aged 25-34, knowledge production as evidenced by highly-cited scientific publications is at the same level as the EU average indicating a good scientific base. This is confirmed by Israel's remarkable level of participation as an associated country in the 7th Framework Programme: Israel has four institutions[3] in the top 50 participant HES organisations in signed grant agreements for the period 2007-2010.

[2] (OECD 2013)

[3] Hebrew University of Jerusalem, Weizmann Institute of Science, Technion and Tel-Aviv University.

Research infrastructures have been largely neglected between 2000 and 2010. An exception is the area of nanotechnology, which was addressed by the Israel Nanotechnology Initiative, funded partly by the government and partly by donors. The Vatat six-year plan is supposed to address this issue, partly through the I-CORE centres (Israeli Centres of Research Excellence), which can be seen as roughly equivalent to the European RI roadmap.

Chart 1. The Israeli R&D Innovation System



The main players in Israel's national research and innovation system, responsible for policy-making and governance, remain the Office of the Chief Scientist (OCS) in the Ministry of Economy responsible for industrial R&D, and the Planning & Budgeting Committee (known as the Vatat) of the Council for Higher Education, which covers academic R&D. However, since 2011, the Ministry of Finance, the ultimate source of funds for R&D initiated by the government and academy (GBAORD and HERD respectively), has become much more involved in innovation policy making. The heightened involvement of the Finance Ministry has helped increase the cooperation and coordination between all entities involved in innovation policy, including the OCS and Vatat.

Operating with a smaller budget, the Ministry of Science, Technology and Space funds some small thematic research centres, runs 10 small regional research centres and is responsible for some aspects of international scientific cooperation. Under this Ministry's aegis is the National Council for Research and Development, a body that has statutory authority to devise policy and advise the government, but has proved largely ineffective in recent years.

Outside of government, most academic research is carried out in seven research universities. PROs do not play a central role except in the field of agriculture. R&D in the business sector is divided between indigenous firms, many of which went public on NASDAQ, subsidiaries of multinational, mainly American corporations, and a large number of technological start-up

companies. Many of the local subsidiaries of multinationals were set up after the acquisition of local start-ups. One of the problems of Israel's relatively large venture capital industry, (see section 3), is that is has become far more difficult to float Israeli companies on NASDAQ, the preferred option in terms of liquidity and visibility, meaning that most of the prevalent strategy for Israeli start-ups is through M&A.

In terms of specialisation, there are two main fields of expertise, one which has been translated into noted commercial success and another which has only partially delivered on expectations. There is a broad range of distinct successful ICT clusters in Israel with expertise ranging from semiconductors though communications to data security and various kinds of software. Academically, life sciences are another strong suit but this has been translated into notable success only in the field of medical devices. Persistent government efforts to stimulate commercial success in pharmaceutical biotechnology have won only partial success (excluding Teva Pharmaceutical Industries – a very large international firm based in Israel). Another major area of expertise in knowledge intensive industries is defence exports, about which most information is classified. Press reports estimated the total volume of defence exports in 2012 at more than €5.8 bn[4]. About 80% of the output of Israel's defence industries goes to exports, since the Israeli army cannot on its own finance the immense costs involved in developing modern weapons systems.

[4] (Jerusalem Post 2013)

2. RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

2.1 National economic and political context

The political context in Israel in 2013 has been marked by the early elections for the 19th Knesset (Israeli parliament), held in Israel on 22nd of January 2013. Public debate over the "Tal law", which allows an exemption for Ultra-Orthodox students to military service, had nearly led to early elections in 2012, but they were aborted at the last moment after Kadima briefly joined the government. The elections were later called in October 2012 after a failure to agree on the budget for 2013 fiscal year.

In the elections, the Israeli population voted for change in government. Likud, Benjamin Netanyahu's party, losing eleven seats, emerged as the largest faction in the Knesset. However it was considered, together with Kadima as the big loser of the election. Yesh Atid, a new centre left party emerged as the second largest party in Israel. Considered as a big electoral success, Yesh Atid received nineteen Knesset seats. Likud Leader, Benjamin Netanyahu, formed the thirty third government, after establishing a coalition with Yesh Atid, the Jewish Home and Hatnuah, which between them held sixty-eight seats. For the first time since 1999, Shah, the ultra-orthodox religious party, is not part of the coalition.

The growth of the Israeli economy decelerated during 2012 to 3.4%[5], against the background of the global slowdown. Increased expenditure on energy imports and a slowdown in the expansion of the construction industry also contributed to the slowdown in growth. In response, monetary and fiscal policy both supported the expansion of activity. Inflation in 2012 of 1.6 % fluctuated within the lower part of the target range (1-3%)[6].

According to the Bank of Israel, in 2012, the rate of economic growth slowed relative to the previous year, primarily as a result of the slowdown in demand worldwide. An analysis of growth figures indicates that the slowdown began in mid-2011 and that during most of 2012 the rate of growth remained relatively stable, with additional slowing in the final quarter. Another contribution to the slowdown in economic growth derived from the slowdown in growth of the construction industry. The participation rate increased, as did the rate of employment. However, there was no change in labour productivity. The unemployment rate remained stable. The production potential of the economy expanded this year, but as labour productivity remained unchanged, it appears that the potential for growth has not been fully realised. The real exchange rate depreciated relative to the previous year in terms of the annual average and the surplus in the current account disappeared, a reflection of the slowdown in exports and the increased expenditure on energy.

Growth in three of the main components of GDP — exports, private consumption and investment — slowed during 2012 in comparison to 2010 and the first half of 2011. Exports were affected directly by the slowdown in world trade. In 2012, world trade grew by 2.8

[5] Last Available data from Central Bureau of Statistics Israel, December 2013.
[6] (Bank of Israel 2012)
http://www.boi.org.il/en/NewsAndPublications/RegularPublications/Research%20Department%20Publications/BankIsraelAnnualReport/Annual%20Report%20-%202012/p3.pdf

percent, which was low relative to both 2010 and 2011 and relative to the average growth rate in each of the two decades preceding the crisis of 2008. As a result, Israeli exports grew only moderately and if it had not been for the contribution to exports of the new Intel factory, exports would virtually have not grown at all.

Private consumption and investment were also affected by the global slowdown, although in this case it is more difficult to identify the channels through which this occurred. Private consumption was influenced through the effect of exports on disposable income and also through a separate channel involving the expectations of future income. With regard to the latter, the worsening of the debt crisis in Europe during the year increased pessimism with respect to the timing of Europe's recovery, which in turn reinforced the drop in domestic private consumption and the increase in private saving. The slowdown in expansion of private consumption was manifested primarily in the consumption of durable goods, which are more sensitive to fluctuations in income.

The slowdown in expansion of investment in the economy was the result of expectations of continued slowdown in growth of GDP and risk associated to geopolitical situation of Israel. The uncertainty of investment in Israel has grown due to the concern of a military confrontation with Iran, changes of regimes in neighbouring countries, and the civil war in Syria.

Despite the slowdown in the rate of growth, the labour force participation rate continued to grow during 2012, and the unemployment rate, with an annual average of 6.85%, remained stable at low levels. The lack of change in the unemployment rate was primarily the result of the flexibility in wages and work hours in the economy. This flexibility is evident from the previous two crises, i.e., 2001–02 and 2008–09, during which workers shared the burden of reduced profits with employers through working fewer hours and a reduction in the level of wages. This makes it easier for employers to hire new workers according to the needs of the business even when there is concern of a slowdown, and allows them to minimize the number of workers laid off. The number of employees in the economy increased this year by 3.4 percent which is similar to the rate of growth in GDP. This implies that worker productivity did not grow this year, compared with its average annual increase of about one percent during the period 1996 to 2010. This is also an indication that the rate of growth in GDP this year was below its potential.

Additional matters concerning the political situation of Israel are:

- The discovery of a natural gas reserve in Tamar is expected to reach consumers in towards the end of 2013. This will have several implications for the economy, primarily a reduction in the cost of electricity production, a reduction in the cost of energy for industry, and it will increase certainty over energy price levels.

- Social protests against government policy. Although the demonstrations of summer 2011 have ended, their effects remain present in government policy. Following the protests, the President formed a Committee to investigate the situation headed by the economist Professor Manuel Trajtenberg. The government and the Knesset accepted nearly all of the Trajtenberg Committee's recommendations in the area of taxation. They represented a change in policy that before had been always aimed at reducing the size of government. They recommended tax increases over expenditures cuts, expand free education, aid for working parents with young children and recommend cutting defence budget. However, while the government refrained from making such a cut, the overall conclusion of the recommendations was to increase spending in social services.

2.2 Funding trends

2. 2.1. Funding flows

Table 1. Basic indicators for R&D investments[7].

	2009	2010	2011	2012	EU Average 2012
GDP growth rate	1.2 (%)	5.7 (%)	4.6 (%)	3.4 (%)	-0.4(%)
GERD (% of GDP)	4.17 (%)	3.97 (%)	3.97 (%)	4.0 (%)	2.06 (%)
GERD (euro per capita)	1,142	1,143	1,217	1,252	525
GBAORD - Total R&D appropriations (€ million)	1,187	1,205	1,276	1,352	86,309.497
R&D funded by Business Enterprise Sector (% of GDP)	1.56 (%)	1.45 (%)			1.12(2011)
R&D performed by HEIs (% of GERD)	13.4 (%)	13.6 (%)	13.0 (%)	12.6(%)	24(%)
R&D performed by Government Sector (% of GERD)	1.9 (%)	2.0 (%)	1.9 (%)	1.8 (%)	12(%)
R&D performed by Business Enterprise Sector (% of GERD)	83.5 (%)	83.2 (%)	84.0 (%)	84.5 (%)	63(%)
Share of competitive vs. institutional public funding for R&D	39.0 (%)	37.6 (%)	37.8 (%)		
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	4.5 (%)	4.4 (%)	4.4 (%)	4.3 (%)	

The global economic crisis has had a mild impact on R&D funding in Israel as can be seen in the table above. GERD, measured as a percentage of GDP, has been in constant decline, falling from 4.17% in 2009 to 3.93% in 2012, despite a marked increase in government expenditure (GBOARD). This highlights the very high exposure of the research and innovation system to global financial conditions, which stems from the very high share of business in funding R&D. Total GERD figures relate only to civilian R&D, as there are no unclassified data on the total expenditure of the large defence related R&D system. The government has never set out specific targets for R&D expenditure, and is unlikely to do so in the future.

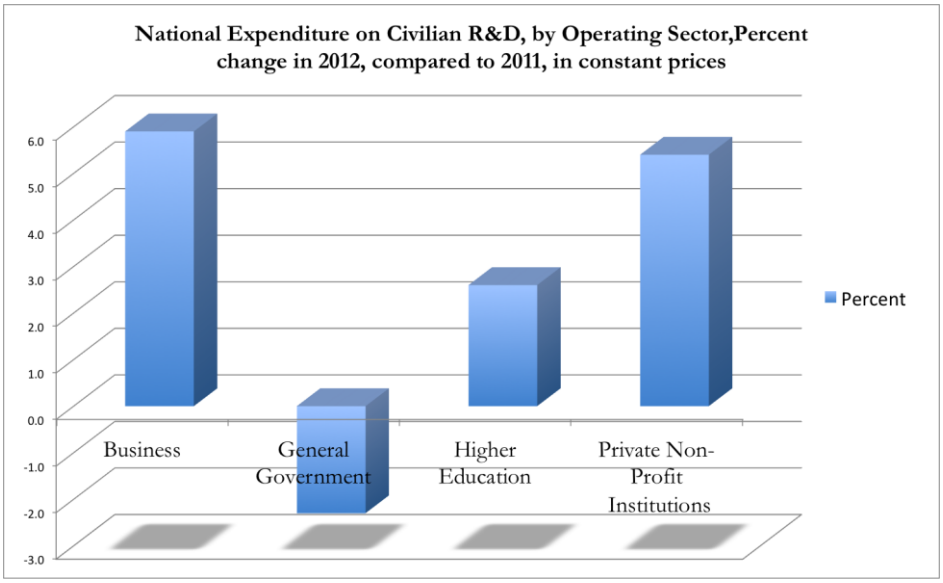
The contribution of the business sector to the funding of R&D, keeps on rising, with its share of GERD reaching 84.5% in 2012. These levels, although normal for Israel, are surprisingly high, especially when compared with the EU 2012 average, where BERD contributes to 63% of the GERD.
According to provisional estimates[8], in 2012 national expenditure on civilian R&D, at constant prices, increased by 5.3%, following increases of 3.8% in 2011 and of 1.3% in 2010 (See Figure 1). The increase in the expenditure on R&D performed in the business sector in 2012 mainly reflects an increase of 7.5%, at constant prices, in software companies, following an increase of 4.0% in 2011, and an increase of 5.8% in R&D companies (including start-up companies, international R&D centres, technological incubators and research institutes), following an

[7] Source for the Israeli data: Central Bureau of Statistics for Israeli data. The EU average comes from Eurostat (provided by IPTS December 2013)
[8] Data provided through personal contact with the Israeli Central Bureau of Statistics (December 2013)

increase of 5.0% in 2011. In manufacturing industries the expenditure increased by 5.1% in 2012, following an increase of 1.6% in 2011.
The Government sector's expenditure on R&D decreased by 2.3% in 2012, after an increase of 3.4% in 2011 and a decrease of 3.3% in 2010. The assignment of funding by the public sector does not seem to be keeping pace with economic growth. In Higher education institutions, R&D expenditures increased by 2.6% in 2012, following an increase of 1.0% in 2011. The proportion of contribution to GERD by Higher Education Institutions (HEI) has shown a slow down due to budget cuts. The expenditure in private non-profit institutions increased by 5.4% in 2012, following an identical increase in 2011.

In 2012, the ratio of BERD to GDP in Israel was twice the EU average, at 3.51%, although this is a lower proportion than in 2009 (3,58%). However, it seems to have recovered from the situation of 2010 (3.44%). In general, though, funding from the private sector has been relatively unaffected by the global crisis.

Figure 1. Evolution of R&D 2012, by Operating Sector (CBS data).



2.2.2. Funding mechanisms

2.2.2.1 Competitive vs. institutional public funding

According to the data provided by the CBS in Israel[9], competitive funding was 37.8 % of the total institutional public funding in the 2011 budget. This represents a mild increase after 2010, but still not reaching the 2009 level of 39%. A large proportion of the competitive funding is awarded by the Israel Science Foundation (ISF), the predominant source of competitive grants funding basic research in Israel. With an annual budget of roughly €47 m, ISF funds more than 1,300 grants a year, providing 2/3 of all such funding in the country. ISF's funds are mostly (96%) provided by the Government of Israel via the Planning and Budgeting Committee (VATAT) of the Israel Council of Higher Education (CHE).

[9] Data provided through personal contact with the Israeli Central Bureau of Statistics (December 2013)

Funding for universities is slated to increase annually by 30% over the course of VATAT plan while appropriations for the ISF will nearly double. In 2012, the total budget for Higher Education was € 8.2 bn. But the proportions between block and competitive funding are unlikely to change to any significant degree because the share of total university funding earmarked for research, as opposed to teaching, is increasing from about 40% to 50%.

2.2.2.2 Government direct vs indirect R&D funding

Most R&D support is through direct funding by the OCS. In 2012, after all the additions, the total budget for OCS was €312 m. A large part of the OCS budget is predicated on co-financing by the private sector, ranging from 50-70% co-financing by the private sector in R&D Fund grants to 15% co-financing in the incubator programme.

2.2.3 Thematic versus generic funding

The I-CORE programme could be considered a form of thematic funding. Besides the I-CORE programme, the Agriculture Ministry funds thematic research with a budget of about €75m and there are also some relatively small thematic research programmes run by the Ministry of Science and Technology.

Most of the thematic civilian research in Israel is carried out with funding from the Seventh Framework Programme (FP7), which is of central importance to the Israeli R&D system. In 2010, before the beginning of the Vatat six-year plan, FP7 funding of university based research was actually higher than the competitive funds from the ISF. This proportion is likely to change over the next six years as the ISF budget grows, but the Framework Programmes will remain of central importance to the national research system.

2.3 Research and Innovation system changes

National expenditure on civilian R&D, at current prices, amounted to €7.8 billion in 2012, constituting 4.0% of GDP. According to provisional estimates, in 2012, national expenditure on civilian R&D, at constant prices, increased by 5.3%. This followed increases of 3.8% in 2011 and 1.3% in 2010. The Government sector's expenditure on R&D decreased by 2.3% in 2012, after an increase of 3.4% in 2011 and a decrease of 3.3% in 2010. In higher education institutions, R&D expenditures increased by 2.6% in 2012, following an increase of 1.0% in 2011.

Following their announcement at the Chief Scientist's Annual Conference for Research and Development held on 3 May 2012, in the Ministery of Economy, a number of new programmes have subsequently been launched by the Office of the Chief Scientist (OCS) and are now fully operational. These include:

A new early stage technology programme created as a response to a decline in early stage investment. The OCS already devotes a large part of its budget to supporting seed ventures, but the sector has had an unusually hard time raising funds because of the global economic environment. The new programme will be designed to leverage private capital invested in seed companies. The OCS plans the creation of a dedicated post for supervising it.

Kamin, part of the pre-competitive and long term programmes, is intended to promote applied research and provide an additional bridge between basic and applied research for those not yet ready for commercial investment. It is intended to encourage academics to pursue research in areas of potential commercial interest. Although managed by the OCS' Magnet Organization it is launched in coordination with the Council of Higher Education and the Finance Ministry.

Tzatam is a grant programme for the purchase of R&D equipment intended for experienced companies specializing in providing research services in the field of life sciences. €7.2 m. has been allocated for the project, over a three year period. An additional €7.2 m. has been allocated specifically for stem-cell research equipment. Tzatam is a TELEM instrument. TELEM is a voluntary partnership between the four organizations that support R&D in Israel: Ministry of Economy, the OCS of the Ministry of Science and Technology, the VATAT and the Ministry of Finance.

Meimad is a collaborative programme to promote new ideas and new technologies that can serve both commercial applications and military needs. It is launched between the Ministry of Defence, the OCS and the Ministry of Finance.

Since the new government took power, discussions about new innovation policy initiatives are being held. However according to information from the OCS, there is, at the time of writing, nothing formalised.

2.4 Recent Policy developments

The list of R&D incentives in Israel was published by the Ministry of Industry, Trade and Labour in 2012. The document structures the Domestic R&D incentives in blocks[10], and some new programmes have been introduced in the 2012 update of the document:

- Competitive R&D:

KIDMA programme: As the Internet plays an increasingly significant role in every life aspect, cyber threats rapidly become more complex and challenging, and their global influence increases. This raises the threshold for successfully developing adequate protection systems. Israel's unique advantages and leading global position in the fields of information security, computer security and communications security, make it a prominent player in the field of Cyber Defence.

The government, wishing to maintain and enhance Israel's abilities is this sector, issued Decision 3611 in mid-2011, calling for "The Advancement of National Capabilities in the Field of Cyber Security". Following this Decision, a programme has been devised by the Office of The Chief Scientist (OCS) and the Israeli National Cyber Bureau (INCB), jointly allocating €15,5 m. to promote the development of advanced cyber defence solutions and establish cyber security knowledge centres. The Programme will be executed through existing OCS Program (R&D fund track and the Incubator programme).

R&D in Space Technologies. Israel has knowledge and development capabilities in many areas in the field of space technology. Due to the technological complexity of the space environment,

[10] (OCS 2012)
(For a discussion of this document see (Fisher, Eilam, and Garcia-Torres 2012))

development of systems and assemblies which could function in space involves high technological risk, as well as high development and production costs.

In order to respond to these unique market conditions, the Ministry of Science and Technology and The Office of Chief Scientist (OCS) in the Ministry of Industry, Trade and Labour have jointly initiated a dedicated programme encouraging research and development in various space technologies.

Companies eligible for this track include those developing: products to be installed in satellites or in earth stations, products designated for the reception or transmission of data from satellites, instruments designed for testing and calibration and equipment to be installed in satellites or relating to their operation, including adjustment of satellite versions for export. An approved project may receive government funding for up to 36 months, subject to compliance with pre-determined milestones and in accordance with the approved business plan. Overall government funding per project shall not exceed €4 m.

- Pre seed and Seed Programmes.

Technology-based industrial incubators support the ongoing operations of start-up companies in order to lead them toward commercialization and market penetration. For a period of two to three years, the programme provides companies whose projects were approved by the Incubators Committee with full financial support (€400,000 of which 50 percent is granted by the government and 50 percent is invested by the incubator), payable only upon generation of sales, in the form of 3% of the revenues annually.

Licensees. The Technological Incubators programme has recently undergone a substantial reform: the Incubators' private-sector licensees, who own and operate the incubator, now undergo a competitive selection process, opening up the investment opportunity to many new actors and making sure the early stage community is constantly at its best. The path is quite lucrative for the private investor –having only to invest 15% of the project funding, while receiving up to 50% of the ownership of the incubated companies. The licensee can be a foreign company.

Alternative Fuels for Transportation

In 2011 the Government of Israel issued a resolution to carry out a national programme encouraging the development of technologies to reduce global consumption of petroleum-based fuels and boost the development of knowledge-based industries in the field of alternative fuels for transportation. The government resolution entailed the creation of an investment encouragement programme in said field.

The objective of this new programme is to encourage investments in Israeli companies specializing in the development and implementation of technologies in the field of alternative fuels for transportation. The government has designated an overall budget of €78 m. to be utilized by 2020.

Reduction of greenhouse emissions

In 2010, the Government of Israel launched a national programme for the reduction of greenhouse gas emissions. Through this programme, the government aims to reduce Israel's greenhouse gas emissions by 20%, compared to a «business as usual» scenario, within ten years. To do so, an investment support mechanism has been established to encourage the installation

of cleaner and less polluting systems, by offering a subsidy of up to 20% of the cost of the project, up to a ceiling of €1,3 m.

- Pre-competitive and long term R&D programmes

MAGNET (the acronym in Hebrew for Generic Pre-Competitive R&D) encourages collaboration among industrial companies, and between the companies and researchers from academic institutions, through several instruments that deal with innovative technologies. These instruments seek to develop Israel's industrial infrastructure by supporting the R&D activities and sharing technological knowledge among the participants. MAGNET works through the formation of consortia composed of industrial companies and academic institutions, in order to jointly develop generic, pre-competitive technologies. The duration of a MAGNET consortium is 3-5 years. Grants are up to 66% of the approved budget for industry and up to 80% for academic institutions.

Nofar

NOFAR is designed to bridge the gap between know-how within academia and the needs of the industry. It does so by encouraging the support of applied academic research activity by an industrial company. The academic research group gains better understanding of the market's needs and tendencies, while the company taps into ground-breaking discoveries in its field of activity. The program supports applied academic research in the following technological areas: biotechnology, nanotechnology, medical devices and storage of water and energy.

The project's budget is up to € 97,000 for a period of 15 months. Grants cover up to 90 percent of the approved budget, to be complemented by the industrial company associated with the project. No royalty payments are mandated. International technology companies are invited to connect with an Israeli academic research institute and take part in the programme.

Nanotechnology.

From 2005 to 2012, six nanotechnology academic research centres have been founded and put into operation in Israel. These six centres were funded by collaborative private and public resources and have collectively received a total budget of € 75,500 m.

A follow-up programme was implemented in 2012, for the next four years, the main goal of which is to establish a strong Nanotechnology industry by transferring technologies from academia to industry and by creating a pool of skilled Ph.D. and an M.Sc. graduates in Nano-science.

Isragrid

The goal of this programme is to enable efficient e-Science research in various fields by providing production e-Infrastructure that takes advantage of Grid and Cloud computing technologies. Isragrid offers the Industry access to Compute/Data resources via EGI (European Grid Infrastructure), user support and training.

2.5 Recent evaluations, consultations, foresight exercises

So far, Israel has never had formalized research or innovation policies in the sense of producing policy documents that lay out long term strategies for the entire system with strategic goals and

quantitative targets. Until fairly recently, research and innovation were not even considered by the same department in the Finance Ministry, and coordination between the two policy fields was on an ad hoc basis.

The level of coordination has improved to a certain degree during the past four years but functionally, research and innovation policies are still considered separately. Research policy is made and enacted by the Council of Higher Education through its Planning and Budgetary Committee, commonly known by its Hebrew acronym, Vatat, while innovation policy is formulated and implemented by the OCS in the Industry Ministry.

3. PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

New doctorate graduates (ISCED 6) per 1000 population aged 25-34	**1.4%** for 2012
Percentage population aged 25-64 having completed tertiary education	**46%** for 2011
Open, excellent and attractive research systems	
International scientific co-publications per million population	**994.95** for 2012 (source: scopus)
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	n.a.
Finance and support	
R&D expenditure in the public sector as % of GDP	**0.54%** for 2012
Public Funding for innovation (innovation vouchers, venture/seed capital, access to finance granted by the public sector to innovative companies)	**€186,7 m, for 2011**
FIRM ACTIVITIES	
R&D expenditure in the business sector as % of GDP	**33.2%** for 2012
Venture capital and seed capital as % of GDP	na
Linkages & entrepreneurship	
Public-private co-publications per million population	No data
Intellectual assets	
PCT patents applications per billion GDP (in PPS€)	**0.047%** by Application date and Inventors country residence for 2011 (source: OECD-STAT)
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)	No data
OUTPUTS	
Economic effects	
Medium and high-tech product exports as % total product exports	**64%** for 2012
Knowledge-intensive services exports as % total service exports	**na**
License and patent revenues from abroad as % of GDP	0.05% for 2011

Israel is a highly knowledge-intensive country. It has a strong and dynamic business sector and has achieved excellence in scientific and technical education and research. This has led to high levels of technological entrepreneurship and start-ups. The economy is very knowledge-intensive with high- and medium-tech products contributing significantly to the trade balance. The main strengths of Israel are its high research intensity, mainly due to very high business expenditure on R&D, and its patenting activity. According to the Competiveness Report 2013 (European Commission 2013), the number of business researchers (head count) per thousand labour force is more than four times the EU average (14.8 compared to 3.4, in 2009) and the country has been successful in attracting foreign investment for research and innovation. Israel is ranked second (to the United States) worldwide in terms of venture capital availability, thus ensuring the right conditions for highly innovative small companies across all sectors.

As commented in the section 1, Israel is well above the EU average for the majority of the R&I indicators. Indeed, Israel's overall level of innovation performance places it among the group of European "innovation leaders". Only Sweden, Switzerland and Finland show higher levels of innovation performance. PCT patent applications per billion GDP are three times higher than the EU average, a remarkable difference.

3.1 Structural challenges of the national R&I system

The Israeli research and innovation system faces three deep structural challenges that derive both from internal factors and from shifts in the global marketplace. These are long term challenges that predate the global economic crisis that started in 2008, even though the crisis may have highlighted their urgency, and they require the kind of long term responses that helped the Israeli research and innovation systems excel in the previous two decades.

At least two of the challenges stem partly from this same success. The ability to attract private investment in R&D is what enabled Israel to be the top scorer in the Innovation Union scoreboard of R&D intensity[11], but that same success made for underinvestment in other factors that also contributed significantly to the success. Like most structural challenges, these challenges are extensively interrelated and touch on many other issues of concern to policymakers, but they are distinct enough to outline separately as follows:

1. Making up for the "lost decade"

Investments in Israeli higher education and research essentially stagnated during the first decade of the century. From 2000 to 2010 budgets effectively declined compared to the growth in population. By the middle of the decade, investment per student had declined by 9% compared to 1995[12] and the average age of faculty in exact science departments was over 55. Investment in research infrastructures also fell behind, forcing universities to rely mainly on donations.

In output terms, the first results could be seen by the end of the decade in the decline in the country's share of world scientific publications which declined from 1.1% in 2000 to 0.9% in 2009[13], proportionately a radical decrease for a small country highly dependent on research and innovation. As far as citation impact is concerned, the decline was less acute, from 12th to 13th place worldwide according to a study[14] of Israeli scientists' publications. The lower drop in citation index rankings was attributed to the impact of papers of older researchers many of whom have reached retirement age.

As a result of this stagnation brain drain became an acute problem. At the end of 2013, there are no up to date definitive figures on brain drain but a study published in 2007[15] showed that Israelis with tertiary degrees had proportionately the highest rate of emigration to the US in the world. In the higher tiers of scientific research this has become such a major problem that it has become a defining policy priority.

2. Heavy Reliance on ICT

The Israeli economy is heavily reliant on ICT based exports and clusters of industries based on a deep pool of talent that stretches from academe to small ICT based start-ups. The Israeli economy offers a fascinating illustration of extraordinary success in innovation, particularly in Information and Communications Technologies (ICT), which came largely as a result of a concerted, long term strategy of government support for commercial R&D, which levered the potential of a highly skilled labour force. Yet, the benefits from the rapid growth of the High

[11] European Commission 2011, page 49
[12] Fisher and Eilam 2009
[13] European Commission 2011, page 137
[14] Samuel Neaman Institute 2011
[15] Gould and Moav 2007

Tech sector eluded the rest of the economy, thus giving rise to a "dual economy": a high rate of growth for ICT and a mediocre growth rate for the economy as a whole. (Trajtenberg 2006)

The success of this industry is what enabled Israeli R&D based industries to attract substantial investment by business in ICT based industries, and this in turn was one of the reasons for the reduction of total government support of business based R&D by 36.3%[16] compared to inflation adjusted prices of the year 2000.

Policymakers have been aware of this situation for years, and have been encouraging Israeli industry to diversify through a variety of measures and initiatives. Yet they face a challenging dilemma: an in depth study[17] has proven that government support of mainly ICT based industries is critical for economic growth in a highly competitive world, even though the majority of funding for innovation comes from the business sector. This means that a decision to divert a major part of the government resources intended to support industrial R&D to other new fields would cause extensive economic damage. Technology based exports, predominantly based on ICT, account for close to half of Israeli exports. There are no data on exactly what percentage of these exports are based on government support programmes, but by definition, government support is extended to the riskiest R&D ventures, those that give Israeli ICT exporters their competitive edge. Hence, diversion of resources from ICT would deprive Israeli industry of an important element of its competitive capacity.

Yet not diversifying is also not seen as a good long range option (Trajtenberg 2006). The overall returns on the heavily ICT based Israeli venture capital industry have been disappointing during the past decade. Since a major part of the Israeli innovation system is predicated on creating new ICT companies this is a strong indicator showing that the innovation system needs new engines of growth.

During the past decade, the government largely abandoned the field of thematic university based research in all civilian fields except for agriculture and most of the thematic research conducted in Israeli universities is through the country's participation in the EU Framework Programmes. Extensive thematic research is carried out is the country's large and classified defence R&D system, and there is anecdotal evidence[18] of major spill-over effects to the civilian based ICT innovation system. This successful example shows that developing new areas of expertise requires not only extensive human and physical infrastructures, but also a judicious mix between thematic academic research and project-oriented R&D. Hence, the challenge to develop non-ICT based innovative industries must be cast not only in terms of the industrial policy, which is managed by the Office of the Chief Scientist in the Ministry of Economy (OCS), but also in terms of research policy managed by Vatat (The Planning and Budgeting Committee of the council for Higher Education, and by the Israeli Science Foundation).

3. Precarious VC Environment

Venture Capital is an essential part of the Israeli innovation system. To put things in proportion, the total annual investment by VCs in Israeli technology start-ups during the past decade has usually been at least four times higher than the total government budget to support innovation in all firms from start-ups to major corporations.

[16] Statement by Avi Hasson, Chief Scientist in the Ministry of Industry, Trade and Employment, October 2011
[17] (Lach, Wasserteil., and Prizant 2008)
[18] (Eilam 2011)

According to the latest data from IVC-Online[19], during 2013 a record was reached with 662 Israeli high-tech companies attracting €1.78 bn. (the most raised in the last 10 years). Three hundred and ninety five VC- backed deals attracted €1,33 bn. or 74 percent of the total amount raised in 2013, just above the 72 percent of 2012, but well lower than the 83 and 87 percent reached in 2011 and 2010, respectively.

The average company financing round in 2013 was € 2.70 m, near to the € 2.63 m of 2012 and the10-year € 2.77 m average. The average financing round of VC-backed deals reached € 3.35 m, compared with € 2.06 m in 2012.

The underlying data may give greater cause for concern. Investments by Israeli VCs now account for only 25-30% of total VC investment in Israel, with the rest coming from foreign funds. This means that investments at the seed stage, which are typically handled by Israeli VCs and not their foreign counterparts, are in jeopardy. In addition, the funds from foreign VC funds are not committed a priori to investments in Israeli firms and could dry up at the next instance of the global financial crisis or be moved to more promising pastures in the Far East.

The Israeli VC industry has become part of the system, and it diminishment could have a severe impact on company formation and the rest of the Israeli innovation system, thus presenting government with a major challenge.

3.2 Meeting structural challenges[20]

Two of the three challenges outlined above, the quality of university research and the precarious status of Israeli venture capital, have been addressed by actions intended to directly mitigate the problems in the country's research and innovation systems. The third challenge, the need to diversify the ICT-centric technology sector, has been addressed by a variety of measures, but this is a long term and complex challenge that defies simple solutions.

It is far too early to assess the effectiveness of the six-year Vatat plan (2011-2017) and the I-CORE programme. The first indicators of success will be the number of new researchers retained by universities and the number of researchers who return to Israel to join I-CORE programmes.[21] However, the real tests of the programme will be in general academic quality as measured both by bibliometric and other indicators, and by the commercial technologies that derive from this basic research. Both of these will take a long time to materialize. There has been some criticism in academic circles of the I-CORE programmes with academics saying that preferred status of I-CORE centres will be at the expense of other academic researchers. But there is so far little evidence to support this claim. In general, the response to the challenge of the "lost decade" seems comprehensive and integrative, especially since it does not seek to turn the wheel back but to create a research environment suited to the conditions of the 21st century.

As reported above, the large venture capital sums attracted by Israeli high-tech firms (€1.78 bn. in 2013) can be interpreted as a positive reaction toward the government policy from the Israeli VC industry. However, the effectiveness of the response depends on so many extraneous factors that it is hard to judge on its own merits. Israeli institutional investors, like their colleagues in other countries, are judged by harsh criteria such as performance per quarter. The decision of

[19] www.ivc-online.com/Portals/0/RC/Survey/IVC_Q4-13_Survey_PR-final.pd
[20] For a deeper analysis see previous editions of this report (Fisher, Eilam, and Garcia-Torres 2012; Fisher and Eilam 2011)
[21] At the end of 2013 there is still no information on the effectiveness of those plans.

whether to lock up capital for seven to 10 years because of the government's commitment to underwrite part of the risk depends to a large extent as much on current market conditions as on strategic considerations about the composition of each investor's portfolio. If Israeli investors are choosing to enter the programme, this is only one part of each fund management company's struggle. They then have to persuade investors abroad, who should make up the majority of each limited partnership to invest in their fund despite the current tumultuous state of capital markets.

The challenge of diversification beyond ICT is both more complex and more intriguing. Proof that it is achievable can be seen in the development during the past decade of a substantial cluster of Israeli companies in the field of medical devices, which is based on the skills and entrepreneurial drive of researchers and technologists from a broad range of fields ranging from medicine to ICT. However, even if the various measures promulgated and enacted by the OCS from biotechnology through nanotechnology to cleantech are successful, and if the I-CORE programme does indeed lead to the development of skills needed for the next generation of technologies, this might not be enough. The various clusters of Israeli companies in ICT are predicated on two additional conditions. The first is markets in a state of rapid growth in which relatively small Israeli companies can make their mark. The second is the existence of a financial ecosystem that can develop these companies. Even if these issues have not been resolved now, it is clear that various government initiatives, if seen in concert, are trying to address the complexities of this problem.

Table 2: Policy measures and assessments

Challenges	Policy measures/actions	Assessment in terms of appropriateness, efficiency and effectiveness
Redressing the "lost decade" in academic research	1. Six-year Vatat plan increasing research budgets and retaining more researchers 2. I-CORE programmes for centres of research excellence	The programme to repair and renew academic research appears to be both appropriate and comprehensive, but it is too early to appraise its effectiveness
Over reliance on ICT-based innovation	1. OCS programmes encouraging R&D in new fields including traditional industry. 2. Government participation in dedicated biotech VC fund.	OCS programmes are generally effective in addressing their immediate target. However the OCS cannot devote more of its limited budget devoted to non-ICT commercial R&D because the funds are needed by proven generators of jobs and wealth in ICT. The drive to diversify must go far beyond the immediate target of reducing the risk of commercial R&D. If the I-CORE programme does indeed produce both the knowledge and human skills needed to develop new fields, this is only part of the infrastructure needed for diversification.
Precarious state of Venture Capital	Government measure to insure 25% of the risk of Israeli institutional investors who join funds as limited partners	It is still early and difficult to assess but there is a positive reaction from the Israeli VC industry in terms of the volume of funds raised.

4. NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

The first round of negotiation between the European Union and Israel on Israel's participation in Horizon 2020 took place during August 2013. Terms and conditions of such negotiations, which include the financial contribution of a non-EU participant to Horizon 2020, needed to be agreed between EU and Israel. To that end the Union and Israel engaged in negotiations on a Memorandum of Understanding. The first round of negotiations was limited to exploratory talks on technical and financial aspects of the Horizon 2020. During September, in the second round of negotiations, discussions started on the territorial scope of the future Memorandum and the application of the Guideline of eligibility of Israel entities and their activities in areas outside the 1967 line. The decision affect grants, prizes and financial instruments funded by EU form 2014 onwards.

Israel has taken part in the Framework Programmes since 1996, and is expected to invest €600 m. over the next seven years in Horizon 2020. It is also expected to receive €900 m. in grants and investments. In December 2013, Israel and the EU have come to a decisive agreement guaranteeing the former's eligibility to Horizon 2020 funding. After months of intense negotiations, EU High Commissioner Catherine Ashton and Israeli Justice Minister Tzipi Livni reached an agreement. The agreement fully respects the EU's financial requirements while at the same time respecting Israel's political sensitivities and preserving its principled positions

4.1 Strengthening the knowledge base and reducing fragmentation

Promoting excellence in education and skills development

In 2009[22] there were some 54,400 researchers in Israel[23], 83% in the business sector and the remainder in the academic sector. This breakdown matches the breakdown of R&D financing in Israel, with some 80% coming from the business sector.

After increasing by 18.5% between 2005 and 2007 (the increase was entirely in the private sector), the number of researchers did not increase at all between 2007 and 2009. This was apparently the result of the global recession, which also led to a reduction in the volume of business sector innovation financing. The fact that the number of researchers in the academic sector remained unchanged throughout 2005-2009 – together with the relatively low share of researchers in this sector – more than hints at a supply problem with researchers at Israel's universities.

During 2013, Israel continued to lay emphasis on its main challenge in the area of flows of researchers, particularly in the academic sector: to attract researchers – both Israelis working abroad and foreign researchers – to conduct research in Israel. The policy vehicle implemented to meet this challenge was the establishment of I-CORE, as part of a new six-year plan which will offer significantly increased budgets for higher education, both for teaching and for

[22] The most recent year for which data are available at December 2013, more updated data have been promised by the CBS in the near future.
[23] Data from the Central Bureau of Statistics; parallel data published in the ERAWATCH Country Report 2010 for Israel differ due to the inclusion of non-research staff in the R&D sector.

research: the plan including the I-CORE initiative was presented to the Government of Israel in March 2010 and its implementation began in 2011. The total six-year budget for the establishment of the 16 Centres is some €320 m out of a total budget for the plan of €1.3 bn[24].

The main goals of I-CORE are to reinforce excellence in Israeli universities, improve their competitive position globally and reverse the brain drain by attracting back to Israel senior researchers who have worked abroad for an extended period.

During 2011, the first four centres established were all in scientific and technological areas – the Molecular Basis of Human Diseases, Cognitive Science, Computers Sciences and Alternative Energy Sources. The second phase of the programme was implemented in 2012 and 11 new centres were established covering a wider range of disciplines: 4 will engage in research in the Social Sciences and Humanities and seven in Exact Sciences, Engineering, Life Sciences and Medicine. The aim is to establish the centres in the coming years. More specifically, the new centres are focused on: Jewish Culture, Education and New Information Society, Legal Studies, Mass Trauma, Quantum Universe, Light and Matter, Astrophysics, RNA Gene Regulation, Biophysics, Environmental Change, and Dynamic Processes in Living Systems.
The second wave represents another major step in the Centres of Excellence programme and is a main pillar in the Multi-Year Reform Plan in Higher Education - a programme aimed at fundamentally strengthening the long term positioning of Israel's academic research and its stature among leading researchers in Israel and abroad.

Research Infrastructures

In the last years there has been no specific initiative concerning financial commitments for the construction and operation of ESFRI roadmap. However it is important to comment that Israel participates in ESFRI as an associated country state.

Israel as a non-member state has no RI obligations. However it is very aware of the Research Infrastructures needs of the country. These are tackled through the VATAT plan and by the institution of the I-Core centres of excellence.

4.2 Getting good ideas to market

Improving access to finance

MATIMOP is a governmental non-profit organization that aims to promote the development of advanced technologies in Israel and to create fruitful international partnerships through industrial cooperation and joint ventures. It acts on behalf of the OCS as the national agency in charge of encouraging and assisting participation of Israeli enterprises in international bilateral or multi-lateral cooperation programmes for industrial R&D. MATIMOP implements most bilateral R&D cooperation agreements on behalf of the OCS and thus serves as a contact point for various agreements. It is the national coordinator of the Enterprise Europe Network (EEN) centre in Israel. The Enterprise Europe Network is comprised of about 600 partner organizations in more than 40 countries in Europe, North America, Latin America and Asia Pacific promoting competitiveness and innovation services to SMEs. EEN offers a "one-stop shop" to meet all the information needs of SMEs and companies in and around Europe The

[24] Data from Vatat

EEN provides partnering and brokerage services, publication of technology offers and technology requests, access to European, national and/or regional support schemes and additional services supporting technological partnerships and internationalization of SMEs. It exploits the synergies between all support services and help desks for European businesses.

The MAGNETON programme promotes technology transfer from academia to industry through mutual cooperation between an individual company and a specific academic research group, in order to reduce the uncertainty before using the technology by the firm in new developments. In 2012, two new initiatives were launched: Nofar, and Meimaid. Nofar, was designed to support applied academic research in specific technological areas (biotechnology, nanotechnology, medical devices, water & energy storage), in order to adapt it to relevant applications in the industry, and promotes the transfer of these technologies to the industry. Meimaid is a collaborative programme between the Ministry of Defense, the OCS at the Ministry of Economy and the Ministry of Finance, to jointly promote new ideas and new technologies that can serve both commercial applications and military needs.

The transfer of knowledge is also fostered in the incubator programme for firms, where there are internal processes dedicated to the diversification of new technological knowledge. Also there is a "Users Association" of industrial companies involved in the dissemination and assimilation of generic advanced technologies, and the sharing or utilizing common technologies.

Protect and enhance the value of intellectual property and boosting creativity

Concerning the protection of intellectual property rights, no recent changes have been implemented. Israel, as a small innovative country very much relies on international IPR systems. No recent policy changes in this area.

Israel's IPR was revised in 1967. At that time, as with most advanced nations, Israel was a signatory to all major relevant treaties of the World Intellectual Property Organization, including the Berne Convention, Paris Convention, and Patent Cooperation Treaty. Israel later joined the World Trade Organizations Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), and in 1999 developed protections for topographies of integrated circuits.

Throughout its modern history, Israel's IP regime was in line with that of the most advanced nations. Strong reciprocal enforcement of international treaties allowed Israeli firms to effectively seek protection in other markets, such as the US and Europe. This cooperation served as a backbone for international trade and was an important foundation for the emergence of strong innovation capabilities. Without strong IP enforcement and reciprocation, it is doubtful that Israel's high tech development could have taken place. (see Avidor 2011; Pugatch, Teubal, and Zlotnick 2010)

Public procurement

Public procurement in Israel relates mostly to the R&D Fund. The R&D Fund is the main instrument of The R&D Law. It gives grants to "Approved R&D Programs", which are programmes lasting one or more years, resulting in the development of a new product or in a significant improvement to an existing product. The development may also lead to a new industrial process or to a significant improvement in an existing industrial process.

A special track is dedicated to traditional industries (industries characterized by relatively low investment in R&D). This track offers separate evaluation and discussion for projects. Operated

since 2010, there is another special track that supports large companies in establishing their R&D centres in Israel's Periphery. It aims to bridge the gap between Israel's centre and its periphery, by convincing large companies to locate their R&D centres in areas with less economic growth. This creates a mechanism of increased quality employment and economic activity within the target geographical areas.

4.3 Working in partnership to address societal challenges

Some Israeli firms and research institutions have already manifested their willingness to participate in the European Innovation Partnerships. However, it is still too early to know if they will be part of the successful consortia.

4.4 Maximising social and territorial cohesion

There is no explicit national Smart Specialisation Strategy, although the Israeli Government fully supports local and regional initiatives towards the development of local strategies. It has shown strong support for the development of the peripheral areas versus the more central advanced Tel-Aviv/ Jerusalem area.

4.5 International Scientific Cooperation

This point is already covered (see 4.1) the establishment to the 20 I-Core Centres has as one of its main goals to attract back top talents from US.

5. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

5.1 More effective national research systems

The increase in research via open national competition in Israel is channeled through two main sources, the competitive R&D fund and the VATAT. The competitive R&D fund is the main instrument of the R&D law. It gives grants to approved R&D programmes that last one or more years, resulting in a new product or process. It is therefore a grant for applied research, given to firms and the development may lead to new industrial process or to a significant improvement in the R&D. The planning and Budgeting Committee (VATAT) is the main instrument to finance, basic research, i.e. research done by universities. In Israel they remain very autonomous, once they are given their budget they are at liberty to decide how to use this budget within the university – for teaching or for research. The financing is allocated by VATAT according a model in which the universities´ achievements both in teaching and research are measured.

5.2 Optimal transnational co-operation and competition

Israel has a long history of joint R&D activity with countries abroad – both in the EU and other countries – in various forms and frameworks. This activity, which is significant and expanding, is not the result of policy actions at the national level, even though some of the activity is under the supervision of government agencies such as the Ministry of Science and Technology (www.most.gov.il). Most of the joint R&D activity is in the form of bilateral agreements between Israel and a single country. In the area of industrial R&D, such agreements are most often arrived at through MATIMOP.

5.3 An open labour market for researchers

In 2013, Israel continued to lay emphasis on its main challenge in the area of flows of researchers, particularly in the academic sector: to attract researchers – both Israelis working abroad and foreign researchers – to do their research in Israel. The policy vehicle implemented to meet this challenge was the establishment of Excellence Centres (known by the generic name I-CORE – Israeli Centres of Research Excellence) as part of a new six-year plan which will offer significantly increased budgets for higher education, both for teaching and for research. The main goals of I-CORE are to reinforce excellence in Israeli universities, improve their competitive position globally and reverse the brain drain by attracting back to Israel senior researchers who have worked abroad for an extended period.

5.4 Gender equality and gender mainstreaming in research

In general, the preparation of women, via higher education, for careers in Israel is similar to that in other developed countries, where more than half of the student population is female: in Israel, this is true also for PhD. students. Even though the overall picture here seems to point to equal opportunities for males and females to become researchers in Israel no clear conclusions can be drawn about women's research opportunities. There are certainly no policy regulations in place to correct any possibilities of discrimination against women in achieving research positions or to promote equal gender representation in academic and research committees, boards and governing bodies. There are also no regulations to guarantee the progression of female researchers with equal opportunities to their male counterparts, after career breaks.

5.5 Optimal circulation, access to and transfer of scientific knowledge including via digital ERA

Even though the importance of knowledge transfer between the academic sector, public research organisations (PRO's) and industry is recognized – and even talked about – in Israel, there are no national guidelines to promote knowledge transfer, no Industrial Liaison Offices in universities and no support measures in place at the national level to facilitate the creation of university spin-offs and to attract venture capital and business angels. Each university has its own rules concerned with Intellectual Property created by researchers, and that fact that the government funds research does not give it any stake in researchers' IP.

Nevertheless, there is considerable de facto knowledge transfer taking place. All seven research universities have highly active technology transfer (TT) companies that specialize in commercialising IP developed in the universities[25], based on different promotion strategies. Some of the universities have turned their TT companies into significant revenue-providers.
It appears that knowledge transfer works in Israel without national guidance or policy, with the partners to the transfer – the developers of technology and the absorbers/appliers/ commercialisers – cognisant of the mutual benefits of TT: this approach seems to parallel the major share of the business sector in R&D development in general in Israel.
Nevertheless, mention should be made of government-initiated programmes aimed at strengthening the connection between academic R&D and industry.

MAGNET is one such programme (www.magnet.org.il). Operated under the auspices of the Office of the Chief Scientist (OCS) at the Ministry of Industry, Trade and Labour (MOITAL), consortia of industrial companies and academics work together to support generic pre-competitive R&D.

[25] Yissum at the Hebrew University of Jerusalem (www.yissum.co.il), Ramot at Tel Aviv University (www.ramot.org), Yeda R&D at the Weizmann Institute (www.yedarnd.com), Carmel Ltd. at Haifa University (www.carmel-ltd.ac.il), T3 Technology Transfer at the Haifa Technion (t3.technion.ac.il), BGN Technologies at Ben-Gurion University (web.bgu.ac.il/Eng/BGN1) and the Bar-Ilan R&D Company at Bar-Ilan University.

ANNEX 1. PERFORMANCE THE NATIONAL AND REGIONAL RESEARCH AND INNOVATION SYSTEM

Feature	Assessment	Latest developments
1. Importance of the research and innovation policy	(+) Innovation policy very present in the government and very much foster by its ministries. Innovation is a crucial concept in Israeli society. Being a small country it is also one of its main ways to enhance growth. (-) Very fragmented between ministries. Sometime there is duplication of programmes addressed to the same target. Need for coordination towards the design and implementation of innovation policy.	(+) The Ministry of Finance has been increasing its involvement in innovation policy. Acting as horizontal agent coordinating policy across all other ministries involved in innovation. (+) Funding is addressing societal challenges. (see section 3.3)
2. Design and implementation of research and innovation policies	(+) The design of Innovation policy is coordinated mostly between the Ministry of Education responsible for a six-year annual programme (VATAT) and the implementation of the I-CORE centers of excellence. The other big agent is the Ministry of Industry responsible for the OCS which implements the R&D fund, and other R&D programmess (see sections 2.3 and 2.4). (-) Smart specialization is not directly addressed, although regional development of some marginal areas are being targeted under some innovation policies (see sections 2.6 and 4.4) (-) No effective monitoring and review system is in place. Every 4-5 years the government set up a committee of experts to review innovation policy.	New government, still early to say which changes will affect the design of innovation policy.
3. Innovation policy	(+) The concept of innovation is very much present in the government and in the society. Known as the start up nation, Israel is well aware of innovation and on its needed effect for the well being of the society. (+) Being a small country looks at the world as it main consumer. Very much export oriented country. However policy mostly address supply side.	(+) In general innovation is very present in the policy and in the society.
4. Intensity and predictability of the public investment in research and innovation	(+) The intensity of R&D being the result of multiannual programmes (VATAT, I-Core centres and R&D fund) it is predictable. The government expenditures have been growing over the last 5 years (See section 2.2). (-) The proportion of R&D performed by government is very small compared by the R&D performed by firms (84,5%). Leave little room for policy intervention.	(+) Positive evolution, over the years there is a constant increase on government expenditures in R&D. (-) In relation to the total R&D performed in Israel, government expenditures have been growing less than private expenditures. Less share being control by the government.
5. Excellence as a key criterion for research and education policy	(+) Balanced allocation of funding. 37% of competitive funding in relation to all government funding. (+) Competitive funding is allocated on the basis of international recognized criteria. (+) A proportion of the budget allocated to universities depends on their international publications.	(+) Most of the experts in charge of allocating fund have a lot of international experience. Very well aware of the international standards.

		(-) In general funding is not portable outside Israel. (-) No deference towards increasing the participation of women in the society.
6. Education and training systems	(+) The higher education is under the VATAT programme. Increasing the amount of money for Universities. (+) Israel is known by having an education system that foster problem solving and creativity toward memorization of concepts. (-)Brain drain is considered one of the current problems of the country.	(+) I- Core centers of excellences are trying to bring back top scientist and revert the brain drain. (-) Scarcity of data to analyzed the real situation of researchers and brain drain.
7. Partnerships between higher education institutes, research centres and businesses, at regional, national and international level	(+) The incubator programme takes into consideration all the process from basic research to marketing and commercialization of the finalized product. (+) Magnet is a programme designed to increase collaboration between private and public agents fostering the transfer of knowledge. (+) Knowledge created by university is being transferred without much government control, but the number of start ups around basic research is a good sign that the transfer is taking place successfully. (+) Bilateral international agreements are normal on a project based. Quite big network.	(+) Normal positive evolution.
8. Framework conditions promote business investment in R&D, entrepreneurship and innovation	(+) The high level of R&D, close to 4% of GDP, is a clear sign that the conditions are in the country. (+) VC industry seems to have recovered from the lack of capacity to raise funds. (-) A high proportion of the BERD and of the VC is in foreign hands, leaving the country too exposed to the international markets.	(+) Very positive situation, capacity to attract a lot of foreign investments. (-) The foreign participation in R&D and VC is so big in relation to the national that leave the country in weak situation too expose to changes in international markets.
9. Public support to research and innovation in businesses is simple, easy to access, and high quality	(-) High level of bureaucracy in the government and in allocation of funding. (-) Although the basic part of the support system does not change, new funds and programmes are always being added (+) National funding is allocated according to international standards.	(-) High level of bureaucracy across all the government. Difficult to change.
10. The public sector itself is a driver of innovation	(+) The government has played always an important role supporting firms and helping them to innovate. It always played from behind trying to be close to firms need. (-) It has never been an innovator itself. (-) Data are difficult to access.	(+) The CBS, main provider of data, is going through a renovation programme aim at providing free data in a user friendly platform.

ANNEX 2. NATIONAL PROGRESS ON INNOVATION UNION COMMITMENTS

		Main changes	Brief assessment of progress / achievements
1	**Member State Strategies for Researchers' Training and Employment Conditions**	No recent changes	(+) Use of the principles of charter & code by all Universities and Research Institutions. (+) In 2012, the EC recognized Technion for working within the best practices guidelines of the European Charter of Researchers
4	**ERA Framework**		
5	**Priority European Research Infrastructures**	Participation in SESAME. New CERN project in the middle East to build a so-called synchrotron light source, functioning like a giant microscope. (2013)	(+) Israel is an Associate Member in the pre-stage to Membership of CERN. Expected to become a full member in the near future.
7	**SME Involvement**	No recent changes	(+)MATIMOP is the national coordinator of the Enterprise Europe Network centre in Israel. Provides partnering access to European, national and/or regional support schemes and internationalization of SMEs.
11	**Venture Capital Funds**	No changes	(+) Public VC are organized under the TMURA programme. (+)Programme to support VC-Backed Companies in The Field of Alternative Fuels for Transportation (-) Although improving the national participation of Israel VC is still low, compare to the foreign VC.
13	**Review of the State Aid Framework**	No changes	(+) A range of government departments provide advice on state aid regulations.
14	**EU Patent**	Not applicable to Israel.	
15	**Screening of Regulatory Framework**	No changes	(+) Not the case of Israel, especially related to R&D support.
17	**Public Procurement**	No changes	(+) Covered mostly by the competitive R&D fund. (+) Special track of the fund is dedicated to innovation in traditional industries. (+) Another special track is dedicated for large companies, which settle in the peripheral areas.

20	**Open Access**	(+) National Bio-bank, a collection of human biological material. It allows researcher to analyse data they could not use before. (2012)	(+) Under Magnet public programme, there is a "Users Association" of industrial companies involved in the dissemination and assimilation of generic advanced technology.
21	**Knowledge Transfer**	-Nofar. Designed to support applied academic research in specific technological areas, and promotes the transfer of these technologies to the industry. (2012) -MEIMAD. A collaborative program to transfer the use of military technology for societal applications. (2012)	(+) MAGNETON is the programme that promotes technology transfer forma academia to industry via mutual cooperation between an individual company and an academic research group. (+) In the incubators programme special agencies devoted to the transfer of technology.
22	**European Knowledge Market for Patents and Licensing**	Not applicable to Israel.	
23	**Safeguarding Intellectual Property Rights**	Not applicable to Israel.	
24	**Structural Funds and Smart Specialisation**	National Institute for Biotech in the Negev. Technological Centers for Water and Renewable Energies Solutions (2011)	(+) The special R&D public funded track devoted to Large companies settling in peripheral areas.
25	**Post 2013 Structural Fund Programmes**	Summer 2013, tensions in the negotiations for Israel to continue in the Programmes (see section 5)	(-) The future participation of Israel in the European Programmes is depending on agreements on Israeli borders.
26	**European Social Innovation pilot**	no changes.	
27	**Public Sector Innovation**	No recent changes.	(+) In general, Israel supports the publications of government data. An example is the National Bio-Bank.
29	**European Innovation Partnerships**	In 2012 several firms expressed willingness to participate in at least two EIP.	Too early to say.
30	**Integrated Policies to Attract the Best Researchers**	I- CORE programmes	(+) Out of the 20 centers included in the I-CORE programme, 15 have already been established.
31	**Scientific Cooperation with Third Countries**	No changes.	(+) Organized in form of bilateral agreements. Israel has a long list of worldwide R&D collaboration agreements. (+) With Europe Participation in EUREKA, Galileo, EEN.
32	**Global Research Infrastructures**	The design of VATAT 2010, includes a six-year programme fund for universities, includes the development of the RIs needed by Israel.	(+) Although this measure is not applicable to Israel. Israel is aware of the development of RI and are included in the VATAT programme.

33	**National Reform Programmes**	Not applicable to Israel.	

ANNEX 3. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

ERA Priority	ERA Action	Recent changes	Assessment of progress in delivering ERA
1. More effective national research systems	Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments	-Amendment of basic industrial R&D (1984) law -TMURA. Encouraging large firms to set up development centres in peripheral areas	(+) 37% of the total funding for innovation is done through competitive funding.
	Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review	-n.a.	(+) The funding is done following international standards.
2. Optimal transnational co-operation and competition	Action 1: Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas	-Israel is conected with Europe as whole via EUREKA, FP7 and COST.	(+) Very good international network.
	Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions	-n.a.	(+) Evaluation follow international peer-review standards.
	Action 3: Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant	-Israel has bilateral cooperation agreements with US, Japan, Canada, India, Russia, South Korea and Singapore.	(+) Positive evolution.
	Action 4: Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when	-Israel participates in ESFRI as a non-member state.	

	developing national roadmaps and the next SF programmes		
	Action 5: Remove legal and other barriers to cross-border access to RIs	-As a non member state Israel is not required. However aware of the needs for new Research Infrastructure and takes cares under VATAT and I-CORE programmes.	(+) The country is aware of the needs for Research Infrastructure.
ERA priority 3: An open labour market for researchers	Action 1: Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers	I-CORE. Setting of 20 Research Centers in Israel to bring back Israeli and International researchers.	(+) Well implemented in Israel.
	Action 2: Remove legal and other barriers which hamper cross-border access to and portability of national grants	n.a.	(-) Most of the funding are not portable outside Israel.
	Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS3 network	n.a.	
	Action 4: Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training.	n.a.	
	Action 5: Create an enabling framework for the implementation of the HR Strategy for Researchers incorporating the Charter & Code	-The Technion is acknowledged by the the EC, as working with the best practice of the European Charter of Researcher and the Code of Conduct for the Recruitment of Researchers.	
ERA priority 4: Gender equality and gender mainstreaming in research	Action 1: Create a legal and policy environment and provide incentives	n.a.	(+) The situation of women participation in Israel is similar to any other advance economy in the world. (-) No change is taking place.
	Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender	n.a.	(-) No change is taking place.

	Action 3: Ensure that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and evaluating	n.a.	(-) No change is taking place.
ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including via digital ERA	Action 1: Define and coordinate their policies on access to and preservation of scientific information	-Magnet. -Nofar -Kadmin.	(+) Fluent transfer of knowledge.
	Action 2: Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies	-n.a.	(-) No changes
	Action 3: Harmonise access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners	n.a.	(-) No changes
	Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services	n.a.	(-) No changes

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LIST OF ABBREVIATIONS

BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
ERA	European Research Area
CHE	Council of Higher Education
COST	European Cooperation in Science and Technology
EPO	European Patent Office
ERA	European Research Area
ERA-NET	European Research Area Network
ESA	European Recovery Programme Fund
ERC	European Research Council
ESFRI	European Space Agency
FP	European Framework Programme for Research and Technology Development
EU-27	European Union including 27 Member States
FDI	Foreign Direct Investments
FP7	7th Framework Programme
GBAORD	Government budget appropriations on R&D
GDP	Gross Domestic Product
GERD	Gross Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HES	Higher education sector

IP	Intellectual Property
ISF	Israel Science Foundation
M&A	Mergers and Acquisitions
OECD	Organisation for Economic Co-operation and Development
MOITAL	Ministry of Industry, Trade and Labour
OCS	Public Research Organization
PRO	Office of the Chief Scientist, Ministry of Industry, Trade and Employment
R&D	Research and development
RI	Research Infrastructures
RDI	Research Development and Innovation
RTDI	Research Technological Development and Innovation
S&P	Standard and Poor
SF	Structural Funds
SME	Small and Medium Sized Enterprise
S&T	Science and technology
Vatat	The Hebrew Acronym for the Planning and Budgeting Committee of the Council of Higher Education
VC	Venture Capital
BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
ERA	European Research Area
CHE	Council of Higher Education
COST	European Cooperation in Science and Technology
EPO	European Patent Office
ERA	European Research Area
ERA-NET	European Research Area Network

ESA	European Recovery Programme Fund
ERC	European Research Council
ESFRI	European Space Agency
FP	European Framework Programme for Research and Technology Development
EU-27	European Union including 27 Member States
FDI	Foreign Direct Investments
FP7	7th Framework Programme
GBAORD	Government budget appropriations on R&D
GDP	Gross Domestic Product
GERD	Gross Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HES	Higher education sector
IP	Intellectual Property
ISF	Israel Science Foundation
M&A	Mergers and Acquisitions
OECD	Organisation for Economic Co-operation and Development
MOITAL	Ministry of Industry, Trade and Labour
PRO	Public Research Organization
OCS	Office of the Chief Scientist, Ministry of Industry, Trade and Employment
R&D	Research and development
RI	Research Infrastructures
RDI	Research Development and Innovation
RTDI	Research Technological Development and Innovation

S&P	Standard and Poor
SF	Structural Funds
SME	Small and Medium Sized Enterprise
S&T	Science and technology
Vatat	The Hebrew Acronym for the Planning and Budgeting Committee of the Council of Higher Education
VC	Venture Capital

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