ERAWATCH COUNTRY REPORTS 2010: Israel

ERAWATCH Network – I-Biz

Yaacov Fisher and Michael Eilan
Acknowledgements and further information:

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

The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) with contributions from Directorate General for Research and Innovation and the ERAWATCH Network. The report has been produced by the ERAWATCH Network in the framework of the specific contract on ERAWATCH Research Inventory and Analytical Country Reports 2010 and 2011 commissioned by JRC-IPTS.

In particular, it has benefited from comments and suggestions of Terttu Luukkonen, who reviewed the draft report. The contributions and comments of Laura de Dominicis from JRC-IPTS and DG-RTD are also gratefully acknowledged.

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

The opinions expressed are those of the authors only and should not be considered as representative of the European Commission’s official position.
Executive Summary

With 4.3% of GDP going towards Research and Development (R&D) in 2009, the Israeli economy escaped relatively unscathed from the world economic crisis. GNP per capita reached €19,788 in 2009 and unemployment receded more or less to pre-crisis levels in 2010. However, the very high percentage of business investment in research, 79% in 2009, exposed the unique vulnerabilities of success in attracting business investment in research because of the exposure to world capital markets.

GERD climbed steadily to a peak of 4.8% in 2007 and then started to recede as less capital was available for both corporate and Venture Capital investments in R&D. Similarly, BERD intensity peaked in 2007 at 3.9% of GDP and declined to 3.4% in 2009.

The government's response to the crisis was decisive. The 2010 budget shows that government funds to support business R&D has climbed steadily by 70% since 2007. There were no radical changes in the policy mix, which in general is regarded as effective and has overcome a previous crisis in business investment in R&D in the early years of the century. The main barriers towards greater R&D investment are not internal and depend to a great extent on global conditions such as the state of the world market for technology purchases and the availability of capital for Venture Capital investments. The government cannot possibly fill the gap, but it is hoped that the proven effectiveness of the policy mix will encourage business to resume investments at a higher level.

The most striking new development in the research scene does not affect business R&D but research in universities. Under the terms of a new six-year plan starting in 2011, funding for universities and research are slated to increase by at least 30% over the period of the plan, with funds for competitive research nearly doubling, higher block funding for university research, a new funding formula intended to stimulate excellence in research and a programme intended to address the country's future HRST problems.

Another noteworthy event in 2010 which affects the entire economy and the ability to compare research in Israel to other countries was Israel's acceptance as a member of the OECD. The Israeli economy has a somewhat anomalous dependence of R&D and the statistical comparison with EU27 averages allows this factor to be analysed on a comparative basis.

Israel relationship with the EU is as an Associated State. It has however been a member of the Framework Programmes since the fourth framework, and FP7 has become an immensely important part of the country's research arena. As a non member state, Israeli policy makers are not bound by EU targets and frameworks, yet policies are made with the evolution of the ERA in mind, and in many cases there are high levels of correspondence between Israeli and EU policies.

Finally, this report refers to civilian R&D and not to defence related R&D, which is classified. Anecdotal evidence suggests that defence R&D is very high and there are numerous cases in which technologies have moved from the defence to civilian sectors, but there is no way of assessing the economic impact of defence R&D.
Knowledge Triangle

New research and education policies have been launched to redress decade-long problems in higher education and university based research. These policies were accompanied by increased funding for innovation. The new element in Israeli policymaking was that these changes stemmed from an awareness of the importance of the research triangle and were launched in an integrated fashion.

Effectiveness of knowledge triangle policies

<table>
<thead>
<tr>
<th>Research policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>New six-year plan for universities plans to revitalize research in universities.</td>
<td>The plan addresses the main weaknesses of the system and was launched in a rare spirit of cooperation between government, universities and funding agencies. Since the plan has just been launched, it is too early to assess weaknesses.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Innovation policy</th>
<th>Increased funding to subsidize business R&amp;D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCS funding is generally highly effective. The question is whether increased funding for the Incubator Programme can compensate for dearth of seed funding from VCs for new start-ups.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education policy</th>
<th>The policy to increase accessibility to higher education for Arabs ad ultra-orthodox Jews aims for a dramatic increase in numbers in institutions of higher education.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The main advantage of the programme is that it aims to increase total numbers of people enjoying tertiary education and hence enhance the country's HRST resources. The weakness is that it has not yet been accompanied by a similarly sweeping programme to improve the quality of primary and secondary education.</td>
<td></td>
</tr>
</tbody>
</table>

European Research Area

Israel's integration into the ERA is a work in progress. As a non-member state, ERA is not an official factor in policymaking, but active participation in many EU programmes has a cumulative effect and many policies march in tandem with ERA priorities.

Assessment of the national policies/ measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main national policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers</td>
<td>Increased budgets for universities aim to increase the total number of researchers. As a non-member state the target of single European market for researchers is less relevant.</td>
<td>The programme will add a total of over 1,600 researchers to Israeli universities in new positions and replacement of retirees. Only time will tell if it can redress the brain drain problem towards universities abroad and the country's high tech industries.</td>
</tr>
<tr>
<td>2 Increase public support for research</td>
<td>Major increase in research budgets and budgets to subsidize business R&amp;D.</td>
<td>It was clear the increase was needed. The potential weaknesses of the programmes can only be assessed over time.</td>
</tr>
<tr>
<td>3 Increase European coordination and integration of research funding</td>
<td>Increased participation in programmes such as FP7, EUREKA and others is making Israeli policy making more attuned to changes in European priorities.</td>
<td>The advantages of closer integration with European programmes are evident both in funding and access to research partners. Weaknesses are not apparent yet.</td>
</tr>
<tr>
<td><strong>ERA objectives</strong></td>
<td><strong>Main national policy changes</strong></td>
<td><strong>Assessment of strengths and weaknesses</strong></td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>4 Enhance research capacity across Europe</td>
<td>No policy changes</td>
<td>Participation in FP7 is a broadly acknowledged benefit. Greater participation in ERA-NETs could strengthen weak thematic research infrastructure.</td>
</tr>
<tr>
<td>5 Develop world-class research infrastructures (including e-infrastructures) and ensure access to them</td>
<td>Accession to CERN and participation in ERSF are of critical importunes. The Israeli I-Core centres of excellence are, however, being developed as Israeli, not European platforms.</td>
<td>The total budget available for research infrastructures under the six-year plan have not yet been published and hence it is hard to assess the strengths or weakness of the programme.</td>
</tr>
<tr>
<td>6 Strengthen research institutions, including notably universities</td>
<td>The new six-year plan address issues across the board: research personnel, more budgets for competitive grants, higher bloc funding and a new formula for block funding intended to foster excellence in research.</td>
<td>The strength of the programme is in that it addresses most of the issues that were weakening universities. Its weaknesses cannot yet be assessed.</td>
</tr>
<tr>
<td>7 Improve framework conditions for private investment in R&amp;D</td>
<td>Policy has not changed but budgets have increased.</td>
<td>The OCS framework has proven strengths and success. A possible weakness is in addressing non-ICT arenas.</td>
</tr>
<tr>
<td>8 Promote public-private cooperation and knowledge transfer</td>
<td>Policy has not changed but budgets have increased.</td>
<td>The main strength is that this cooperation is focused in one programme, Magnet, which deals with pre-competitive research. The weakness is in that there are other areas of cooperation that could benefit from such focused attention.</td>
</tr>
<tr>
<td>9 Enhance knowledge circulation across Europe and beyond</td>
<td>No policy changes</td>
<td>R&amp;D cooperation is a high priority both for universities and for business. The main weakness is relatively weaker business oriented R&amp;D with Europe compared to the US and Far East.</td>
</tr>
<tr>
<td>10 Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world</td>
<td>No policy changes</td>
<td>R&amp;D cooperation is a high priority both for universities and for business. The main weakness is relatively weaker business oriented R&amp;D with Europe compared to the US and Far East.</td>
</tr>
<tr>
<td>11 Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle</td>
<td>No policy changes</td>
<td>Officially Israeli policy is built on a standalone basis. FP7, however, has a profound influence and could serve as the basis for more policy cooperation.</td>
</tr>
<tr>
<td>12 Develop and sustain excellence and overall quality of European research</td>
<td>New Vatat bloc funding formula is intended to prioritize research excellence.</td>
<td>Unknown yet</td>
</tr>
<tr>
<td>ERA objectives</td>
<td>Main national policy changes</td>
<td>Assessment of strengths and weaknesses</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>13 Promote structural change and specialisation towards a more knowledge-intensive economy</td>
<td>No policy changes</td>
<td>Much of the structural changes have been achieved. The challenge is to keep on changing to adopt to new global conditions.</td>
</tr>
<tr>
<td>14 Mobilise research to address major societal challenges and contribute to sustainable development</td>
<td>Some of the new ISF Centres of Excellence address societal challenges.</td>
<td></td>
</tr>
<tr>
<td>15 Build mutual trust between science and society and strengthen scientific evidence for policy making</td>
<td>Surveys show a very high level of trust between society and science.</td>
<td></td>
</tr>
</tbody>
</table>
# Executive Summary

# 1 Introduction

# 2 Performance of the national research and innovation system and assessment of recent policy changes

## 2.1 Structure of the national research and innovation system and its governance

## 2.2 Resource mobilisation

### 2.2.1 Resource provision for research activities

### 2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

### 2.2.3 Providing qualified human resources

## 2.3 Knowledge demand

## 2.4 Knowledge production

### 2.4.1 Quality and excellence of knowledge production

### 2.4.2 Policy aiming at improving the quality and excellence of knowledge production

## 2.5 Knowledge circulation

### 2.5.1 Knowledge circulation between the universities, PROs and business sectors

### 2.5.2 Cross-border knowledge circulation

### 2.5.3 Main societal challenges

## 2.6 Overall assessment

# 3 Interactions between national policies and the European Research Area

## 3.1 Towards a European labour market for researchers

### 3.1.1 Stocks and mobility flows of researchers

### 3.1.2 Providing attractive employment and working conditions

### 3.1.3 Open recruitment and portability of grants

### 3.1.4 Meeting the social security and supplementary pension needs of mobile researchers

### 3.1.5 Enhancing the training, skills and experience of European researchers

## 3.2 Research infrastructures

### 3.2.1 National Research Infrastructures roadmap

### 3.2.2 National participation in the ESFRI roadmap. Updates 2009-2010

## 3.3 Strengthening research institutions

### 3.3.1 Quality of National Higher Education System

### 3.3.2 Academic autonomy

### 3.3.3 Academic funding

## 3.4 Knowledge transfer

### 3.4.1 Intellectual Property Policies

### 3.4.2 Other policy measures aiming to promote public-private knowledge transfer
3.5 Cooperation, coordination and opening up national research programmes within ERA

3.5.1 National participation in intergovernmental organisations and schemes

3.5.2 Bi- and multilateral agreements with other ERA countries

3.5.3 Other instruments of cooperation and coordination between national R&D programmes

3.5.4 Opening up of national R&D programmes

3.6 International science and technology cooperation

3.6.1 International cooperation

3.6.2 Mobility schemes for researchers from third countries

4 Conclusions

4.1 Effectiveness of the knowledge triangle

4.2 ERA 2020 objectives - a summary

References

List of Abbreviations
1 Introduction

The main objective of the ERAWATCH Analytical Country Reports 2010 is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals and of the 2020, post-Lisbon Strategy. The assessment will focus on the national R&D investments targets, the efficiency and effectiveness of national policies and investments into R&D, the articulation between research, education and innovation, and on the realisation and better governance of ERA. In doing this, the 15 objectives of the ERA 2020 are articulated.

The report builds on the 2009 report streamlining the structure and updating the 2009 policy assessment in the domains of human resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. The information related to the four ERA pillars covered in the 2009 report is also updated and it is extended in order to cover all six ERA pillars and address the corresponding objectives derived from ERA 2020 Vision.

Given the latest developments, the 2010 Country Report has a stronger focus on the link between research and innovation, reflecting the increased focus of innovation in the policy agenda. The report is not aimed to cover innovation per se, but rather the 'interlinkage' between research and innovation, in terms of their wider governance and policy mix.

2 Performance of the national research and innovation system and assessment of recent policy changes

The aim of this chapter is to assess the performance of the national research system, the 'interlinkages' between research and innovation systems, in terms of their wider governance and policy and the changes that have occurred in 2009 and 2010 in national policy mixes in the perspective of the Lisbon goals. The analysis builds upon elements in the ERAWATCH Country Report 2009, by updating and extending the 2009 policy assessment in the domains of resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. Each section identifies the main societal challenges addressed by the national research and innovation system and assesses the policy measures that address these challenges. The relevant objectives derived from ERA 2020 Vision are articulated in the assessment.

2.1 Structure of the national research and innovation system and its governance

This section gives the main characteristics of the structure of the national research and innovation systems, in terms of their wider governance.

Research, Development and Innovation (RDI) are mainstays of the Israeli economy. As a small country with a population of 7.4 million and GDP per capita of €19,788 in 2009, RDI-based goods and services account for about half of the country’s exports and are the most powerful engine of economic growth.
With 4.3% of GDP devoted to civilian R&D in 2009, Israel faces challenges that are in many ways opposite to those facing many EU countries. If the aim in the EU is to increase businesses’ share of R&D expenditure, in Israel, with BERD standing at 79% of GERD, the challenge that policymakers are now addressing is to increase the share of public investment in research.

The undoubted advantages of very high business investment in research and development and a strong Venture Capital (VC) industry come with their own special sets of vulnerabilities. The percentage of GERD in GDP declined from a height of 4.8% in 2007 to 4.3% in 2009 largely because of the impact of the global economic crisis on business R&D and a concomitant decline in VC investments in Israeli start-up companies.

**Main actors and institutions in research governance**

The two main actors in regulating Israeli governmental support for research and development are the Council for Higher Education (CHE) and the Ministry of Industry, Trade and Labour. The two executive bodies responsible for budgets and in many cases for making policy are the CHE’s Planning and Budgeting committee, commonly known by its Hebrew acronym Vatat, and the Ministry's Office of the Chief Scientist (OCS). Vatat is responsible for funding universities and university based research, and the OCS is responsible for funding industrial R&D.

Vatat and the OCS control the vast majority of all government funding for civilian research and have the effective means of governance, fiduciary controls and administrative frameworks to manage their respective areas of responsibility. Both command considerable political support from the two bodies that have most say in determining budgets for research, the Prime Minister's Office, and the powerful budget division in the Ministry of Finance. Proof of this support can be seen in the growth of their budgets.

One part of government's response to the global financial crisis was to increase R&D budgets, and the OCS budget has grown by more than 70% since 2007 to its 2010 level of about €430m. Other budgets for non university based research grew only incrementally in the same period, such as budgets for areas regarded as important like agricultural research reaching €43 in 2010 compared to €40m in 2008. The higher education budget managed by Vatat which includes both block and competitive funding for research grew from €1.26b in 2008 to €1.43b in 2010, but this was largely the result of wage increases stemming from industrial action. On the other hand, the Vatat budget is set to increase by at least 30% during the period of its six year plan that starts in 2011, and this can be seen as an indicator both of the real need to help universities and university based research and of Vatat's ability to persuade government to respond to the need.

There is no effective body that coordinates between Vatat and the OCS. The body which should have filled this void, the National Council for Research and Development (NCRD), proved unable to fulfil this function and as a result the entire board of the council resigned in October 2010. A new board was appointed, and its chairman is determined to create high level coordination and planning between all the R&D bodies in the country. It remains to be seen whether this can be accomplished and it will probably take a few years to assess it efficacy.

The need for more coordination in policy making is clear. There has been one small but highly significant change that seeks to address the problem and might auger a change towards a more comprehensive approach. In the Finance Ministry’s powerful
Budgets Division the officials in charge of higher education and university research have been moved from the education unit to the R&D unit, meaning that on this level at least issues connected to both university based research and industrial R&D are being considered and budgeted in consultation and coordination.

A less significant player in research governance is the Ministry of Science and Technology, which according to government budget documents has a budget, of €20.6m compared to the €430m budget of the OCS and a commensurate influence on policy. Other government ministries have relatively small research budgets. The exception to this rule is the Agriculture Ministry, which has a significant budget, its own research policy and its own research institute.

Figure 1: Overview of the Israel's research system governance structure
Vatat is the Hebrew acronym for Va’ada leTichnun veTiktzuv, the Planning and Budgeting Committee of the Council for Higher Education. Iserd is the Israeli Directorate for EU Framework Programmes. MATIMOP is the Hebrew acronym for Merkaz Hata'asiya Hayisraelit leMekhkar vePituach, the Israeli Industry Centre for R&D. The Incubator Programme, the R&D Fund and Magnet are the three instruments used by the Office of the Chief Scientist in the Industry Ministry to execute policies.

**The institutional role of regions in research governance**

As a small unitary country, regional government plays no role in Israeli research governance.

**Main research performer groups**

The main research performers supported by government funding are the country's seven research universities, funded via Vatat and business enterprises that seek and receive funding from the OCS. The country has six scientific research institutes but these play a significantly less prominent role than their counterparts in Europe.

**2.2 Resource mobilisation**

Since 2000, Europe has made evident progress towards ERA but at the same time it is clear that Europe's overall position in research has not improved, especially regarding R&D intensity, which remains too low. The lower R&D spending in the EU is mainly a result of lower levels of private investment. Europe needs to focus on the impact and composition of research spending and to improve the conditions for private sector R&D investments.

This section assesses the progress towards national R&D targets, with particular focus on private R&D and of recent policy measures and governance changes and the status of key existing measures, taking into account recent government budget data. The need for adequate human resources for R&D has been identified as a key challenge since the launch of the Lisbon Strategy in 2000. Hence, the assessment includes also the human resources for R&D. Main assessment criteria are the degree of compliance with national targets and the coherence of policy objectives and policy instruments.

**2.2.1 Resource provision for research activities**

Israel reached its high level of R&D investment without ever adopting formal targets, possibly because the policy mix worked well in tandem with market conditions to encourage business to invest heavily in R&D. Hence, it is impossible to assess policy as a function of meeting numerate targets, especially since the EU targets have long been surpassed.

One reason why numerate goals are less relevant is the degree of business investment in R&D. The changes in GERD (as a percentage of GDP), 4.4% in 2006, 4.8% in 2007, 4.7% in 2008 and 4.3% in 2009 were the result not of government policy but of conditions in world technology and capital markets. It would be mistaken, however, to assume that Israeli policymaking has abrogated responsibility for such an important element of the country's economy. Resources for research through the two main funding vehicles, Vatat and OCS, have been expanded considerably, more or less at the same time, but for different reasons.
Provisions for R&D activities

Officials in government and the country's universities often refer to the first 10 years of this century as the "lost decade." The country's leading universities had high ranking in international ranking systems, but budgets were stagnant, research staff was ageing, donors had to bear the brunt of funding research infrastructures and some of the best younger talent left either to universities abroad or to the country's technology industries, which offered far higher salaries.

It was clear that something had to be done because university based research was one of the core resources that enabled the country to attract such high investment in business for technology based exports. Changes in management at Vatat, the Finance Ministry and the Education Ministry helped officials find common cause in devising a six year programme to help universities. As it now stands, the programme, drafted and approved in 2010 and operational from 2011, envisages a gradual rise in funding for universities and university based research to a level about 30% higher in the sixth year compared to today, excluding the usual updates to budgets that stem from general economic factors. This budget may yet increase if the student union agrees to higher tuition fees for students from more affluent homes. Negotiations with the union were broken off because of student elections, but the hope is that if these negotiations succeed the total budget for the six year plan will be increased to a total of about 40% higher than the current level at the end of the plan. The increased budgets will be used to:

- Hire an extra 1,600 researchers in universities over the next six years to reach a net gain of over 800 researchers (taking retiring academics into account);
- Nearly doubling the annual budget allocated for competitive grants through the Israel Science Foundation (ISF);
- Increase block funding according to a new formula that will give greater weighting to excellence in research;
- Create a programme to upgrade research infrastructures (the details of which have not yet been released);
- Offer a programme to improve accessibility to higher education for ultra-orthodox Jews and Arabs.

Unlike Vatat, the OCS budget does not operate on multi-year plans. The budget started to rise sharply after the beginning of the world economic crisis and is now at a level 70% higher than it was in 2007. One major reason for the increased funding was a decline in VC investments in Israeli start-ups as can be seen in the chart below.
Two additional factors made it imperative to increase the budget. One was the declining percentage of investment by Israeli VCs and the second, related reason, was a decline in funding for the seed stage of companies that were funded by VCs that reached a low of only €23m in 2010. It is perhaps significant that the OCS is now funding Internet start-ups in incubators, an area that was once entirely the domain of angels. Details about the three main funding vehicles used by the OCS, the **R&D Fund**, the **Incubator Programme** and **Magnet** are available in section 2.4.2 of the Israel country fiche. The budget for Magnet in 2009 was €45m, the incubator programme received €37m, while the R&D fund received slightly less than €200m. The budget for 2011 is approximately 25% higher, but the breakdown between the three programmes for 2010 and 2011 is not known yet, since the actual expenditure per programme is only revealed after the fact. Tax incentives are not used as a policy tool to encourage R&D, even though R&D expenses are recognized on preferential terms by tax authorities. There has been a government decision to explore using tax incentives, but this has not been implemented.

The issue of public private cooperation in knowledge transfer has never been a critical problem in Israel. The OCS Magnet programme successfully acts as a proactive generator of such cooperation, while the university technology transfer companies, on the other hand, are eager to exploit commercial possibilities for university based research.

The issue of creating mutual trust between science and society has not attracted much interest in Israel. A survey of public attitudes towards science and research commissioned by the National Council for Research and Development in 2009 shows overwhelmingly positive attitudes towards government support of scientific research both in universities and private enterprises.

Grand challenges are not defined as research goals by either of the two main funding mechanisms in Israel, Vatat and the OCS. Nevertheless both bodies have programmes that are roughly equivalent to the grand challenges of Member States. The OCS has departed from its norm of funding only research projects by initiating an alternative energy research centre near the southern town of Eilat. The OCS will invest half of the €24m budget to set up the centre which will be operated by a consortium of businesses, who will invest the other half, and Ben Gurion University.

Two of the first four Vatat I-Core Centres of Excellence include programmes that address societal challenges. One is entitled Systems-Level Analysis of the Molecular
basis for Human Diseases: From Genomics to Personalized Therapy. The second centre of excellences will deal with Renewable and Sustainable Sources of Energy.

2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

Israel never adopted national R&D targets but nevertheless has maintained consistent policies that successfully allowed it to exceed the Lisbon targets. The policy mix intended to encourage private investment in research is managed entirely by the OCS. Aside from the increased budgeting for university research, the prioritization between the six axes of the policy mix has not changed since 2009 and is covered in detail in the Israel ERAWATCH Country Report 2009.

The core strategy of the OCS towards encouraging private investment in R&D is to offer grants to reduce companies' and investors risk. Some of these grants are outright outlays of capital and others are given as part of an agreement in which the companies pay royalties to the OCS if the specific project the OCS supported was successful. Throughout the years the OCS has maintained a consistent policy in which roughly 60% of its budget goes to the R&D Fund, 20% to the Incubator Programme and another 20% to the Magnet Programme. The first two programmes are relevant to the policy mix of encouraging R&D in commercial enterprises. The third programme, Magnet, is relevant to the route of encouraging extramural R&D in cooperation with the public sector.

The R&D Fund, the largest framework, accepts proposals from all firms from the smallest start-up to well established firms with global markets. It is also the instrument used to target specific areas, such as encouraging firms in traditional industries to engage in R&D, or to favour specific industries such as life science companies, nanotechnology firms or cleantech. The main criteria for support are whether the proposed project is innovative in global markets (a criterion which is relaxed for traditional industries) and whether it shows sound commercial potential. Most grants from the R&D Fund oblige firms to pay royalties. The R&D Fund's support typically amounts to 20-50% of the proposed project's cost. In lean budgetary years the fund tended to reduce its level of support, but in recent years with higher budgets the level of support accorded by the Fund's Research Committee is usually an expression of the committee's belief in the validity of the project.

The creation of new indigenous R&D performing firms is the domain of the Incubator Programme. This veteran programme was successfully privatized and 24 of the 25 incubators spread around the country are private firms with ownership stakes in new companies supported by the Incubator Programme. The OCS makes grants of 85% of the new company's first two years of R&D intensive operation costs with the remainder coming from the incubator management company. Incubator grants are not subject to royalties though companies do have to pay a penalty if they sell the Intellectual Property developed with the OCS grant to a foreign firm. Companies in life sciences enjoy support from the Incubator Programme for three years, basically because of the longer and more expensive development path they face. Individual inventors can make use of another smaller programme, Tnufa, in which they can get outright grants up to €40,000 to build prototypes and register patents.

The general OCS framework has remained remarkably stable over the past 10 years with few changes in the proportion of total funds awarded to each framework. What do change in a fairly fluid fashion are the preferences towards various technologies or business sectors.
OCS programmes are broadly regarded as highly efficient and of great value to the taxpayer. They are considered much easier to access than many European frameworks. The application forms are relatively short and a large part of the evaluation of a proposed project is based on on-site visits by OCS specialists.

With BERD intensity at 3.8% in 2008 and more a function of global economic conditions than government policy, there were no changes in the policy mix, but budgets of existing programmes were increased to try to alleviate the impact of less global investments in R&D. The evolution of GERD, from €5.7b at current prices in 2005 to €6.5b in 2009, is due largely to business investment rather than government policy. Israeli government policy does not aim to stimulate innovation through procurement policies, possibly because nearly all technology intensive industries are focused on exports.

### 2.2.3 Providing qualified human resources

Compared to the OECD, Israel has a high ranking in tertiary education with 44% of the population between 25 and 65 enjoying the benefits of a college or university education. The numbers of new graduates in science and engineering stands at 21%, roughly the OECD average.

These statistics do not however, tell the whole story. For the past 20 years Israel has enjoyed the benefits of mass immigration from the former Soviet Union in the early 1990s, when the population expanded dramatically by about 20% with the influx of over a million immigrants with a high level of education, especially in engineering and sciences. This "free" influx of well educated immigrants boosted the country's HRST standing without the cost of paying for the infrastructure to create these skills. However, many of these well educated immigrants are now reaching retirement ages, creating a challenge for the country's education system.

Yet another piece of the puzzle that skews the meaning of the statistical data is that about 30% of the population is grossly underrepresented in the HRST picture. These include 20% of the population who are Arab and 10% who are ultra-orthodox Jews. Among Arabs the average years of education are 10.4 compared to 13.9 in the Jewish majority (excluding ultra-orthodox Jews.) Among ultra-orthodox Jews the figures are far lower but unknown because most men study in yeshivot (religious schools with an entirely religious curriculum.) Women usually study in schools that do have a partly secular curriculum, which usually gives them an advantage in the work market compared to ultra-orthodox men. Two groups, ultra-orthodox men and Arab women, are grossly underrepresented in the labour force which is why labour force participation in Israel stands at a very low 56%.

This picture can be viewed as a challenge because the burden of maintaining a HRST pool to support a technology intensive economy rests only with 70% of the population. It can also be viewed as an opportunity because higher participation in the HRST pool by both the Arab and ultra-orthodox communities could contribute tremendously to these communities and to the entire economy. Policymakers have chosen to focus on the opportunity and are rolling out measures both in the higher education system and other frameworks to exploit the possibilities in both communities. They are supported by labour force participation data that show that average participation among Arab women stands at 27%, but at a much higher 60% among Arab women with tertiary education and at 75% among Arab women with a university education.
The HRST outlook, between the retiring Russian immigrants and the opportunity of the ultra-orthodox and Arab communities, is one of the main reasons that the Vatat budget has been expanded so considerably after years of stagnation. Vatat has initiated two programmes to improve accessibility and overcome cultural barriers for the ultra-orthodox and Arabs. The first programmes for the ultra-orthodox have already started and the response has been so enthusiastic that Vatat envisages expanding the programmes. The programmes for the Arab population are due to start during the next year and a similarly enthusiastic response is expected. The Israel Central Bureau of Statistics is now conducting a survey commissioned by the National Council for Research and Development on S&E training and R&D employment. Until that survey is completed the available data is from the OECD, which as said above, indicates that 21% of university degrees are in S&E. But since the general numbers of people with tertiary education are very high (third in the OECD) there is not any immediate problem in the supply of qualified human resources for research. The Vatat programmes launched in 2011 are intended to address perceived future problems in this field.

Most of the government programmes for job training and lifelong learning are not in research intensive areas. There is a large private industry that provides technological training and diplomas, mainly revolving around ICT. The attraction of relatively high wages in ICT industries is strong enough to attract both students and a large number of private enterprises that provide training at various levels. Similarly, there is a network of government sponsored local institutions that provide coaching for would-be entrepreneurs, but like government job training this is mainly aimed at non technological new businesses. Given the very high rate of entrepreneurship in R&D intensive industries, there is no need for including entrepreneurship training in tertiary education curricula.

### 2.3 Knowledge demand

There are no broad based measures designed to specifically stimulate knowledge demand in Israel since in most sectors demand is robust enough not to require stimulation. In some specific sectors such as traditional industries with low levels of innovation and low productivity, a specific measure was introduced both to support innovation in these industries and to stimulate demand by offering consulting services that showed managers in these industries the benefits they would get from introducing R&D into process or products. In biotechnology and life sciences industries the government responded to what was perceived as a market failure in demand for knowledge by investing as a limited partner in a biotechnology VC fund that is be to be launched soon.

Business driven knowledge demand is the predominant factor in Israeli knowledge demand given its role in total R&D funding. Foreign Direct Investment (FDI) is an important factor both in direct investments in Israeli start-ups, indirect investment through Israeli VC funds, and direct investment in the R&D facilities of foreign owned subsidiaries in Israel. A predominant portion of these investments goes to ICT, which represents 79% of total business investment compared to the 21% average for ICT investment in the EU27. Here again the vulnerabilities of very high BERD in the total research picture because of global economic conditions are illustrated by the following chart showing FDI fluctuations.
The peak in the graph above in 2006 is largely result of the sale of two veteran Israeli companies. Without this peak the trend shows a high level of correspondence between FDI figures and the data is the chart in section 2.2.1 showing levels of VC investment in Israeli technology firms. Whether the investments are made by Israeli or foreign VCs, the source of the funds is nearly entirely foreign. Not all FDI is in start-ups, but the structure of FDI in Israel is as such that the same global factors that affect start-ups affect FDI, since the main recipients of FDI are research intensive industries.

2.4 Knowledge production

The production of scientific and technological knowledge is the core function that a research system must fulfil. While different aspects may be included in the analysis of this function, the assessment provided in this section focuses on the following dimensions: quality of the knowledge production, the exploitability of the knowledge creation and policy measures aiming to improve the knowledge creation.

2.4.1 Quality and excellence of knowledge production

Output indicators, as last measured by the OECD in 2008, are strong but reflect pre-crisis investments. Scientific publications per million population reached 1,380. According to data from the Shmuel Ne’eman Institute, Israel was ranked fifth in the world after Switzerland, Sweden, Denmark and Finland in publications per capita between 2004-2008, a decline from the third place it achieved between 2001-2005. It is possible to link this decline to inputs -- the stagnation in higher education budgets during the past decade -- but there is no rigorous research to prove this point. There is, however, a similar trend in terms of total output not linked to population size: between 2004 and 2008 Israeli publications accounted for 1.13% of total world publications whereas between 2001 and 2005 the figure stood at 1.25%. A citation index compiled by the Shmuel Ne’eman Institute from a large variety of international sources put Israel in the tenth place globally. Another index compiled by the institute ranked average citation numbers according to field showing that Israel had a particularly strong showing in citations of papers of space sciences and physics with the average citation number being over 1.5 times the global average and a weak
showing in fields like psychology and social sciences with citations averaging around .87 of the global average. In output as measured by international patents there is none of the relative decline that can be seen in the number of academic publications, It is perhaps more useful to examine patent applications in the US rather than Europe since three times as many applications are made to the USPTO compared to the EPO. In 2007 Israel tied for the third place with Korea after Taiwan and Japan in the number of applications per capita. In certain areas like medical electronics Israel is in the first place per capita and in the fourth place in absolute numbers, according to USPTO data. In European terms applications to the EPO, Israel submitted 185 applications per million inhabitants in 2006 compared to the EU27 average of 119.

The data on patents is not recent enough to see whether the relative decline in inputs to business R&D starting in 2009 had a commensurate effect on patent applications.

2.4.2 Policy aiming at improving the quality and excellence of knowledge production

Two main polices are in place to ensure excellence of knowledge production in the country's universities. The first, which has not changed, is the academic evaluation unit in Vatat which is described in section 3.3.1 below. The second, which has changed this year, is the budgeting model according to which Vatat divides block funding for research between the country's universities. Block funding was awarded according to universities' success with a weighting system that allocated funds according to the following formula: 34% for winning competitive grants, 29% for the number of doctoral students, 20% for grants from non-competitive sources, 15% for scientific publications with the remainder allocated to the number of second degree students who complete a thesis. Over the years universities optimized their performance to meet these criteria.

The new model gives a weighting of 34% to the number of competitive grants, and another 34% to publications measured by the importance of the journals in which the papers were published, with the remaining 32% allocated to the other criteria. Vatat hopes that this model will drive universities and researchers to compete harder in research and publications. A further element of the new model will encourage universities to specialize in areas of core excellence rather than spreading their efforts across many areas.

Competitive funding through the Israel Science Foundation is awarded in a two-tier process that involves preliminary screening of pre-proposals by expert committees that are reconstituted every year and then by international peer review of full proposals. The system is considered as an efficient guarantor of quality.

Like most other arms of Israeli government, the OCS does not engage in systematic evaluation of projects and programmes but rather individual evaluation of each grant according to criteria of its commercial success. However, the percentage of projects which were successful and paid royalties is also not a reliable indicator of progress towards improving the excellence of R&D. The budget for 2011 includes 23% of funds that are supposed to come back to the OCS in the form of royalties. The aim, however, is not to reach a higher percentage because that would indicate that the OCS was backing safe bets rather than expanding companies’ knowledge base by supporting R&D that would be considered too risky according to normal commercial criteria.
2.5 **Knowledge circulation**

Tackling the challenges that European society faces in the 21st century will require a multi-disciplinary approach and coordinated efforts. Many debates and conferences, e.g. the Lund Declaration recognise that such complex issues cannot be solved by single institutions, technology sectors or MS acting alone. Hence strong interactions within the "knowledge triangle" (education, research and innovation) should be promoted at all levels. Moreover, in the context of increasing globalisation, cross-border flows of knowledge are becoming increasingly important. This section provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

2.5.1 **Knowledge circulation between the universities, PROs and business sectors**

The main framework for encouraging knowledge circulation between universities and business is the set of various programmes run under the Magnet Organization, which typically gets about 20% of OCS funding. Since Public Research Organizations are not a prominent player in the Israeli research scene, the main stress is to encourage cooperation between universities and business in precompetitive generic research. The main instrument is the Magnet Programme, which organizes consortia of academics and business to cooperate of various projects. Other programmes for individual academics and business are Magneton and Nofar. The OCS typically funds 66% of a project's cost with the rest coming from the companies that are members of the consortium or project. A good measure of the programmes popularity is that applications for Magnet funding are on the rise.

2.5.2 **Cross-border knowledge circulation**

The most important instrument for international collaboration is the Seventh Framework Programme. The framework programmes have become an integral and hugely important part of the Israeli research scene, providing more competitive funding for Israeli academe than the Israel Science Foundation (ISF) last year. This situation will change as the ISF budget grows as Vatat's six-year plan progresses, but FP7 has become a critical part of the Israeli research scene, not only because of the budgets but because of the connections it has created between Israeli and European researchers. More information of Israeli participation in FP7 is in section 3.3.1. below.

In terms of research in shared research infrastructures, Israel is a candidate for accession at CERN and has been an active contributor as an observer since 1991, and is also a member of The European Synchrotron Radiation Facility (ESRF).

In industrial research, Israel is an active participant in the EUREKA programme, with funds for Israeli collaborators coming from the OCS Research Fund.

2.5.3 **Main societal challenges**

The only thematic programmes in Israeli research are the new I-Core centres of excellence, which do address some societal issues but are not tailored for transnational cooperation.
## 2.6 Overall assessment

### Table 1: Summary of main policy related opportunities and risks

<table>
<thead>
<tr>
<th>Domain</th>
<th>Main policy opportunities</th>
<th>Main policy-related risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource mobilisation</td>
<td>Increased funding both for academic and business research creates the opportunity to a) overcome the impact of Israel's &quot;lost decade&quot; in university based research and b) overcome the impact of the world economic crisis on business R&amp;D.</td>
<td>Revitalizing university based research is a complex challenge requiring cooperation from highly independent bodies such as Vatat, the universities, student unions and academic unions. Funding programmes for commercial R&amp;D must take into account that it typically takes several years for R&amp;D investments to recover after a crisis.</td>
</tr>
<tr>
<td>Knowledge demand</td>
<td>Policy to encourage R&amp;D in traditional industries could be of great economic and societal benefit. The new government backed biotech fund could help overcome a long standing market failure.</td>
<td>There is less risk in the traditional industries programme, which seems to be working well. Biotech, on the other hand, is a notoriously risky business which takes a long time to bear fruit.</td>
</tr>
<tr>
<td>Knowledge production</td>
<td>With increased budgets, the new block funding formula adopted by Vatat is intended to stimulate excellence and specialization in research.</td>
<td>The complexity risk -- similar to that of the entire Vatat programme -- is mitigated to a certain extent by the natural competitiveness between universities which will encourage researchers to publish more and in better journals.</td>
</tr>
<tr>
<td>Knowledge circulation</td>
<td>There are no new measures in this area and hence no new challenges.</td>
<td></td>
</tr>
</tbody>
</table>

The fact that the new Vatat six-year programme was approved and budgeted by the Finance Ministry is a breakthrough after 10 years of stagnation. It scope is truly ambitious: within six years close to 20% of academic staff will be new hires, either replacing retirees or coming into the new research positions provided for by the Vatat programme. The question will be if the leadership of Vatat and the Finance Ministry will be as adept in implementing the programme as they have in getting it approved.

### Table 2: Main barriers to R&D investments and respective policy opportunities and risks

<table>
<thead>
<tr>
<th>Barriers to R&amp;D investment</th>
<th>Opportunities and Risks generated by the policy mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>The global economic crisis affected R&amp;D investment in new and established Israeli firms.</td>
<td>Increased OCS funding is meant to fill the breach. It cannot however fill the entire shortfall and the risk is whether the stimulation will suffice to bring business investment back to pre-crisis levels.</td>
</tr>
<tr>
<td>Decreasing investment in Israeli start-ups by Israeli VCs compared to investments by foreign VCs means that far less funds are going into seed money for very new R&amp;D performing firms.</td>
<td>Increased funding for the Incubator Programme can fill part of the breach, but it is doubtful whether the government can or should try to match the scale of VC funding by Israeli VCs in better years.</td>
</tr>
</tbody>
</table>
3 Interactions between national policies and the European Research Area

3.1 Towards a European labour market for researchers

The Communication Better careers and more mobility: A European Partnership for Researchers proposed by EC in May 2008 aims to accelerate progress in four key areas:

- Open recruitment and portability of grants;
- Meeting the social security and supplementary pension needs of mobile researchers;
- Providing attractive employment and working conditions;
- Enhancing the training, skills and experience of researchers

The Commission has also launched concrete initiatives, such as dedicated information services for researchers, in particular through the activities grouped under the name of EURAXESS – Researchers in Motion. Based on the assessment of the national situation in the four key dimensions detailed above, this section will conclude if national policy efforts are supporting a balanced ‘brain circulation’, with outward mobility levels matching inward mobility levels. High levels of outward mobility coupled with low levels of inward mobility often signal an unattractive national labour market for researchers and unsuitable research infrastructures. This may trigger, despite the policy efforts supporting the mobility the ‘brain drain’ rather than brain circulation.

3.1.1 Stocks and mobility flows of researchers

Data on the number of researchers in Israel are currently being collected by Israel's Central Bureau of Statistics in accordance with OECD statistical requirements. Incomplete data for 2008 (covering the academic and business sectors, probably the main part of total researchers) show that there were some 63,800 researchers that year, constituting some 2.3% of total employed persons. An interesting feature of the data is their division between the two sectors covered. The business sector had some 54,600 researchers (2% of total employment in 2008) while the academic sector had just 9,200 (0.3% of total employment). This breakdown matches the breakdown of expenditure on R&D with the business sector contributing by far the largest share (BERD constitutes some 80% of GERD, on average, in recent years) and emphasises the huge importance of the business sector to R&D development in Israel in general.

Since the data on researchers are new, we have no indication regarding inflows and outflows to the number of researchers in the business sector. But one thing is crystal clear – for a considerable period, there has been concern about brain drain—a greater outflow than inflow of researchers in the academic sector. Several reasons have been presented to account for the outflow of Israeli researchers abroad: better salaries, more sophisticated infrastructure.

Whatever the reasons, the current Israeli government has been sparked into action: one of the targets of the new 6-year plan to boost the universities (see section 2.2.1.above) is to encourage Israeli researchers working abroad to come home and join one of 30 Centres of Excellence (I-Core) in Israeli universities. The research
areas of the first 4 centres have already been decided (Analysis of the Molecular Basis for Human Diseases, Cognitive Science, Computer Sciences and Renewable and Sustainable Sources of Energy). The total 6-year budget for the establishment of the 30 Centres is some €320m.

The Centres of Excellence are for returning Israeli researchers only and will not be open for non-Israeli researchers who would like to do research in Israel. The philosophy here seems to be a need to compensate for the brain drain of recent years, with the consideration that the best investment is in Israeli researchers who are more likely to stay in Israel once they return.

The Centres of Excellence under the new 6-year plan have yet to be established. But in the meantime, there are other frameworks to provide assistance in incoming researchers, such as the Centre for Absorption in Science of the Ministry of Immigrant Absorption, where immigrant and returning resident scientists can obtain assistance in their employment in R&D. But the available budget here is very limited – some €3-4m annually.

As mentioned, the emphasis on all the above is encouraging the inflow of Israeli researchers rather than the two-way flow of researchers. Nevertheless, Israel has a EURAXESS portal but there is no information as to the extent to which either Israeli or European researchers have been taking advantage of this facility. At the present time, just 639 jobs are posted on the main EURAXESS portal for Europe as a whole and less than 80 jobs in Israel. Israeli researchers tend to make use of FP7 instruments for mobility and rely on academic word of mouth for sources of information.

3.1.2 Providing attractive employment and working conditions

In the EU, employment and working conditions for researchers are defined in the 2005 European Charter for Researchers, which is a set of general principles and requirements that specify the roles, responsibilities and entitlements of researchers as well as employers and/or funders of researchers. Basically, the Charter constitutes a framework for researchers, employers and funders that invites them to act responsibly and as professionals within their working environment.

Israel's 7 research universities (the Hebrew University of Jerusalem, Tel-Aviv University, Haifa University, the Technion, Ben-Gurion University, Bar-Ilan University, the Weizmann Institute) have agreed in principle to the Charter and signed a declaration to this effect: the declaration, dated 23 June 2006 states that "The Israeli Forum of Vice Presidents for R&D adopted the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers and noted the importance of the principles set forth therein."

Researchers in Israel – both in the academic world and in industry - continued to be among the best-paid professional groups in Israel. If the overall monthly average wage in 2009 was close to €1,500; the comparable average salary of R&D personnel was €3,700. This relatively high salary level – by Israeli standards – was clearly not sufficient to restrain the brain drain of researchers of recent years, but as already mentioned, salary levels (compared to abroad) were probably not the major factor behind the brain drain, though they may well have limited the inflow of researchers to Israel from abroad.

Given the relative attractiveness of researchers' salaries, at least within Israel, there do not appear to be any regulations that hinder entrance into a research career. The
academic unions are the major negotiators with the government regarding the salaries of university staff, and basic salary levels are common to all seven universities.

With women constituting 24.9% of the R&D workforce (according to data from Israel's Central Bureau of Statistics), Israel is seventh in the world in female R&D employment, but there is obviously much to be done since many of the women who complete academic degrees in sciences and engineering are not subsequently employed as researchers. There is no aggregate data on doctorate degrees in science and engineering, but in overall doctorates women constituted 53% of the recipients of third degrees in 2006.

Women researchers – as all employed women in Israel – have clear rights, established by law, in the case of career breaks due mostly to maternity leaves. Female employed persons are entitled to three months maternity leave with full pay. Should they decide to take a longer career break following birth, the law determines that their position be left open for them to return to up to one year, though in the additional nine months after the initial maternity leave, they are not entitled to receive their salaries.

3.1.3 Open recruitment and portability of grants

In principle, Israeli universities offer open recruitment both to Israeli and non-Israeli researchers. With regard to the latter, the significant degree of autonomy of Israeli universities (see Section 3.3.2 below for a fuller discussion of autonomy) determines their ability and willingness to absorb researchers from abroad: there are no restrictions placed on them in this area by national legislation or on their eligibility to compete for permanent research and academic positions. In general, researchers from abroad are recruited solely on the basis of their qualifications. The fact that permanent positions at Israeli universities are published on the EURAXESS database is evidence of open recruitment, but it is not certain that all Israeli universities publish positions on this portal.

One factor that could hinder this openness, in some cases, is the ability of non-Israeli applicants for permanent positions to communicate in the Hebrew language, which is sometimes a necessary criterion of their absorption by the university.

The portability of grants is a more complicated issue, because grants are most often extended to a researcher at a particular university. Firstly, there is only limited mobility between universities within Israel so the matter of grant portability is not often a relevant issue. But when it is, it appears that the universities connected with the mobility (that is, the university that the researcher leaves and the one that he/she goes to) would have to agree to the transfer of grant money. The Israel Science Foundation (ISF) states that grants are indeed portable between Israeli universities, but are not portable to an academic institution abroad.

3.1.4 Meeting the social security and supplementary pension needs of mobile researchers

The transferability of researchers' payments and rights towards health insurance and social security depends on bilateral agreements that Israel has with some, but not all EU countries.

There are no such agreements regarding pension plans and no specific tax incentives to facilitate participation of foreign researchers in local pension schemes.
3.1.5 Enhancing the training, skills and experience of European researchers
Not relevant for Israel.

3.2 Research infrastructures
Research infrastructures (RIs) are a key instrument in the creation of new knowledge and, by implication, innovation, in bringing together a wide diversity of stakeholders, helping to create a new research environment in which researchers have shared access to scientific facilities. Recently, most EU countries have begun to identify their future national RI needs, budgets and priorities in the so called National Roadmaps for Research Infrastructures. These strategic documents also set out a strategic view on how to guarantee and maintain access to research facilities. Although some countries invest heavily in RIs, none can provide all the required state-of-the-art facilities on a national basis. Several large RIs have already been created in Europe. While optimising the use and development of existing RIs remains important, new infrastructures are needed to respond to the latest research needs and challenges. European Strategic Forum for Research Infrastructures (ESFRI) was established in April 2002 to support a coherent approach to policy-making on RIs in Europe and to act as an incubator for international negotiations on concrete initiatives. This section assesses the research infrastructures national landscape, focusing on the national RI roadmap and national participation in ESFRI.

3.2.1 National Research Infrastructures roadmap
As a non-EU member state, Israel is not required to produce a National Research Infrastructure (RI) roadmap. Yet the issue of research infrastructures is a high priority under the parameters of the new Vatat six-year plan and there is a general intention to produce a roadmap that might correspond to the European version.

Besides the budget for the Centres of Excellence, which includes a heavy RI investment, there are no published figures yet on the extent of the planned RI investment and no authoritative summary of the total funding for research infrastructures from all sources. One reason for the lack of clarity might be that the total budget for the six-year plan might expand considerably if the newly elected leadership of the student unions agrees to tuition fee hikes for students from more affluent homes. Another major source of funding in RI in Israeli universities is donations, and in many cases such as the RI for the Israel Nanotechnology Initiative, donations more than matched government funding,

3.2.2 National participation in the ESFRI roadmap. Updates 2009-2010
Not applicable to Israel.

3.3 Strengthening research institutions
The ERA green paper highlights the importance of excellent research institutions engaged in effective public-private cooperation and partnerships, forming the core of research and innovation ‘clusters’, mostly specialised in interdisciplinary areas and attracting a critical mass of human and financial resources. The Universities/ research institutions should be embedded in the social and economic life where they are based, while competing and cooperating across Europe and beyond. This section gives an overview of the main features of the national higher education system,
assessing its research performance, the level of academic autonomy achieved so far, dominant governing and funding models.

### 3.3.1 Quality of National Higher Education System

The new 6-year plan to bolster Israel's higher education system in 2011-2015 with significant increases in budget shows a recognition on the part of the present government that expanded budgets are a necessary condition not only for improving the quality of the higher education system within Israel but also to guarantee that the Israeli higher education system will remain competitive.

There are seven research universities in Israel – the Hebrew University of Jerusalem, Tel Aviv University, Haifa University, Ben Gurion University of the Negev, Bar-Ilan University, the Technion and the Weizmann Institute: both Haifa University and the Technion are situated in the northern city of Haifa. All seven universities are budgeted via VATAT so none are considered private.

One of the interesting developments of recent years has been the establishment of academic colleges alongside the seven universities. In the 2009-2010 academic year there were altogether 27 academic colleges and 27 teacher training colleges, but only some of these are budgeted through the VATAT: the non-budgeted colleges are considered private. In the 2008-2009 academic year, there were some 9,600 staff members at Israeli universities and some 6,800 at budgeted academic colleges. Compared to the 2004-2005 academic year, the number of staff at academic colleges jumped by 21.2% compared to a minimal 1.7% increase in university staff.

This is one indication of the growth of the academic colleges. Another is the increase in the number of students: in the decade up to the 2009-2010 academic year, the number of students at academic colleges (budgeted and non-budgeted together) increased by an annual average of 10.6%, compared to the 0.9% average increase at universities. In the 2009-2010 academic year, there were more first degree students at academic colleges than at universities (83,500 compared to 75,100, though still far less 2nd degree students (8,400 compared to 36,900). It is clear that from the point of view of the quality of higher education, at least at the first degree level, several academic colleges are considered on a par with universities, while the relatively higher fees at the private colleges have clearly not been a disincentive to growth of the student body.

Despite the growing importance of academic colleges for several years now, data on academic R&D cover only the seven universities: the Central Bureau of Statistics, the source of the R&D data, is aware that the data on HERD published in Israel are somewhat biased downwards for this reason, though the bias may be minimal. However, because of the emphasis here on R&D, and also because only the universities offer tertiary degrees, the analysis will continue based on the universities alone.

If the total number of students at universities has increased by a meagre 0.9% annual average over the past decade (of academic years), the number of 3rd degree students has jumped by 4.8% annually. If in the decade up to the academic year 2008-2009, the total number of degree recipients at universities increased by an annual average of 2.1%, the average increase in the recipients of 3rd degrees was 6.2%. At the same time, the percentage of female recipients of 3rd degrees has declined somewhat in recent years – from 52% in 2004-2005 to 49.2% in 2008-2009.
Total HERD in 2008 (the last year available) amounts to some €800m and constituted some 12% of total expenditure on civilian R&D in Israel: this share of HERD is down from 20-30% in the 1990's (at the same time, the share of BERD was over 80% of the total in 2008, compared to 50-60% in the first half of the 1990's).

The business sector financed 7.3% of HERD in 2006 (the last year available): the government is the largest financier, with 55.3% of the total. Other sources of finance were funds from abroad (13.6%) and private non-profit institutions (8.7%). HERD was self-financed by higher education to the extent of 16.8% in 2007.

It seems clear that these trends in recent years – limited growth in the number of university students and staff and the falling share of university R&D – stem from limited budgets. One of the targets of the new six-year plan is to change the direction of these trends.

The access procedures to the seven universities are fairly uncomplicated. The main method of accepting students is by means of psychometric tests – with different faculties demanding different minimum scores as a requisite of acceptance – and high-school matriculation results. There are limits placed on the number of students accepted by faculty.

In the Shanghai University Rankings for 2010, only the Hebrew University of Jerusalem is ranked in the world's top 100 universities (at place 72, down from places 64-65 in the previous three years). Tel Aviv University, the Haifa Technion and the Weizmann Institute are ranked in places 100-150, while the other three Israeli universities are ranked much lower.

Israeli universities do not appear in other international university rankings such as the Times Higher Education University Rankings and the 4icu World University Ranking.

Israeli universities do benefit from a quality assurance mechanism. This was established as a unit for academic quality assurance within the Vatat (the Planning & Budgeting Committee of the Council for Higher Education). The quality assurance is conducted in four stages: a) self evaluation; b) visits to the university by a committee of experts in a particular field; c) discussion of the results of the evaluation in the Council for Higher Education and d) publication of the results. The committees of external evaluators are comprised of senior members of Israeli academe and senior academics from leading universities abroad.

3.3.2 Academic autonomy

The subject of academic autonomy was presented at length in the ERAWATCH Country Report for Israel in 2009.

Universities in Israel remain very autonomous: once they have been allocated their annual budget (block financing) by the Budgeting and Planning Committee (Vatat: see section 3.3.3 below), they are at liberty to decide how to use this budget within the university – for teaching or for research. In general, the block financing is allocated by Vatat according to a model in which the universities' achievements both in teaching and research are measured. The allocation model is currently being reworked under the new 6-year plan.

In principle, each university in Israel has autonomy in managing its research budgets, in hiring research personnel and in the design of research agendas and the choice of topics of research specialization.
In the matter of university governance, the current situation in Israel also remains unchanged. There are two main governing bodies, the Senate, made up of senior university staff, and the Board of Trustees, above the Senate in hierarchy, which can – and does – include external stakeholders. Over time, the governing power of the Senate has been relatively reduced, so that, in principle, the governing power of the external stakeholders on the Board of Trustees has increased, though since members of the Senate also sit on the Board of Trustees, it is not certain that the external stakeholders have a majority vote. Nevertheless, there seems to be a trend over time of increasing the influence of external stakeholders in university governance.

This seems to be reflected in the fact that the President at universities in Israel is the one senior university official that is recruited through an open tender process: all other senior officials - Rectors, Deans - are recruited from within the university. The President at an Israeli university could therefore, in principle, be someone from outside the university world, who could bring his non-university professional experience to bear in university governance.

3.3.3 Academic funding

The overall budget of the Council of Higher Education (which is then allocated to the institutions of higher education by the Planning & Budgeting Committee - VATAT) was €1.23bn in 2008, €1.26bn in 2009, €1.39bn in 2010, and will amount to €1.54bn in 2011. The sharp increase in 2010 was largely due to the unofficial initial implementation of the reform programme built into the new six-year plan for HE. The increase in 2011 reflects a full year of the reform programme implementation.

In the 2010 budget year, about 90% of the overall budget, some €1.25bn, was awarded in funding to universities and academic colleges, and of this, 85% went to the seven research universities. One of the important changes of the last two years is a significant increase in the share of block funding dedicated to research – from some 40% in previous years to 50.6% in 2009 and 51% in 2010. Hence, the block funding for research in 2010 reached about €542m. The formula for distribution of block funding for research is now changing and is discussed in section 2.4.2.

Competitive funding, whose principal source is the Israel Science Foundation (ISF), is bottom up in the sense that there are no pre-defined research themes and grants are given purely on the academic merits of the applicants for funds and their choice of research topics, as judged by local and international peers.

The budget allocated to the ISF for competitive research will increase from €52m in 2010 to €69m in 2011, as part of the plan to nearly double this budget in six years. As already mentioned (see Section 3.3.1 above), in recent years, the funds Israeli researchers won in competitive grants from FP7 amounted to more than funds made available by the ISF, but this ratio will change in coming years. In 2009, 258 Israeli entities secured FP7 funding: of these, 194 were from universities, 41 from industry and 23 from other organizations, according to Iserd, the Israeli directorate that manages Framework Programmes in Israel. During the first four years of FP7, Israeli entities received a total of €360m in FP7 funding. The importance of this funding for Israeli universities is shown by end-2009 figures: universities received some 63% of total Israeli FP7 funding up to the end of that year. The importance of the funding to

---

1 The annual budgets were converted from Israeli shekels to Euro using the average annual shekel/Euro exchange rates.
universities can also be shown by a comparison with funding made available through end-2010 by the Israel Science Foundation (ISF): FP7 funding for universities by the end of 2010 was approximately €228m, while ISF funding during the same period was some €208m.

The bare numbers do not tell the entire story. FP7 offers a huge range of opportunities to Israeli researchers whether in academe or in industry. It is also the predominant source of thematic funding for Israeli research, and as such provides a window into the areas of research interest for the EU.

### 3.4 Knowledge transfer

The importance of knowledge dissemination and exploitation in boosting competitiveness and contributing to the effectiveness of public research has been increasingly recognised by EC and EU Member States. Following the publication of the [ERA Green Paper](#) in April 2007, the EC Communication "Improving knowledge transfer between research institutions and industry across Europe" was issued, highlighting the importance of the effective knowledge transfer between those who do research, particularly HEIs and PROs, and those who transform it into products and services, namely the industry/SMEs.

Several Member States have taken initiatives to promote and facilitate knowledge transfer (for instance new laws, IPR regimes, guidelines or model contracts) and many others are planning to intensify their efforts in this direction. However, these initiatives are often designed with a national perspective, and fail to address the transnational dimension of knowledge transfer. This section will assess the national policy efforts aimed to promote the national and trans-national public-private knowledge transfer.

Even though the importance of knowledge transfer between the academic sector, public research organizations (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.

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 universities2, 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. One such programme is [MAGNET](#), under the auspices of the OCS, in which consortia of

---

2 [Yissum](#) at the Hebrew University of Jerusalem, [Ramot](#) at Tel Aviv University), [YedaRnD](#) at the Weizmann Institute, [Carmel Ltd](#) at Haifa University, [T3 Technology Transfer](#) at the Haifa Technion, [BGN Technologies](#) at Ben-Gurion University and the Bar-Ilan R&D Company at Bar-Ilan University.
industrial companies and academics work together to support generic pre-competitive R&D. Another example is the Kamin programme, set up just in mid-2010, which aims at promoting academic research by individual researchers that is considered to have potential for Israeli industry by creating jobs in general and enabling the absorption of scientific and technology staff in particular. The OCS does not usually publicly allocate specific funds for new programmes and it remains to be seen how many requests will be submitted to the new programme and how many will be approved.

3.4.1 Intellectual Property Policies

Intellectual property (IP) policy in Israel is based on the Israel Patents Law of 1967. In principle, the law sets down that IP created within a place of employment is the property of the employer: an employee is obliged to notify his employer of any invention which he made in consequence of his employment or during the period of his employment, as soon as possible after he invented it, and also of any patent application submitted by him.

The IP can remain the property of the employee if the employer relinquishes the employee's invention within six months being notified of its creation by the employee. In the case of a dispute between the employer and employee as to ownership of IP created within an employment framework, either one can apply to the Registrar of Patents in the Ministry of Justice to decide the question.

Should there be no agreement regarding the extent and conditions of remuneration the employee is entitled to for an invention he created within his employment, the matter will be decided by the Compensation and Royalties Committee of the Ministry of Justice. In making its decision, the Committee takes into account: a) the capacity in which the employee was employed; b) the nature of the connection between the invention and the employee's work; c) the employee's initiative in creating the invention; d) the possibilities of exploiting the invention and its actual exploitation; e) expenses incurred by the employee to secure protection of the invention in Israel.

The Law sets down different provisions for employees in the private sector and in the Stat sector: a State employee who creates IP within the period of his employment or within six months from the end of his employment and within the scope of his work must give notice of this IP to the State Service Commissioner.

In practice, historically, State employees in PRO's who were obligated by the Patents Law to file their inventions through the State had no facilities for doing so. As a result, many state inventions were either filed privately and were misappropriated by the inventor, or were not filed and the rights were lost. The issue was finally addressed head on and after years of negotiations, an agreement was recently reached where researchers at Israeli State hospitals will be entitled to a 35% royalty from their invention, the hospital research fund will receive 30%, the hospital itself will receive 25% and the government's share will be 10%, to be divided equally between the Office of the Chief Scientist of the Ministry of Health and the Finance Ministry of Health.

3.4.2 Other policy measures aiming to promote public-private knowledge transfer

The Boards of Trustees at Israeli universities include external stakeholders – mostly wealthy individuals who have contributed considerable funds to the university and are probably from the business sector - in addition to members of the Senate, the other
university governing body, made up of senior university staff and below the Board of Trustees in hierarchy. As already mentioned in Section 3.3.2 above, the governing power of the Senate has been relatively reduced over time, so that, in principle, the governing power of the external stakeholders on the Board of Trustees has increased, though they may not have a majority vote. Nevertheless, there seems to be a trend over time of increasing the influence of external stakeholders in university governance.

However, in practise, this capacity of external stakeholders to govern may not be felt that much. The Board of Trustees meets just once a year. The Board does elect the President of the university – this election used to be in the hands of the Senate – but in general, the Trustees, including the external stakeholders, are not particularly involved in the current governance of universities in Israel.

Inter-sectoral mobility
There is no current data on inter-sectoral mobility in Israel.

Promoting research institutions - SME interactions
As explained (see introduction to Section 3.4 above), the complete area of knowledge transfer in Israel is based on the individual initiatives of the organizations mainly involved: the technology transfer companies at Israel's research universities on the one-hand and industrial companies on the other, without any guiding hand to promote interaction between the two sides.

The proximity of research institutions and firms as a facilitator of knowledge transfer is not that relevant for Israel, which is altogether a small country with most industry and six of the seven research universities concentrated in the central part of the country (this is true also of the business technology sector in Israel.

There are no specific policies aimed at encouraging SME interactions with research institutions because these are not perceived as necessary given that 46% of all commercial R&D was conducted in 2007 by companies with less than 250 employees and 20% by companies with less than 50 employees.

EU cohesion policy
Not applicable to Israel, as an Associate country.

Spin-offs
There are no specific measures to facilitate spin-offs from university research since spin-offs take place at the initiative of university technology transfer companies that take full advantage of the incentives offered by the Office of the Chief Scientist (OCS) at the Ministry of Industry, Trade and Labour such as the R&D Fund and the Incubator Programme.

3.5 Cooperation, coordination and opening up national research programmes within ERA
The articulation between the R&D Framework Programmes, the Structural Funds and the Competitiveness and Innovation Programme is still underdeveloped in terms of coordination, synergies, efficiency and simplification. The policy fragmentation at EU and national level, and between EU and national policies can hinder the build of critical masses of research excellence, leads to the duplication of efforts, sub-optimal impacts of the different instruments and unnecessary administrative overheads. Differences between research selection procedures and criteria can also be an
obstacle to the overall spread of excellence. This section assesses the effectiveness of national policy efforts aiming to improve the coordination of policies and policy instruments across the EU, all part of the drive to create an integrated ERA.

### 3.5.1 National participation in intergovernmental organisations and schemes

Israel participates in most of the main intergovernmental organizations and programmes: see Section 3.3.1 above for the importance of FP7 in funding R&D – particularly academic - R&D in Israel: Israel's participation in FP7 is managed by ISERD – Israel-Europe R&D Directorate for the EU Framework Programme. Reference has also been made to Israel's participation in EURAXESS (see Section 3.1.1 above).

Israel participation in EUREKA is of particular importance this year as Israel assumed the chairmanship of EUREKA. A statement issued during 2010 by the Office of the Chief Scientist (OCS) reported that Israeli firms participate in 10% of EUREKA projects. One reason for the high level of participation could be that EUREKA funding is channelled through the OCS R&D fund, and the Israeli approach to supporting commercial research is through direct participation in R&D costs.

Israel is also active in COST: at the present time, Israel has representatives in 67 of the approximately 200 COST activities.

In addition, Israel participates in the MINERVA programme (which promotes European cooperation in the area of ICT) and in the MATERA project (which aims at strengthening cooperation among European countries in the area of researching and developing advanced materials). Israeli participation in these two programmes – as well as in COST – is managed by the Ministry of Science and Technology.

### 3.5.2 Bi- and multilateral agreements with other ERA countries

**MATIMOP** – Israeli Industry Centre for R&D, the government agency that generates and implements international cooperative industrial R&D programmes between Israeli and foreign enterprises, currently runs a network of 29 bilateral agreements with various countries, mostly in Europe.

### 3.5.3 Other instruments of cooperation and coordination between national R&D programmes

MATIMOP (see previous sub-section) has recently issued thematic calls for proposals within the following ERA-NET programmes:

- ETB – Biotechnologies;
- MATERA – Material Sciences (already mentioned above – see section 3.5.1); and
- MANUNET – Manufacturing technologies.

---

3 MATIMOP's current bilateral agreements in Europe are with Denmark, Finland, France, Germany, Italy, Slovenia, Spain, Sweden, Turkey and the UK, in Asia – with China, India, Taiwan and the Australian State of Victoria, in North America – with the US states Maryland and Virginia, and in South America – with Argentina, Brazil and Uruguay. Most recently, MATIMOP has issued the first calls for bilateral Israel-Romanian, Israel-Hungarian and Israel-Czech projects with an expected upcoming call for bilateral Israel-Poland projects.
3.5.4 Opening up of national R&D programmes

As a non-EU member state, Israel does not have the full range of opportunities for joint programming that EU Member States do, though – as we have seen in previous sub-sections of 3.5, it does participate actively in many EU projects.

The high level of participation is indicative of a major commitment towards coordination, but does not necessarily signify an opening of national research programmes. The Israel Science Foundation (ISF) is targeted towards Israeli researchers and the only specific program it manages in this regard is to persuade expatriate Israeli researchers to come home. The following points are however worth mentioning in the context of opening up national research programmes:

- Israel is definitely interested in providing access for non-national participants to existing research programmes, though this cannot be considered a matter of national R&D priority.
- Besides EU frameworks, bi-national R&D agreements are a high priority. The largest of these frameworks is BIRD-F, which funds commercial R&D between Israeli and American firms (the total amount of grants under BIRD-F was €7.5m in 2009). A large network of other agreements governs projects with other countries as well as multi-national corporations.

3.6 International science and technology cooperation

In 2008, the European Commission proposed the Strategic European Framework for International Science and Technology Cooperation to strengthen science and technology cooperation with non-EU countries. The strategy identifies general principles which should underpin European cooperation with the rest of the world and proposed specific orientations for action to: 1) strengthen the international dimension of ERA through FPs and to foster strategic cooperation with key third countries through geographic and thematic targeting; 2) improve the framework conditions for international cooperation in S&T and for the promotion of European technologies worldwide. Having in view these aspects, the following section analyses how national policy measures reflect the need to strengthen the international cooperation in S&T.

3.6.1 International cooperation

Since business plays such a dominant part in Israeli research, it often leads internationalization of Israeli research. Besides the EU, the country's technology companies have strong business and R&D relationships primarily with the US and in recent years with many East Asian countries. The R&D relationship with the US is critical for ICT companies and also for start-ups, both those funded from abroad and those funded by Israeli VCs, most of whom have limited partners from the US.

3.6.2 Mobility schemes for researchers from third countries

The only official policy is intended to attract expatriate Israeli researchers to try to redress the persistent brain drain. However there is considerable mobility, albeit usually for shorter periods under the aegis of FP7 programme.
4 Conclusions

4.1 Effectiveness of the knowledge triangle

Table 3: Effectiveness of knowledge triangle policies

<table>
<thead>
<tr>
<th>Policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research policy</td>
<td>New six-year plan for universities plans to revitalize research in universities.</td>
<td>The plan addresses the main weaknesses of the system and was launched in a rare spirit of cooperation between government, universities and funding agencies. Since the plan has just been launched, it is too early to assess weaknesses.</td>
</tr>
<tr>
<td>Innovation policy</td>
<td>Increased funding to subsidize business R&amp;D.</td>
<td>OCS funding is generally high effective. The question is whether increased funding for the Incubator Programme can compensate for dearth of seed funding from VCs for new start-ups.</td>
</tr>
<tr>
<td>Education policy</td>
<td>The policy to increase accessibility to higher education for Arabs ad ultra-orthodox Jews aims for a dramatic increase in numbers in institutions of higher education.</td>
<td>The main advantage of the programme is that it aims to increase total numbers of people enjoying tertiary education and hence enhance the country's HRST resources. The weakness is in that it has not yet been accompanied by a similarly sweeping programme to improve the quality of primary and secondary education.</td>
</tr>
</tbody>
</table>

Israel's high rate of GERD and very high rate of BERD could not have been achieved without a good university system both for research and training qualified personnel. Unfortunately, the system was neglected for the past decade. The important elements of the new programme are not only higher levels of funding for the entire system, but the changes of the allocation system of block funding and the societal programmes to include more ultra-orthodox Jews and Arab in tertiary education.

The advantage of the programme is that it is bold, ambitious and attempts to redress a broad swath of problems in an inclusive framework. Successful implementation will require a great deal of cooperation between government, Vatat, universities and the respective student and academic staff unions.

Perhaps one of the most significant elements of the new policies is that the growing public awareness of the importance of the knowledge triangle was translated into integrated action by policymakers. For example, the new higher education polices did not only increase budgets but changed the block funding formula to increase the effectiveness of both research and teaching. The increased in funding for innovation, on the other hand, is being overseen by the same group of Finance Ministry executives who are in charge of higher education and research funding, thus ensuring a comprehensive approach towards policy making in the knowledge triangle.
### 4.2 ERA 2020 objectives - a summary

Table 4: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main policy changes</th>
<th>Assessment of national strengths and weaknesses with regard the specific ERA objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers</td>
<td>Increased budgets for universities aim to increase the total number of researchers. As a non member state the target of a single European market for researchers is less relevant.</td>
<td>The programme will add a total of over 1,600 researchers to Israeli universities in new positions and replacement of retirees. Only time will tell if it can redress the brain drain problem towards universities abroad and the country's high tech industries.</td>
</tr>
<tr>
<td>2  Increase public support for research</td>
<td>Major increase in research budgets and budgets to subsidize business R&amp;D.</td>
<td>It was clear the increase was needed. The potential weaknesses of the programmes can only be assessed over time.</td>
</tr>
<tr>
<td>3  Increase European coordination and integration of research funding</td>
<td>Increased participation in programmes such as FP7, EUREKA and others is making Israeli policy making more attuned to changes in European priorities.</td>
<td>The advantages of closer integration with European programmes are evident both in funding and access to research partners. Weaknesses are not apparent yet.</td>
</tr>
<tr>
<td>4  Enhance research capacity across Europe</td>
<td>No policy changes</td>
<td>Participation in FP7 is a broadly acknowledged benefit. Greater participation in ERA-NETs could strengthen weak thematic research infrastructure.</td>
</tr>
<tr>
<td>5  Develop world-class research infrastructures (including e-infrastructures) and ensure access to them</td>
<td>Accession to CERN and participation in ERSF are of critical importunes. The Israeli I-Core centres of excellence are, however, being developed as Israeli, not European platforms.</td>
<td>The total budget available for research infrastructures under the six-year plan have not yet been published and hence it is hard to assess the strengths or weakness of the programme.</td>
</tr>
<tr>
<td>6  Strengthen research institutions, including notably universities</td>
<td>The new six-year plan address issues across the board: research personnel, more budgets for competitive grants, higher bloc funding and a new formula for block funding intended to foster excellence in research.</td>
<td>The strength of the programme is in that it addresses most of the issues that were weakening universities. Its weaknesses cannot yet be assessed.</td>
</tr>
<tr>
<td>7  Improve framework conditions for private investment in R&amp;D</td>
<td>Policy has not changed but budgets have increased.</td>
<td>The OCS framework has proven strengths and success. A possible weakness is in addressing non-ICT arenas.</td>
</tr>
<tr>
<td>8  Promote public-private cooperation and knowledge transfer</td>
<td>Policy has not changed but budgets have increased.</td>
<td>The main strength is that this cooperation is focused in one programme, Magnet which deals with pre-competitive research. The weakness is in that there are other areas of cooperation that could benefit from focused attention.</td>
</tr>
<tr>
<td>ERA objectives</td>
<td>Main policy changes</td>
<td>Assessment of national strengths and weaknesses with regard the specific ERA objective</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9 Elevate knowledge circulation across Europe and beyond</td>
<td>No policy changes</td>
<td>R&amp;D cooperation is a high priority both for universities and for business. The main weakness is relatively weaker business oriented R&amp;D with Europe compared to the US and Far East.</td>
</tr>
<tr>
<td>10 Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world</td>
<td>No policy changes</td>
<td>R&amp;D cooperation is a high priority both for universities and for business. The main weakness is relatively weaker business oriented R&amp;D with Europe compared to the US and Far East.</td>
</tr>
<tr>
<td>11 Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle</td>
<td>No policy changes</td>
<td>Officially Israeli policy is built on a standalone basis. FP7, however, has a profound influence and could serve as the basis for more policy cooperation.</td>
</tr>
<tr>
<td>12 Develop and sustain excellence and overall quality of European research</td>
<td>New Vatat bloc funding formula is intended to prioritize research excellence</td>
<td>Unknown yet</td>
</tr>
<tr>
<td>13 Promote structural change and specialisation towards a more knowledge-intensive economy</td>
<td>No policy changes</td>
<td>Much of the structural changes have been achieved. The challenge is to keep on changing to adopt to new global conditions.</td>
</tr>
<tr>
<td>14 Mobilise research to address major societal challenges and contribute to sustainable development</td>
<td>Some of the new I-Core Centres of Excellence address societal challenges</td>
<td></td>
</tr>
<tr>
<td>15 Build mutual trust between science and society and strengthen scientific evidence for policy making</td>
<td>Surveys show a very high level of trust between society and science</td>
<td></td>
</tr>
</tbody>
</table>

The table above is a fairly good indicator of Israel’s integration into the ERA. As a non-member state the ERA is not an official factor in policy making. However, participation in European programmes, particularly FP7, has a creeping effect. For example, Vatat is now working on a research infrastructures programme that has more than a nodding acquaintance with the equivalent European programme. Integration into the ERA is a work in progress but evidence on the ground suggests that it might be far more advanced than policy makers officially acknowledge. Another example: as far as policy makers are concerned the only priority regarding researcher mobility is to attract expatriate Israeli to return home. But the umbrella of FP7 provides considerably more inward and outward researcher mobility with far fewer headlines and declarations.

Where Israel differs from ERA is in that it has achieved and surpassed the R&D expenditure targets and has to learn how to cope with the vulnerabilities of very high business expenditure on research. However, most Israeli policy makers are not deeply concerned by the drop in BERD caused by the world economic crisis. It is clearly an issue that must be addressed but the tools to address it are budgetary, and
the OCS has a proven track record with the tools judged appropriate to confront the challenge. The big challenge is the six-year programme that is intended to revitalize research in Israeli universities. This programme is too young to be assessed but it is clear to all that much of the country's future well being depends on its success.
References

Economic Models Ltd (2010): Integrating the Arab Sector into the Economy, Characteristics and Barriers.

Note on References: Most of the sources used in compiling this report are in Hebrew, and the translations of the titles are by the authors of this report

List of Abbreviations

BERD Business Expenditures for Research and Development
CERN European Organisation for Nuclear Research
CHE Council For Higher Education
COST European Cooperation in Science and Technology
ERA European Research Area
ERA-NET European Research Area Network
ERP Fund European Recovery Programme Fund
ESA European Space Agency
ESFRI European Strategy Forum on Research Infrastructures
EU European Union