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### ISRAELI GOVERNMENT RESEARCH AND DEVELOPMENT SUBSIDIES TO HIGH TECHNOLOGY COMPANIES

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#### **Introduction**

Israel has a very talented and educated workforce. In order to capitalize on this natural competitive advantage which Israel enjoys, there has been a shift in the Israeli economy towards high-tech industry in recent years. In addition to Israel's large business conglomerates, there has been a tremendous amount of entrepreneurial activity in this field. Manufacturers Association of Israel officials estimate that there are currently about 1100 high-tech “start ups” in Israel.<sup>1</sup> As a consequence, a great deal of industrial research and development (“R&D”) takes place in Israel.

Total Israeli non-military R&D expenditures increased by 32 percent in real terms between 1990 to 1995, and reached \$1.92 billion in 1995, the most recent year for which statistics are available. Expenditures by Israel's business sector accounted for nearly half of this total R&D expenditure, or \$863 million.<sup>2</sup> Of this \$863 million, \$234 million, or 24 percent, was financed by the Israeli government.<sup>3</sup> The main conduit for this funding is the Office of the Chief Scientist (the “OCS”), a division of the Ministry of Industry and Trade. Altogether the OCS budget amounted to \$368.6 million in 1998.<sup>4</sup> This is about \$60 per Israeli citizen, and about \$300 per Israeli family annually.

While Israeli government funding of business sector civilian R&D has existed for decades, and has more than tripled in real terms since 1988, only during the past year has anyone in Israeli policy circles even thought to question the economic logic or necessity of these subsidies. Due to the dearth of private venture capital available for high-tech companies and start-ups prior to the early 1990s, policy experts, business leaders and politicians all assumed that

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these government subsidies were fully justified. To question their utility or necessity was heretical, tantamount to being opposed to high technology, the future of Israel's economy, and even to common sense.

The issue of government industrial R&D subsidies is both significant and interesting from a theoretical economic perspective, as it constitutes an aberration from liberal-classic economic theory. This theory, the intellectual basis for free market capitalism, deals with "price theory and reducing government intervention to a minimum...in order to stimulate economic development and growth,"<sup>5</sup> as it was defined in 1997 by the Gabbai Commission. This Commission was established in 1996 by Avraham "Beige" Shochat and Micha Harish, respectively the ministers of finance and industry and trade at the time, to study a number of the business subsidy and incentive programs implemented by the Ministry of Industry and Trade.

The Gabbai Commission Report continues:

According to [liberal-classic economic theory] government intervention creates in most cases price distortions and economic waste....The approach is that market signals will ultimately bring to optimal allocation in accordance with the individual and national system of preferences.<sup>6</sup>

This *Policy Studies* addresses in five parts the question whether there is any justification to deviate from this classical economic theory when it comes to financing R&D in Israeli high-tech companies. The five parts are: The history and structure of high-tech subsidies in Israel; the recent growth of the private sector high-tech finance industry; analysis of distortions and damages of these subsidies; international comparisons; and finally, conclusions and recommendations.

### **The History of Government Subsidized Industrial R&D in Israel**

The Israeli government's subsidization of scientific and industrial research is closely intertwined with the beginning of the Zionist movement. Many of Israel's current scientific bodies are successors to institutions that the British Mandatory government established. For instance, in 1942 the British established the Scientific Advisory Committee of the Palestine War Supply Board to promote the Allied war effort.<sup>7</sup> After the war this became the Board for Scientific and Industrial Research ("BSIR"), which in January 1949, immediately upon the conclusion of Israel's War of Independence, was reinstated as the Scientific Council under the auspices of the Israeli government.

The Scientific Council, which was headed by Prime Minister David Ben Gurion, had as its main objective the expansion of Israel's institutional scientific infrastructure.<sup>8</sup> In the 1950s and early 1960s the Scientific Council established a number of governmental research laboratories, such as the National Physics Laboratory in 1950, the Israel Institute of Biological Research in 1952, and the Fibers Institute in 1953.<sup>9</sup> The latter, which still exists, is a government funded laboratory intended to strengthen Israel's competitive position in the textile industry.

Having succeeded in establishing a government-centered scientific infrastructure in Israel, the Scientific Council was dissolved in 1959 and was replaced by the National Council for Research and Development (“NCRD”).<sup>10</sup> The NCRD was initially intended to be responsible for the formulation of national policy for scientific research, something that the Scientific Council had not been successful in doing, as well as to coordinate government R&D.<sup>11</sup> In practice however, the NCRD’s main effort was focused on encouraging industrial research.<sup>12</sup>

Until the mid-1960s, almost no civilian business sector R&D was conducted in private industry in Israel. The little that did exist, mostly connected to mineral extraction from the Dead Sea, was not government subsidized.<sup>13</sup> This situation soon changed, however, as a result of the recommendations of the 1966 Kachalsky Commission.

In 1966 Israel’s prime minister, Levi Eshkol, appointed Ephraim Kachalsky (later Katzir), a distinguished biologist and later Israel’s fourth president to head a committee to review the organization and administration of government research.<sup>14</sup> The main recommendations of this important commission, published in December 1968, included increasing the amount of R&D activity performed by the industrial sector.<sup>15</sup> To do this, chief scientist positions were recommended for in the Ministry of Industry and Trade, as well as the ministries of Agriculture, Health and Energy.<sup>16</sup>

It was hoped that these chief scientist positions would coordinate their respective ministry’s activities in R&D. Particularly with regard to the chief scientist’s position in the Ministry of Industry and Trade, the hope was to stimulate applied research by private sector firms.<sup>17</sup> As a consequence, substantially more government funds were available for subsidizing private sector R&D.<sup>18</sup>

In 1967, during the active period of the Kachalsky Commission, and before the chief scientist position had been created, the Ministry of Industry and Trade established the Industrial Research Fund. The objective of this Fund was to subsidize civilian R&D in the industrial sector. Shortly after its creation, the Fund was administered by the newly created chief scientist position.

The Ministry of Industry and Trade had originally intended that its system of R&D subsidies would subsidize R&D equally for all approved projects, without reference to industrial, technological, or product considerations. This policy was short-lived.<sup>19</sup>

In 1976 the Office of the Chief Scientist (OCS) instituted its National Programs scheme. The scheme was open only to large firms that had a track record of success with R&D grants from the OCS, and provided for higher R&D than existing subsidy levels.<sup>20</sup> While the new scheme discriminated among firms it was still neutral with respect to technological field.<sup>21</sup> The National Programs system distributed 30 percent of all annual OCS grants, and was phased out of existence by the early 1980s, in preference of a policy which did not discriminate between specific firms.<sup>22</sup>

In 1984 the Knesset passed the Law for the Encouragement of Industrial Research and Development. Its object was to govern and direct the activities of the OCS. The law sought to encourage and to assist technology-oriented Israeli corporations to invest in R&D projects that were based upon independently developed products and technologies, and to share in the risk of such activities.<sup>23</sup>

In the early 1990s the OCS was a main vehicle in the State's attempt to direct the activities of highly educated Russian immigrants. Several new programs were created, such as a business "incubator" program. The OCS budget rose significantly (see Table 1 below at p. 7).

In addition to augmenting the OCS budget in the early 1990s, the government took other measures to stimulate employment in this period of large scale immigration from the former Soviet Union. One measure was the establishment of Yozma ("initiative") in January 1991, a government-owned venture capital firm run by OCS.

Yozma was supposed to stimulate the creation of venture capital firms in Israel by sharing in their risk at lenient terms. Yozma invested an average of \$7.8 million in 10 Israeli venture capital funds. The government was to be a limited partner in the ventures, and would have no say in the investment decisions made by them. Furthermore, the new ventures had an option to buy out Yozma's stake.<sup>24</sup> This was in contrast with the OCS's historic method of operation whereby the government made the decision as to which companies to fund, and under what terms. The Yozma Fund was privatized by the Israeli government in March 1997, and is currently a privately owned fund.<sup>25</sup>

In December 1996 the Gabbai Commission, the most recent government commission to analyze the subsidization policies of the OCS, submitted its findings to the Minister of Finance and the Minister of Industry and Trade. While the main purpose of this commission was to assess the effectiveness of business subsidies in underdeveloped areas in Israel, as mandated by the Law for the Encouragement of Capital Investment, it also addressed alternative economic intervention tools, including the OCS. The commission members seemed particularly impressed with Magnet, the OCS generic, pre-commercial R&D development program. On the whole, while the commission members did not especially single out the OCS for praise, they also did not question its role.<sup>26</sup>

In the spring of 1998 a brief yet unprecedented public debate took place on the editorial pages of Israel's leading newspapers about the role of the OCS. The debate was triggered by the question whether the OCS would receive additional funding that year. Officials from the OCS, joined by leading high-tech industry figures and some business journalists, vehemently justified the activities of the OCS.<sup>27</sup> Other skeptics of the OCS, including senior Finance Ministry officials, posed biting questions about aspects of the program.<sup>28</sup> In the course of this debate, David Milgrom, the director of the Finance Ministry's budget department, referred to the OCS as the "best bank in the country."<sup>29</sup> Milgrom added, "The governmental system of R&D support is giving away money...which creates an ever increasing amount of demand."<sup>30</sup>

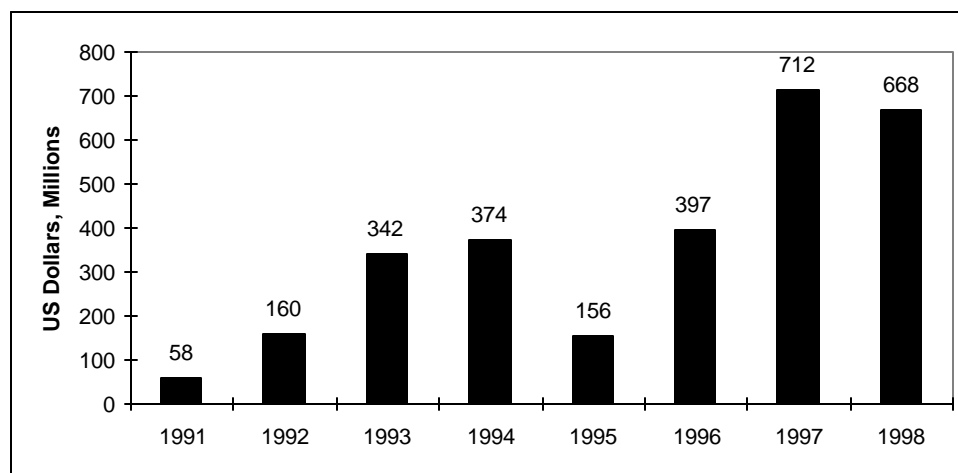
## The Growth of the Venture Capital Industry in Israel

During the past decade a great deal of money has become available to finance Israeli high technology start-ups and established companies. Barely existing at the beginning of the 1990s, the venture capital industry has grown exponentially. According to a survey of the Israeli venture capital industry by Giza Investment Management, as of the beginning of 1999 there were 88 separate venture capital funds operating in Israel.<sup>31</sup> Israel figures prominently in the world of venture capital, and according to a recent survey by Venture One, an American research firm, is the most popular foreign country in the world for them to invest.<sup>32</sup>

As shown in Figure 1 below, the private venture capital funds in Israel raised a cumulative total of \$2.865 billion between the years 1991-1998. By the end of 1998 they had invested \$1.721 billion, or 60 percent of this amount, in high-tech start-ups, and had a remaining \$1.144 billion available to invest.

Figure 1

### Funds Raised by Year by Private Sector High-Tech Venture Capital Firms in Israel, 1991- 1998



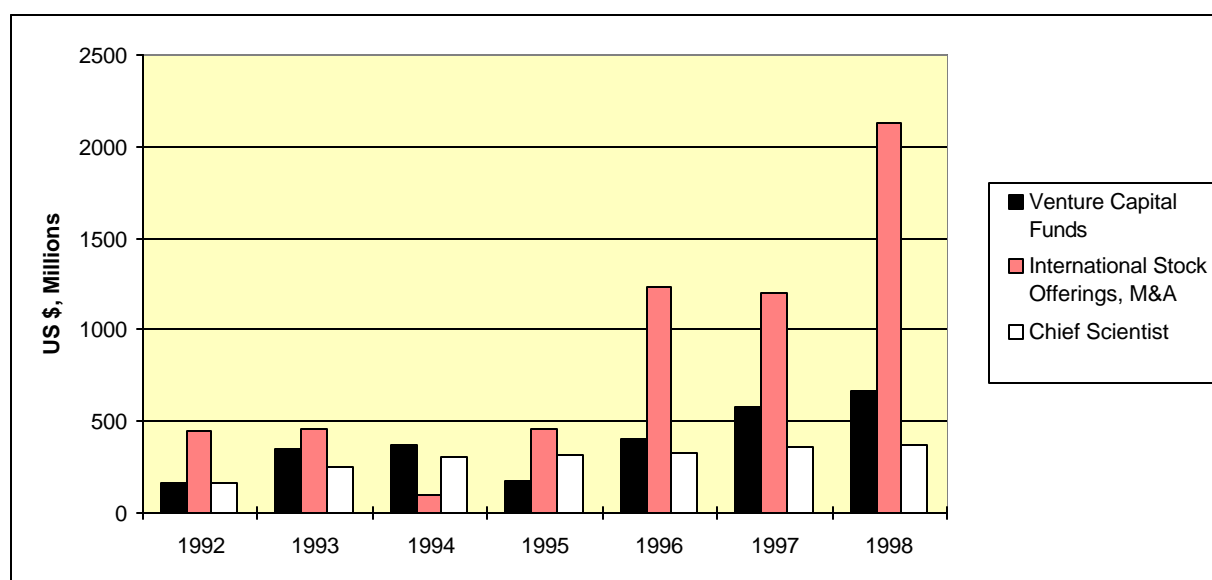
Source: Allon Reiter and Yishai Klein, "The Israeli Venture Capital Industry Review," in *Israel Venture Association 1999 Yearbook*, ed. Giza Group (Tel Aviv: Israel Venture Association, 1999), p. 110.

In addition to the venture capital industry, another source of income for high technology companies, albeit for far more established ones, is public offerings from foreign, primarily U.S. stock exchanges. Between 1993 and 1998, a total of 122 such offerings were made, raising a total of \$3.904 billion.<sup>33</sup> In 1998 alone, Israeli companies raised \$628 million in this manner.<sup>34</sup> Merger and acquisition transactions (M&As), however, have proven to be the largest source of funding for Israeli high-tech companies. In 1998 Israeli firms received \$1.5 billion through M&As.<sup>35</sup>

Figure 2 below shows that during the past six years, public offerings and M&As have been a far greater source of funding for Israeli high-tech companies than the OCS.

**Figure 2**

**Comparison of Sources of R&D Funding for Israeli High-Tech Companies, 1992-1998**



Source: Office of the Chief Scientist, *Survey of Industrial Research and Development in Israel* (Jerusalem: Ministry of Industry and Trade, 1997), p. 9. [Hebrew]; Allon Reiter and Yishai Klein, "The Israeli Venture Capital Industry Review," in *Israel Venture Association 1999 Yearbook*, ed. Giza Group (Tel Aviv: Israel Venture Association, 1999), pp. 109, 113.

### The OCS – Office of the Chief Scientist

The OCS is the second largest component of the Ministry of Industry and Trade. Only the benefits program provided by the Law for the Encouragement of Capital Investment is larger. In 1997 the OCS budget comprised 30 percent of the ministry's budget.<sup>36</sup> Table 1 below shows the changes in the OCS budget during the past decade.<sup>37</sup> These budget figures do not include the administrative expenses of the OCS staff, as these expenditures are considered part of the overall budget of the Ministry of Industry and Trade.

**Table 1**

**Total Annual Expenditures of the Office of the Chief Scientist  
1988 – 1998 (1999 prices, \$ millions)**

<b>Year</b>	<b>Total OCS Budget</b>	<b>% Change From Previous Year</b>
1988	149.3	
1989	151.5	+1
1990	160.5	+6
1991	147.0	-8
1992	169.1	+14
1993	253.2	+50
1994	309.4	+22
1995	321.9	+4
1996	326.0	+1
1997	365.1	+12
1998	368.6	+6
<b>Total Increase</b>	<b>+\$195.1</b>	<b>+159%</b>

Source: Ministry of Finance, *Proposed Budget for the Ministry of Industry and Trade 1988-1999* (Jerusalem: Ministry of Finance, 1987-1998). [Hebrew]; Lydia Lazanes, director of budget department, Office of the Chief Scientist, interview with the author, June 14, 1999.

The OCS headquarters are in Jerusalem, although some of its programs, including the incubator program, Magnet, and the bi-national investment funds, are based in Tel Aviv. The OCS altogether has about 40 employees, divided into departments. Interestingly, the OCS is on the forefront of privatization in Israel's public sector, as several of its key departments, such as the department responsible for collecting royalties, have been out-sourced to private companies.

It is important to understand the process by which applicants receive funding from the OCS in order to understand the inherent problems of a bureaucratic process driven by budget concerns and not by economic and business realities. The process is as follows. First a prospective grantee they must fill out the OCS application forms, which deal with the technological, economic and budgetary aspects of the project.<sup>38</sup> Then a professional reviewer from the private sector prepares an evaluation of the proposed project.

Next, the application is submitted to the Research Committee for final decision. This Committee has 12-15 members, including the chief scientist, the two deputy chief scientists, other senior OCS employees, as well as representatives of the private sector.<sup>39</sup> Altogether the funding process takes 2-3

months, depending on the workload of the OCS. Funding for multi-year projects must be resubmitted to the Research Committee each year for the life of the project in order to receive funding.

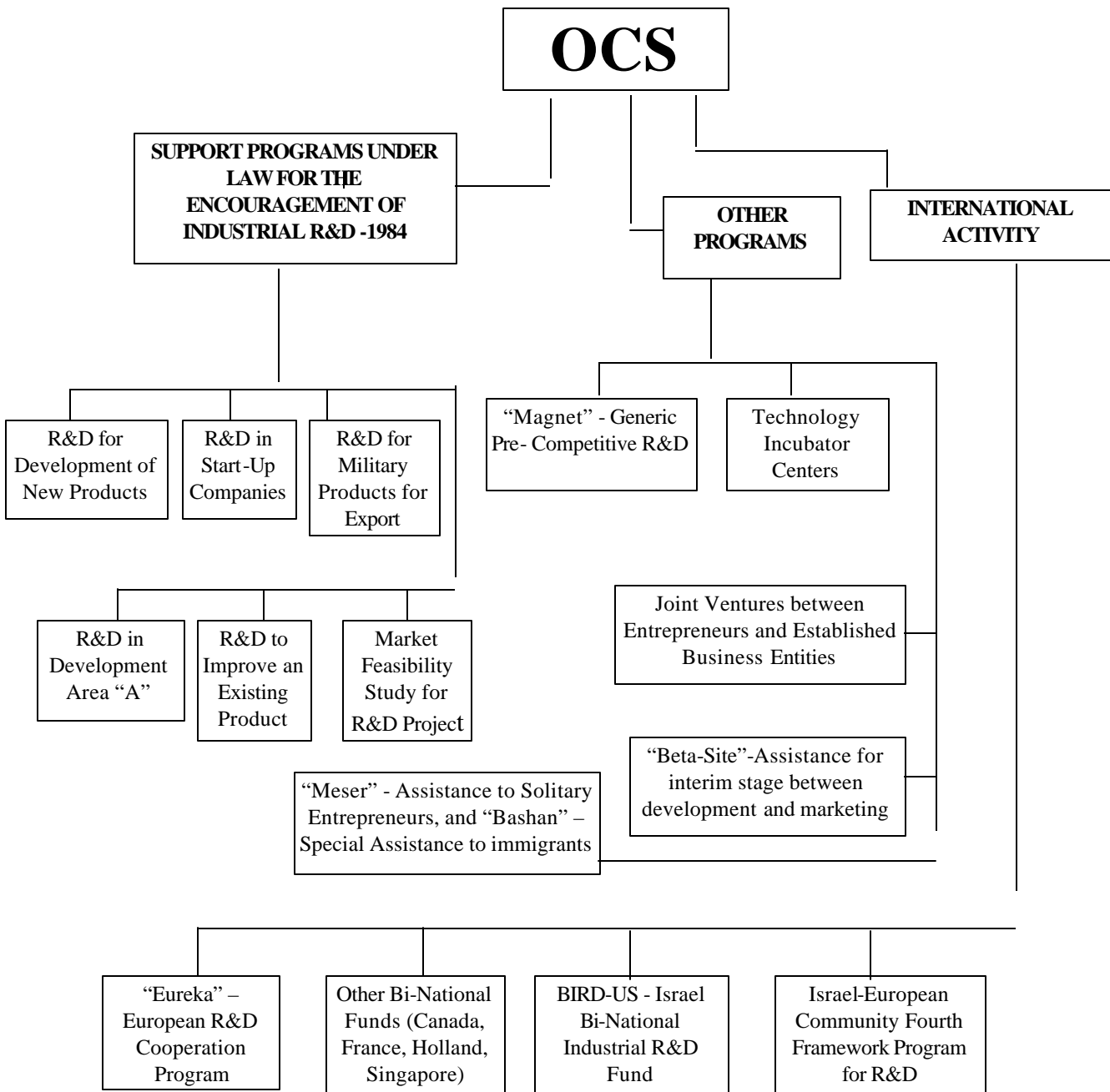
Companies which receive R&D funding from the OCS are required to pay royalty payments if the R&D they conduct with government funds are successful and result in the sales of commercial products. Royalties are a percentage of sales: 3 percent for the first three years, 4 percent for years 4-6, and 5 percent from the seventh year onward.<sup>40</sup> The Law for the Encouragement of Research and Development stipulates that the royalties received will not go into the general revenues of the Treasury, but rather will be reinvested by the OCS.<sup>41</sup> The maximum amount of royalties that must be paid back to the OCS is 100 percent of the grant, in inflation adjusted terms. However, this amount can increase to 300 percent if all or a portion of the production rights of the subject of the government-financed R&D are transferred abroad.<sup>42</sup>

The possibility always exists that grant recipients from the OCS will blur their sales accounting procedure in order to minimize the amount of royalties they have to repay. While this would be difficult for start-up companies to do, as they typically have only one product, it is much easier for larger companies, which have revenues from several different products. Moshe Bardugo, the OCS official responsible for royalty collection, when interviewed, explained that the policy of the OCS is to presume that companies correctly report the amount of royalties that they owe. However, if the OCS suspects that particular companies are underreporting, then the OCS has the ability to conduct audits of recipient companies. Mr. Bardugo estimated that the OCS conducts about 30 audits a year of companies that receive grants from the OCS. These audits, he said, “nearly always show insufficient royalty payment by the recipient companies.”<sup>43</sup>

As shown in Figure 3 below, the Office of the Chief Scientist has a number of different means at its disposal by which to subsidize high-tech companies in Israel. Some are purely domestic programs, while others are in conjunction with other countries. A brief explanation of the main OCS R&D grant programs are described in brief in Appendix 1.

Figure 3

Diagram of Office of the Chief Scientist Benefits Programs



Source: Adaptation of data from Office of the Chief Scientist, *The Encouragement of Industrial Research and Development – Guidelines for the Entrepreneur and Developing Enterprise* (Tel Aviv: Matimop, 1996).

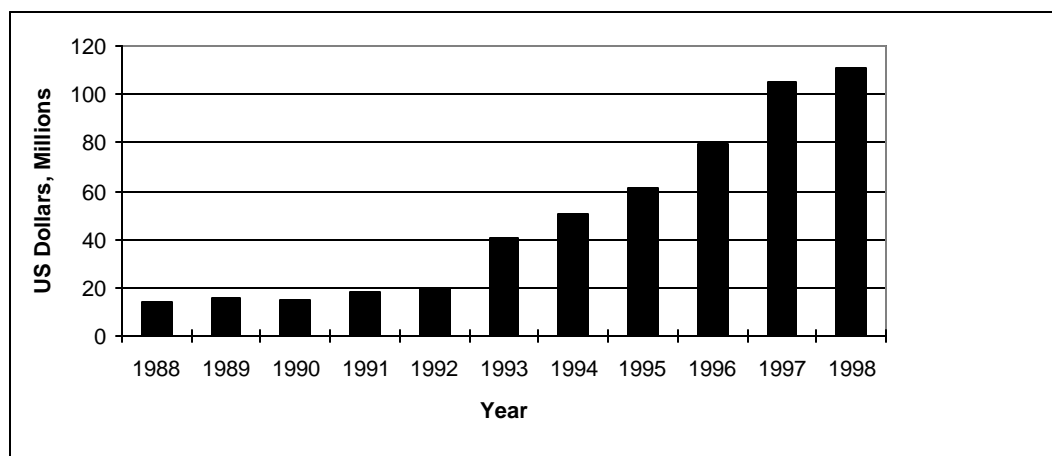
The following sections will review the preceding points to examine the question whether the OCS is necessary and to analyze its efficiency.

### Negative OCS Rate of Return on Investment

As can be seen in Figure 4, the OCS has succeeded in recent years in collecting steadily increasing amounts of royalties from its grants. The \$110.6 million in royalties which the OCS received in royalties in 1998 amounted to 30 percent of its \$368.6 million in expenditures in that year.<sup>44</sup> This is a misleading comparison, however, as it gives the impression that what is being compared is annual budget with annual return on investment. This is not the case. To estimate the average annual OCS return on investment, one must divide the accumulated total of all OCS royalties received since the beginning of the program with the accumulated budgets of the OCS since its creation.

Figure 4

OCS Annual R&D Royalty Revenues, 1988 – 1998  
(1999 prices, \$ millions)



Source: Source: Ministry of Finance, *Proposed Budget for the Ministry of Industry and Trade 1988-1999* (Jerusalem: Ministry of Finance, 1987-1998). [Hebrew]; Lydia Lazanes, director of budget department, Office of the Chief Scientist, interview with the author, June 14, 1999.

Unfortunately, the OCS does not officially calculate the annual rate of return on each company it invests in, or the cumulative annual rate of return on all of its investments. This is because the OCS claims that it has not yet developed the software to permit tracking the approximately 3,500 grants over the past 25 years.

**Table 2**  
**Cumulative OCS Expenditures and Royalties, 1968-1998**  
**(1999 prices, \$ millions)**

<b>Year</b>	<b>OCS Expenditure</b>	<b>OCS Royalties Received</b>
1968	2.14	
1969	7.5	
1970	9.5	
1971	7.8	
1972	9.6	
1973	14.36	
1974	15.2	
1975	19.0	
1976	50.9	
1977	42.0	
1978	47.7	.20
1979	51.2	.72
1980	56.8	1.05
1981	82.1	.95
1982	95.1	1.63
1983	103.8	2.21
1984	121.0	3.03
1985	98.3	3.84
1986	151.2	7.39
1987	154.5	7.32
1988	149.3	13.76
1989	151.5	15.51
1990	160.5	15.23
1991	147.0	18.60
1992	169.1	20.18
1993	253.2	40.31
1994	309.4	50.72
1995	321.9	61.05
1996	326.0	79.67
1997	365.1	104.72
1998	368.6	110.6
<b>Total</b>	<b>\$3,861,200,000</b>	<b>\$558,990,000</b>

Source: Ministry of Finance, *Proposed Budget for the Ministry of Industry and Trade 1968-1999* (Jerusalem: Ministry of Finance). [Hebrew]; Lydia Lazanes, director of budget department, Office of the Chief Scientist, interview with the author, June 14, 1999.

The reader should note in Table 2, that since the beginning of the OCS program in 1968, the OCS has spent \$3.86 billion. Against this expenditure the OCS has collected \$558.7 million in royalties. In other words, as of 1998 the OCS has been able to collect only \$0.14 in return for every dollar that it spent. This is a 30-year cumulative loss of \$3.3 billion in Israeli taxpayer money, or 86 percent of the funds that it has expended.

However, the finding is to be qualified by the fact that investments in high-tech typically do not bear fruit for at least two years, often much longer. It is possible that future OCS royalties will be significantly larger than they are today. This would lower the OCS loss of \$3.3 billion. Yet, in a 30-year review of OCS activities, it is indisputable that the ratio between OCS royalties received and OCS funds expended is extremely low.

**Distorted Allocation of OCS Budget Between Start-Up and Established Companies**

While the OCS is closely associated with start-up companies, it should be borne in mind that most OCS grants do not go to start-ups. As can be seen in Table 3, 39.2 percent of all OCS approved grants, a sum amounting to \$157 million, went to its 24 largest recipients in 1998. While the percentage of the OCS grants allocated to these companies has steadily decreased during the past five years, this is still a great deal of taxpayer money.

**Table 3**

**Amount and Percentage of OCS Grants Allocated to OCS's  
24 Largest Recipients  
1993-1998 (1999 prices, \$ millions)**

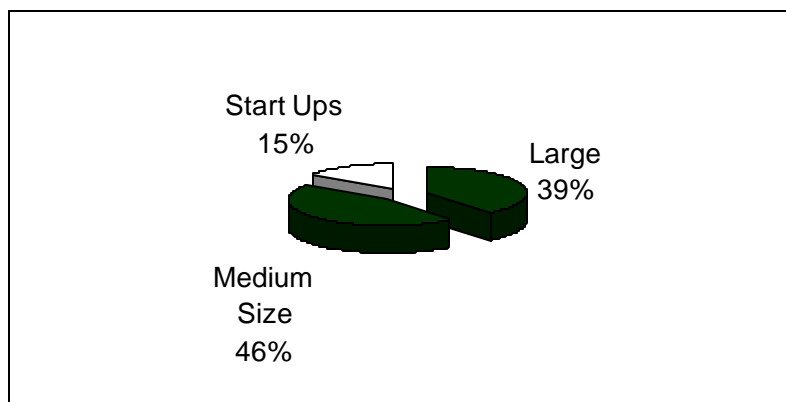
<b>Year</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>
<b>Amount (\$ millions)</b>	124	136.5	144	149	161	157
<b>% of Total OCS Grants</b>	50.7%	42%	41.6%	42.8%	40.5%	39.2%

Source: Adaptation of data from Ministry of Industry and Trade, *Background Information for the 1999 Budget* (Jerusalem: Ministry of Industry and Trade, 1998) p. 21. [Hebrew]; Office of the Chief Scientist, "1998 Activities Data" (Jerusalem: Office of the Chief Scientist, 1999, unpublished document), p. 5. [Hebrew]

In addition, (see Figure 5) another 45.8 percent of its grants were allocated to medium-size corporations, many of which are also publicly-traded companies or are concurrently receiving funds from private sector venture capital funds. Only 15 percent of OCS grants in 1998 went to start-up corporations, and even among this group, many are concurrently receiving funding from private sources.<sup>45</sup>

**Figure 5**

**1998 Allocation of OCS Grants by Size of Recipient Company**



Source: Office of the Chief Scientist, “1998 Activities Data” (Jerusalem: Office of the Chief Scientist, 1999, unpublished document), p. 5. [Hebrew]

Of the 24 largest recipients of OCS largesse, many of which are listed in Table 4 below, almost all publicly-traded, either directly or through their parent companies, and are nearly all among the 150 largest corporations in Israel.<sup>46</sup> As Table 4 shows with regard to a number of the largest OCS grant recipients, these grants comprise up to 327 percent of these companies’ pre-tax corporate profits.

It is not known exactly how much of the OCS budget actually goes to start-up companies. However, a close approximation can be made. While in 1998 the OCS approved \$400 million in grants to companies of all sizes,<sup>47</sup> the actual expenditures of the OCS in 1998 was \$368.6 million,<sup>48</sup> or 7.9 percent less than this amount. Of the \$400 million in grants approved by the OCS in 1998, \$60 million, or 15 percent of this amount, was allocated to start-up companies.<sup>49</sup> Assuming that the 7.9 percent gap between OCS grants approved and OCS grants exercised is constant among the companies receiving these grants, one should reduce the \$60 million amount by 7.9 percent, which would leave the amount of \$55.3 million. Assuming this is the amount the OCS allocated to start-up companies in 1998, it allocated a further \$313.3 million, or 85 percent of its budget, to medium and large size corporations.

The Chief Scientist’s activities raise several questions. The OCS annual \$368.6 million budget are public, taxpayer funds being allocated to private, for-profit businesses. On the one hand, when dealing with publicly-traded companies (e.g., the very profitable Teva Pharmaceutical Industries) the OCS R&D subsidies essentially serve to enrich their shareholders. The question must be asked: why is Teva deserving of a taxpayer-financed government handout? On the other hand, when dealing with start-ups, these OCS R&D subsidies serve to benefit highly educated entrepreneurs and scientists, people who in most cases could easily find high-tech jobs in the private sector at more than double the average national salary.

**Table 4**  
**1997 OCS Grants to Some of Israel's Largest Corporations,**  
**as a Percentage of Their Pre-Tax Annual Profits**  
**(\$ Millions)**

Company	1997 Revenues	1997 Corporate Profits, Pre-tax	Amount Received From OCS in 1997	OCS Grant as Percentage of Corporate Profits	Royalties Paid in 1997	Royalties Paid as a Percentage of Revenues
<b>E.C.I. Telecom</b>	\$677.74	\$132.44	\$18.33	13.8%	\$9.05	1.3%
<b>Teledata Communications</b>	\$84.15	\$14.99	\$2.1	14%	\$1.95	2.3%
<b>Motorola Israel</b>	\$946.1	*	\$10.93	*	\$4.74	0.5%
<b>Telrad Communications</b>	\$469.9	**	\$ 8.51	**	\$4.82	1.0%
<b>Scitex</b>	\$679.42	\$4.85	\$ 9.58	198%	\$3.07	0.5%
<b>Elscint+Elscintek Ltd.</b>	\$304.67	\$1.91	\$ 6.25	327%	\$4.40	1.4%
<b>Teva Pharmaceutical Industries</b>	\$1,123.08	\$140.36	\$ 6.19	4.4%	\$0.87	0.07%
<b>Efrat Future Technology</b>	\$136	***	\$14.15	***	\$4.79	3.5%
<b>Tadiran Communications</b>	\$444.01	\$23.86	\$15.76	66.1%	\$7.63	1.7%
<b>Orbotech</b>	\$190.80	\$34.61	\$ 5.43	15.7%	\$2.66	1.4%
<b>Indigo</b>	\$107.85	-\$56.47	\$ 7.95	---	\$1.09	1.0%
<b>Agan Chemical Manufacturers</b>	\$371.64	\$33.35	\$ 1.61	4.8%	\$0.44	0.1%
<b>Bromine Compounds Ltd.</b>	\$496.09	\$60.81	\$ 1.45	2.4%	\$1.30	0.2%

**Notes:**

\* Motorola Israel is a subsidiary of Motorola U.S.A., a publicly-traded U.S. company, and does not disclose profits for its Israeli subsidiary.

\*\*Telrad is a privately owned company, and does not disclose the amount of its profits.

\*\*\*Efrat Future Technology is a subsidiary of Comverse Technology Inc., a publicly-traded U.S. company, and does not disclose its profits.

Sources: Office of the Chief Scientist, "Analysis of Performance of the 24 Largest Companies" (Jerusalem: Office of the Chief Scientist, 1998, unpublished document). [Hebrew]; 1997 corporate financial reports for each company.

### **OCS Flawed Rationale for Investment in Initial Stage Start-Ups**

The Office of the Chief Scientist's rationale to justify its estimated \$55.3 million financial assistance to high-tech start-ups is that the government must provide financing because the private sector will not.<sup>50</sup> This rationale, often repeated by Dr. Orna Berry, the current Chief Scientist, as well as others,<sup>51</sup> is misconceived.

Why should private sector investors, in Israel or anywhere else, not invest in start-up businesses? Berry's reasoning is flawed. According to the very nature of capitalism, lenders take risks in order to reap rewards. The goal of investors is to make a profit with as little risk as possible. It is unreasonable to suppose the investment community collectively refuses to invest in ideas at the business plan stage.

Taking Berry's argument at face value, one would have to conclude that either all possible initial-stage investments are bad (an unlikely hypothesis), or the government's intervention makes this market less attractive. Indeed, the facts suggest that there is no basis for the argument that the government is needed to support Israeli start-ups and that if there is a dearth of venture capital it is due to a government program providing monies to start-ups without the financial rewards and punishments of the marketplace. According to a study by Kesselman and Kesselman, an Israeli accounting firm, in 1998 alone, venture capitalists provided \$26.6 million in initial financing for Israeli start-ups, despite the readily available OCS funding for this purpose.<sup>52</sup> While this \$26.6 million comprises only 5 percent of total investments by venture capitalists in 1998,<sup>53</sup> it does show that venture capitalists are willing to assume the responsibilities that the OCS has taken upon itself.

In comparison, venture capital investment in initial stage start-ups in California's Silicon Valley are higher. According to investment bankers who work there, venture capitalists, either operating institutionally or as individual "angel" investors,<sup>54</sup> often invest in business ideas at the business plan stage, and sometimes even before the idea is put on paper. For example, Pamela Lynch of Associated Venture Investors of Los Altos, California, said her firm has made numerous investments at the business plan stage. The amounts range from \$500,000 to \$5 million.<sup>55</sup> Similarly, Judy Ward of the respected Kleiner Perkins Caufield and Byers firm of Menlo Park and San Francisco, California, reported that her firm regularly invests in business ideas at the business plan stage, and sometimes at just the executive summary stage. The amounts range from \$1 million to \$10 million.<sup>56</sup>

In addition to providing money, Kleiner Perkins even provides free office space to entrepreneurs, at no cost to the American taxpayer.<sup>57</sup> Once the entrepreneur has a prepared business plan to show, Kleiner Perkins may invest in it. If not, the entrepreneur is free to negotiate with the multitude of competing venture capitalists who are active in Silicon Valley and elsewhere in America. The Mayfield Fund, another venture capital firm in Silicon Valley, has a similar business incubator program, as do several large American corporations, such as Xerox.<sup>58</sup> Indeed, the growing interest in

low-level start-up investing by individual “angel” investors provides sufficient proof that the private sector is more than capable of financing worthwhile start-ups.

As can be seen from this brief survey of the private sector investment environment in United States, as well in Israel itself today, market forces are capable of providing capital for initial stage start up companies. There is no need for the Israeli government to involve itself in this activity.

### **OCS Exacerbates Skilled Labor Shortage in High-Tech Industries**

While the OCS finances R&D projects in Israel’s high-tech sector, thus creating taxpayer subsidized jobs for Israeli skilled professionals, it is not clear that this is even necessary from an employment perspective. According to a recent study, Israel’s high-tech sector has 3500 positions for electrical engineers and computer scientists that it cannot fill.<sup>59</sup>

Unfortunately, the OCS has never made an official estimate of how many people are employed through the R&D projects it subsidizes. Upon request, however, OCS officials did provide the formula shown below to help people calculate a rough estimate of this amount.<sup>60</sup>

$$\#EPC = \{(0.9B) - [(0.45)(0.9B)]\} / [(3500)(12)]$$

where EPC = employee positions created  
and B = Annual OCS budget

The OCS explanation for this formula is as follows: 90 percent of OCS grants are for salaries, with the remaining 10 percent for equipment. Forty-five percent of the amount for salaries is consumed by administrative overhead on a project; the average monthly salary of employees on OCS-funded R&D projects is \$3,500.00.<sup>61</sup>

Using this formula to estimate the number of employee positions created by the \$368.6 million in R&D subsidies which the OCS made in 1998, one reaches the estimate of 4,350 people. This is an amount larger than the labor shortage in this field. Granted, not all of the high- tech positions funded by the OCS directly contribute to the labor shortage in this sector, as not all of the OCS-subsidized workers would be desirable as employees without the OCS subsidy. Nevertheless, it is plain that the OCS subsidies create imbalance between supply and demand for skilled labor in this field in Israel. This has the inevitable effect of driving up salaries, and making Israeli companies less competitive internationally as a consequence.

### **Lenient OCS Repayment Terms an Attraction to Corporate Borrowers**

One reason that OCS R&D funding is so appealing to Israeli entrepreneurs and established businesses is that its terms are so lenient. While venture capitalists and investment bankers require recipient companies to surrender equity in their company in order to receive funding, the OCS requires no surrender of equity, but rather only lenient royalty repayments on no-risk terms. Consequently, if the

OCS-financed R&D project fails, the company that received the funding pays back nothing, even if it has plenty of cash on hand from its other business activities. The OCS loses all of its investment. However, if the OCS-funded project succeeds, the company only has to repay royalties to the OCS at a rate of 3-6 percent of gross sales from the project per year, up to repayment of the original R&D grant. Yet, in the high- tech world a new product may generate high revenues for only three or four years, and then become obsolete, and have no more sales. Under the Chief Scientist’s system of repayment, with its low annual royalty repayment levels, in many cases only a fraction of the government’s outlay is recovered.

**Economic Waste in OCS’s Budget Driven Funding Process**

From telephone interviews conducted in August 1998 with representatives of a number of venture capital firms in California’s Silicon Valley, it turns out that only about 2 percent of applications for funding receive favorable responses.<sup>62</sup> An entrepreneur can significantly improve his chances of funding by making the same application to a large number of venture capital firms, in the hope that the criteria for funding vary between them. Nevertheless, even taking this into account, in the absence of government R&D financing, only about 5 percent of business proposals receive private sector funding. Thus, the private-sector, driven by the profit-motive, carefully weighs start-up risk against the potential for profits.

In contrast, the OCS rate of approval for funding requests is about 1500 percent higher than the private sector. This is because the OCS approval process is budget driven, and not project- or profit-driven, as in the private sector. Table 5 shows the OCS has approved over 75 percent of the requests that have been made to it for funding during the past five years.

**Table 5**

**OCS Rate of Approval for R&D Funding Requests, 1993-1998**

Year	Number of Applications for Funding to the OCS	Number of Applications for Funding Which Were Accepted	Acceptance Percentage Rate
1993	1513	1055	70%
1994	1583	1276	81%
1995	1553	1220	79%
1996	1378	1072	78%
1997	1311	1007	77%
1998	1298	995	77%

Source: Office of the Chief Scientist, “Committee Approvals” (Jerusalem: Office of the Chief Scientist, 1998, unpublished document). [Hebrew]; Dr. Orna Berry, “Office of the Chief Scientist,” in *Israel Venture Association 1999 Yearbook*, ed. Giza Group (Tel Aviv: Israel Venture Association, 1999), p. 100.

The reason why there is such an enormous gap between the OCS’s funding approval rate and that of the private sector venture capital industry is because while the venture capitalists are accountable to their investors for their funding decisions, the government workers at the OCS are not accountable for the bottom-line of its investments. OCS officials know that they are not going to lose their jobs if their funding decisions prove to be unsuccessful, and thus have no incentive to be as diligent in their work as their private sector counterparts. The only pressure that the OCS officials seem to be under is to distribute their entire government budget, even if there is a decline in interest by the private sector in receiving the money. Indeed, when in 1999 the OCS was faced with a 25% decline in funding requests by start-up companies, Dr. Orna Berry, the OCS Chief Scientist, petitioned the Ministry of Finance to be allowed to increase funding to large companies, so as to eliminate any possible OCS budget surplus.

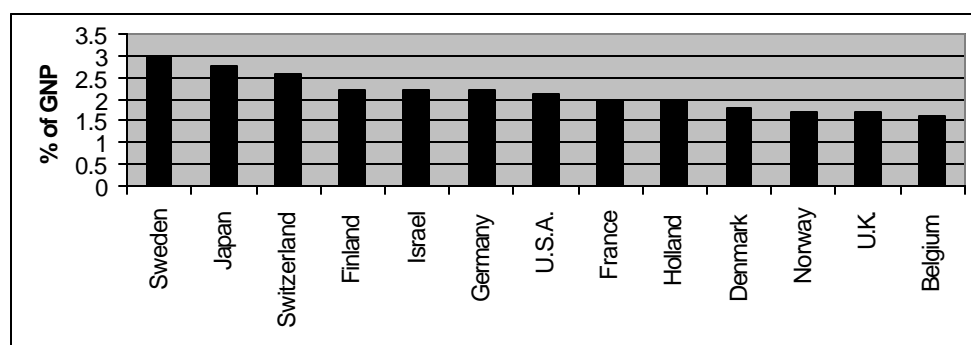
63

### International Comparisons

Figure 6 below shows how Israel invests a significant percentage of its GNP in civilian R&D, and is among the leaders in this field among OECD countries. While this fact speaks well, it is not sufficient to convey the entire truth. What is important is to show how the *funding* of this R&D in Israel, particularly in the business sector, differs from OECD countries.

Figure 6

**Expenditure on Civilian R&D as a Percentage of GNP in Israel and OECD Countries, 1995**



Source: Central Bureau of Statistics, *National Expenditure on Civilian Research and Development 1989-1997* (Jerusalem: Central Bureau of Statistics, 1998), p. 56.

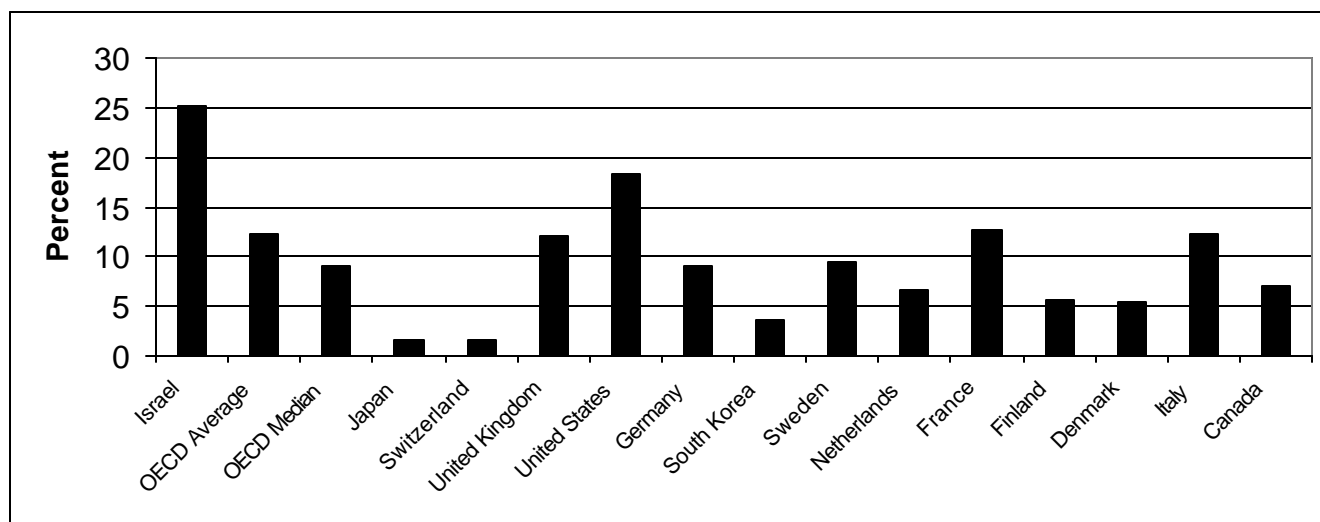
As shown in Figure 7 below, the Israeli government subsidizes Israel’s business sector R&D at the highest level. In fact, at 25.2 percent, the Israeli government’s business R&D subsidy level is higher than all OECD countries, and nearly *triple* the median OECD level of 9 percent. Even more significant is the fact that, at 1.6 and 1.7 percent respectively, the level of business R&D funding by the

government in Japan and Switzerland, two of the most prosperous high-tech countries in the world is less than 1/15<sup>th</sup> the level of Israel.

While the United States business R&D subsidy level, at 18 percent, appears to be relatively high, it should be borne in mind that nearly all of this amount is accounted for by tax credits, and not actual government expenditures, as is the case in Israel. Under the Tax Reform Act of 1986 and other Federal legislation, the U.S. tax code provides for a 20 percent tax credit for increases in R&D expenditures.<sup>64</sup> No such R&D tax credits exist under Israeli tax law.

**Figure 7**

**Comparison of Percentage of Business Sector R&D Financed  
by the Israeli Government and OECD Countries**



Source: Central Bureau of Statistics, *National Expenditure on Civilian Research and Development 1989-1997* (Jerusalem: Central Bureau of Statistics, 1998), p. 81.

**Conclusion and Recommendations**

This paper has shown that the venture capital industry in Israel is mature and fully capable of financing promising start-ups. It has also shown how a significant percentage of the OCS budget does not go to start-ups at all, but rather to established companies. Further, it has made the point that Israel's business R&D subsidy levels are as much as 15 times higher than those in other advanced Western industrialized countries. Finally, it has uncovered sufficient facts to suggest that that the OCS liberally dispenses the taxpayer funds entrusted to it without proper screening of the companies that apply for grants.

Market signals are fully capable of structuring the Israeli economy. If Israeli companies cannot compete with companies in other countries as a place in which to manufacture high-tech products based on technology developed in Israel, then they will either have to lower their cost structure, become more innovative, or go out of business. As shown by all the wealth generated by Israeli high-tech inventor-entrepreneurs, such as the founders of Checkpoint and Mirabilis, two legendary Israeli start-ups, there are great opportunities in Israel in the luxury services sector.

Contrary to the thinking of high-tech and start-up enthusiasts, not every idea is worthy of being funded. In fact, there is a great opportunity-cost loss associated with funding mediocre or poor ideas, as it leaves fewer resources available for good ideas. When too many ideas receive funding, including weak ideas, financial and human resources are siphoned away from businesses with a stronger chance of succeeding. The private sector, on the other hand, is able to painstakingly screen ideas, and elaborately fund those which are good. Aspiring entrepreneurs whose ideas weren't accepted will have to work for someone else, and try to improve their business idea in their spare time.

Most damaging and disheartening is the wasteful and unnecessary expenditure of the taxpayer's money. A ministry budget allocation should not be a license to give away money to industrial fat-cats or to highly-sought after and highly-paid high-tech specialists. If the taxpayers wish to invest in Israeli high-tech, let them do so by their own choosing, not by bureaucratic fiat.

In conclusion, there is no need for the Israeli government to be in the business of providing R&D subsidies to Israeli high-tech companies, whatever their size. Israel is fortunate in the fact that it can be handled by the private sector. The OCS can be closed, and any future royalties that are owed to the OCS can be put directly into the Israeli Treasury. The savings can then be used to reduce the tax rates in Israel. This is the surest way to ensure sustainable growth in the Israeli economy in general, and the high technology sector in particular.

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**Appendix 1**

**Main Paths for Support of the Office of the Chief Scientist**

No.	Path	Amount of Aid (as % of Total R&D Program Budget)	Comments
1.	“Regular” R&D Program for an Existing Company	50%	Development of a new product intended for export
2.	R&D Program in a “Start Up” Company	66%	Maximum assistance \$335,000 over two years
3.	R&D Program in Development Area “A”	60%	Most of the work on Development Area “A” R&D Projects must take place in the Development Area.
4.	Improving a Civilian Product	30%	
5.	Development of Products for Military Use	30% -40%	Development Area “A” - 40% Rest of Country - 30%
6.	Transfer Stage between R&D and Market (Beta Site)	30% -50%	Small Corporation - 50% Medium-Sized Corporation – 30%
7.	Generic R&D, “Magnet” Program	66% -80%	Magnet grantees are exempt from royalty payments
8.	Joint Ventures Between Entrepreneurs and Established Business Entities	66%	Up to \$400,000 assistance over two years.
9.	Support of Entrepreneurship in Technological Incubators	66%	Maximum assistance \$255,000 over two years.
10.	Commercial Feasibility Study, Business Plan	50-66%	Assistance of up to \$20,000 for a Feasibility Study, and up to \$3300 for a Business Plan.

Source: Ministry of Industry and Trade, *Government Encouragement for Industrial Research and Development* (Jerusalem: Ministry of Industry and Trade, 1998).

## NOTES

<sup>1</sup> Yehoshua Abromovich, Manufacturers Association of Israel chief economist, interview with the author, June 27, 1999.

<sup>2</sup> Central Bureau of Statistics, *Statistical Abstract of Israel 1998* (Jerusalem: Central Bureau of Statistics, 1999), p. 23-4.

<sup>3</sup> Ibid.

<sup>4</sup> Lydia Lazanes, director of the budget department at the Office of the Chief Scientist, interview with the author, June 14, 1999.

<sup>5</sup> Ministry of Finance, *Report of the Commission to Assess the Law for the Encouragement of Capital Investment and Alternative Intervention Tools* (the "Gabbai Commission"), (Jerusalem: Ministry of Finance, 1996), p. 12. [Hebrew]

<sup>6</sup> Ibid.

<sup>7</sup> Ministry of Science and Development, *Scientific Research in Israel* (Jerusalem: Ministry of Science and Development, 1988), p. 30.

<sup>8</sup> Ibid., p. 31.

<sup>9</sup> Alex Keynan, *Science and Israel's Future* (Jerusalem: Israel Academy of Sciences and Humanities, The Jerusalem Institute for Israel Studies, 1988), p.15.

<sup>10</sup> Ibid., p.16.

<sup>11</sup> Ibid.

<sup>12</sup> Morris Teubal, *Neutrality in Science Policy: The Promotion of Sophisticated Industrial Technology in Israel* (Jerusalem: The Maurice Falk Institute for Economic Research in Israel, 1983), p. 180.

<sup>13</sup> Ibid., p. 181.

<sup>14</sup> Keynan, *Science and Israel's Future*, p. 17.

<sup>15</sup> Ministry of Science and Development, *Scientific Research in Israel*, p. 32.

<sup>16</sup> Office of the Prime Minister, *Report of the Committee to Inspect the Organization of Governmental Research and its Management* (the "Kachalsky Commission"), (Jerusalem: Office of the Prime Minister, 1968).

<sup>17</sup> Keynan, *Science and Israel's Future*, p. 17.

<sup>18</sup> Ibid., p. 18.

<sup>19</sup> Teubal, *Neutrality in Science Policy*, p. 188.

<sup>20</sup> Ibid.

<sup>21</sup> Ibid.

<sup>22</sup> Ibid., p. 190.

<sup>23</sup> *Law for the Encouragement of Research and Development in Industry (5744-1984)*, Sections 1-2; Office of the Chief Scientist, *Government Encouragement for Industrial Research and Development in Israel* (Jerusalem: Ministry of Industry and Trade, 1997), p. 12.

<sup>24</sup> *Ha'aretz*, February 5, 1998.

<sup>25</sup> Ibid.

<sup>26</sup> Gabbai Commission, *Report*, p. 8.

<sup>27</sup> See *Globes*, April 16, 1998 and June 5, 1998.

<sup>28</sup> See *Ha'aretz*, April 15, 1998.

<sup>29</sup> *Ha'aretz*, May 22, 1998.

<sup>30</sup> Ibid.

<sup>31</sup> Allon Reiter and Yishai Klein, "The Israeli Venture Capital Industry Review," in *Israel Venture Association 1999 Yearbook*, ed. Giza Group (Tel Aviv: Israel Venture Association, 1999), p. 109.

<sup>32</sup> *Ha'aretz*, March 1, 1998.

<sup>33</sup> Reiter and Klein, "Venture Capital Industry Review," p. 113.

<sup>34</sup> Ibid.

<sup>35</sup> Ibid.

<sup>36</sup> Ministry of Finance, *Proposed 1998 Budget for the Ministry of Industry and Trade* (Jerusalem: Ministry of Finance, 1997), p. 23. [Hebrew]

<sup>37</sup> For the years 1987-1990 in this table, the year in question is not the January - December calendar year, but rather the March 31-March 31 fiscal year then in use. When the Ministry of Finance decided in 1991

to convert its fiscal year to the calendar year, it implemented a special nine month, March 31-December 31 fiscal year in 1991 in order to enable the transition.

<sup>38</sup> Office of the Chief Scientist, *The Encouragement of Industrial R&D – Guidelines for the Entrepreneur and Developing Enterprises* (Tel Aviv: Matimop, 1996), p. B-2.

<sup>39</sup> Office of the Chief Scientist employee, interview with author, Jerusalem, July 26, 1998. [Name withheld upon request.]

<sup>40</sup> *Regulations for the Encouragement of Research and Development in Industry (Rate of Royalties and Guidelines for Paying Them)* (5756-1996), Section 2(E). [Hebrew].

<sup>41</sup> *Law for the Encouragement of Research and Development in Industry* (5744 – 1984), Section 21(B). [Hebrew]

<sup>42</sup> Office of the Chief Scientist, *The Encouragement of Industrial R&D*, p. B-2.

<sup>43</sup> Moshe Bardugo, Office of the Chief Scientist, interview with the author, Jerusalem, January 13, 1999.

<sup>44</sup> Ministry of Finance, *Proposed Israeli Government Budget for the Ministry of Industry and Trade 1988-1999* (Jerusalem: Ministry of Finance, 1987-1998). [Hebrew]

<sup>45</sup> Ministry of Industry and Trade, *Background Information for the 1999 Budget* (Jerusalem: Ministry of Industry and Trade, 1998), p. 21. [Hebrew]

<sup>46</sup> Dun & Bradstreet, *Dunsguide 15,000* (Tel Aviv: Dun & Bradstreet, 1998), pp. 7-10. [Hebrew]

<sup>47</sup> Office of the Chief Scientist, “1998 Activities Data” (Jerusalem, Office of the Chief Scientist, 1999, unpublished document), p. 1. [Hebrew]

<sup>48</sup> Ministry of Finance, *Proposed 1999 Israeli Government Budget for the Ministry of Industry and Trade* (Jerusalem: Ministry of Finance, 1998), p. 23. [Hebrew]

<sup>49</sup> Ministry of Industry and Trade, *Background Information*, p. 21.

<sup>50</sup> *Ha'aretz*, May 26, 1998, quoting OCS Chief Scientist Dr. Orna Berry.

<sup>51</sup> *Ibid.*

<sup>52</sup> Yossi Fellus and Dani Maor, “Money Tree Survey – Where Did Venture Capital Funds Invest in 1998?” in *Israel Venture Association 1999 Yearbook*, ed. Giza Group (Tel Aviv: Israel Venture Association, 1999), p. 118.

<sup>53</sup> *Ibid.*

<sup>54</sup> See, e.g., Mary Beth Grover, "Angel in the Valley," *Forbes*, November 2, 1998, 184-193. Northern California groups such as the "Band of Angels" and Silicon Valley's "Angels Forum" have funded some prominent start-ups, and the Internet-based, virtual incubator and early-stage investing vehicle "Garage.com" is itself a venture-backed start-up. See, Lisa Branson, "Apple Veteran Tries to Match Entrepreneurs with Investors," *The Wall Street Journal*, May 14, 1998.

<sup>55</sup> Pamela Lynch, Associated Venture Investments, Los Altos, CA, telephone conversation with the author, July 1, 1998.

<sup>56</sup> Judy Ward, Kleiner Perkins Caufield and Byers, Menlo Park, CA, telephone conversation with the author, July 1, 1998.

<sup>57</sup> *Ibid.*

<sup>58</sup> *New York Times Magazine*, March 1, 1998.

<sup>59</sup> David Cohen and Ilana Shalev, *The Shortage of Electrical Engineers and Computer Science Graduates in Companies Affiliated with the Electronics Industry Association* (Technion City: The S. Neaman Institute for Advanced Studies in Science and Technology, 1997), p. 4. [Hebrew]

<sup>60</sup> Office of the Chief Scientist employee, interview with the author, Jerusalem, December 2, 1998. [Name withheld upon request.]

<sup>61</sup> *Ibid.*

<sup>62</sup> Cathy Loudon of Kleiner Perkins Caufield and Byers, Menlo Park, CA, and Mara Colligan of Associated Venture Investors, Los Altos, CA, telephone conversations with the author, August 12, 1998.

<sup>63</sup> "Contrary to Estimates: NIS 100-200 Million Budget Surplus in R&D Assistance Fund," *Arena*, June 10, 1999, <[www.globes.co.il/cgi-bin/Serve\\_Archive\\_Arena/pages/English/1.3.1.2/19990610/1](http://www.globes.co.il/cgi-bin/Serve_Archive_Arena/pages/English/1.3.1.2/19990610/1)>

<sup>64</sup> William McCuthchen, Jr., "Estimating the Impact of the R&D Tax Credit on Strategic Groups in the Pharmaceutical Industry," *Research Policy* 22 (1993): 337-351.

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