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**IS VENTURE CAPITAL SPECIAL? EMPIRICAL EVIDENCE  
FROM A GOVERNMENT INITIATED VENTURE CAPITAL MARKET**  
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# Is Venture Capital Special?

Empirical Evidence from a Government initiated Venture Capital Market

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# Is Venture Capital Special?

## Empirical Evidence from a Government initiated Venture Capital Market

### ABSTRACT

The financing extended by venture capital funds is examined in this paper, using a unique database that includes information about *all* the firms in the portfolio of *all* the Israeli venture capital funds in 1997–2000, and data on a control group of firms that were not backed by venture capital funds but were supported by Israeli investment companies (financial intermediaries with different characteristics) specializing in the high-tech industry.

The first part of the paper describes the venture capital (VC) market in Israel initiated by a large scale government support at the beginning of the 1990s. This VC market evolved to an entirely private market with a very high level of international standards, resembling those of the US market. The data provide quite unique insights on the VC industry: most of the venture capital funds tend to invest (also or only) in the initial stages of a firm's life; there is considerable involvement of banks—both Israeli and foreign—in the funds; the proportion of companies backed by VC funds that succeeded in reaching exit stage is significantly lower in Israel than in the US—apparently also because of the relative youth of the Israeli funds.

In the second part of the paper I examine three main questions: In which firms do VC funds invest, or in other words – do they screen projects? Do companies backed by venture funds succeed more than others? Which financing characteristics of venture capital influence the success of companies? The papers results support the view that venture capital is indeed 'special,' and that firms backed by it succeed more than others in terms of the chances of reaching an exit stage. The results indicate that what makes the funds special appears to derive from their monitoring after the investment has been made, as well as from their reputation, which sends a positive signal to the market about the firms they support. I find evidence that the funds also screen projects before deciding to invest, but it is not that screening that affects the firms' success.

The unique feature of the VC market in Israel is that it was created as a result of the initiative and direct involvement of the government. Such government support can also lead to distortions. Nevertheless, the general conclusion of the paper is that despite the government's involvement, the corporate governance mechanisms that developed are seemlier to those that exist in countries where the market developed by the private sector.

Key words: Venture capital, R&D, corporate governance, investment banking, government support.

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## 1. INTRODUCTION

In the last few decades much has been written about banks, and it has been claimed that they are ‘special’ and enable projects to be financed that would not otherwise be implemented, even though they are economically worthwhile (because of the existence of asymmetric information). Nevertheless, empirical evidence shows that there is a segment of companies in which banks (and especially ‘anonymous’ capital markets) tend not to invest; these are firms with particularly high asymmetry of information because they are very young, operate in new and highly uncertain environment, and have a large share of non-tangible assets (start-ups).<sup>1</sup> The need of these companies for finance has led to the creation of venture capital funds, which stressed their ability to solve these firms’ problems of asymmetric information. Apart from the readiness of VC funds to finance the activities of start-ups their uniqueness was also expressed in the results of the financing: empirical evidence from the US indicates that the performance of companies backed by VC is better than that of companies without it, at least in the case of companies that are publicly traded (Brav and Gompers, 1997). The existence of spillover effects from the activities of start-ups (R&D) and findings of this kind, led the public sector in some countries—including Israel—to support the VC market in various ways.<sup>2</sup>

In this paper I focus on the question whether venture capital is special and what makes it so. Attention is paid to examining whether and how the funds manage to solve the asymmetric information problems. Various studies, primarily in the US, have tried to answer

<sup>1</sup> Alternatively, start-ups can be defined as companies that manufacture knowledge and do not sell products (based on that knowledge).

<sup>2</sup> For evidence of the existence of spillover effects from investment in R&D in manufacturing in Israel, see Bar Eliezer and Bregman, 2001.

similar questions in different ways. The current paper differs from existing literature in several respects: first, it uses a unique database that includes information on start-ups which are still private—at their initial stage, when some of them are backed by VC and some are not. This database makes it possible to address the question of whether VC funds screen firms in advance, and in what way the financing they extend is unique. Other studies have focused on later stages in the life of companies—after they have gone public. (For Israel see Blass and Yosha, 2001; Locomat, 2001).<sup>3</sup> Secondly, the present paper focuses on a VC market that began with an extent government involvement that was unparalleled world-wide, and which—after less than ten years of very rapid growth—is comprised entirely of private funds and money. Government involvement in venture capital was and still is prevalent in various countries (e.g., the US and the UK), but in these countries it was only partial, focusing on certain areas in which a specific market failure (mainly geographical) was identified. Israel is the only place in the world where the VC market was created by an active government involvement and support, and this raises the question of whether this market has nevertheless evolved in the same way as it has in countries where the industry began as a private initiative.

What distinguishes venture capital funds? The literature that has emerged in the last two decades<sup>4</sup> notes two stages in their activity. At the first stage, when funds focus on screening specific projects, and at the second stage – when they monitor the firms constantly. Firms are also screened to some extent by banks and other financial intermediaries, such as investment companies. Although it has been claimed that VC funds do this differently, there is no

<sup>3</sup> Blass and Yosha examined the R&D financing patterns of manufacturing and software firms traded on the stock market in Israel and the US, and Locomat analyzed the effect of venture capital funds on the stock return of firms which went public on the New York stock market.

empirical evidence for this. The monitoring process, which is also performed by banks and investment companies, appears to be implemented more intensively by the funds, including active involvement in managing the firm—*inter alia* via membership at the board of directors.<sup>5</sup> At this stage, the interaction between the VC fund and the firm in which it has invested also includes guidance by persons with technological, managerial, and financial expertise. The ownership composition of the funds—which includes *inter alia* institutional investors, banks, and private investors—enables them to help the firms they support to raise capital at advanced stages of their activity, especially that of the initial public offerings (IPOs). In general, it would seem that in view of the similarity that appears to exist between the activities of banks, investment companies, and VC funds, the funds’ uniqueness—if it exists—is expressed primarily in the mechanisms they use. As stated, the present paper focuses on the attempt to understand what these mechanisms are.

The importance of start-up companies for various economies has intensified greatly in the last decade. In Israel, too, in the last few years start-ups have made a significant contribution to economic growth. In 2000, when GDP growth soared, about half of the increase was attributed to the activity of start-ups,<sup>6</sup> which were mostly supported by VC funds. An analysis of the characteristics of venture capital is also important for understanding the effects of the slowdown in the funds’ ability to raise capital on the activity of start-ups.

The database on which this paper is based comprises all the start-ups in the portfolio of all Israeli VC funds in 1997–2000.<sup>7</sup> The information includes *inter alia* data about the sphere in

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<sup>4</sup> Much of this literature is summed up in Gompers and Lerner, 1999.

<sup>5</sup> In some countries, e.g., Germany, banks may also be members of a company’s board of directors.

<sup>6</sup> The effect of start-ups on GDP in Israel is examined in the memo of Friedman and Frisch, 2001.

<sup>7</sup> Those years, in which the venture capital industry became established in Israel, were characterized by a boom in capital markets all over the world, and in the US in particular. A trend reversal in the

which each firm operates and its status by mid-2001, i.e., whether it went public on a stock market, was sold, merged with another company, closed, or had not reached any of those stages. Because most of those companies are private, this information is not available to the general public, and was gathered primarily from reports of the Israel Venture Capital Association (IVA), to which all the Israeli VC funds report. The database also includes information about the funds that invested in these start-ups. Alongside these data, information was collected for a control group of about 200 companies that were not supported by an Israeli VC fund and raised capital from Israeli investment companies. These investment companies are financial intermediaries that have different characteristics than those of VC's. The IVA also collects information about them once they are identified as specializing in the high-tech industry.

After examining the characteristics of the VC market, in order to ascertain whether venture capital is special, I first estimate in which firms VC funds invest, then I estimate the probability of a firm reaching exit stage testing to see if it had received venture capital or not. The third stage of the paper focuses just on companies that received venture capital, and examines which mechanisms or characteristics of venture capital affect the success of start-ups.

The results are striking and show that venture capital is indeed special: funds screen projects—choosing those that appear *ex-ante* to have the highest chances of succeeding, and also monitor the companies in which they have decided to invest, by providing the finance in stages and supervising them constantly. As a result, the companies that receive venture

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capital markets, as has been evident since 2000:IV, directly affects the venture capital funds' sources of finance, and may also the mechanisms of those that are studied here. It is still too early to determine whether this is in fact the case, and the present paper does not investigate those changes.

capital have the greatest chance of reaching exit. The attempt to identify which of the actions taken by the funds causes the success of the firms they support indicates that this lies less in the initial screening process than in the support and supervision extended once it has been decided to back a firm, i.e., in the monitoring process. The paper also shows that the funds' reputation, and their need to establish it in order to continue raising capital, also has a positive effect on the chances of success of the firms they support.

The data provide quite unique insights on the VC market in Israel: A large proportion of the funds invest (only or also) in the early stages of a firm's life, which are the most risky. The ownership characteristics of the funds indicate that there is fairly high involvement by banks (as limited partners) in funds. Israeli banks are partners in 12 percent of the funds, and foreign banks have a 16 percent share in them, indicating that the banks as classic financial intermediaries are unable or unwilling to finance the activities of start-ups directly, preferring to benefit from the unique nature of the VC funds and finance these activities indirectly.

The rest of the paper is organized as follows: the second section describes the VC market in Israel today, and its development in the last decade. The data set and its limitations are described in the third section. The fourth section presents an attempt to examine in which firms VC funds invest, and what is the influence of the latter on the success of the former. The fifth section contains an estimation of the effect of venture capital's characteristics on the success of the companies, and the sixth section concludes.

## 2. THE VENTURE CAPITAL MARKET IN ISRAEL



*a. The public sectors' contribution to the development of the market*

In contrast with venture capital markets elsewhere, Israel's VC market was created as a result of the initiative and direct involvement of the government. Following the Research and Development Law that had been passed in 1985, a public committee had recommended various ways of encouraging venture capital in order to boost economic growth in general, and the high-tech industry in particular (Securities Authority, 1989). The committee stressed that government support for the VC industry should have two aims—to make it easier to obtain finance for VC investment, and to create the conditions for the development of a VC market, specializing primarily in managing investment and encouraging the participation of specialized financial entities. In this context, it was decided in 1991 to support the establishment of VC funds that would undertake and manage investments in R&D; this would be achieved by providing government guarantees for the purchase of shares in funds via the “Inbal” government insurance company.<sup>8</sup> In this framework, three VC funds were founded in 1991–93, whose investments were guaranteed by the state.<sup>9</sup> At the next stage, in 1992, at the initiative of the Ministry of Commerce and Industry, the “Yozma” government VC fund was set up in order to establish VC funds in cooperation with private foreign investors, and was allocated equity of \$ 100 million. Until its dissolution, the fund, which was set up for a limited period of seven years, supported the establishment of ten private VC management funds,<sup>10</sup> which together had raised capital of \$ 2.7 billion by 2000. Concurrent

<sup>8</sup> “Inbal” undertook to buy the shares of any investor in an approved venture capital fund should he or she wish to sell them, at an agreed date and at a price equal to a given percentage of the purchase price.

<sup>9</sup> The funds guaranteed by “Inbal” were Teuza, Marathon, and Poraz. In return for government support, various restrictions were imposed on these funds as regards the nature of the investment and the amount of money they could invest.

<sup>10</sup> The management funds established by Yozma and the capital raised by each one by the end of 2000 were as follows: Polaris (\$ 700 million), Star (\$ 600 million), Concorde (\$ 270 million), JVP (\$ 255 million), Gemini (\$ 250 million), Vertex (\$ 200 million), Walden (\$ 150 million), Inventech (\$ 100

with this direct involvement, in the 1990s the government acted to foster the VC industry by extending direct assistance to R&D (Table 1).

The public sector's involvement in VC market existed and still exists in various countries, albeit directed to specific niches, and especially to geographical areas where venture capital has not developed (see Harrison and Mason, 2000). Thus, in both the US and the UK, where venture capital was concentrated in the major centers and equity gaps were identified, the decision of the public sector to get involved was made in order to reduce the market imperfections that existed. Various strategies were employed, e.g., increasing the yield to investors by granting tax concessions or capital grants, or by reducing costs. In some cases governments extended indirect and partial support to private VC funds, and the experience of the US and the UK (Doran and Bannock, 2000) as well as Scotland (Hood, 2000) has shown that the performance of government-sponsored VC funds was on equal with that of private funds without such sponsorship.

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million), Medica (\$ 70 million), Eurofund (\$ 72 million). The capital of these management funds was invested via some 24 venture capital funds.

**Table 1**  
**Direct and Indirect Public-Sector Support for the Development of the Venture Capital Market in Israel**

<b>Year</b>	<b>Program</b>	<b>Details</b>
1985	R&D Law	It was decided to extend aid to 50% of commercial R&D, according to criteria of innovativeness, commercial potential, etc.
1991	Government guarantees extended to investors in approved venture capital funds via “Inbal” insurance company.	It was decided that Inbal (a government company) would guarantee the shares in venture capital funds investing in R&D projects. Three VC funds were then set up. In 1994 Inbal ceased supporting the funds.
1991	Technological incubator project founded.	Incubators were set up to support projects in their first two years (pre-seed). The support was financial and mainly managerial (guidance, legal aid, etc.). By 2001, 24 incubators had been set up, comprising 600 projects.
1992	Yozma VC fund established.	With the support of the Chief Scientist, a VC fund was set up and allocated \$ 100 million. Its aim was to enroll experienced foreign investors and together with them establish VC funds that would invest in start-ups. The fund was set up for a period of 7 years. By 2001, 10 VC funds had been established under the aegis of Yozma and in conjunction with foreign investors, and had together raised capital of \$ 2.7 billion, which was (or will be) invested in start-ups.
1993	Magnet program: support for generic industries.	Support for a consortium of firms together with academic institutions in order to encourage cooperation and extend spillover effects.

Source: Based on data in M. Trajtenberg, 2000.

Government support for VC can also lead to distortions. Thus, for example, a situation could arise in which the supply of government sources led to investment in companies that

are not economically viable, or that the public sources will crowd out private ones (Lach, 2000).<sup>11</sup> Conflicts of interest could also arise between the social objectives of the public sector supporting the funds and the economic objectives of venture capital activity. In these respects, it appears that the decision of the Israeli government to support the establishment of funds that would raise capital from the *public* served to minimize the distortions which its involvement could have created.

***b. The structure of Israel's venture capital market in mid-2000***

As described above, government involvement in the VC market in Israel led to the rapid development of a large market which is today comprised entirely of private entities. By mid-2000 Israel's VC funds—which are registered with the Registrar of Companies—managed capital of \$ 5 billion via 62 management companies managing 97 funds (Table 2). Despite the large number of funds, the market is characterized by a relatively high level of concentration, with the five largest funds managing about 25 percent of the industry's capital. The sources raised by the funds in 2000 amounted to 3 percent of GDP—a particularly high rate comparing to other countries (in the US, for example, it was 0.7 percent of GDP at that time).

*Spheres of investment:* the companies in the funds' portfolio were divided into 33 areas of activity (see appendix). Most of the funds invest in more than 4 spheres of activity, i.e., they are not highly focused.

<sup>11</sup> Lach (2000) presents the effect of subsidies granted by the Ministry of Commerce to R&D in Israel on expenditure on R&D, and shows that a \$ 1 increase in R&D subsidy led to a \$ 1.4 rise in R&D expenditure, i.e., the government subsidy did not crowd out private money.

*Stages of investment:* the funds divide the life of a firm into several stages: the initial stage—which includes incubation, seed, and start-up—and later stages, i.e., expansion, an intermediate stage, and bridging. Half of the funds invest in all the stages of a start-up's life. About 35 funds (36 percent) invest only in the initial stage (14 of them also in the very first incubation stage). Altogether, it would seem that most of the funds invest also or only in the initial stages of companies, when uncertainty is at its highest. (It is possible that at a time of crisis in the capital markets, as is currently the case, the funds change this investment strategy).

*Type of finance:* the funds can invest in a firm by buying shares (capital investment), purchasing convertible bonds, or extending loans. Almost all the funds choose to invest via capital and convertible bonds, and just a few funds also extend loans to the companies in their portfolio.

*Ownership of funds:* most of the funds are privately owned (95 percent of all the funds), and only five percent are publicly owned (their shares are traded on the stock exchange). Many of the funds (25 percent) were established by Yozma fund. The data also show that there is relatively high involvement of banks (as limited partners) in funds; an Israeli or foreign bank is involved in about 30 percent of the funds. Since banks do not directly finance firms at these stages (by extending credit), this indirect involvement via VC funds has increased the sources of finance available to these firms.

**Table 2**  
**The Israeli Venture Capital Fund Market in Mid-2000**

	Total	Equity (\$ million)		
		Average	Minimum	Maximum
Fund management comps.	62	81	10	577
Employees	360	-	-	-
Venture capital funds	97	54	4	577
No. of firms in funds' portfolio	503	-	-	-
<b><i>a. Spheres of investment/focus</i></b>				
Invest in four or fewer spheres	25 (27%)	55	11	225
Invest in more than four spheres	67 (73%)	76	4	577
<i>Of which</i> Invest in medical spheres	40	44	7	125
<b><i>b. Stages of investment</i></b>				
Early stages only	35 (37%)	33	4	100
<i>Of which</i> Incubation stage	14	32	7	90
Later stages only	6 (6%)	48	8	140
All stages	53 (56%)	69	10	577
<b><i>c. Type of finance</i></b>				
Invest only in capital	40 (45%)	65	8	577
Invest in capital and convertible bonds	47(53%)	48	4	150
Invest in capital and loans	2 (2%)	14	7	21
<b><i>d. Ownership of funds</i></b>				
1. Publicly traded	5 (5%)	37	22	68
1. Other	92 (95%)	54	4	577
2. Linked to "Yozma"	24 (25%)	76	15	577
2. Other	73 (75%)	47	4	225
3. Israeli bank involved	16 (16%)	68	14	225
3. Foreign bank involved	12 (12%)	74	20	160

Israeli venture capital funds are registered with Israel's Registrar of Companies. The figures in parentheses denote the percentage of all funds (or of those for which the data is relevant).

*The structure of the funds' activity in Israel* is almost identical with that in the US. The Israeli funds were set up for a limited period of seven years (as compared with ten years in the US), at the end of which they are liquidated (although the management funds may continue functioning). During this period they invest in firms in order to bring them to a stage where they can realize their investment (henceforth, exit). In other words, the activity of the funds—from the time the firms are selected and throughout the stage of investment in them—is undertaken for one purpose. Because the lifetime of each fund is limited, the management fund tend to open a new one every three years. The funds are set up as limited partnerships so that the capitalists (limited partners) are not involved in the current activity of the fund, and just receive periodic statements. The payment to the managers of the VC funds is usually divided into two: current annual payment as a percentage of the fund's capital (which in Israel is 2–2.5 percent), and a percentage of the yield on successful investments (20–25 percent), which is usually received only after the initial capital has been repaid to the capitalists (i.e., not at the first exit).

### 3. THE DATABASE

#### *a. Sources of the data*

The database which was constructed for the paper includes information about all the start-ups in the portfolio of all the Israeli VC funds between 1997 and mid-2000, as well as data on the VC funds that invested in those firms. The funds' portfolio comprised some 500 firms in those years (on average more than one fund invest in each firm), and with time the

number of Israeli funds increased, as did the number of firms in their portfolio. The database also included a control group of 200 firms that were in the portfolio of Israeli investment companies. Most of the data—for both companies receiving venture capital and those supported by investment companies—was obtained from annual reports of the IVA, which has been collecting these data on a quarterly basis since the beginning of 1997.<sup>12</sup>

Some firms in the database ‘disappeared’ from the funds’ and investment companies’ portfolio over the years—because they reached an exit stage, whether as a sale, merger, or flotation, or because they ceased functioning. A very small number was ‘dropped’ even though their activity continued (this kind of exit is executed by selling the shares to another investor).

The data was constructed at the following way: we began by ‘taking a snapshot’ of the composition of the Israeli venture capital funds’ and investment companies’ portfolio in mid-2000. After that we examined which firms were in the portfolio of the funds and investment companies in 1997–99 but not in mid-2000, and we added them to the database. This gave us the funds’ entire portfolio in 1997–2000, as well as the entire portfolio of the investment companies specializing in the high-tech sphere. This solved the problem of selection created by the removal of some of the companies from the funds’ portfolio during the period. The status of the companies (private, post-exit, or those whose activity ceased) was updated to the beginning of 2001, i.e., we added information up to then on issues, sales, mergers, and cessation of activity of firms in the portfolio of the funds and the investment companies.

<sup>12</sup> Every quarter the IVA sends out a questionnaire to all the Israeli funds and requests information on the firms in which they have invested, the amount raised at that time by the company from all sources of



The data on the start-ups include the year in which they were founded, the three-digit industry to which they belong (according to 33 categories), the number of employees in each firm, its status, and the names of the Israeli VC funds that invested in it. For some firms there was information about the number of times capital was raised, the amount raised each time, and the firm's value before the capital was obtained and on the basis of which the investment was made. The data on the VC funds include, in addition to data on the firms in which they invested, the year in which the fund was established, its equity, area of specialization, number of employees, restrictions on the extent of investment (minimum and maximum) in a firm, and the number of firms in its portfolio.

***b. The control group***

As stated, in order to examine whether and to what extent venture capital is special, we use data on a control group of firms that were backed by Israeli investment companies. These companies invest in start-ups in order to diversify their portfolio, realize their investment, and generate profits. Notwithstanding, in contrast with the VC funds, the structure of their activity does not distinguish between management and ownership of funds, they usually have less equity, and are not set up for a limited period. Furthermore, investment companies are characterized by greater flexibility in their investments, unlike VC funds, which have a limiting contract with the capitalists (the limited partners).<sup>13</sup> Nonetheless, the literature on agency problems stresses the value of restrictions in creating optimal contracts.

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finance, the industry to which the company belongs, and the value of the start-up when the fund invested in it. The IVA also collects data about the funds themselves.

<sup>13</sup> The contract between a capitalist and a management fund usually determine *inter alia* a limit to the amount to be invested in one firm, in order to reduce risk (increase diversity), the fund's specialization as regards the stages of the life of the firms in which the money is invested (early, late, etc.), and

The control group comprised some 180 firms backed by 32 Israeli investment companies identified by the IVA as specializing in investment in high-tech firms. Some of the investment companies are sponsored by large corporations (Clal, Poalim, Discount, Rafael); 14 of them report on the capital they manage, \$ 28 million (the median of the sample)—less than the capital managed by the VC funds, and each portfolio contains about 9 firms (the median of the sample).

*c. Limitations of the sample*

*It includes only Israeli venture capital funds:* As stated, the data reflect the entire portfolio of Israeli VC funds. However, since the mid-1990s foreign VC funds have also been active in Israel's VC market, and the database does not include data for them. If there is a difference between Israeli and foreign VC funds as regards methods and expertise, the results below cannot be regarded as comprehensive. Nevertheless, the almost exact imitation of the American VC industry by the domestic market, with respect to working arrangements and the structure of funds (as described above), and the fact that most of the money in the Israeli funds originates from foreign investors, supports the hypothesis that there is no substantial difference between the activities of the foreign and Israeli funds.

*The capital market boom:* The sample applies to a period when global capital markets were booming (in part, this may have been a bubble), and does not include a period of slump. The evidence indicates that one of the factors affecting the timing of a firm's exit is the state of the capital market (Lerner, 1994), hence, some of the results may be derived from the unique nature of the period taken, and could change during a slump. It would be

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geographical specialization, as well as restrictions on the frequency with which the management

interesting, therefore, to widen the sample at a later stage and examine the functioning of venture capital during a capital market slump.

*Selection?* The database includes information on firms that were backed by VC funds as well as on others that received finance from investment companies. Start-ups may also obtain finance directly from private investors (known as angels) and banks (though these tend to feature less prominently). As stated, the literature on the relative advantages of VC funds stresses their ability to screen projects in advance. This advantage of funds will be compared with investment companies which, as financial intermediaries, raise sources and invest them in various firms in order to eventually realize their investment. If, however, both the VC funds and the investment companies undertake more stringent screening than banks or private investors, the group of firms in the database is not completely representative. However, one of the main aims of the paper is to examine the differences between the firms that were selected by the VC funds, in order to identify the characteristics of VC that lead to their success. In an analysis of this kind the problem of selection does not exist. If the results show that there is a connection between *specific* characteristics of venture capital and the fact that *some* of the firms in the portfolio succeeded and others did not, it will not be possible to link this to the initial selection process undertaken by the funds, as this applies to all the firms.

#### ***d. Description of the sample***

Using the database constructed, it is possible to characterize the start-ups in the funds' portfolio (Table 3). It can be seen that the firms' (median) age is five years, and that the

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company may set up additional funds.

number of its employees is 30, although there are wide variations between firms (as is indicated by the difference between the median and the mean number of employees). Thus, the data show that the firms in the funds' current portfolio are neither extremely young nor small. This information presents a snapshot of the funds' portfolio in mid-2000, rather than the stage at which the funds invested in the firms (which was earlier, see Table 2). The by-industry distribution of the firms in the funds' portfolio indicates that the funds invest to a similar extent in communications, the internet, software, and life sciences (the last incorporating medical and biotechnology spheres). A small proportion of the investments are in non-technological spheres. The characteristics of the firms in the portfolio of the investment companies (the control group) resemble those of the firms in the portfolio of the VC funds except for the diversification among different industries.

The data also make it possible to divide the start-ups in the funds' portfolio in 1997–2000 into those that succeeded in reaching exit (by the beginning of 2001) and those that did not. The first group includes those firms that attained exit in one of the following ways: merger, acquisition, or IPO—whether in Israel, the US, or Europe. The second group includes firms which closed, as well as those which are still active (and private) and may still reach exit (or close) in the future.

**Table 3**  
**Characteristics of Firms in the Portfolio of Israeli Venture Capital Funds and the Investment Companies Specializing in the High-Tech Industry**

	In portfolio of	
	Venture capital funds	Investment companies
<i>Age (years)</i>		
Mean	6	6
Median	5	4
<i>No. of employees</i>		
Mean	63	167
Median	30	20
<i>Sphere (% of total portfolio)</i>		
Communications	20.8	17.9
Internet	15.2	28.8
Software	26.7	21.2
Life sciences	19.7	10.9
Other technological	13.0	15.2
Non-technological	4.6	6.0

Total: 517 firms in the funds' portfolio in 1997–2000, and 184 in the portfolio of the investment companies specializing in the high-tech industry.

The distribution of firms in the venture capital funds' portfolio by their success (Table 4) shows that 21.5 percent reached exit. An examination of the kinds of exit shows that 41 percent of the firms achieved this by being sold or merged, and 59 percent by going public. Equivalent data for the US (Gompers and Lerner, 1999) show that the proportion of firms backed by VC that reached exit is significantly higher (Figure 1). According to a random sample of about 800 firms backed by American VC funds, 61.6 percent reached exit, and 51

percent of these did so by being sold or merged, 49 percent by going public.<sup>14</sup> The fact that a large part of the Israeli VC funds are still young, as are the firms they back, may well create a downward bias in the success rate. Support for this view is provided by another piece of information, namely, that just 9.4 percent of start-ups in the portfolio of the Israeli funds went bankrupt or closed, while in America the proportion is 19.7 percent. Nevertheless, the data for Israel also include the funds' performance during the boom period (1999–2000), which was not included in the American data.

**Table 4**  
**The Success of Start-Ups and Characteristics of the Venture Capital Funds that Invested in Them**

	No exit	Exit					
			Sale	Merger	IPO on TASE	IPO in US	IPO in Europe
No. of firms	395 (78.5%)	108 (21.5%)	39	5	3	51	10
<i>Characteristics of funds (average for all funds investing in a firm)</i>							
No. of funds	2.0	2.3	2.2	1.8	1.0	2.7	1.8
Equity (\$ mill.)	74.2	105.8	99.5	47.0	23.3	12.9	84.9
Age of funds (years)	5	7	7	6	7	7	6
No. of firms in portfolio	19.6	23.2	24.9	12.6	8.0	24.7	17.1

Note: The table presents the distribution of the firms in the portfolio of the venture capital funds in 1997–2000, divided into those that reached exit and others. The lower part of the table gives the characteristics of the funds that invested in firms (in most cases more than one fund invested in a start-up, so that we took the average of the characteristics of the funds investing in each firm).

An comparison of the firms that succeeded with those that did not reach an exit stage

<sup>14</sup> Gompers and Lerner (1999), chapter 5, p. 100. The sample is from 1999.

shows that the former were backed by older and larger VC funds, as indicated by the average extent of the equity managed by those funds and the size of their portfolio.

#### 4. THE VENTURE CAPITAL FUNDS' SELECTION PROCESS, AND EFFECT ON A FIRM'S SUCCESS

##### *a. In which firms do the funds invest? Selection and screening of projects*

One of the main characteristics mentioned in the literature on the activity of VC funds is the screening process they implement before deciding to invest in a firm. In some cases the funds approach firms in order to try to identify those with chances of succeeding, but in most instances a firm at the initial stage of its life approaches a fund in order to obtain finance. An answer—at least in part—to the question of which companies VC funds invest in is given below, with a statistical comparison between the characteristics of firms backed by funds and those backed by investment companies – that as VC's invest in very early stages of the firms' lives. Investment companies also screen before investing, but this may be less intensive or based on different criteria. Thus, for example, the fact that VC funds are established for a limited period may affect their investment decisions. Under this hypothesis the funds will tend to invest less in spheres where the 'maturing time' is longer, such as the medical and biotechnology areas.

The results of the test intended to identify the firms in which VC funds invest are given in Table 5. In the first three columns the dependent variable (VC) takes the value of 1 for companies backed by VC funds, and zero otherwise.<sup>15</sup> Since the independent variable is

<sup>15</sup> Some of the firms in the group of those backed by venture capital funds also received finance from investment companies. The control group includes firms *not* supported by venture capital funds. On this bases the regressions are trying to answer in what firms do VC invest. Nevertheless, all the estimations

discrete, the estimation uses the probit method, in which the coefficient of the independent variables measures the contribution of each variable to the probability that the firm will be included in the group of firms backed by a VC fund. In the first three columns the independent variables are the year in which the firm was established (HAKMFIRM)—which is also a proxy for the stage the firm has reached, and dummy variables for the various industries.<sup>16</sup> The results show that the VC funds choose to support firms of the same age as those backed by investment companies. It is often assumed that the firms in the portfolio of the VC funds are younger than those obtaining credit from banks, and certainly than those seeking finance from the capital market. However, this finding indicates that the firms backed by VC funds are not younger than those supported by investment companies. The results of the estimation (Table 5, column 1) indicate that, contrary to our initial hypothesis, funds tend to extend more support to firms in the medical sphere—incorporating biotechnology—which take longer to mature. Thus, the funds appear to invest less in the internet sphere.

In order to enhance the examination of the screening process, we estimate the equation described above with the addition of the variable for a firm's value at the time finance is obtained from a VC fund or an investment company (PREVALUE). This value of the company is determined in the agreement it signs with the VC fund (or investment company) *before* the investment is made, and it is on that basis that the proportion of ownership

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given below were run without the 114 companies which received finance from both sources, and the results were not affected.

<sup>16</sup> The data on which the initial test is based are not from the date the screening was done but for a few years later. However, this is not very significant, as the variables used are age—which rises linearly and constantly over time—and the industry to which the firm belongs (which does not change with time).



accorded to each side in the transaction is determined.<sup>17</sup> This variable can constitute a proxy for a firm's potential, as assessed *ex ante* by experts. Thus, firms with a high value can be expected to be assessed as having the best chances of succeeding. Data on the value of the firm before the investment by a VC fund or investment company were found for only a quarter of the firms (some 160 observations), and so we add them only at the second stage of the estimation. The data show that the firms' pre-value lies between 0.85 to 360 million dollars, with average of 50 millions (and median 27.8 millions). To control for the possibility that the value of the firm reflects its size we: 1. Control for the year the firm was established, that can be regarded as correlated with size; 2. Calculate the following ratio: the value of the firm divided by the number of employees in the firm (used in column 3, Table 5).

The estimation of the probit regression (Table 5, column 2) indicates that a firm's chances of obtaining venture capital rise significantly as its value increases (the coefficient of the PREVALUE is positive and significant). Using the second measure - the value of the firm to the number of employees in the firm - gives the same results (the regression is even better, column 3). In addition, a simple statistical comparison of the value of the firms backed by VC funds with that of those backed by investment companies (not keeping other things equal) shows that the median value was \$ 30 million in VC backed firms, compared with the \$ 15 million of the latter.

### ***b. The effect of funds' backing on firms' success***

<sup>17</sup> In view of the boom in the capital and money markets in the last few years, a bubble may have been involved at the time that might have affected this variable. Nonetheless, even if this was the case, it may have been affecting all firms - VC backed and others.

The process of screening companies in order to identify those with the greatest chances of succeeding, and of monitoring them subsequently (described and analyzed in detail below), are what makes venture capital special, and should therefore affect the firms' chances of success. In this section we examine whether this is in fact the case. Here, too, we use the control group described above.

The success of a firm is defined in this paper as its reaching the stage where the investors realize their investment (or part of it), by going public (in Israel, the US, or Europe), being bought, or merging with another company. Most of the firms in the funds' portfolio are, as stated, start-ups whose aim is to create knowledge rather than products, so that most of these firms are not interested in sales income. Nonetheless, while it is possible to find a different indicator of success, such as the firm's realization price, this would be relevant only for companies that have reached exit.

In the estimation (Table 5, column 3 to 6), the dependent variable takes a value of 1 in cases where the firm has reached exit, and zero otherwise. The other cases naturally include companies whose activities have ceased as well as some which have continued functioning. In this latter category, some companies may still reach exit and others may close. The results show that the chances that a company will reach exist are significantly greater if it is backed by venture capital (as shown by the VC coefficient of the regression in column 3, which is positive and significant at the 5 percent level). This is an indication of the fact that the support of VC funds is important, and that this may derive from either the screening or the monitoring they undertake.<sup>18</sup> The estimation also shows that, as expected, the older a firm is

<sup>18</sup> These results are consistent with those obtained in the UK from comparing the activities of independent venture capital funds with those sponsored by corporations, and which resemble the investment companies here - as regards structure and activity (Van Osnabrugge and Robinson, 2001).

(i.e., the more time that has passed since it was established), the greater are its chances of reaching exit. The results of the effect of the sub-industries are not robust among the various specifications. In some we get that firms in the communications and software spheres had the greatest chances of succeeding in the years reviewed (column 4, coefficients of the COMM and SOFTW variables).

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That paper, which was based on a questionnaire administered to a large number of venture capital funds, showed that the independent funds spend more on screening and monitoring firms.

Table 5

**Estimation of the Screening of Firms by Venture Capital Funds, and the Effect of their Support on a Firm's Chances of Succeeding**

	VC	VC	VC	EXIT	EXIT	EXIT
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	YES	YES	YES	YES	YES	YES
VC	-		-	0.99 (3.1)*	-	-
PREVALUE	-	0.01 (1.81)*	0.5 (2.0*)	-	-0.002 (-0.4)	-0.0009 (-0.02)
HAKMFIRM	0.008 (0.5)	-0.03 (-0.4)	-0.5 (-3.2*)	-0.14 (-6.1)*	-0.04 (-3.8)*	-0.5 (-4.1*)
COMM	0.37 (1.2)	0.52 (0.74)	1.5 (1.7)	0.97 (2.9)*	1.1 (1.2)	1.4 (1.4)
INTER	-0.54 (-1.8)**	0.14 (0.2)	1.5 (1.6)	0.4 (1.0)	-0.6 (-0.5)	-0.06 (-0.05)
SOFTW	0.14 (0.5)	1.3 (1.5)	1.9 (1.9*)	0.6 (1.7)**	0.06 (0.06)	0.5 (0.5)
LIFE	0.67 (2.0)*	1.7 (1.9)*	1.5 (1.5)	-0.3 (-0.8)	-0.25 (-0.3)	-0.2 (-0.2)
R-squared	0.03	0.08	0.33	0.12	0.27	0.29
Obs with Dep=0	147	27	21	496	132	120
Obs with Dep=1	475	126	119	126	21	20

Notes: The first three columns in the table present data on firms venture capital funds invest in compared with investment companies. Columns 3 to 6 show the funds' influence on the firms' success (the chances of reaching exit). The regressions are estimated using data on firms in the VC funds' portfolio, and a control group of firms backed by investment companies. The regressions were estimated using the probit method, in which the dependent variable receives the value of zero or 1, and the correlation coefficient is PSRSQUARED. \* denotes significance at the 5 percent level, and \*\* denotes significance at the 10 percent level.

VC takes a value of 1 if a VC fund has invested in a firm, and zero otherwise; EXIT takes a value of 1 if a firm has reached exit (by IPO, sale, or merger), and zero otherwise; PREVAL is the value of a firm before obtaining backing. In column 3 and 6 PREVAL is the ratio of the firm's value to its number of employees; HAKMFIRM is the year in which the firm was established; COMM is a dummy variable that receives the value of 1 if the firm is in the communications sphere; INTER denotes the firm's affiliation to the internet sphere; SOFTW is affiliation with the software sphere; LIFE is affiliation to the sphere of life sciences (including biotechnology).

***c. Is it screening or monitoring that affects a firm's success?***

We showed above that there is a significant correlation between the backing by a VC fund and the firm's success, but it is still difficult to derive causality from this. Are funds able to identify successful firms and invest in them, so that in retrospect it looks as if the firms backed by VC funds were more successful, i.e., are funds better than other intermediaries at screening investment opportunities? Alternatively, while funds may be no better at identifying potentially successful firms, the monitoring, supervision, and support they provide (to be described below) once they have decided to back a firm improve its chances of succeeding? Obviously, the combination of the screening and monitoring processes could influence a firm's chances of success.

The first result, presented above, is that the funds invest in firms that are assessed in advance (before the investment) as having high economic value. If this variable represents the investors' assessment of the start-up's potential *ex-ante*, it could be claimed that the funds identify the 'good' firms through screening. In order to examine this point more closely, we also use the variable of the value of the firm before the investment at the second stage of the examination, when we attempt to ascertain what increases a firm's chances of succeeding. However, this examination is limited because, as stated, there we have data on this variable just for a quarter of the firms. Thus, when the variable of a firm's value is included in the regression where the dependent variable is the firm's success *ex post* (exit) instead of the VC variable (because of the high correlation between them), it does not have a significant effect on the success of a firm (as can be seen from Table 5, column 5, for the PREVALUE variable). The same result is obtained when using the ratio of the firm's value

to its employees (to control for the firm's size), see column 6. Thus, the fact that a firm is regarded as valuable at the initial stages of its activity (on the basis of which the VC funds and other investors back it) is not a good indicator of its chances of success later on. From this it may be concluded that the success of firms backed by venture capital *does not* appear to derive from the funds' ability to screen 'successful' firms but rather from the support the funds provide to the firms they have decided to back or other things, as will be seen below.

## 5. THE EFFECT OF THE CHARACTERISTICS OF VENTURE CAPITAL ON A FIRM'S SUCCESS

Several characteristics of the structure of the venture capital funds' activity and finance have emerged in order to overcome the asymmetry of information and the agency problems that could ensue from it. Below we examine the characteristics of financing by a VC fund, and then present the relation between the funds' mechanisms of operation and the success of firms backed by them.

### *a. Intensive monitoring*

The considerable asymmetry of information between the founders and backers of a firm could give rise to classic agency problems. Thus, for example, the founders of a company may try to keep it going even after it has transpired that it has little chance of succeeding. They may also tend to spend money on activities that increase their personal benefits but do not serve the needs of the investors (investment in enhancing their own reputation rather than in the project). Consequently, investors who wish to finance a firm's activities will tend to closely monitor its activities in order to reduce the asymmetry of information (on the other

hand, in view of this asymmetry, many investors will prefer not to invest in firms of this kind at all). The existence of economies of scale in information-gathering, as well as the problem of 'free riders,' increase investors' tendency to prefer to invest via a representative ('delegated monitor,' Diamond, 1984). In the literature on banks this approach assumes a central role, and has been extended to VC funds. Since the asymmetry of information could be serious in firms that the funds back intensive monitoring is required. It is almost impossible for a bank, which finances the activity of a great many projects, to undertake this intensive monitoring and constant contact which also require technological expertise in the spheres in which the firms are engaged.

The main proxy used for the VC's monitoring is the number of financing stages implemented, i.e., 'finance by stages.'

*Finance by stages:* venture capital funds tend to invest in a firm in stages. According to the literature, this constitutes an efficient and safe mechanism for monitoring and supervising a firm's activity, enabling the fund to decide afresh at each stage whether it considers it economically worthwhile to continue investing in it. The greater the number of financing stages, the more stringent the monitoring of the firm by the VC fund. Naturally, this kind of monitoring process has costs (reassessing the project, drawing up a new contract for the next financing stage, etc.). The fund thus has to consider the trade-off between increasing the monitoring costs and decreasing the agency cost in the firms in which it invests. The variable we use is the number of repeat investments undertaken by a VC fund in the firms in its portfolio (FOLLOW).<sup>19</sup>

<sup>19</sup> Each fund reports annually on the number of its new and renewed investments.

Another measure—albeit limited—of the intensity of the monitoring is the *number of funds that have invested in a firm* (NOKRANOT): a VC fund monitors a firm not only at every new financing stage, but also on an ongoing basis, including guidance by experts in technology, finance, etc. In addition, in many cases the VC fund has a director in a firm it is backing (the finding for the US was that on a board consisting of six directors an average of two were from the VC funds; the equivalent information was not available for Israel). Consequently, it can be expected that the larger the number of VC funds investing in a firm, the more closely will it be monitored and supervised. Nevertheless, this relation need not necessarily be linear (and may even be inverted) above a certain number, as the problem of ‘free riding’ (each fund will expect the others to undertake the monitoring so that it can benefit) may emerge. The data for Israel suggest that the number of funds backing a firm is not very high, ranging from one to nine, the average being 1.8.

***b. The funds’ reputation - as a signal of the quality of the firms they support***

The successful realization of an investment is important so that a VC fund can obtain a high return for its investors. Successful realization is also important for creating a fund’s reputation and enabling it to raise additional capital for its future activities. A VC fund establishes its reputation through its expertise in selecting and monitoring firms, making them successful, and bringing them to market at prices that reflect their value (Megginson and Weiss, 1991). Evidence for the importance of reputation can be found in data for America. Gompers (1996) showed that a VC fund’s previous successes have a substantial effect on its ability to raise fresh capital (this applies in particular to young funds). He also found that start-ups backed by young VC funds reach IPO at an earlier stage of their life, and



are characterized by greater underpricing—indicating that these funds are prepared to pay in order to create a reputation.

The main variable used in order to measure the reputation of a VC fund is the number of its previous successes (SUMSUCCS), i.e., the number of firms it has backed that have reached exit (or the proportion of the companies in a fund's portfolio that have reached exit; in our sample, as stated, this was 21.5 percent on average).

An alternative variable for a fund's reputation is its size, as indicated by the amount of its capital (SIZEFUND).

### *c. The ownership of venture capital funds*

The identity of the investors in a venture capital fund (the limited partners) could influence the success of a firm in which it invests if various owners have different objective functions and risk preferences.<sup>20</sup> In this respect we undertake a statistical estimation to examine three kinds of ownership: Yozma funds (YOZMA), which were set up under government auspices and account for one quarter of Israel's VC funds; public funds (PUBLIC), whose shares are traded on the stock market; and funds with involvement of Israeli and foreign banks (BANKS).

A comparison of the identity of investors in VC funds in Germany, Israel, Japan, and the UK (Mayer, Schoors, and Yafeh, 2001) shows that there are considerable differences between the countries (banks predominate in Germany, corporations in Israel, insurance companies in Japan, and pension funds in the UK). In that sample these differences were

<sup>20</sup> Evidence on the effect of the identity of owners on firms' performance was found by Ber, 1998, who showed that different share-holders had varying influences on the firms' profitability and risk.

found to influence the funds' investment strategies, i.e., the extent of their specialization in certain stages of a firm's life (early vis-à-vis late) and in specific spheres.

#### ***d. Specialization***

A high level of specialization by funds could enhance their ability to help the companies they back. As we saw earlier, most of the firms in which Israeli VC funds invest are in the high-tech field, although some funds diversify their investments in other areas too. For each VC fund we calculated a *focus variable* (FOCUS) which gets the value of zero if the fund invests in four or fewer spheres, or 1 if it invests in more than four spheres.

To the estimation we added a variable for *specialization in medical spheres* (MEDICAL), which takes a value of 1 for VC funds that specialize (also or only) in these spheres.

In order to examine whether the financing characteristics described above affect the success of firms, we estimated several probit regressions, in which the dependent variable takes a value of 1 for companies reached exit, and zero otherwise. The sample used here consists solely of companies backed by VC funds, i.e., all the firms that passed the first stage of selection. Each firm appears only once in the estimation, even if more than one VC fund invested in it. The independent variables in the regressions include firm characteristics—the year in which the company was founded, the sphere to which it belongs (see appendix), and the number of its employees, indicating the extent of its activity. We also use variables representing the financing characteristics of the funds investing in the firm, as represented above in the division into four groups: variables for the extent of monitoring undertaken by

the funds; the reputation of the VC funds that are backing the firm; the funds' specialization, and their ownership. In every case where several VC funds supported the same firm a simple mean (of the funds characteristics) was calculated.

In light of the existence of strong correlations between the independent variables—such as a high positive correlation between the number of a fund's successes and its size (its capital), the number of its renewed investments, and the number of its employees—we show several alternative specifications, in each one of which there was at least one variable from each of the above four groups of financing variables.

The results of the estimation (presented in Table 6) show that the proxies for monitoring undertaken by the funds has a positive and significant effect on the success of the firms they back. Thus, the more repeat investments a fund makes in firms (more stages), the greater that firm's chances of success (a positive and significant coefficient of the FOLLOW variable, column 3). Similarly, the greater the number of funds that invest in a firm (and monitor it), the greater the probability that it will reach exit (coefficient of the NOFUNDS variable, columns 1 and 2), indicating that there is no disadvantages for several funds investment in one company. A similar picture is obtained from observing the average of these variables for firms that reached exit (exit = 1) and those that did not (column 4). Another clear-cut finding is that companies backed by VC funds with a good reputation have a greater chance of succeeding, so that the variable for the number of a fund's previous successes (SUMSUCC) is positive and significant (columns 1 and 2). On the other hand, the variable for the size of the fund (SIZEFUND) does not have a positive effect on a firm's chances of success, although a simple comparison of averages indicates that firms that succeeded were supported by funds with more equity (column 4).

An examination of the effect of different ownership structures on firms' chances of success does not yield significant results, i.e., support from Yozma funds does not appear to lead to more or less success than backing from other funds (given size, and the other characteristics of the funds and the firms in which they have invested). The involvement of banks—whether foreign or Israeli—does not have a significant effect on the chances of success of a firm backed by a fund, either; as is the case with public funds.

Other results are that age has the expected positive effect on the chances of success, as does the number of employees, which is an indicator of a firm's size (and also possibly of the stage in its life); the results for industry affiliation indicate that firms in the life sciences and biotechnology sphere had lower chances of success than other firms—apparently *inter alia* because of their longer maturing time.

Table 6  
**Estimation of the Effect of VC's Financing Characteristics on Firms' Chances of Success**

	EXIT	EXIT	EXIT	Independent variables	
	(1)	(2)	(3)	Exit = 0	Exit = 1
Constant	YES	YES	YES	-	-
<b>Characteristics of start-ups</b>					
HAKMFIRM	-0.07 (-5.9)*	-	-0.07 (-5.5)*	1996	1992*
NOMEMP-FIRM	-	0.006 (6.1)*	-	42.6	131.7*
COMM	0.3 (1.4)	-0.16 (-0.7)	0.37 (1.7)**	0.2	0.35
INTER	0.0 (0.0002)	-0.35 (-1.2)	-0.06 (-0.2)	0.17	0.1
SOFTW	0.08 (0.4)	-0.3 (-1.3)	0.1 (0.47)	0.22	0.27
LIFE	-0.38 (-1.6)**	-0.44 (-1.7)**	-0.48 (-1.76)*	0.23	0.11
<b>Financing characteristics of funds investing in start-ups</b>					
<b>Monitoring</b>					
NOM-FUNDS	0.1 (1.93)*	0.09 (1.6)*	0.08 (1.42)	2.1	2.3*
FOLLOW	-	-	0.02 (2.8)*	17.8	26.0*
<b>Reputation</b>					
SIZEFUND	-	-	-0.0003 (-0.4)	76.2	99.5*
SUMSUCC	0.05 (3.91)*	0.05 (3.3)*	-	4.8	8.7*
<b>Ownership</b>					
YOZMA	0.03 (0.02)	0.04 (0.2)	-0.11 (-0.6)	0.55	0.65
PUBLIC	0.14 (0.74)	0.3 (1.4)	0.32 (1.63)**	0.17	0.27
BANKS	-0.02 (-0.15)	0.02 (0.14)	-	0.5	0.5
<b>Specialization</b>					
FOCUS	-	-	0.34 (1.4)	0.2	0.2
MEDICAL	-0.16 (-0.9)	-0.35 (-1.78)*	-0.14 (-0.7)	0.69	0.64
R-squared	0.155	0.20	0.152		
Obs with Dep=0	367	303	338		
Obs with Dep=1	108	87	101		

Notes: The table presents different specifications of the effect of various characteristics of venture capital finance on the success of firms in their portfolio. The econometric estimation uses the probit method in which the dependent variable receives a value of 1 (success) or zero. The figures in parentheses are Z values. \* denotes significance at the 5 percent level, and \*\* at the 10 percent level. Where several funds invested in one company the independent variable was calculated as the simple average of these funds. EXIT takes a value of 1 if the firm reached the stage of realization (by IPO, sale, or merger), and zero otherwise. HAKMFIRM is the year in which the firm was established; NOMEMPFIRM is the number of its employees; COMM is a dummy variable that takes the value 1 if the firm belongs to the communications sphere; INTER denotes firms that belong to the internet sphere; SOFTW denotes firms that are in the software sphere; LIFE denotes firms that belong to the life sciences sphere (including biotechnology); FOLLOW represents the number of repeat investments undertaken by a VC fund; SIZEFUND is the capital managed by a fund, in millions of dollars; SUMSUCC is the number of firms in a VC fund's portfolio that have reached exit; YOZMA is a dummy variable that takes the value 1 for funds set up with the support of the government VC fund, Yozma; PUBLIC denotes funds whose shares are traded on the stock market; BANKS a dummy variable that takes a value of 1 if a foreign or Israeli bank is part of the VC fund; FOCUS is a variable that takes a value of zero if funds invest in four or less spheres of activity, and 1 if they invest in more than four; MEDICAL is a variable that takes the value 1 if the fund specializes (also or only) in medical spheres, and zero otherwise.

## 6. CONCLUSION

The paper describes the venture capital market in Israel with regard to what makes venture capital special, using a unique database that includes data on the entire portfolio of all Israeli VC funds in 1997–2000. The analysis of the industry at the beginning of 2000 shows that many of the methods and arrangements used are almost identical with those of the American VC industry. This is probably because most of the venture capital invested in the Israeli funds originates from the US, and the vast majority of exits by firms are as IPOs on a stock market in the US or the sale of the firm to investors there.

The database shows that the Israeli funds tend to invest in the early stages of a firm's life—when there is particularly high asymmetry of information and firms have difficulties raising capital from classic financial intermediaries. It is also seen that the banks—who have little comparative advantage in extending loans to these firms (start-ups)—participate in financing a considerable proportion of these companies via their involvement (as limited partners) in funds. Note, too, the relatively low success rate (exit) of firms in the Israeli funds' portfolio—21.5 percent, compared with 61.6 percent for those in the US. The low success rate of the Israeli funds appears to be due to their relative 'youth,' while the proportion of firms in the portfolio of the Israeli funds that went bankrupt or ceased operating (before 2001 and the impact of the crisis in the US capital markets) is also lower than in the US.

Further results of the special character of venture capital are as follows:

1. *The funds screen firms* and invest more (relative to investment companies) in firms from the spheres of life sciences and biotechnology, and less in firms that are involved with

the internet. The VC funds also invest more in firms which have greater value (as indicated by a firm's value *prior* to the investment by the fund or investment company). Nevertheless, the value of a firm at the time the capital is invested in it does *not* constitute a good indicator of its success *ex post*, and from this result it may be concluded that it is not the funds' screening process that affects a firm's success.

2. *The support of a venture capital fund increases a firm's chances of reaching exit:* an analysis of the success of firms backed by venture capital with that of those supported by investment companies show that the former had greater chances of succeeding.

3. *Venture capital is distinguished by the monitoring undertaken by the funds and the funds' reputation:* the funds monitor the firms they are backing—both on an ongoing basis and by means of 'funding by stages'—and the more intensive the monitoring process, the greater a firm's chances of success. The same applies to the funds' *reputation*, which is important for their ability to raise additional capital. The results indicate there is a positive effect of the funds' reputation on a firm's success. This may constitute evidence of the fact that the backing of a VC fund sends a signal to the market as regards the quality of firms, thereby enhancing their chances of success.

4. *The ownership structure of the funds has no effect (positive or negative) on their success:* firms supported by funds under the aegis of the "Yozma" fund did not succeed more (or less) than those supported by other funds. The support of funds in which banks have invested or which are publicly traded did not increase firms' chances of success, either.

All these results were obtained on the basis of data at a time when the global capital and money markets were soaring, possibly partly involving a bubble effect. Nevertheless, at this

stage it is difficult to assess if the change in the market had an effect on the mechanisms of VC funds, or to examine whether there was excess investment in R&D companies at that time. These results do indicate, however, that despite the high level of government involvement at the beginning of the emergence of the VC market in Israel, a large private market has been created with mechanisms and methods of activity that are identical with those of the US. This attests to the fact that the government's involvement has been successful, serving to increase the finance extended to projects that bring positive external benefits to the economy.



## Appendix: Classification of Spheres of Firms' Activity

The firms in the portfolio of venture capital funds and investment companies are classified by the sphere of activity as defined by the IVA. In the present paper, this classification was further divided into six areas of activity:

### ***Communications***

Data communications  
Multimedia  
Telecommunications  
Wireless communications  
TV broadcasting/production/cable

### ***Internet***

e-commerce  
e-health  
internet

### ***Software***

Data mining  
Data security  
Digital printing  
Information technology  
Software  
Networking

### ***Life science***

Biotechnology  
Healthcare  
Healthcare information  
Medical devices  
Pharmaceuticals

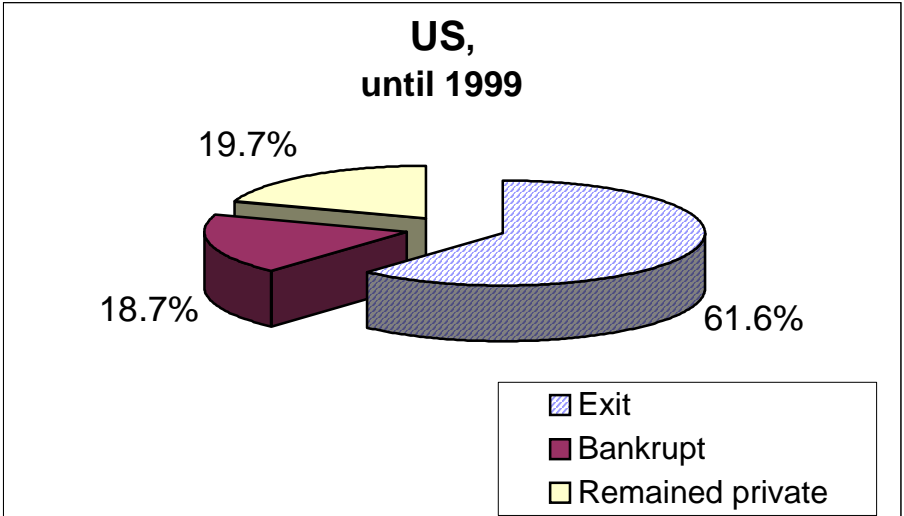
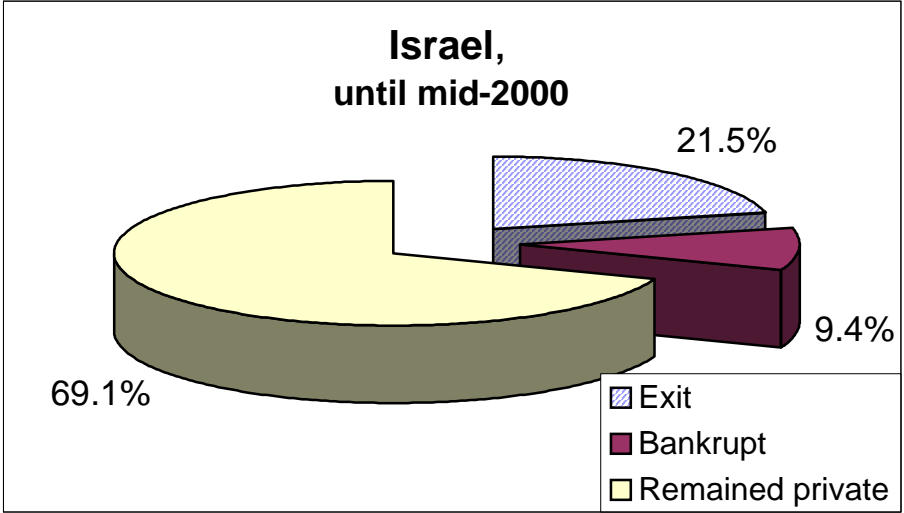
### ***Other technology***

Agro-technology  
Applied materials  
Consumer products  
Electronics  
Industrial product  
Semiconductors  
Robotics and automated inspection

### ***Other non-technology***

Capital equipment  
Holding company  
Real estate  
Services  
Financial  
Environmental  
Construction

Figure 1  
**Success and Failures of Firms in Venture Capital Funds Portfolios**



The data for Israel are from the database constructed for this paper and refer to *all* the Israeli VC funds in 1997-2000. The data for the US are taken from Gompers and Lerner, 1999, and include a random sample of some 800 firms with venture backing up to 1998.

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