What are Firms?
Evolution from Early Business Plans to Public Companies

by

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Abstract

We study how firm characteristics evolve from early business plan to initial public offering to public company for 49 venture capital financed companies. The average time elapsed is almost 6 years. We describe the financial performance, business idea, point(s) of differentiation, non-human capital assets, growth strategy, customers, competitors, alliances, top management, ownership structure, and the board of directors. Our analysis focuses on the nature and stability of those firm attributes. Firm business lines remain remarkably stable from business plan through public company. Within those business lines, non-human capital aspects of the businesses appear more stable than human capital aspects. In the cross-section, firms with more alienable assets have substantially more human capital turnover.

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Introduction

Since Coase (1937), economists have attempted to understand why firms exist and what constitutes firms.[1] Despite the long history of theory and empirical work, there is little systematic or non-case evidence concerning what constitutes a firm at birth and how a firm evolves from birth to mature company. In this paper, we provide such evidence by studying 49 venture capital-financed firms from early business plan to initial public offering (IPO) to public company (three years after the IPO).

This exercise has two goals. First, we provide a systematic description of the early life and evolution of an important sample of firms. Second, we consider how our findings can be interpreted in relation to existing theories of the firm and what new theories might try to explain.

Our analysis begins with the identification and classification of firm characteristics when the firms are very young (at the time of an early business plan). Fewer than half the sample firms have revenues at that time. For each sample firm, we describe the financial performance, business idea, point(s) of differentiation, non-human capital assets and technology, growth strategy, customers, competitors, alliances, top management, ownership structure, and board of directors. We then consider how firm financial measures and firm characteristics evolve by describing the firms at the IPO and at the third annual report after the IPO. We pay particular attention to measuring if those characteristics remain constant, change, or disappear.

After describing the initial characteristics and evolution of these firms, we examine two cross-sectional relationships. We consider the relation between human capital turnover and the nature of firm assets. Then, we consider the division of value between human and non-human capital assets by estimating the determinants of founder ownership.

In describing the initial characteristics of firms and how they evolve, we try to shed light on different theories of the firm. While some of these theories are motivated by specific examples or cases, we provide some of the first systematic and (relatively) large sample evidence on these issues.

Several theories emphasize the difference between non-human and human assets. For example, the basic assumption of the Hart-Moore framework is that firms are defined by their non-human assets. In the

[1] Both Holmstrom and Roberts (1998) and Gibbons (2004) describe and summarize some of this work.

words of Hart (1995), "a firm's non-human assets, then, simply represent the glue that keeps the firm together, whatever this may be … Control over non-human assets leads to control over human assets… If non-human assets do not exist, then it is not clear what keeps the firm together." (p. 57). Holmström (1999) comes to a similar conclusion, but argues that firm ownership of non-human assets allows the firm to structure internal incentives and to influence external parties (e.g., suppliers) who contract with the firm.

Two aspects of our analysis address these theories. First, we try to identify the "glue" that holds firms together and determine the extent to which the glue derives from non-human or human assets. Second, to the extent that the theories are static theories (in that they assume a non-human asset or glue already exists), we provide evidence as to the stage of a firm at which the glue emerges or "sticks" and how the "glue" evolves over a firm's life cycle.

We also relate our results to theories of the firm that emphasize the existence of specific assets or resources that are critical to the firm's evolution and growth. In particular, Wernerfelt (1984) and Rajan and Zingales (2001b) focus on critical resources. A critical resource may be a person, "an idea, good customer relationships, a new tool, or superior management technique." According to these theories, a "firm is a web of specific investments built around a critical resource or resources… At some point, the critical resource becomes the web of specific investment itself." [Zingales (2000)]. One can interpret this latter statement as something of a dynamic theory. By examining firms' resources (non-human and human assets) early in their lives and over time, we shed light on the nature of critical resources and the periods in which they are critical.

The theories above (as well as others such as Hart and Moore (1994)) also have implications for how rents are divided between providers of human (founders) and non-human capital and the ability of firms to raise outside financing. When specific human capital is more crucial, these models suggest that the specific human capital will capture more of the rents and make it more difficult to finance firms. With our data, we estimate the magnitude of the rents retained by specific human capital (founders) and the relation of those rents to the nature of the firms' assets.

This analysis also sheds light on the "new firms" described in Zingales (2000) and Rajan and Zingales (2001a). They argue that today's new firms differ from the old, traditional firms of the (early) 20th century. Old firms are "asset-intensive and highly vertically integrated … [their] boundaries are clear cut and sufficiently stable that one can take them for granted." New firms, on the other hand, tend to be "non-vertically integrated, human capital intensive organizations operating in highly competitive environments." Rajan and Zingales (2001a) argue that alienable assets – assets that can be assigned or pledged to other firms – have become less important relative to human capital and inalienable assets (e.g., business processes or knowledge). In fact, Zingales (2000) suggests that in today's corporations "human capital is emerging as the most crucial asset."

Related to the theoretical questions concerning the role of human and non-human capital assets is an old and ongoing debate among venture capitalists (VCs). Some VCs believe that the company's business and market are the key determinants of success while others believe that the key determinant is the company's management team. While VCs try to invest in companies with both strong businesses and strong management (see Kaplan and Strömberg (2004)), different VCs claim to weigh one or the other more heavily at the margin. For example, Donald Valentine of Sequoia Capital, the VC investor in Cisco, is a well-known proponent of the business / market view. Others favor the best available management team view. Quindlen (2000) discusses these two views from the VC perspective (p. 33-35). This debate is often characterized as whether one should bet on the jockey (management) or bet on the horse (the business / market).

Our results can be summarized as follows. The companies in our sample experience dramatic growth in revenue, assets, and market capitalization, but do not become profitable. While the companies grow dramatically, their core businesses appear remarkably stable. Only one firm changes its core line of business in the sense that the company produces a different product or service, or abandons its initial market segment to serve a different one. Rather than changing businesses, firms typically maintain or broaden their offerings within their initial market segments. The firms also sell to similar customers and compete against similar competitors in the three stages of the life cycle we examine. This suggests that the firms' business lines become fixed or elemental at a relatively early stage in a firm's life cycle.

Almost uniformly, firms claim that they are differentiated by a unique product, technology, or service at all three stages of the life cycle we examine. At the same time, however, the stated importance of expertise (which one might interpret as specific human capital) declines. Roughly half of the firms stress the importance of expertise at the business plan while fewer than 15% do so by the IPO and third annual reports.

With regard to non-human capital assets, firms stress the importance of proprietary intellectual property (IP), patents, and physical assets in all three stages. Patents and physical assets become increasingly important over time.

While the points of differentiation, alienable assets, customers, and competitors remain relatively constant, the human capital of the sample firms changes more substantially. At the time of the annual report, one-half of the CEOs at the business plan remain; only one-quarter of the next four top executives remain.

At this point, the results provide some insight into the Hart-Moore-Holmström view that a firm must be organized around non-human capital assets. Consistent with this view, we find that non-human capital assets form very early in a firm's life. Identifiable lines of business and important physical, patent, and IP assets are created in these firms by the time of the early business plan, are relatively stable, and do not change or disappear as specific human capital assets turn over.

This should not be interpreted as saying that specific human capital is unnecessary or unimportant. Obviously, a specific person has to have the initial idea and start the firm. Proprietary, but non-patented intellectual property is indeed critical to many firms. In contrast to non-human assets, however, the importance of specific people and initial expertise diminishes early in the firm's life cycle. Once the firm's non-human assets are established, it seems possible (and not unusual) to find other people to run the firm.[2]

These findings also have implications for the critical resource theories. The early emergence and stability of non-human assets are consistent with those assets being critical resources. The instability of the human assets suggests that to the extent that the initial critical resource is a specific person or founder, the "web of specific investments built around the founder(s)" itself becomes the critical resource relatively early in a firm's life.

[2] For evidence consistent with this, see Bertrand and Schoar (2003).

Our cross-sectional analysis provides further support to our interpretations of the Hart-Moore-Holmström and critical resource theories. Firms with more alienable assets at the time of the business plan have substantially more human capital turnover over time. Again, this suggests that specific human capital is more critical before alienable assets have formed.

Our results also are consistent with recent theoretical work by Aghion, Dewatripont, and Stein (2005). Their model studies the tradeoffs between academic and private sector research. Based on control right considerations, they predict that once an idea becomes the property of a private firm (rather than an academic institution), it will be developed along relatively narrow lines.

From a practitioner perspective, we interpret the greater stability of the lines of business in our sample relative to that of management teams as favoring the business / market view of VC investing over the best available management team view. The results suggest that VCs are regularly able to find management replacements or improvements for good businesses. At least in our sample, we do not find cases in which VCs invest in good managers who move the firms into different businesses.

We then consider the division of rents. Using ownership stakes just before the IPO, we estimate the percentage of value that founders retain for their ideas rather than for incentive purposes. For their human capital assets specific to the company, our estimates suggest that founders retain from 10% to 19% of the value created by the firm. Regardless of whether these estimates are interpreted as small or large, they appear to be much lower than those for an earlier time period in Baker and Gompers (1999). This finding raises some doubt regarding the claim in Zingales (2000) that more recent, "new" firms are more dependent on specific human capital and, therefore, should allot a greater fraction of the value created to founders.

We view this study and methodology as an early empirical step in studying the nature and evolution of firms. While we believe that the results are novel and useful in interpreting theories of the firm, we acknowledge that the sample is indeed a special one in that the firms are all VC-funded and eventually went public. There are two reasons we chose to study this sample. First, we were able to obtain a relatively large data set. Second, as we discuss in the paper, VC-funded firms represent a substantial fraction of all IPOs (at least 39%) and a higher fraction of all start-ups that ultimately go public.

At the same time that this is an economically important sample to study, there are two reasons why the results may be special to this sample. First, VCs may choose to fund only those companies in which specific human capital is relatively unimportant. Zingales (2000) argues that VCs will invest in and organize firms such that the organization is not too dependent on any specific entrepreneur or individual. Kaplan and Strömberg (2003) find that VC contracts are carefully designed to give the VCs sufficient control rights to organize firms and replace founders and management when appropriate. Second, VCs may have special skills that can be interpreted as specific human capital. Hellman and Puri (2000 and 2002) find that VC-backed firms introduce products and professionalize management more quickly than non-VC-backed firms. This type of human capital may substitute for the human capital of a specific founder. A logical avenue for future research is to consider whether our results hold for non-VC backed firms.

Our work is closely related to three other research efforts. Bhide (2000) studies 100 companies from Inc. Magazine's list of 500 fastest growing companies in 1989. Based on interviews with founders, Bhide finds that over 70% of those companies are founded by people who replicated or modified an idea encountered in their previous employment. They do relatively little planning before starting the business. Partly as a result, these companies frequently adjust their business plans as they operate. Bhide contrasts these companies to VC-funded companies which he argues are more likely to "have innovative ideas and a verifiable record of … achievement (p. 111)." Our study complements his in that we focus on VC funded companies. In addition, we focus more on the nature of the initial attributes of a company, how those attributes evolve, and how those attributes affect outcomes.

Our work also is related to the papers that emerged from the Stanford Project on Emerging Companies (Baron and Hannan (2002), Baron et al. 1999, Baron et. al. 2001; Hannan et al. 2000; and Hellman and Puri (2000 and 2002)). Like we do, they study a panel of young firms – high technology firms in Silicon Valley – but they ask a different set of questions. Baron and Hannan (2002) summarize the findings of their papers as showing that initial employment models are important and tend to persist. When they are changed, employee turnover increases and performance declines.

Finally, Santos and Eisenhardt (2004) provide a case-based study of five new information technology firms. They study how those firms attempted to claim their initial market, how they demarcated that market, and how they used acquisitions to consolidate that market.

The paper proceeds as follows. Section I describes our sample. Section II describes the initial financial characteristics, business idea, point(s) of differentiation, assets and technology, growth strategy, customers, competitors, strategic alliances, management, ownership structure, and board of directors of the sample firms and their evolution. Section III presents our cross-sectional estimates. Section IV summarizes and discusses our results.

I. Sample

The sample consists of forty-nine companies that went public in an IPO and for which we obtained an early business plan or business description at the time of a VC financing. We obtained twenty-nine of the companies from the sample of VC financed companies in Kaplan and Strömberg (2003). We obtained an additional twenty companies by asking several VCs to provide business plans of companies they had financed that had subsequently gone public.

For all of the companies in the sample, we have copies of the business plans and / or the venture capitalist investment memos that describe the company at the time of venture capital funding. (We do not find meaningful differences in the two types of documents. Accordingly, in what follows, we drop the distinction and collectively refer to them as business plans.) We are able to identify the early (and often initial) characteristics of these firms. For all of the sample companies, we also have detailed descriptions of the companies at the time of their IPOs. We obtain IPO descriptions from S-1 registration statements and 424B prospectuses filed with the SEC. When available, we collect the company's annual report that is closest to 36 months after the IPO, a period roughly equal to the time from the business plan to the IPO. If an annual report is not available 36 months after the IPO, we collect the latest annual report that is at least 12 months after the IPO. We obtain annual report descriptions from SEC form 10-K filings.

For ten companies, we do not record an annual report observation: three companies were taken over and one went bankrupt less than one year after the IPO; five companies are public, but have not filed an annual report more than twelve months after the IPO; one company is a Canadian firm which does not file annual reports with the SEC. We retain the business plan and IPO observations for all forty-nine firms.

A. Description

Table 1 presents summary information for our sample. The median company is 24 months old as of the business plan, so these documents describe the companies when they are young. As we document below, these companies are early stage businesses at the time of the business plan; the median company had no revenue in the most recently ended fiscal year at the time of the business plan.

The median time elapsed between the business plan and the IPO in our sample is 34 months, with a further median gap of 33 months between the IPO and the annual report observations. The IPO observation is therefore quite close to the midpoint of the business plan and annual report observations. The median total time elapsed is 63 months; the average is 68 months. Since the median total time elapsed is more than twice the median company age at our first observation, our 3 observations should be sufficiently spaced in time to have the opportunity to observe meaningful time series variation in company characteristics.

Of the 48 companies whose founders we were able to identify, 21 have one founder, 16 have two co-founders, and 11 were co-founded by three or more individuals.

The frequency distributions in table 1 show that the bulk of the sample companies were founded in the early-to-mid nineties while the business plans describe the companies in the mid-to-late nineties. Thirty-one of the forty-nine IPOs took place in 1998, 1999, or 2000, at the height of the technology boom. The industry breakdown of our sample is heavily weighted towards high-technology firms: 17 in biotech, 15 in software/information technology, 3 in telecom, 5 in healthcare, 5 in retail, and 4 in other industries, of which 3 are high-tech companies. The time frame of the sample, therefore, also corresponds to the period in which "new firms" emerged as described in Zingales (2000) and Rajan and Zingales (2001b).

Finally, table 1 shows our companies' status as of July 31, 2005. 27 are still active, independent companies. 15 have been acquired, and 7 have failed and gone bankrupt.

B. Sample selection issues

In this section, we discuss potential selection issues. Most importantly, our sample includes only VC-backed firms because it is from our VC contacts that we were able to obtain the necessary data. VC-backed firms represent only a small fraction of all entrepreneurial firms and are unlikely to be representative of the typical entrepreneurial firm because of various constraints, conditions, and practices governing venture capitalists' selection of their portfolio companies. For example, VCs typically invest several million dollars in any given company. For such an investment to make sense, the VC must expect the portfolio company to be able to use the capital and offer a return that is a multiple of the VCs' investment. Typical mom-and-pop stores or other low-risk, low-reward start-up firms are not in a position to do either of these.

Even though they are not representative of all start-ups, VC-backed start-ups are an important subject for study because they tend to include the most promising start-ups that end up having a disproportionate impact on the economy. In particular, VC funded companies typically comprise a substantial fraction of young companies that go public in any given year. According to the National Venture Capital Association (2004), about 39% of all IPOs from 1993 to 2003 are VC-financed companies. This understates the fraction of IPOs of young companies that are VC financed because some of the non-VC financed IPOs are mature companies such as divisions of public companies (spin-offs or equity carve-outs) or companies returning to the public markets after having gone private. We discuss results that may be special to VC-backed firms as we come to them in the paper and in the conclusion.

Among the VC-financed universe of firms, our sample of portfolio companies and financings is not a random sample in that we obtained the data from VC firms with whom we have a relationship. The 29 companies from Kaplan and Strömberg (2003) are taken from a sample of 119 VC-backed companies. As Kaplan and Strömberg (2003) do not find any obvious bias in the 119 companies, we do not think there are any obvious biases in the 29 companies that went public. The additional 20 companies provided by VCs at

our request represent those companies that the VCs had financed and subsequently taken public. The VCs who agreed to participate provided all the relevant business plans they could find so there should not be a selection bias for any particular VC.

Finally, it is possible that there is some bias in the VCs who decide to participate. Such a bias would affect our results only if those VCs invest in companies with atypical initial assets that evolve in an atypical way. For example, the VCs in our sample may focus on one of non-human or human capital over the other. Although this is possible, we have no reason to believe the participating VCs are atypical in this sense.

The industries of the sample firms are representative of the industries that VCs invest in. At the same time, however, investments in biotech and healthcare are over-represented – 45% of our sample versus roughly 20% of the overall VC market – while investments in software, information technology and telecom are under-represented relative to the overall VC market (see National Venture Capital Association (2004)). Because biotech firms, in particular, are oversampled and potentially different from other types of companies, we report most of our results separately for biotech and non-biotech firms.

II. Results

A. Financials and Employees

Table 2 summarizes the financial and employment histories of our firms. Consistent with describing the firms at an early stage, revenues, assets, and employees of the sample firms are small at the time of the business plans. They increase by orders of magnitude between the business plan and the annual report. Negative profits are the norm at the business plan. Despite increases in revenues, assets, employees, and market capitalization, the median firm does not become profitable through the post-IPO annual report.

A.1 Revenue

At the business plan, the median company reports no revenue in the prior fiscal year. Average revenue is $5.5 million, reflecting seven companies with revenues over $10 million.

At the IPO, the median and average revenue figures increase dramatically to $7.2 million and $40.5 million. Four companies go public with no revenue in the latest fiscal year; another nine have less than $1 million in revenues. By the annual report, revenues increase by another order of magnitude, to a median of $35.1 million and an average of $179.0 million. The huge percentage changes are consistent with the revenue levels. Both the biotech and non-biotech firms experience substantial growth, but the biotech firms begin from a smaller base.

The extremely rapid revenue growth exhibited by our sample suggests that they are successful in supplying products and services to quickly growing segments of the economy. We believe that the evolution of company characteristics we consider in this paper is particularly interesting in light of this rapid growth. Rapid revenue growth into the millions of dollars per year is characteristic, according to Bhide (2000), of the types of start-ups VCs try to select.

A.2 Employees and revenue per employee

The median company has 22 employees at the business plan, 124 at the IPO, and 378 at the annual report. Because retail companies tend to be more labor-intensive than others in our sample, panel B provides employee statistics excluding the five retail companies. The median number of employees for non-retail companies is 18, 102, and 256 at the business plan, IPO, and annual report.

Revenue per employee also increases dramatically over time, from a median of 0 at the business plan to $50.5 thousand at the IPO and $124.6 thousand at the annual report. The increase for the non-retail subsample is similar to that of the overall sample.

A.3 Assets

Asset growth for the sample parallels revenue growth, suggesting the need for large investment outlays to generate such rapid growth. The median company's book assets at the business plan, IPO, and annual report are, respectively, $2.6 million, $19.6 million, and $96.7 million; the average company's are $5.9 million, $44.3 million, and $274.9 million.

A.4 Earning Before Interest and Taxes (EBIT)

Our companies are unprofitable at the time of the business plan – when we can measure profitability. The losses increase from the business plan through the IPO and annual report. This is consistent with the patterns for recent IPOs described in Fama and French (2003), particularly for young firms. The median company's EBIT for the fiscal year prior to the business plan, IPO, and annual report are, respectively, -$0.78 million, -$6.7 million, and -$25.6 million. Bhide (2000, p. 155) writes that "the financial projections of VC-backed firms usually anticipate negative cash flows for several years." These projections are borne out in our sample -- only 17%, 18%, and 15% of firms, respectively, are profitable at the business plan, IPO, and annual report. The patterns of medians are similar for both biotech and non-biotech firms. However, biotech firms are less likely to be profitable, with 13%, 6%, and 0%, respectively, profitable at the business plan, IPO, and annual report.

A.5 Market capitalization and market-to-assets ratio

We calculate market capitalization at the business plan as the value of the company after a VC financing that occurs within six months of the date of the business plan. Market capitalization at the IPO is calculated as the first trading day's closing price times the number of shares outstanding following the offering. Market capitalization at the annual report is the average of the high and low stock prices during the last quarter of the year covered by the annual report times the number of shares outstanding as of the issue date of the report. We do not have a market capitalization figure at the annual report for one company whose shares were delisted.

The median market capitalization increases sharply from $17.9 million at the business plan to $232.4 million at the IPO, and then declines to $176.9 million at the annual report. The corresponding median market-to-assets ratios are 5.4, 13.9, and 1.8. The market capitalization figures indicate a roughly tenfold increase in value from business plan to IPO, a period of roughly 3 years. These companies, despite their

negative profits, are highly valued. The decline in the market capitalization after the IPO is consistent with (and likely driven by) the technology stock "bust" from 2000 to 2002.

B. Business

1. Line of business

Panel A of table 3 presents a description of each company's business as described in each of the three relevant documents. For each company, we determine if the description of the business changes from one point in time to the next. We categorize the changes in two ways. First, we consider whether firms change their line of business. The line of business changes if the firm sells to a completely different set of customers or if the firm markedly changes the products or services it offers. Second, we consider whether firms broaden, narrow, or maintain their initial business model or line of business. If Apple Computer were in the sample, we would classify Apple as having the same line of business it had when it started – personal computers sold to the same customers – but with a line of business that had broadened.

These comparisons admittedly have a subjective component to them. We report the individual descriptions to give the reader a sense of the type and magnitude of these changes. The descriptions have been coarsened to protect the anonymity of the portfolio companies and VC firms. The descriptions in the business plans and other documents are always at least a paragraph and usually much longer. We base our measurements and conclusions on the more detailed descriptions to which we have access.

At the end of panel A, we report the percentage of companies that fall into each category. One notable result emerges quickly in this table. While we observe broadening or narrowing of the business, only one of the forty-nine firms in our sample changes its line of business. For example, a biotech firm may decide to narrow its focus from disease prevention in general to focusing on a specific type of vaccine (company 36). Or an e-commerce firm might broaden its e-commerce offerings to include more services and infrastructure offerings (company 31). We do not observe any of the firms undertaking acquisitions unrelated to the original business. We also do not observe radical shifts in focus such as a medical equipment company switching to drug development. Company 49 undergoes the greatest change, moving

from offering a new computing platform to a new operating system to a suite of software programs, each time dropping the previous idea, but even in this case there is a general focus on personal computing.

This result suggests that the initial business lines and / or the accompanying attributes of those businesses do not change and, therefore, appear to be core to our sample firms. The result is consistent with the assertion of Bhide (2000, p.155) that "VC-backed firms face less pressure to change their plans than do [other] promising start-ups."

For the most part, companies tend to broaden or at least not reduce their offerings within markets. For the 48 companies that did not change their line of business, panel A of table 3 shows that only 13% narrowed their lines of business between the business plan and IPO, 8% narrowed between the IPO and annual report, and only 13% had narrower offerings at the annual report than at the business plan. Over the corresponding periods, 42%, 42%, and 37%.of the firms keep their offerings roughly the same, while 46%, 50%, and 50% broaden their offerings.

Non-biotech firms differ from biotech firms in that non-biotech firms rarely narrow their line(s) of business while biotech firms are more likely to narrow and less likely to broaden their line(s) of business.

2. Origin of business idea

Panel B of table 3 classifies the origin of the business idea. Of the 34 companies for which we were able to find a definitive source, 5 were formed as spin-offs or joint ventures of already existing companies, 15 were started to exploit an idea the founder(s) had as a result of previous jobs, and 14 were based on academic research. Again, there is a clear difference for biotech firms which are more likely to be based on academic research while non-biotech firms are most likely to be based on ideas from previous jobs.[3]

[3] See Gompers et al. (2005) who study the background of founders in a large sample of venture-backed start-ups. The margin between forming new ventures as start-ups (entrepreneurship) or within established firms (intrapreneurship) has been analyzed to some extent (e.g., Gromb and Scharfstein 2002). Also, see Aghion et al. (2005) who study the role of non-profit academic institutions in innovation.

3. Business strategy

Panel B also classifies our companies' business plan strategies into the categories of Baron, Hannon, and Burton (1999). Innovators are companies striving to create novel products for new, undeveloped markets. Enhancers are companies striving to improve upon products for already developed markets. Marketers are companies whose core competency lies in the marketing, distribution, and sales of their products. Technology/marketing hybrids are companies that share characteristics of the marketers as well as innovators/enhancers. Cost refers to companies who compete primarily by providing their product at low cost. We classify 24 firms (49%) as innovators, 11 (22%) as enhancers, 5 (10%) as marketers, 6 (12%) as technology/marketing hybrids, and 3 (6%) as cost. This distribution is similar to that of Baron et al.'s (1999) larger sample of 149 companies: 50%, 19%, 13%, 11%, and 7%, respectively.

C. Point of differentiation

In table 4, we classify how the sample firms differentiate themselves from their competitors over the sample period. We rely on the distinguishing characteristics stated by the companies themselves.

We mention two caveats in interpreting these results. First, it is possible that the business plans are overly positive because the entrepreneurs are marketing their companies to the VCs. While possible, we do not find any appreciable difference between business plans (prepared by the firms) and investment memos (prepared by the VCs) with respect to the variables we analyze. Second, it is possible that the descriptions in the public documents – IPO prospectuses and Annual Reports – differ from those in the business plan because of legal liability concerns rather than business reasons.

By far the most important factor, cited by 100%, 98%, and 92% of companies, respectively, at the business plan, IPO, and annual report, is a belief that the company offers a unique product and/or technology.

A small number of firms – 6%, 12%, and 13% – cite the comprehensiveness of their products as differentiating at the three relevant dates.

Customer service becomes an increasingly important source of differentiation over time, increasing from 8% to 16% to 26% as a differentiating factor, respectively at the business plan, IPO, and annual report. Not surprisingly, customer service is relatively more important in the non-biotech firms.

Alliances and partnerships are of modest importance throughout with 12%, 12%, and 8% of the firms referring to them at the business plan, IPO and annual report.

At the business plan, 45% of companies cite the expertise of their management and other employees as distinguishing characteristics. This suggests that specific human capital plays an important role in the early life of many of these companies. The percentage of firms that cite expertise declines to 14% at the IPO and 13% at the annual report. This result is suggestive of an increasingly important role for non-human capital compared to specific human capital as companies mature. There is not much difference in the importance of expertise between biotech and non-biotech firms.

A small number of firms – 4%, 2%, and 5% – also cite scientific advisors, another human capital related resource – as important.

Finally, a small number of firms – 6%, 8%, and 8% – cite reputation as important. This may reflect human or non-human capital reputation.

The transition percentages shown in table 4 indicate that self-reported company distinguishing characteristics are generally stable over time. The columns labeled “yes to no” and “no to yes” show the percentage of firms for which a given characteristic was (was not) cited at one time but was not (was) cited at a later time. The one exception is the large reduction in firms citing management or employee expertise as a differentiating characteristic from the business plan to the IPO.

Overall, self-reported distinguishing characteristics suggest that non-human capital assets are more important than specific human capital assets initially, and that the relative importance increases over time.

D. Assets and Technology

In table 5, we describe the types of assets owned by our firms. We note whether each firm mentions patents, physical assets, and / or non-patented intellectual property as important or central to the business.

For example, while all firms have some physical assets, those physical assets do not necessarily differentiate or add value to the business. In particular, specific physical assets are generally not critical to software firms.

We classify the patents and physical assets as alienable assets because they can potentially be sold or assigned to other companies. We classify non-patented intellectual property as some kind of process, technique, or knowledge that the company believes is an important asset, but is not patented or assignable. Such non-patented intellectual property may or may not be tied to specific human capital.

A firm can have both patented and non-patented intellectual property. In the table, when we refer to proprietary intellectual property, this includes both patented and non-patented intellectual property. The distinction does not affect the percentages because all firms with patented intellectual property also claim to have non-patented intellectual property.

Table 5 indicates that patents and physical assets become increasingly important from the business plan to the IPO to the annual report. At the business plan, 29% of companies own or are the exclusive licensees of patents; at the IPO, 49%; and at the annual report, 62%. While patents and exclusive licenses are most important for biotech firms, they also are important for non-retail, non-biotech firms.

Physical assets are relatively unimportant for biotech firms and always important for retail firms. Physical assets become increasingly important for non-retail, non-biotech firms, going from 9% to 18% to 29% from business plan through annual report. When patents and physical assets are combined as alienable assets, we find that 43%, 67%, and 82% of the sample firms have such assets, respectively, at the business plan, IPO, and annual report.

Proprietary intellectual property is important for almost all of the non-retail firms – both biotech and non-biotech. Intellectual property, therefore, whether patented or not, is substantially more important than physical assets. This implies that the non-retail companies in the sample are based largely on ideas or knowledge rather than physical capital. This is consistent with arguments in Zingales (2000) that firms are increasingly defined by intellectual rather than physical capital.

E. Growth strategy

In table 6, we document the elements and evolution of the companies' growth strategies. At all times, the firms are strongly oriented towards internal growth. The most cited strategies at the business plan, IPO and annual report are to produce new or upgraded products (59%, 82% and 72%, respectively), followed by obtaining additional customers through increased market penetration or market leadership (49%, 71%, and 56%, respectively). Companies also plan to expand geographically (20%, 43%, and 21%, respectively). All three types of internal growth peak at the time of the IPO. It is worth noting that the emphasis on internal growth and, particularly, new products, is consistent with the result in table 5 that these companies rely heavily on differentiated products and technologies.

External growth through alliances and partnerships or through acquisitions becomes relatively more important over time. At the business plan, 29% and 2%, respectively, of the firms look for growth through alliances or acquisitions. By the time of the third annual report, this has increased to 51% and 28%, respectively. At all times, biotech companies are more likely to pursue alliances – typically with large pharmaceutical companies for the development, testing, and / or distribution of their products.

The transition percentages show that growth strategies tend to broaden between the business plan and IPO. The percentages in the "no to yes" column are all considerably larger than those in the "yes to no" column. By the IPO, companies are trying to grow along more dimensions than at the business plan.

Surprisingly, growth strategies seem to narrow somewhat between the IPO and annual report. Except for acquisitions, the percentages in the "yes to no" column are larger than those in the "no to yes" column. Two explanations are possible. Perhaps some of the growth strategies cited at the IPO were unsuccessful and, therefore, abandoned. Another explanation is increased conservatism due to the decrease in market capitalization and net income.

F. Customers

In table 7, we describe the evolution of our companies' customers. At the business plan, only 47% actually have customers; by the IPO, 90% have customers; and by the annual report, 95% have customers.

At all stages, biotech firms are less likely to have customers than the non-biotech firms. All of these percentages are consistent with the revenue results presented in table 2.

Roughly 85% of the sample companies target businesses as customers while 15% target consumers as customers. These percentages are stable through all stages, consistent with the results on the stability of the business model in table 3.

We characterize the evolution of company customer bases as broadening, narrowing, or staying about the same. An example of a broadening customer base would be a company that targets its products to medium-sized businesses at the business plan, but targets its products to both medium-sized and large (Fortune 500) companies at the IPO. The majority of the companies address a similar customer base over time, consistent again with the stability of the business models in the sample. Roughly one-third of the firms broaden their customer bases. About one-quarter broaden from business plan to IPO and another 15% broaden from IPO to annual report. A small fraction of the sample firms narrows their customer base.

These results suggest that the dramatic revenue increases in table 2 are primarily driven by selling more to an initial customer type either through increased market penetration or by selling additional products. The revenue increases are likely driven secondarily by selling to new types of customers.

G. Competitors

Table 8 describes the competition faced by the sample companies. At the business plan, 84% of the companies note that they face competition in their target markets. Typically this competition includes other startups as well as established firms. Of the other 16% of companies, 10% do not mention competition while 6% (three companies) claim that their product or market niche is so unusual that they face no real competition. All 49 companies note that they have competition by the IPO.

The type of competition named remains fairly stable with 56% of the firms claiming to face similar competitive threats over all three stages. Roughly 40% see a broadening in the types of companies they compete with while one company sees a narrowing. Again, this result seems consistent with the stability of the business model found in table 3.

H. Strategic alliances and other partnerships

The use of strategic alliances provides some evidence regarding firm boundaries because such alliances allow firms to contract to cooperate and share resources without merging. Table 9 summarizes the use and evolution of strategic alliances and other similar partnership arrangements by the sample companies.

The use of strategic alliances increases from business plan to IPO and then is approximately flat from IPO to annual report. The increase is particularly large for the biotech firms. At the business plan, 35% of the companies mention strategic alliances. This increases to 67% at the IPO and 69% at the annual report. For biotech companies, 18%, 82%, and 82%, respectively, have alliances at the business plan, IPO and annual report; for non-biotech companies, the corresponding percentages are 44%, 59%, and 64%. Among companies with strategic alliances, the median (average) number of alliances increases over time from 2 (2.2) at the business plan to 3 (3.3) at the IPO to 4 (5.4) at the annual report.

Although strategic alliances are not as common before the IPO, those that do exist are more stable through the IPO. Among companies with strategic alliances at the business plan, a median (average) 67% (60%) of those alliances still exist at the IPO. Among companies with strategic alliances at the IPO, only 42% (46%) survive to the annual report. Overall, only a median 20% (average 39%) of alliances at the business plan still exist at the annual report.

I. Management

The previous tables have focused largely on the non-human capital elements of the sample companies. We now turn our attention to the human capital elements of the firms.

Panel A of table 10 characterizes the top five executives described in the business plan, IPO prospectus, and annual report. At the time of the business plan, the management teams are incomplete, particularly the biotech firms: six of the companies (12%), five of which are in biotech, do not have a CEO; only 42% list a chief financial officer (CFO) as one of the top five executives; and only 38% list a sales or

marketing executive (CMO). Consistent with the importance of technology, 77% of the firms list a Chief Scientist, Chief Technical Officer, Vice President of Engineering (CTO), or similar as a top five executive.

By the time of the IPO and annual report, CFOs have become increasingly important, with 80% and 85% of the companies listing a CFO as a top five executive. The importance of sales and marketing remains fairly constant over time with 38%, 37%, and 41% of companies having a VP of marketing or similar as a top five executive at the business plan, IPO, and annual report. Biotech companies are much less likely to have such a person as a top five manager. The importance of a chief technology or science officer is stable at the IPO (at 77%), but declines substantially (to 47%) by the annual report

Panel A also provides information on the involvement of founders. Founders are heavily involved with the companies at the time of the business plan. We can identify a founder as the CEO of 77% of the 43 companies with a CEO (33 companies). We also can identify a founder as being on the board in 92% of the companies in which the founder is not the CEO and we have board information. A founder is a top five manager or on the board of all 47 companies for which we have board and management data.

Involvement of founders declines steadily over time. By the time of the IPO, only 57% of the CEOs are founders while 92% of the firms still have a founder as a top executive or a director. By the time of the annual report, 46% of the CEOs are founders while only 72% of the firms still have a founder as a top executive or a director. This suggests that over time, founders move from operating positions to board positions to no involvement with the company.

Panel B describes the previous backgrounds of the top five executives listed in the business plan. We characterize 42% of these executives with a background in general management, 25% in technical or technology management, 16% in science or other technical jobs, 9% with marketing backgrounds, and 8% with backgrounds in finance or accounting. The biotech company executives are more likely to have a technical management or science background while the non-biotech company executives are more likely to have a general management background. Nevertheless, for both types of firms, it seems, then, that a fairly broad set of skills are employed to manage our sample companies, even when they are very young. These companies employ the skills of experienced professionals fairly early on.

In panel C, we address the stability of human capital in more detail. CEO turnover is relatively low from the business plan to the IPO with 84% of the CEOs remaining in place. Turnover of the other top executives is greater with only 55% remaining in place from business plan to IPO. Turnover of both the CEO and the other top five executives is more common after the company has gone public. Only 59% of the CEOs retain their jobs between the IPO and the annual report while only 36% of the other top five executives remain the same. Overall, therefore, turnover is substantial. From the business plan to the annual report, exactly 50% of the CEOs and only 25% of the other top five executives remain the same.

The third row of panel C reports whether the former CEOs remain with the company in some capacity. At the IPO and annual report, respectively, only 29% and 11% of the former CEOs remain with the firms, suggesting, for the most part, that former CEOs leave the sample companies. The fourth row of panel C, presents a similar calculation for the former next four executives. To an even greater extent, those former executives leave the sample companies.

The relatively high incidence of founder and early executive departures is interesting. It may indicate that those founders and executives are particularly good at starting companies / providing early critical resources. Once the non-human capital is sufficiently established, these founders go on to do the same thing at other companies. We ascertain the extent to which this is true in by considering what the departing founders and executives do after leaving the firm.

We search for evidence of subsequent job or founder history in another young company for the departing executives in the CapitalIQ, VentureEconomics, and VentureOne databases. If they do not appear in these databases, it is unlikely that they went to another VC-backed or high profile young company. The results are in panel D of table 10. The first part of panel D shows that we can identify subsequent jobs or activities for roughly half of the departing founders and non-founders. The second part of panel D indicates that relatively few of these individuals subsequently found new companies. The highest percentage is 17%, representing one founder who departed between the business plan and the IPO, and subsequently founded another company. The third part of panel D reports the percentage of departing founders and non-founder

top executives who become top executives of other young companies. A larger fraction, roughly one-third, of founder and non-founders go on to do so.

These results in panel D, therefore, indicate that relatively few of the departing founders and executives found new companies while a greater (but minority) percentage repeat their experience in working for young companies and, potentially providing early critical resources. We report these findings with the caveat that they may understate the true percentages because not enough time has elapsed for some of the individuals to emerge in other companies.

J. Ownership

In the previous we described the evolution of human capital. In this section, we consider the rewards and incentives of the providers of that human capital. Table 11 summarizes company ownership. Ownership data at the business plan reflects 33 firms as we do not have ownership data at that time for 16 firms.

Panel A shows the evolution of ownership by the founders (taken as a group) and the CEO at the different company stages. We report ownership at the business plan immediately after the VC financing for which we have data. We report ownership both immediately before and immediately after the IPO.

Founder ownership declines sharply from a median of 28.9% at the business plan to 12.4% just before the IPO to 8.8% immediately following the IPO. Because founders typically are not allowed to sell any shares until six months after the IPO, this suggests that founders give up a substantial fraction of their ownership stakes in order to attract VC financing and / or outside management talent. Founder ownership continues to decline over the company's public life, to a median 5.3% at the annual report. This decline reflects founder stock sales as well as issuance of additional stock.

CEO ownership also declines as the firm ages: the median CEO owns 15.9% of the company at the business plan, 6.7% pre-IPO, 5.4% post-IPO, and 3.6% at the annual report. CEO ownership declines by a median 38% from the business plan to the pre-IPO.

The six CEOs who are not founders own a median of 5.5% of the company at the time of the business plan. The twenty-one non-founder CEOs at the time of the IPO own a median of 4.2% of the company just before the IPO. One can interpret these results as indicating that VC-financed companies allocate roughly 5% of the company's equity to attract and provide incentives to an outside CEO.

Panel A also breaks out the companies by biotech and non-biotech firms. Biotech and non-biotech founders own roughly the same percentage of the companies at the business plan. At the time of the IPO, however, biotech founders own less of the firms than non-biotech founders. Biotech CEOs own less of the firms than non-biotech CEOs both at the business plan and at the IPO. These results suggest that specific human capital is less important in biotech companies. There are at least two possible explanations. First, it may be easier to patent or assign the intellectual property of these companies. Second, these companies may require more financial capital.

The CEOs in our sample own an average of 9.8% of the pre-IPO (7.5% of the post-IPO) equity of the sample firms. This is less than the 19.1% pre-IPO (14.0% post-IPO) reported in Baker and Gompers (1999) for 433 VC-backed firms that went public between 1978 and 1987. Part of the reason for the difference is that our sample includes relatively more biotech firms which have relatively fewer founder CEOs. However, even for non-biotech firms, the CEO only owns 10.6% pre-IPO (8.2% post-IPO). Surprisingly, this suggests that human capital may have become less important rather than more important over time.

Panel B of table 11 reports how the ownership of the firm is divided immediately before the IPO. VCs, in exchange for financial capital and, potentially, their own human capital, own a median of 52.6% of the median company at the IPO. Founders retain a median 12.4%. When non-founders, CEOs own a median 4.2%; non-founder managers other than the CEO collectively own a median 2.2%. Business partners, such as original parent companies and strategic alliance partners, own none of the median firm and 3.8% of the average firm. Others, which include non-VC investors and non-founder employees, collectively, own a median of 22.7%. Panel B also indicates that the founders and management team have smaller equity positions in biotech firms than in non-biotech firms.

The last column of panel B calculates the dollar value of the founders' equity stakes using the first trading day's closing price, finding a median value of $17.5 million and an average of $103.3 million. The dollar value of non-biotech founders' holdings is substantially higher than those of biotech founders.

Using the ownership stakes just before the IPO in panel B, we can obtain three estimates of the percentage of value that founders retain that is not related to ongoing incentives. The first is the founders' average ownership percentage of 14.6% (median 12.4%). This is an upper bound, because some of this ownership is present for incentive purposes and would be given to non-founding managers. It is also an upper bound because the founders may have contributed non-human capital.

The second estimate begins with the ownership of founders and the top five managers that equals an average of 20.3% (median 16.3%). In the six cases in which there are no founders among the top five managers, their average ownership is 6.0% (median of 6.2%). The 6.0% stake provides an estimate of how much equity is required to attract a new management team to replace the existing one. The 14.3% difference provides another upper bound estimate of the value of the specific human capital that the founders provided.

A third measure calculates the equity needed for ongoing incentives by adding the average ownership of non-founder CEOs, 5.0%, to that of other non-founder, non-CEO top managers, 3.5%, to get a total of 8.5%. Subtracting this 8.5% from the ownership of founders and top five managers of 20.3% yields an estimate of 11.8% as the value of the specific human capital provided by the founders.

In an unreported regression, we regress pre-IPO founder ownership on a constant and a dummy variable equal to one if the founder is the CEO at the IPO. The coefficient on the dummy variable provides an estimate of the ownership needed for incentive purposes for the CEO. The coefficient is likely to be biased upward, however, because if the founder is still CEO, the CEO's value may be unusually high and the ownership may include some compensation for specific human capital. The constant term, therefore, can be considered a lower bound on compensation for the idea or specific human capital. In this regression, the constant term is 10.8%.

Overall, the estimates in panel B suggest that founders retain 10.8% to 14.6% of the value of the pre-IPO equity for their human capital assets specific to the company.

In estimating the value accruing to specific human capital, we have used the total market value of the firm's equity. This overstates the value created by the firm because it ignores the financial capital invested in the company, particularly by the VCs. Panel C of table 11 presents an analysis similar to that in panel B for pre-IPO ownership, except that it measures the founders' share of total value created before the IPO. We measure the total value created before the IPO as the value of the pre-IPO shares outstanding at the post-IPO stock price less the amount of outside financing raised by the firm before the IPO. The analysis assumes that the founders did not invest any money to obtain their shares and do not need to invest any money to exercise any options they may have. As a result, the analysis in panel C overstates the fraction of value accruing to founders (while panel B understates the fraction). One firm did not create any value – pre-IPO outside capital exceeded the value of the pre-IPO shares at the IPO price. We exclude this firm from the analysis.

Panel C indicates that the founders receive an average of 19.1% (median of 14.4%) of the value created. Again, this is an upper bound because some of this ownership is present for incentive purposes. The other two methods of calculating the value founders retain for non-incentive purposes generate estimates of 17% and 15.5%.

The estimates and calculations in panels B and C indicate a range of 10.8% to 19.1% as the value that founders retain of the firm for their idea or initial contributions that is not related to ongoing incentives.

K. Boards of directors

Table 12 documents the size, composition, and turnover of the boards of directors of our companies. The median board size is 5 seats at the business plan, 7 seats at the IPO, and 7 at the annual report. Insiders, defined as founders and current or past company managers, hold a constant median of 2 seats at each of the business plan, IPO, and annual report. VCs hold a median of 2 seats at the business plan, 3 at the IPO, and 1 at the annual report. This pattern reflects additional VC investment between the business plan and IPO, and profit-taking once the company has issued shares to the public. Meanwhile, the board presence of non-VC outsiders, who are generally either industry experts and / or experienced executives of other firms, increases from a median of 1 seat at the business plan to 2 at the IPO to 3 at the annual report.

Director turnover also increases after the company goes public. While 71% of directors at the business plan are still directors at the IPO, only 57% of the directors at the IPO are directors at the annual report. Only 40% of the directors at the business plan remain at the annual report.

III. Cross-sectional Analysis

In this section, we present the results of two cross-sectional analyses.

First, we consider the relation of human capital turnover to the nature of a firm's assets. One can (loosely) interpret the theories of the firm considered above as predicting that founders and specific human capital will be less important or critical when a firm has built up its non-human capital. In table 13, we try to test this by estimating the likelihood of a founder remaining CEO after the business plan. In panel A, the dependent variable equals one if one of the founders is CEO at the IPO; in panel B, the dependent variable equals one if one of the founders is CEO at the annual report. (We obtain qualitatively similar results if we use CEO turnover, regardless of whether the CEO was the founder.) As independent variables, we use the results in table 5 and create three dummy variables that equal one if, respectively, alienable assets, physical assets, or patents, are cited as significant assets at the business plan. We also create a dummy variable equal to one if the firm has no patents and non-patentable intellectual property (IP) is significant.

The regressions show a clear pattern. Firms with more alienable assets at the time of the business plan have substantially more founder turnover over time. All of the relevant coefficients are negative; the majority, statistically significant. Again, this suggests that specific human capital is more critical before alienable assets have formed, consistent with both the critical resource and the Hart-Moore-Holmström theories. The strong cross-sectional relation also corroborates our interpretation of the descriptive data.

The presence of non-patentable IP at the business plan is also negatively related to the likelihood that the founder will be remain as CEO later on. One interpretation of this result is that even unpatented know-how may be part of alienable organizational capital rather than tied to a specific founder.

The regressions also include a number of controls whose signs are more difficult to interpret. The age of the firm at the business plan is positively related to the likelihood of retaining the founder as CEO, while expansion of the firm's business line is negatively related. The last regression also includes the founder ownership stake at the business plan, which is strongly positively related to retaining the founder as CEO. Although this is an endogenous variable, it can be thought of as a proxy for the bargaining power of the founder, which in turn should be correlated with the value of the founder's specific human capital.[5]

Our second cross-sectional analysis considers the determinants of pre-IPO founder ownership. The theories of the firm imply that founders' bargaining power should decrease in the alienability of a firm's assets. To the extent that founder ownership is a measure of bargaining power and rents, founder ownership should decrease in alienability (tangibility and patents). We present this analysis in table 14. The dependent variable is pre-IPO founder ownership. The independent variables are the asset dummies used in table 13, and the age of the firm at the business plan. Unlike the results in table 13, none of the asset dummy variables is significant in the regressions. While it may reflect a paucity of observations or that there are many other determinants of founder ownership, the results in table 14 do not provide support for the hold-up theories. The lack of a result for hold-up also suggests that the measurement issues stressed in Holmstrom (1999) may be more important than hold-up in these companies.

IV. Summary and Discussion

In this paper, we have studied the evolution of firm characteristics from early business plan to initial public offering to public company for 49 VC financed companies. This exercise had two goals: to provide a systematic description of the early life and evolution of an important sample of firms; and to interpret our findings in relation to existing theories of the firm and what new theories might try to explain.

The typical company in our sample experiences dramatic growth. While the companies grow dramatically, their core businesses remain remarkably stable. Within core businesses, firm activities tend to

[5] Alternatively, it could be a proxy for the control rights that the founder retains in the venture. However, in regressions using a more direct measure of control, the fraction of founder board seats, the variable is not significant.

stay the same or broaden over time. The firms also sell to similar customers and compete against similar competitors in the three stages of the life cycle we examine.

Almost uniformly, firms claim that they are differentiated by a unique product, technology or service at all three stages. The points of differentiation also tend to be stable over time. Firms stress the importance of proprietary intellectual property (IP), patents, and physical assets in all three stages. Alienable assets – patents and physical assets – become increasingly important over time. At the business plan, roughly half of the firms also stress the importance of expertise (which one might interpret as human capital). The stated importance of expertise, however, declines to less than 15% by the IPO and third annual reports.

While points of differentiation, alienable assets, customers, and competitors remain relatively constant, the human capital of the sample firms changes substantially. At the time of the annual report, one-half of the CEOs at the business plan remain; only one-quarter of the next four top executives remain.

We believe that these results provide support for and help interpret prominent theories of the firm. Consistent with the Hart-Moore-Holmström view that a firm must be organized around non-human capital assets, non-human capital assets form very early in a firm's life. Identifiable lines of business and important physical, patent, and IP assets are created in these firms by the time of the early business plan, are relatively stable, and do not change or disappear as specific human capital assets turn over. These arguably constitute the "glue" that holds firms together.

These findings also have implications for the critical resource theories. The early emergence and stability of non-human assets are consistent with those assets being critical resources. The instability of the human assets suggests that to the extent that the initial critical resource is a specific person or founder, the "web of specific investments built around the founder(s)" itself becomes the critical resource relatively early in a firm's life.

Our cross-sectional analysis provides further support to our interpretations of the Hart-Moore-Holmström and critical resource theories. Firms with more alienable assets at the time of the business plan have substantially more human capital turnover over time. Again, this suggests that specific human capital is more critical before alienable assets have formed.

Our analysis also sheds light on the argument in Zingales (2000) and Rajan and Zingales (2001a) that today's "new firms" differ from the old, traditional firms of the (early) 20th century in that alienable assets – assets that can be assigned or pledged to other firms – have become less important relative to human capital and non-alienable assets (for example, business processes or knowledge). This argument implies that human capital should retain a larger fraction of the value of these "new firms." The ownership results in our sample do not support this implication. Founders retain a smaller fraction of their firms at the IPO than the founders in IPOs of the 1980s studied in Baker and Gompers (1999).

From a practitioner perspective, we believe that the greater stability of lines of business and non-human assets in our sample relative to the stability of management teams favors the business / market / horse view of VC investing over the best available management team / jockey view except, perhaps, at the birth of a company. The results suggest that VCs are regularly able to find management replacements or improvements for good businesses. At least in our sample, we do not find cases in which VCs invest in good managers who find business replacements. An initial strong management team, therefore, is neither necessary nor sufficient. An initial strong business may not be sufficient, but appears necessary.

Some practitioners have suggested that business plans do not matter much – if a VC puts in a great management team in a mediocre business, the team will figure out what to do. Our results suggest that the business plan – whether or not it is written down – is very important.

Finally, we end with an important caveat. We have studied a special sample of firms – those VCs choose to fund. It is possible, if not likely that VCs fund companies in which specific human capital becomes less important relatively quickly. It also is possible that VCs do not allow managers to change the business. Nevertheless, our results apply to a large fraction of firms that go public – at least 39%. A logical avenue for future research is to consider whether these results hold for non-VC backed firms. Whether or not the results generalize, however, we view the results in this paper as an early empirical look at important questions that clearly merit further research.

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Table 1 – Sample Summary

Median, average, and standard deviation of (i) the age of the firm in months as of the date of the business plan (BP), (ii) the time elapsed in months between the business plan and the IPO, (iii) the time elapsed in months between the IPO and the annual report (AR), and (iv) the time elapsed in months between business plan and the annual report for 49 VC-financed companies that subsequently went public. The table also reports frequency distributions of the number of founders, the dates sample firms were founded, the dates of their business plans, IPOs, and annual reports, the industries in which they operate, and their status as of August 2004.

	Age (months) at Business Plan	Months between Business Plan and IPO	Months between IPO and Annual Report	Months between Business Plan and Annual Report
Median	24	34	33	63
Average	40	38	32	68
St. dev.	51	23	8	23
Num. Obs.	49	49	39	39

Number of companies with Business Plan dated prior to or concurrent with first VC financing: 19

Number of companies with one founder:	21
Number of companies with two co-founders:	16
Number of companies with three or more co-founders:	11

	Number firms founded	Number BPs	Number IPOs	Number ARs
1975-1980	3			
1980-1984	2			
1985-1989	5	4	1	
1990	1	1		
1991	4			1
1992	3		2	
1993	2	3		
1994	7	1		1
1995	9	8	3	1
1996	5	11	3	
1997	2	9	3	2
1998	6	9	5	3
1999		2	14	1
2000			12	9
2001		1		5
2002			1	9
2003			1	6
2004			4	1

Industry breakdown:

	Biotechnology	Software/IT	Telecom	Healthcare	Retail	Other
#firms	17	15	3	5	5	4

Status as of 7/31/2005:

	Active	Acquired / Merged	Bankrupt
#firms	27	15	7

Table 2
Financials and Employees

Median, average, and standard deviation of revenue, assets, earnings before interest and taxes (EBIT), net income, market capitalization, EBIT to revenue ratio, market capitalization to book assets ratio, number of employees, and revenue per employee at the business plan (BP), IPO, and annual report (AR) for 49 VC financed companies that subsequently went public. Revenue, net income, and assets are reported as of the end of the prior fiscal year. Panel A reports statistics broken out by all sample firms, biotechnology firms, and non-biotechnology firms. Panel B reports some statistics for non-retail firms.

Panel A

	All firms			Biotechnology firms			Non-biotechnology firms		
Revenue ($M)									
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	0	7.2	35.1	0	2.9	20.7	0.6	12.7	97.5
Average	5.54	40.5	179.0	0.7	4.9	30.1	8.3	59.5	241.4
St. dev.	13.6	154.5	332.7	1.6	5.3	14.8	16.5	189.4	376.0
Num. Obs.	47	49	39	17	17	11	30	32	28
Revenue percentage change									
	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	390	408	2,591	140	419	209	607	397	2,094
Average	2,954	3,569,242	63,255	131	18,249	821	3,378	5,131,678	74,273
St. dev.	7,593	21,400,000	234,524	224	56,443	1,229	8,081	25,700,000	253,878
Num. Obs.	23	36	20	3	11	3	20	25	17
Number of employees									
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	22	124	378	10	71	134	31	209	561
Average	92	340	1,267	17	87	195	138	475	1,688
St. dev.	202	659	2,320	13	67	141	246	785	2,630
Num. Obs.	42	49	39	16	17	11	26	32	28
Number of employees percentage change									
	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	515	100	1,519	528	62	1,170	500	125	2,023
Average	720	277	3,848	579	128	1,803	806	336	4,700
St. dev.	808	492	7,617	544	183	1,970	935	562	8,896
Num. Obs.	42	39	34	16	11	10	26	28	24

Table 2 (continued)

	All firms			Biotechnology firms			Non-biotechnology firms		
Revenue per employee ($thousand)									
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	0	50.5	124.6	0	48.9	87.7	9.9	53.5	136.3
Average	29.5	63.3	139.4	5.8	45.9	97.7	44.0	72.5	155.8
St. dev.	58.5	64.5	98.7	16.4	40.0	66.9	69.8	73.3	105.2
Num. Obs.	42	49	39	16	17	11	26	32	28
Revenue per employee percentage change									
	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	51	116	374	-17	111	163	63	120	453
Average	269	217,486	1497	-17	6,685	163	304	310,239	1,687
St. dev.	518	1,290,494	3815	113	20,714	237	539	1,548,924	4,059
Num. Obs.	18	36	16	2	11	2	16	25	14
Assets ($M)									
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	2.6	19.6	96.7	1.8	18.5	91.7	2.9	20.8	108.9
Average	5.9	44.3	274.9	3.3	23.7	96.7	6.7	55.4	345.0
St. dev.	10.8	69.6	663.0	3.9	18.3	64.5	12.3	83.5	773.9
Num. Obs.	35	49	39	9	17	11	26	32	28
Assets percentage change									
	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	430	287	2,498	689	361	1,077	396	274	3,253
Average	2,570	913	52,605	1,231	646	3,505	3,057	1,018	65,526
St. dev.	6,137	1,812	158,013	1,557	994	5,877	7,090	2,053	176,211
Num. Obs.	30	39	24	8	11	5	22	28	19
EBIT ($M)									
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	-0.8	-6.7	-25.6	-1.4	-10.3	-32.8	-0.8	-5.4	-22.4
Average	-1.6	-7.7	-48.6	-1.9	-11.7	-30.4	-1.5	-5.6	-55.8
St. dev.	2.5	13.5	93.3	2.0	7.5	18.1	2.6	15.5	109.2
Num. Obs.	36	49	39	8	17	11	26	32	28
% positive	17%	18%	15%	13%	6%	0%	18%	25%	21%

Table 2 (continued)

EBIT percentage change

	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	159	156	996	538	239	755	120	154	1,046
Average	1,149	-2,129	9,818	969	182	2,938	1,199	-3,037	11,694
St. dev.	2,978	15,320	43,675	1,554	212	6,157	3,292	18,091	49,258
Num. Obs.	32	39	28	7	11	6	25	28	22

Market capitalization ($M)

	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	17.9	232.4	176.9	14.1	254.9	265.8	18.7	218.8	163.5
Average	29.0	697.7	470.8	16.2	388.3	257.6	33.3	862.0	557.7
St. dev.	32.9	1920.3	1378.6	11.9	368.2	216.2	36.5	2357.8	1630.9
Num. Obs.	40	49	38	10	17	11	30	32	27

Market capitalization percentage change

	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	1,586	-55	496	2,064	-53	2,370	1,409	-57	417
Average	7,778	98	10,492	7,101	14	2,830	8,005	132	13,250
St. dev.	108865	362	37,055	16,631	139	3,146	19,813	418	43,066
Num. Obs.	40	38	34	10	11	9	30	27	25

Market capitalization to assets ratio

	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	5.4	13.9	1.8	2.3	13.6	2.2	7.1	15.6	1.6
Average	8.9	23.6	2.3	5.1	22.1	2.8	9.9	24.5	2.0
St. dev.	10.1	25.2	2.1	5.6	21.1	2.5	10.8	27.4	1.9
Num. Obs.	25	49	38	5	17	11	20	32	27

Market capitalization to assets ratio percentage change

	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	80	-89	-61	110	-91	-38	62	-89	-74
Average	328	-65	-23	694	-79	120	237	-60	-57
St. dev.	588	73	162	1015	25	354	420	85	52
Num. Obs.	25	38	21	5	11	4	20	27	17

Table 2 (continued)

Panel B – Excluding retail firms

				Percentage Change		
	BP	IPO	AR	BP to IPO	IPO to AR	BP to AR
Number of employees						
Median	18	102	256	523	96	1,519
Average	56	179	582	726	258	3,958
St. dev.	115	216	991	821	493	8,056
Num. Obs.	38	44	34	38	34	30
Revenue per employee ($thousand)						
Median	0	43.6	121.7	51	164	409
Average	23.2	55.3	135.0	309	252,558	1,908
St. dev.	54.3	53.8	96.5	580	1,390,606	4,369
Num. Obs.	38	44	34	14	31	12

Table 3
Lines of Business

Stated business at the business plan, IPO, and annual report, as well as the percentage of companies whose stated lines of business broaden, narrow, or stay the same over those periods for 49 VC financed companies that subsequently went public. Panel B categorizes the origin of each company's business idea, according to the business plan, as an existing business, academic research, a previous employer of the founder(s), or unknown. Panel B also categorizes business strategies as of the business plan according to the Baron, Hannan, and Burton (1999) classification system.

Panel A

Companies whose line of business stays about the same over time

Company	Business Plan	IPO	Annual Report
1	●Development of analgesics	●Development of analgesics	●Development of analgesics
2	●Chemical analysis instrumentation and research services	● Contract research and development services	●Contract research and development services
3	●Specialty supermarkets	● Specialty supermarkets	● Specialty supermarkets
4	●Customer information management software	●Enterprise relationship management software	●Enterprise customer relationship management software
5	●Category-dominant specialty retailer	●Specialty retailer	● Specialty retailer
6	●Sustained-release drug delivery systems	●Sustained-release drug delivery systems	●Sustained-release drug delivery systems
7	●Non-invasive cardiac surgery	●Non-invasive cardiac surgery	●Non-invasive cardiac surgery
8	●Production of nanocrystalline materials	●Development and marketing of nanocrystalline materials	●Engineering and manufacturing of nanocrystalline materials
9	●Telecom service provider	●Telecom service provider	●Telecom service provider
10	● Superstore specialty retailer	● Full-line specialty retailer	● Full-line specialty retailer
11	●Office supply stores	●Office supply stores	● Office supply stores
12	●Digital prepress equipment	●Digital prepress equipment	
13	●Maps and mapping-related products, services, and technology	●Mapping products and services	
14	● Therapeutic products for cancer and infectious diseases	● Therapeutic products for cancer and infectious diseases	
15	● Small business equipment leasing	● Small business equipment leasing	

Table 3 (cont.)

Companies whose line of business broadens/narrows (B/N) between the business plan and IPO but not between the IPO and the annual report

Company	Business Plan	IPO	Annual Report
16	●Wireless data communications	(N) Wireless communication and information systems for health information	●Wireless health information communication systems
17	●Web-based enterprise application software	(N) Live business collaboration software and services	●Application software and services for real-time enterprise collaboration
18	●Experimentation platform for a wide range of biological analyses	(N) Tools for large-scale analysis of genetic variation and function	●Tools for large-scale analysis of genetic variation and function
19	●Combinatorial chemistry	(N) Computational drug discovery	
20	●Software and services to industries transformed by human genome research	(N) Software products and services to accelerate drug discovery and development	
21	●Implantable hearing devices	(B) Implantable and semi-implantable hearing devices	●Implantable and semi-implantable hearing devices
22	●Drug screening and discovery	(B) Drug candidate development	●Drug candidate development
23	●Drug target discovery	(B) Drug target discovery and small molecule drug development	●Small molecule drug discovery and development
24	●Products for the treatment of abnormal uterine bleeding	(B) Surgical systems for the diagnosis and treatment of gynecological disorders	●Surgical systems for the diagnosis and treatment of gynecological disorders
25	●Products and services to accelerate drug discovery	(B) Creating drug candidates through innovations in chemistry	● Creating small molecule drugs through the integration of chemistry, biology and informatics
26	●Internet-based micropayments system and incentive currency	(B) Internet-based direct marketing and advertising services combined with programs that reward consumers with cash	
27	●Treatment for psychotic major depression	(B) Drug development for severe psychiatric and neurological diseases	
28	●Discovery and development of drugs for memory-related disorders	(B) Development of drugs for a broad range of central nervous system disorders	
29	●Development of treatments for pulmonary inflammatory diseases	(B) Discovery and development of treatments for allergies, infectious diseases, and chronic inflammatory diseases	

Table 3 (cont.)

Companies whose line of business broadens/narrows (B/N) between IPO and annual report but not between business plan and IPO

Company	Business Plan	IPO	Annual Report
30	●Diagnostic imaging and treatment of cancer and cardiovascular disease	●Diagostic imaging and treatment of cancer, artherosclerosis, and other diseases	(N) New drugs to treat cancer and artheroscelerosis
31	●Internet data delivery software	●Internet data delivery software	(B) E-business infrastructure software and services
32	●Sales and marketing automation software	●Sales, marketing, and customer support automation software	(B) Customer relationship management software
33	●Microfluidics	●Microfluidics	(B) Novel assay chemistry solutions for drug discovery and development
34	●Upscale, casual ethnic restaurants	●Upscale, casual ethnic restaurants	(B) Upscale, casual ethnic restaurants and casual ethnic diners

Companies whose line of business broadens/narrows (B/N) between both the business plan and IPO and the IPO and annual report

Company	Business Plan	IPO	Annual Report
35	●E-commerce solutions	(N) E-commerce and direct marketing services	(B) Technology infrastructure and services
36	●Disease prevention	(N) Live-virus vaccines	(B) Disease prevention through vaccine technology
37	●Novel antimicrobial compounds	(B) New antibacterial and antifungal drugs	(N) Prevention of ventilator-associated pneumonia
38	●Internet marketing software	(B) Internet marketing and data aggregation software	(B) E-business products and services
39	●Internet communication services	(B) Internet system and network management	(B) Internet infrastructure outsourcing
40	●Website production software	(B) Web content management software	(B) Enterprise content management software
41	●Hotel reservation and commission collection system	(B) Transaction processing services for the worldwide hotel industry	(B) Hotel reservation and representation services for the global hotel industry
42	●Market research	(B) Market research and polling	(B) Market research and consulting
43	●Semiconductor laser diodes and related systems and subsystems	(B) Semiconductor optoelectronic integrated circuits and high power semiconductor lasers	(B) Semiconductor circuits and lasers; fiber-optic systems
44	●Local switched telecommunications services	(B) Competitive local exchange carrier	(B) National communications provider
45	●Basic local telephone services	(B) Facilities-based competitive local exchange carrier	(B) Facilities-based operator of a fiber optic communications infrastructure
46	●Customer interaction software	(B) E-business infrastructure software	(B) Enterprise software vendor
47	●Sterilization systems for medical instruments	(B) Sterile processing and infection prevention systems	(B) Infection prevention, contamination control, microbial reduction, and critical care support products and services
48	●Disease gene discovery	(B) Gene and drug target discovery, database, and information technology products and services	(B) Population genetics company developing drugs and DNA-based diagnostics

Companies whose line of business changes (C) between both the business plan and IPO and the IPO and annual report

Company	Business Plan	IPO	Annual Report
49	●New computing platform	(C) Computer operating system	(C) Software solutions for Internet appliances

Table 3 (cont.)

All Firms	BP to IPO	IPO to AR	BP/IM to AR
Percent whose business model changes	2	3	3
Number observations	49	39	39

All Firms			
Percent whose line of business	BP to IPO	IPO to AR	BP/IM to AR
Stays about the same	42	42	37
Broadens	46	50	50
Narrows	13	8	13
Number observations	48	38	38

Biotechnology Firms			
Percent whose line of business	BP to IPO	IPO to AR	BP/IM to AR
Stays about the same	29	55	18
Broadens	47	27	45
Narrows	24	18	36
Number observations	17	11	11

Non-biotechnology Firms			
Percent whose line of business	BP to IPO	IPO to AR	BP/IM to AR
Stays about the same	49	37	45
Broadens	45	59	52
Narrows	6	4	3
Number observations	31	27	27

Panel B

Origin of Business Idea:

	Existing business	Previous employer	Academic research	Out of the blue or unknown
All firms	5	15	14	15
Biotech	1	2	10	4
Non-Biotech	4	13	4	11

Baron et al. (1999) classification of business plan strategy:

	Innovator	Enhancer	Marketing	Tech/marketing hybrid	Cost
All firms	24	11	5	6	3
Biotech	12	4	0	1	0
Non-Biotech	12	7	5	5	3

Table 4
Point of differentiation

Percent of companies that explicitly mention the following characteristics as those that distinguish the company: unique product, service, or technology; comprehensive product offerings; strong customer service; alliances, partnerships, and other business relationships; management and/or employee expertise; strength of scientific advisors; and reputation for 49 VC-financed companies that subsequently went public. We also report the percentages of companies who do or do not change what they consider their distinguishing characteristics over time (e.g. The "yes to no" column under "BP to IPO" reflects the percentage of companies who report a given item as a distinguishing characteristic in the business plan but not at the IPO).

	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
	All firms			*Biotechnology firms*			*Non-biotechnology firms*		
Unique product/technology	100	98	92	100	100	91	100	97	93
Comprehensive products	6	12	13	6	6	0	6	16	18
Customer service	8	16	26	0	6	9	13	22	32
Alliances/partnerships	12	12	8	0	12	0	19	13	11
Expertise	45	14	13	47	12	18	44	16	11
Scientific advisors	4	2	5	6	0	0	3	3	7
Reputation	6	8	8	0	6	9	9	9	7
Number of observations	49	49	39	17	17	11	32	32	28

	BP to IPO				IPO to AR				BP to AR			
	Yes to yes	Yes to no	No to yes	No to no	Yes to yes	Yes to no	No to yes	No to no	Yes to yes	Yes to no	No to yes	No to no
Unique product/technology	98	2	0	0	92	5	0	3	92	8	0	0
Comprehensive products	4	2	8	86	8	3	5	85	3	5	10	82
Customer service	8	0	8	84	15	5	10	69	8	3	18	72
Alliances/partnerships	8	4	4	84	3	10	5	82	5	8	0	85
Expertise	8	37	6	49	8	5	5	82	8	36	5	51
Scientific advisors	2	2	0	96	3	0	3	95	3	3	3	92
Reputation	4	2	4	90	8	3	0	90	3	5	5	87
Number of observations	49	49	49	49	39	39	39	39	39	39	39	39

Table 5
Assets and Technology

Percent of companies that have patented technology, physical assets, alienable assets (either physical assets or patents), and proprietary intellectual property for 49 VC-financed companies that subsequently went public. We also report the percentages of companies for which these are or are not constant over time (e.g. The "yes to no" column under "BP to IPO" reflects the percentage of companies who report a given item as part of their assets in the business plan but not at the IPO).

	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
	All firms			*Biotechnology firms*			*Non-biotechnology firms*			*Retail firms*			*Non-biotechnology/ Non-retail firms*		
Patents	29	49	62	53	76	91	16	34	50	0	0	0	32	55	71
Physical assets	18	27	38	6	6	9	25	38	50	100	100	100	9	18	29
Alienable assets	43	67	82	59	76	91	34	63	79	100	100	100	36	64	79
Proprietary IP	84	86	82	94	100	100	78	78	75	0	0	0	93	95	94
Number of observations	49	49	39	17	17	11	32	32	28	5	5	5	44	44	34

	All firms BP to IPO				*Biotechnology firms* IPO to AR				*Non-biotechnology firms* BP to AR			
	Yes to yes	Yes to no	No to yes	No to no	Yes to yes	Yes to no	No to yes	No to no	Yes to yes	Yes to no	No to yes	No to no
Patents	29	0	20	51	46	0	15	39	26	0	36	38
Physical assets	18	0	8	73	31	0	8	62	21	0	18	62
Alienable assets	43	0	24	33	69	0	13	18	44	0	38	18
Proprietary IP	84	0	2	14	82	0	0	18	79	0	3	18
Number of observations	49	49	49	49	39	39	39	39	39	39	39	39

Table 6
Growth Strategy

Percent of companies that explicitly report the following as elements of their growth strategy for 49 VC-financed companies that subsequently went public: increase market penetration or establish market or technology leadership, develop new products or upgrade existing products, develop new strategic alliances or other business partnerships, expand geographically, acquire other companies. We also report the percentages of companies who do or do not change the elements of their strategies over time (e.g. The "yes to no" column under "BP to IPO" reflects the percentage of companies who report a given item as part of their growth strategy in the business plan but not at the IPO).

	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
	All firms			*Biotechnology firms*			*Non-biotechnology firms*		
Market penetration/leadership	49	71	56	24	47	55	63	84	57
New/upgraded products	59	82	72	94	100	91	41	72	64
Expand geographically	20	43	21	0	6	0	31	63	29
New alliances/partnerships	29	59	51	47	71	64	19	53	46
Acquisitions	2	22	28	0	29	27	3	19	29
Number of observations	49	49	39	17	17	11	32	32	28

	BP to IPO				IPO to AR				BP to AR			
	Yes to yes	Yes to no	No to yes	No to no	Yes to yes	Yes to no	No to yes	No to no	Yes to yes	Yes to no	No to yes	No to no
Market penetration/leadership	47	2	24	27	49	21	8	23	36	15	21	28
New/upgraded products	53	6	29	12	64	15	8	13	51	5	21	23
Expand geographically	14	6	29	51	21	26	0	54	13	13	8	67
New alliances/partnerships	24	4	35	37	51	8	0	41	23	2	28	46
Acquisitions	2	0	20	78	10	10	18	62	3	0	26	72
Number of observations	49	49	49	49	39	39	39	39	39	39	39	39

Table 7
Customers

Percent of companies that have customers at the business plan, IPO, and annual report for 49 VC-financed companies that subsequently went public. We also report whether the customer base is primarily businesses or consumers, and whether the customer base broadens, narrows, or stays about the same over time.

	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
	All firms			*Biotechnology firms*			*Non-biotechnology firms*			*Retail firms*			*Non-biotechnology, Non-retail firms*		
Has customers (%)	47	90	95	12	83	82	66	94	100	100	100	100	59	93	100
Primarily businesses (%)	86	86	85	94	94	91	81	81	82	20	20	20	93	93	96
Primarily consumers (%)	14	14	15	6	6	9	19	19	18	80	80	80	7	7	4
Number of observations	49	49	39	17	17	11	32	32	28	5	5	5	27	27	23

	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
	All firms			*Biotechnology firms*			*Non-biotechnology firms*		
Customer base similar (%)	73	77	62	88	100	82	66	68	54
Customer base broader (%)	24	15	33	6	0	9	34	21	43
Customer base narrower (%)	2	8	5	5	0	9	0	11	4
Number of observations	49	39	39	17	11	11	32	28	28

Table 8
Competitors

Percent of companies who have competitors at the business plan for 49 VC-financed companies that subsequently went public. We also report the percent of companies whose competitor base broadens, narrows, or stays about the same over time.

Number of observations: 49 Lists competitors as of business plan (%): 84

	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
	All firms			*Biotechnology firms*			*Non-biotechnology firms*		
Competitor base similar (%)	63	79	56	47	82	36	72	79	64
Competitor base broader (%)	35	21	41	53	18	64	25	21	32
Competitor base narrower (%)	2	0	3	0	0	0	3	0	4
Number of observations	49	39	39	17	11	11	32	28	28

Table 9
Strategic alliances and other business partnerships

Percent of companies that explicitly mention strategic alliances or other business partnerships as elements of their business for 49 VC-financed companies that subsequently went public. For those that do report alliances, we report the median, average, and standard deviation of the number of reported alliances or partnerships; the number and percent of alliances or partnerships that remain over time; and the number of new alliances or partnerships over time.

	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
	All firms			*Biotechnology firms*			*Non-biotechnology firms*		
Alliances mentioned (%)	35	67	69	18	82	82	44	59	64
Num. Obs.	49	49	39	17	17	11	32	32	28
Number reported alliances									
	All firms			*Biotechnology firms*			*Non-biotechnology firms*		
Median	2.0	3.0	4.0	2.0	3.0	4.0	2.0	3.0	6.5
Average	2.2	3.3	5.4	2.0	3.1	4.0	2.3	3.5	7.1
Standard deviation	1.3	2.1	4.6	1.0	1.7	2.6	1.5	2.5	6.1
Num. Obs.	11	26	18	3	13	10	8	13	8

	BP to IPO	IPO to AR	BP to AR
Number alliances still existing			
Median	1.0	1.0	1.0
Average	1.0	1.6	0.7
Standard deviation	0.7	1.4	0.8
Num. Obs.	9	14	7
Percent alliances still existing			
Median	67	42	20
Average	60	46	39
Standard deviation	44	38	46
Num = 100%	4	3	2
Num. = 0%	2	3	3
Num. Obs.	9	14	7
Number new alliances			
Median	2.0	3.0	4.0
Average	2.5	4.0	5.5
Standard deviation	2.2	3.8	4.6
Num. Obs.	20	15	13

Table 10
Management

Percent of companies whose top 5 managers include a chief executive officer (CEO), a chief technologist, scientist or similar (CTO), a chief financial officer (CFO) or similar, and a marketing or sales director or similar (CMO) for 49 VC-financed companies that subsequently went public. The table also reports whether a founder is the CEO or, if not, a director; the extent of executive turnover; and the backgrounds of the business plan management team.

Panel A:

	All firms			Biotechnology firms			Non-biotechnology firms		
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Has a CEO(%)	88	100	100	71	100	100	97	100	100
Num. Obs.	49	49	39	17	17	11	32	32	28
CEO is a founder (%)	77	57	46	75	53	36	77	59	50
Num. Obs.	43	49	39	12	17	11	31	32	28
A founder is a director if none is the CEO (%)	92	71	48	83	75	71	100	69	36
Num. Obs.	12	21	21	6	8	7	6	13	14
A founder is a top 5 manager or a director	100	92	72	100	94	82	100	94	68
Num. Obs.	47	49	39	16	17	11	31	32	28
Has a CFO or similar (%)	42	80	85	35	71	100	45	84	79
Num. Obs.	48	49	39	17	17	11	31	32	28
Has a CMO or similar (%)	38	37	41	12	12	9	45	50	54
Num. Obs.	48	49	39	17	17	11	31	32	28
Has a CTO or similar (non-retail) (%)	77	77	47	76	82	55	77	74	43
Num. Obs.	43	44	34	17	17	11	26	27	23

Table 10 (continued)

Panel B:

All firms

	General mgmt	Technical mgmt	Technical	Marketing	Finance
Top 5 business plan executives' background (%)	42	25	16	9	8
Num. Obs.	47	47	47	47	47

Biotechnology firms

	General mgmt	Technical mgmt	Technical	Marketing	Finance
Top 5 business plan executives' background (%)	26	42	27	1	4
Num. Obs.	16	16	16	16	16

Non-biotechnology firms

	General mgmt	Technical mgmt	Technical	Marketing	Finance
Top 5 business plan executives' background (%)	50	16	10	13	11
Num. Obs.	31	31	31	31	31

Panel C:

	All firms			Biotechnology firms			Non-biotechnology firms		
	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
CEO remains the same (%)	84	59	50	92	64	56	81	57	48
Num. Obs.	43	39	36	12	11	9	31	28	27
Next 4 top execs remaining (%)	55	36	25	41	36	22	63	36	27
Num. Obs.	49	39	39	17	11	11	32	28	28
Former CEO still at co. (%)	29	19	11	0	25	25	33	17	7
Num. Obs.	7	16	18	1	4	4	6	12	14
Former next 4 execs still at co. (%)	25	6	6	29	18	2	24	1	7
Num. Obs.	41	38	42	14	11	14	27	27	28

Panel D: Departing founders/executives

	All firms: departed between		Biotechnology firms: departed between		Non-biotech firms: departed between	
	BP and IPO	IPO and AR	BP and IPO	IPO and AR	BP and IPO	IPO and AR
Identified next job (%):						
Founders	50	45	50	50	50	43
Num. Obs.	6	15	2	4	4	11
Non-founder CEOs	0	60		100	0	50
Num. Obs.	1	5		1	1	4
Non-founder other top 5	41	42	33	53	46	39
Num. Obs.	32	33	12	8	20	25
Founded new company (%):						
Founders	17	10	50	0	0	14
Num. Obs.	6	15	2	4	4	11
Non-founder CEOs	0	0		0	0	0
Num. Obs.	1	5		1	1	4
Non-founder other top 5	11	4	4	4	15	4
Num. Obs.	32	33	12	8	20	25
Top executive of startup company (%):						
Founders	33	27	50	0	25	36
Num. Obs.	6	15	2	4	4	11
Non-founder CEOs	0	40		0	0	50
Num. Obs.	1	5		1	1	4
Non-founder other top 5	36	36	20.8	40	45	35
Num. Obs.	32	33	12	8	20	25

Table 11
Ownership

Panel A reports common stock ownership of company founders (taken as a group), CEOs, and non-founder CEOs at the business plan, immediately before the (pre-) IPO, immediately after the (post-)IPO, and at the annual report, as well as percentage changes in these variables. Percentage changes are from business plan to pre-IPO. Ownership at the business plan is after the financing round. Panel B summarizes the division of firm ownership pre-IPO. Panel C summarizes the shares of net value, defined as pre-IPO value minus total consideration paid by all existing investors, owned by founders and executives of the firm, assumed that none of them paid consideration to the company.

Panel A – Beneficial ownership of common stock

	All firms				Biotechnology firms				Non-biotechnology firms			
Founder(s) (%)												
	BP	Pre-IPO	Post-IPO	AR	BP	Pre-IPO	Post-IPO	AR	BP	Pre-IPO	Post-IPO	AR
Median	28.9	12.4	8.8	5.3	28.9	4.3	3.5	5.1	31.7	13.1	10.3	5.3
Average	36.0	14.6	11.2	7.2	34.4	11.4	8.6	8.0	36.7	16.4	12.6	6.8
St. dev.	25.4	12.4	9.7	7.5	30.8	12.7	9.5	9.2	23.6	12.1	9.7	7.0
Num. Obs.	31	49	49	37	9	17	17	10	22	32	32	27

Founder(s) percentage change									
	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	-45	-51	-77	-51	-49	-63.8	-38	-53	-86
Average	-39	-54	-72	-42	-52	-64.1	-37	-55	-75
St. dev.	40	40	27	46	20	26.1	38	45	27
Num. Obs.	31	36	25	9	10	7	22	26	18

CEO (%)												
	BP	Pre-IPO	Post-IPO	AR	BP	Pre-IPO	Post-IPO	AR	BP	Pre-IPO	Post-IPO	AR
Median	15.9	6.7	5.4	3.6	6.8	4.3	3.1	3.2	17.4	8.0	6.4	3.8
Average	20.1	9.8	7.5	5.7	15.5	8.2	6.2	6.1	22.0	10.6	8.2	5.6
St. dev.	15.8	9.0	7.0	6.6	14	9.9	7.1	8.7	16.5	8.6	6.9	5.9
Num. Obs.	27	49	49	38	8	17	17	10	19	32	32	28

CEO percentage change									
	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	-38	-50	-78	-19	-36	-72.2	-38	-55	-79
Average	-31	-40	-69	-15	-48	-62.9	-38	-37	-71
St. dev.	37	70	26	45	27	32.8	32	80	23
Num. Obs.	27	38	23	8	10	7	19	28	16

Table 11 (continued)

	All firms				Biotechnology firms				Non-biotechnology firms			
Non-founder CEO (%)												
	BP	Pre-IPO	Post-IPO	AR	BP	Pre-IPO	Post-IPO	AR	BP	Pre-IPO	Post-IPO	AR
Median	5.5	4.2	3.0	1.7	4.2	3.6	2.8	1.2	6.5	6.6	5.0	2.0
Average	5.1	5.0	4.0	1.9	4.2	3.5	2.7	1.6	5.5	6.0	4.8	2.1
St. dev.	2.0	3.1	2.6	1.4	0.7	1.2	0.9	1.3	2.4	3.5	2.9	1.4
Num. Obs.	6	21	21	20	2	8	8	6	4	13	13	14
Non-founder CEO percentage change												
	BP to IPO	IPO to AR	BP to AR		BP to IPO	IPO to AR	BP to AR		BP to IPO	IPO to AR	BP to AR	
Median	-30	-48	-72		-20	-33	-86		-30	-56	-70	
Average	-23	-56	-80		-20	-45	-86		-24	-60	-76	
St. dev.	27	28	19		50	37	20		20	24	21	
Num. Obs.	6	14	5		2	4	2		4	10	3	

Panel B – Division of ownership pre-IPO (%)

	Founders	Non-founder CEO	Non-founder other top 5 managers	VCs	Partners	Others	All executive officers and directors	Founders + top 5 mgrs	Founder not a mgr: top 5 mgrs	Founder $ pre-IPO ($M)
					All firms					
Median	12.4	4.2	2.2	52.6	0.0	22.7	52.0	16.3	6.2	17.5
Average	14.6	5.0	3.5	53.0	3.8	23.1	55	20.3	6.0	103.3
St. dev.	12.4	3.1	4.4	17.1	8.2	13.0	21.9	13.1	3.4	398.5
Num. Obs.	49	21	49	49	49	49	49	49	6	49
					Biotechnology firms					
Median	4.3	3.6	1.6	52.6	0.0	28.0	48.3	8.0	6.1	11.7
Average	11.4	3.5	2.2	51.4	4.7	28.8	49.7	15.2	6.1	29.7
St. dev.	12.7	1.2	1.7	16.4	7.8	12.7	17.2	12.5	3.6	39.2
Num. Obs.	17	8	17	17	17	17	17	17	2	17
					Non-biotechnology firms					
Median	13.1	6.6	2.8	54.1	0.0	20.5	56.0	18.9	6.2	21.3
Average	16.4	6.0	4.2	53.9	3.3	20.1	57.9	23.0	6.0	142.4
St. dev.	12.1	3.5	5.2	17.6	8.5	12.3	23.8	12.7	3.9	490.4
Num. Obs.	32	13	32	32	32	32	32	32	4	32

Panel C – Founder and executive shares of pre-IPO net value (%)

	Founders	Non-founder CEO	Non-founder other top 5 managers	Founders + top 5 mgrs	Founder not a mgr: top 5 mgrs
		All firms			
Median	14.4	5.3	3.1	20.6	9.8
Average	19.1	6.6	4.4	26.5	9.5
St. dev.	18.1	3.9	5.0	19.4	4.5
Num. Obs.	48	21	48	48	6
		Biotechnology firms			
Median	8.7	4.8	2.9	15.5	11.7
Average	14.6	5.3	3.2	20.4	11.7
St. dev.	14.6	2.3	2.4	13.8	3.4
Num. Obs.	16	8	16	16	2
		Non-biotechnology firms			
Median	16.7	7.8	3.5	21.2	8.4
Average	21.4	7.5	5.1	29.5	8.3
St. dev.	19.5	4.5	5.9	21.2	4.9
Num. Obs.	32	13	32	32	4

Table 12
Board of Directors

Summary statistics on the size, composition, and turnover of the boards of directors at the business plan (BP), IPO, and annual report (AR) for 49 VC-financed companies that subsequently went public.

	BP	IPO	AR
Board Size			
Median	5.0	7.0	7.0
Average	5.0	6.9	6.8
St. dev.	1.3	1.4	1.5
Num. Obs.	29	49	39
Number Insiders			
Median	2.0	2.0	2.0
Average	2.2	1.9	1.8
St. dev.	1.0	0.8	0.8
Num. Obs.	28	48	39
Number VCs			
Median	2.0	3.0	1.0
Average	1.6	2.8	1.7
St. dev.	1.2	1.2	1.6
Num. Obs.	28	48	39
Number non-VC outsiders			
Median	1.0	2.0	3.0
Average	1.3	2.2	3.2
St. dev.	1.3	1.4	1.1
Num. Obs.	28	48	39

	BP to IPO	IPO to AR	BP to AR
Percent directors remaining	71	57	40
Num. Obs.	29	39	21

Table 13
Determinants of Founder remaining CEO at the IPO or first Annual Report

Probit regressions of the likelihood of the founder remaining CEO of the company either at IPO or at the first annual report after going public. Independent variables are: 'Alienable assets at BP' is a dummy variable taking the value of one if the firm has either significant physical assets or patents at the time of the business plan (BP). 'Physical assets at BP' is a dummy variable taking the value of one if the firm has significant physical assets at the time of the BP. 'Patents at BP' is a dummy variable taking the value of one if the firm has patents at the time of the BP. 'Non-pat. IP at BP' is a dummy variable taking the value of one if the firm has no patents but has proprietary intellectual property at the time of BP. 'Age (months) at BP' is the age of the firm at the time of the BP in months. 'Fdr ownership at BP' is the founder's ownership stake in percent at the time of the BP. Reported coefficients are marginal effects of independent variables. . Heteroskedasticity-robust standard standard errors in parentheses. */**/*** indicate that the coefficients are statistically significantly different from zero at the 10% / 5% / 1% level.

Panel A: Founder remains CEO at the IPO.

	Coeff.	(STDE)	Coeff.	(STDE)	Coeff.	(STDE)	Coeff.	(STDE)
Alienable assets at BP	-0.148	(0.150)						
Physical assets at BP			-0.443	(0.198)**	-0.700	(0.164)***	-0.971	(0.048)***
Patents at BP			-0.069	(0.169)	-0.529	(0.235)**	-0.814	(0.194)***
Non-pat. IP at BP					-0.504	(0.194)***	-0.698	(0.167)***
Age (months) at BP	0.002	(0.002)	0.005	(0.003)*	0.007	(0.003)**	0.008	(0.003)**
Fdr ownership at BP							0.014	(0.005)**
Constant	0.118	(0.270)	0.009	(0.273)	1.165	(0.567)**	0.711	(0.839)
Number of obs.	49		49		49		30	
Pseudo R-squared	0.03		0.07		0.12		0.38	

Panel B: Founder remains CEO at the first Annual Report.

	Coeff.	(STDE)	Coeff.	(STDE)	Coeff.	(STDE)	Coeff.	(STDE)
Tangible assets at BP	-0.518	(0.195)***						
Physical assets at BP			-0.506	(0.252)**	-0.642	(0.232)***	-0.835	(0.165)***
Patents at BP			-0.359	(0.195)*	-0.599	(0.235)**	-0.599	(0.262)**
Non-pat. IP at BP					-0.355	(0.247)	-0.568	(0.245)**
Age (months) at BP	0.014	(0.004)**	0.012	(0.005)**	0.014	(0.006)**	0.014	(0.005)***
Fdr ownership at BP							0.010	(0.005)**
Constant	-0.543	(0.326)*	-0.665	(0.348)*	-0.012	(0.605)	-0.445	(0.843)
Number of obs.	39		39		39		26	
Pseudo R-squared	0.27		0.25		0.28		0.40	

Table 14
Determinants of Founder ownership pre- IPO

OLS regressions of the determinants of founder pre-IPO ownership percentage. Independent variables are 'Tangible assets at BP' is a dummy variable taking the value of one if the firm has either significant physical assets or patents at the time of the business plan (BP). 'Physical assets at BP' is a dummy variable taking the value of one if the firm has significant physical assets at the time of the BP. 'Patents at BP' is a dummy variable taking the value of one if the firm has patents at the time of the BP. 'Non-pat. IP at BP' is a dummy variable taking the value of one if the firm has no patents but has proprietary intellectual property at the time of BP. 'Age (months) at BP' is the age of the firm at the time of the BP in months. 'Fdr ownership at BP' is the founder's ownership stake in percent at the time of the BP. Probit coefficients are reported, with heteroskedasticity-robust standard errors in parentheses. */**/*** indicate that the coefficients are statistically significantly different from zero at the 10% / 5% / 1% level.

	Coeff.	(STDE)	Coeff.	(STDE)	Coeff.	(STDE)
Tangible assets at BP	-0.210	(3.650)				
Physical assets at BP			5.771	(5.541)	3.288	(6.555)
Patents at BP			-5.561	(3.591)	-8.997	(5.036)*
Non-pat. IP at BP					-4.218	(5.301)
Age (months) at BP	0.049	(0.039)	0.031	(0.033)	0.040	(0.038)
Constant	12.738	(2.479)***	13.913	(2.384)***	17.317	(4.341)***
Number of obs.	49		49		49	
R-squared	0.04		0.12		0.13	