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 (IPO) to public company for 50 venture capital (VC) financed companies. We describe the financial performance, line of business, point(s) of differentiation, non-human capital assets, growth strategy, top management, ownership structure, and the board of directors. The most striking finding is that firm business lines or ideas remain remarkably stable from business plan through public company. Within those business lines, non-human capital aspects of the businesses are more stable than human capital aspects. In the cross-section, firms with more alienable assets experience more human capital turnover suggesting that specific human capital becomes less critical as firms establish non-human assets. We obtain qualitatively similar results to those in our primary sample for all non-financial start-up IPOs in 2004 – both VC- and non-VC backed. This suggests that our main results are not specific to the presence of a VC or to the time period. We discuss how our results relate to theories of the firm and to VC investment decisions.

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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 when it is very young and how a young firm evolves to a mature company. In this paper, we provide such evidence by studying 50 venture capital-financed firms from early business plan to initial public offering (IPO) to public company (three years after the IPO).

This paper has three main goals. First, we provide a systematic description of the early life and evolution of an important sample of firms. In so doing, we provide information on firms before the post-IPO period studied in Fama and French (2004). Second, we consider how our findings can inform and be interpreted in relation to existing theories of the firm and what new theories might try to explain. Third, we discuss how our findings relate to an ongoing debate among venture capitalists (VCs) concerning the relative importance of a young company's business idea and management team to the company's success.

In describing the early characteristics of firms and how they evolve, we try to inform different theories of the firm and, in so doing, provide some systematic and (relatively) large sample evidence relating to these theories. 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 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). Hart 's analysis focuses on specific investment and the importance of hold-up problems. 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. Second, to the extent that the theories are static theories (in that they assume a non-human

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

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 such as Wernerfelt (1984) and Rajan and Zingales (2001b) that emphasize specific assets or resources critical to the firm's evolution and growth. 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. A person must have the idea that starts the business. That particular person may be critical to the business for some time. At some point, however, the non-human assets may be sufficiently developed that any specific person ceases to be a critical resource. 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. As specific human capital becomes more crucial, the theories suggest that human capital will capture more of the rents (and make it more difficult to finance firms). Zingales (2000) and Rajan and Zingales (2001a) argue 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 specific human capital and inalienable assets (e.g., business processes or knowledge). If so, one would expect the human capital providers to capture a greater share of the rents generated by the firm than they did in the past. 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.

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). 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. Some VCs believe that the company's business and market are

the key determinants of success while others believe the key determinant is the company's management. This debate is often characterized as whether one should bet on the jockey (management) or bet on the horse (the business / market). Quindlen (2000) and Gompers and Lerner (2001) discuss these two views.

According to Gompers and Lerner (2001), Tom Perkins of Kleiner Perkins looked at a company's technological position and asked whether the technology was superior to alternatives and proprietary. Don Valentine of Sequoia assessed the market for the product or service and considered whether the market was large and growing. For example, many VCs declined to invest in Cisco because the team was considered weak. Valentine invested in Cisco anyway because he saw a huge market.

Alternatively, Arthur Rock, an early investor in Apple Computers, emphasized the quality, integrity and commitment of management. According to Rock, a great management team can find a good opportunity even if they have to make a huge leap from the market they currently occupy. In their Venture Capital Handbook, Gladstone and Gladstone (2002) also take this perspective, quoting an old saying: "You can have a good idea and poor management and lose every time. You can have a poor idea and good management and win every time."[p. 91-92.]

Our results are as follows. The companies in our sample experience dramatic growth in revenue, assets, and market capitalization (although they do not become profitable). While the companies grow dramatically, their core businesses or business ideas 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 sell to similar customers and compete against similar competitors in the three life cycle stages we examine. This suggests that the firms' business idea or line of business is fixed or elemental at a relatively early stage in a firm's life.

Almost uniformly, firms claim they are differentiated by a unique product, technology, or service at all three stages 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. Only 72% of the CEOs at the IPO were CEOs at the business plan; only 42% of the CEOs at the annual report were CEOs at the business plan. Similarly, roughly one-half of the next four top executives at the IPO were top executives at the business plan; roughly one-quarter at the annual report were top executives at the business plan.

In our cross-sectional analysis, we find that firms with more alienable assets at the time of the business plan have substantially more human capital turnover over time.

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 10.8% to 19.6% 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) and raise some doubt regarding the claim in Zingales (2000) that "new" firms are more dependent on specific human capital and, therefore, allot a greater fraction of the value created to founders.

To address concerns that our sample of 50 VC-backed firms might be special in some way, we repeat our analyses of line of business changes, top management changes, and ownership structure for all non-financial start-ups firms that went public in 2004 – both VC and non-VC backed. We obtain qualitatively similar results to those in our primary sample. We find that 7.5% of the 106 firms changed its line of business. While this is somewhat greater than the 2% for our main sample, it is still small in an absolute sense. We find no statistical difference between changes for VC-backed and non-VC backed firms: 8.0% of the 88 VC-backed firms and 5.6% of the 18 non-VC-backed firms change lines of business.[2] For the 8

[2] The fact that 88 of the 106 non-financial start-up IPOs in 2004 are VC-backed underscores the importance of VC-backed firms to the economy. A large fraction of IPOs are reverse buyouts, spin-offs, REITS and other non-start-up IPOs.

companies that change business lines, the median date of the change is 7 years before the IPO – longer than the median time to IPO for our main sample. At the same time and as with our primary sample, we find more substantial turnover of management. At the IPO, a founder is CEO of only 49% of the VC-backed firms and 61% of the non-VC-backed firms.

We believe that our results inform the theories of the firm mentioned earlier. The theories of Hart-Moore-Holmström assume that a firm must be organized around non-human capital assets. 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. These can be interpreted as the "glue" referred to in Hart (1995).

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. In contrast to non-human assets, however, our results indicate that it is possible and not unusual to replace the initial human assets (founders) and find other people to run the firm. I.e, very early on, the firm is not built around specific people. General human capital (and, likely general human capital that is talented given the meaningful equity they receive) are sufficient replacements for the founders.

Our 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.[3] 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.

The cross-sectional analysis provides further support to these interpretations of the Hart-Moore-Holmström and critical resource theories. Firms with more alienable assets at the time of the business plan

[3] The stability of non-human assets is consistent with Lemmon, Roberts, and Zender (2006) who find that firms' capital structures are "remarkably stable over time". To the extent that a firm's assets remain stable over time, one might expect the way those assets are financed to remain stable as well.

have substantially more human capital turnover over time. This suggests that specific human capital is less critical after alienable assets have formed.[4]

Finally, we believe our results inform the VC debate about the relative importance of the business / horse and the management team / jockey. We think the results call into question, if not reject the claim that "a great management team can find a good opportunity even if they have to make a huge leap from the market they currently occupy." The results for the main sample and the 2004 IPO sample indicate that firms that go public rarely change or make a huge leap from their initial business idea or line of business. This suggests that it is very important that a VC pick a good business. On the other hand, it is common for firms to replace their founders and initial managers with new ones and still be able to go public, suggesting that VCs are regularly able to find management replacements or improvements for good businesses.

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 inform theories of the firm, we acknowledge that the samples may be special in that all the firms eventually go public. This excludes three types of start-ups. First, the sample excludes start-ups that fail. We do not view this as a major omission because we are studying how firms evolve and grow. Second, the sample excludes firms (some of which are successful) that are acquired by others. We agree these would be interesting firms to study, but it is difficult to obtain data for such a sample. That said, if there is a bias in firms that are acquired, we suspect that it is towards firms in which specific human capital is relatively less important. Third, the sample excludes firms that evolve and grow, but do not go public. Again, while these would be interesting firms to study, it is difficult to obtain data for such a sample. We also suspect that relatively few of these firms reach significant size.

Our work 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); Beckman and Burton (2005), Hannan et al. (2000); Hellman and Puri (2000 and 2002)). As we do, they study a panel of young firms – high tech firms in Silicon Valley – but they ask a different set of questions. Baron and Hannan (2002) summarize the

[4] Our results also are consistent with 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.

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. Beckman and Burton (2005) study the evolution of top management teams. The human-capital characteristics of the founding teams of their companies do not predict venture capital financing or going public. This is suggestive that the business idea and non-human capital assets are relatively more important to success.

Our research is also related to Bhide (2000) who studies 100 companies from Inc. Magazine's list of 500 fastest growing companies in 1989. Bhide finds that many of those companies are founded by people who replicated or modified an idea encountered in their previous employment, but did relatively little formal planning before starting the business. Partly as a result, these companies adjust their initial concepts, sometimes changing and sometimes broadening them. Our work is complementary in that it appears that Bhide's focus is more on the formation stage in which the entrepreneur is the critical resource, rather than the growth stages that we study after the firm has been formed.

The paper proceeds as follows. Section I describes our samples. Section II describes the initial financial characteristics, business idea, point(s) of differentiation, assets and technology, growth strategy, customers, competitors, management, ownership structure, and board of directors of the sample firms and their evolution. Section III presents our cross-sectional estimates. Section IV presents the results for the 2004 IPO sample. Section V summarizes and discusses our results.

I. Sample

The main sample consists of fifty 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 thirty of the companies from the sample of VC financed companies in Kaplan and Stromberg (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 sample companies, we have copies of the business plans and / or the VC 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.) From these documents, we identify the early (and often initial) characteristics of these firms. For all sample companies, we also obtain detailed company descriptions at the time of their IPOs from S-1 registration statements or 424(b)(4) 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. We obtain annual report descriptions from SEC form 10-K filings.

For nineteen companies, we do not record an annual report observation: eight companies were taken over and three went bankrupt less than three years after the IPO; seven companies are public, but have not filed an annual report more than two years 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 fifty firms.

We describe and present the sample of all 2004 IPOs later in section IV.

A. Description

Table 1 presents summary information for our main sample. The median company is 23 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 34 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 (and we constructed it to be so). The median total time elapsed is 70 months; the average is 73 months.

Of the 49 companies whose founders we were able to identify, 21 have one founder, 17 have two co-founders, and 11 were co-founded by three or more individuals.

Table 1 also shows 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 fifty IPOs took place in 1998, 1999, or 2000, at the height of the technology boom. 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). 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, 6 in retail, and 4 in other industries, of which 3 are high-tech companies.

Finally, table 1 shows the companies' status as of May 31, 2006. 25 are still active, independent companies. 18 have been acquired, and 7 have failed and gone bankrupt.

B. Sample selection issues

As discussed in the introduction, there are some selection issues with this sample. First, we only analyze VC-backed companies because it is from our VC contacts that we were able to obtain the necessary data. Second, the companies may not be random VC-backed companies because our VC contacts may not be representative of all VCs. Third, the majority of the companies were funded in the tech boom because we began to collect the original sample in the late 1990s. Fourth, we only analyze companies that go public.

We address the first three issues in section IV by analyzing the sample of all start-up IPOs in 2004. These include all VC-backed and non-VC backed IPOs in 2004. These also include firms that survived, if not thrived after the tech bust of the early 2000s.

In our main sample, we analyze companies that go public because data are available on them. The 2004 IPO sample has the same selection bias. In using these samples, we exclude firms that fail, firms (some of which are successful) that are acquired by other firms, and firms that survive but do not go public. Given that the goal of the paper is to study how firms evolve, it is natural to exclude firms that fail. We also do not think that studying such firms would change our conclusions. Irregardless of whether failed firms change their business ideas or not, it is still the case that successful firms do not change their business ideas.

While we agree that it would be interesting to study firms that are acquired, it is difficult to obtain data for such a sample. That said, if there is a bias in acquired firms, we would argue that it is towards firms in which specific human capital is relatively less important. The reason for this is that acquirers generally

retain the business, but do not always retain (and often let go) the top management and employees of the firms they acquire. Firms that go public retain the business, the top management and employees.

Similarly, while it would be interesting to study firms that survive but do not go public, it is difficult to obtain data for such a sample. We suspect, however, that relatively few such firms reach significant size.

We mention one last selection issue. The industries of the 50 sample firms are representative of the industries that VCs invest in. However, investments in biotech and healthcare are over-represented – 44% 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. Again, this is not an issue for the sample of 2004 IPOs.

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.

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. Most of our firms, but not all, therefore are very young. Our results are qualitatively identical when we restrict the sample to those firms with no revenue. At the IPO, the median and average revenue figures increase dramatically to $7.3 million and $42.3 million (although four companies go public with no revenue in the latest fiscal year). By the annual report, revenues increase by another order of magnitude, to a median of $64.3 million and an average of $243.4 million. The rapid revenue growth in our sample firms suggests that they are successful in supplying products and services to quickly growing segments of the economy.

The median company has 22 employees at the business plan, 129 at the IPO, and 414 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 328 at the business plan, IPO, and annual report. Asset growth for the sample parallels revenue growth, suggesting the need for large investment outlays to generate such rapid growth.

Our companies are unprofitable at the time of the business plan – the earliest 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 (2004), 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, -$6.6 million, and -$26.6 million. Only 19%, 20%, and 19% of firms, respectively, are profitable at the business plan, IPO, and annual report.

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 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 shares outstanding as of the report.

The median market capitalization increases sharply from $18.6 million at the business plan to $233.4 million at the IPO, and then declines to $224.5 million at the annual report. 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 "bust" of 2000 to 2002.

B. Business

Table 3 presents a description of each company's business. For each company, we then determine if the description of the business changes from one point in time to the next. To obtain the business description and changes in the business, we examine the relevant document (business plan, S-1, annual

report) for each stage for information summarizing the company's business. In the S-1 and annual report, this information is usually near the beginning of the document and then repeated with additional details in the section titled "Business". The business plans are more free-form, but there is often an executive summary at the beginning that contains the key information. The information always includes the company's main or intended product(s). It also describes, if applicable, the company's key technologies that contribute to the development of the product(s). It usually, but not always, describes the customer base, either to whom the company is already selling or to whom the company's products are targeted. For example, the customer base may be consumers or Fortune 500 companies or small businesses. It sometimes mentions key customers which tend to be large, well-known companies. We supplement the information in the documents by searching Lexis Nexis, Venture Source, google, and the companies' web sites – both current and historical. This potentially allows us to capture changes that occur before the business plan.

We categorize changes in two ways. First, we consider whether firms change their line of business or business idea. The line of business changes if the firm markedly changes the products or services it offers, or sells to a completely different set of customers.

Second, we consider whether firms broaden (doing the same things as before, but adding others), narrow (doing some of the same things, but dropping others), or maintain their initial line of business. If Apple Computer were in the sample, we would classify it 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 in table 3 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 companies and the VCs. 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 the table, 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 fifty firms in our sample changes its line of business. Company 50 undergoes the greatest change,

moving from offering a new computing platform to a new operating system (although even in this case there is a general focus on personal computing). We also do not observe any of the firms undertaking acquisitions unrelated to the original business.

This result suggests that the initial business idea or line of business and the accompanying attributes of the business do not change and, therefore, appear to be core to our sample firms. The result also indicates that it is very rare for management teams to make huge leaps from one market to another, counter to the view of some VCs (such as Arthur Rock quoted earlier).

For the most part, companies tend to broaden or at least not reduce their offerings within markets. For the 49 companies that did not change their line of business, panel A of table 3 shows that only 12% narrowed their lines of business between the business plan and IPO, 6% 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, 43%, 45%, and 32%.of the firms keep their offerings roughly the same, while 45%, 48%, and 55% 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.

C. Point of differentiation

In table 4, we classify how the sample firms differentiate themselves from their competitors over the sample period. We code this by reading each document to determine whether each point we consider is explicitly mentioned as an actual, perceived, or expected source of competitive advantage. This information is usually within the first few pages of the "business" section of the IPO prospectus and annual report and sometimes is within its own subsection. It often has its own section in the business plan.

By far the most important factor, cited by 100%, 98%, and 90% 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 – 8%, 14%, and 16% – 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 10% to 18% to 29% 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 14%, 12%, and 10% of the firms referring to them at the business plan, IPO and annual report.

At the business plan, 46% 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 16% at the IPO and 16% at the annual report, and the decline is statistically significant at the 1%-level.. 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 6% – also cite scientific advisors, another human capital related resource – as important.

Finally, a small number of firms – 6%, 8%, and 10% – 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, then, self-reported distinguishing characteristics suggest that firms differentiate themselves more by non-human characteristics than by specific human capital, and that the difference increases over time. 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.

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 collect this information from the business plan and from the intellectual property section (if there is one) of the S-1 and annual report. Physical assets are considered meaningful if they are specialized to the company's operations or business.

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 through the annual report. At the business plan, 28% of companies own or are the exclusive licensees of patents; at the IPO, 48%; and at the annual report, 61%. While patents and exclusive licenses are significantly more 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 11% to 26% to 50% from

business plan through annual report. Combining patents and physical assets as alienable assets, we find that 44%, 68%, and 84% of the 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

We also considered the elements and evolution of the companies' growth strategies. To conserve space, we do not report the results in a table. 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%, 80% and 71%, respectively), followed by obtaining additional customers through increased market penetration or market leadership (50%, 72%, and 55%, respectively). Companies also plan to expand geographically (22%, 44%, and 19%, respectively). All three types of internal growth peak at the time of the IPO.

External growth through alliances and partnerships or through acquisitions becomes relatively more important over time. At the business plan, 28% and 2%, respectively, of the firms look for growth through alliances or acquisitions. By the time of the third annual report, this increases to 58% and 22%, respectively.

F. Customers and Competitors

We also considered the evolution of customers and competitors. Again, to conserve space, we do not report the results in tables.

Roughly 84% of the sample companies target businesses as customers while 16% 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 lines in the sample. Roughly one-third of the firms broaden their customer bases. About one-quarter broaden from business plan to IPO and another 13% 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.

We also characterize the competition faced by our sample companies. The type of competition named remains fairly stable with 58% 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 no company sees a narrowing. Again, this result seems consistent with the stability of the businesses found in table 3.

G. 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 7 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: seven of the companies (14%), five of which are in biotech, do not have a CEO; only 43% list a chief financial officer (CFO) as one of the top five executives; and only 35% list a sales or marketing executive (CMO). Consistent with the importance of technology, 77% of the firms list a Chief Scientist or Chief Technical Officer (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 81% of the companies listing a CFO as a top five executive. The importance of sales and marketing remains

fairly constant over time with 35%, 38%, and 42% of companies having a VP of marketing or similar as a top five executive at the business plan, IPO, and annual report. The importance of a chief technology or science officer is stable at the IPO (at 77%), but declines substantially (to 44%) 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 66% of our 50 companies, or 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 48 companies for which we have board and management data.

Involvement of founders declines steadily over time. By the time of the IPO, only 58% of the CEOs are founders while 94% of the firms still have a founder as a top executive or a director. By the time of the annual report, 39% of the CEOs are founders while only 68% 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.

In panel B, we address the stability of human capital in more detail. At the IPO, 72% of the CEOs are the same as the CEO at the business plan. We consider the CEO a new CEO if the firm did not have a CEO at the time of the business plan. By the time of the annual report, only 42% of the CEOs are the same as the CEO at the business plan. Given the six year period, this amounts to turnover of roughly 10% per year, a rate that is substantial, but somewhat lower than CEO turnover in large public companies.[5] The third row of panel B reports whether the former CEOs remain with the company in some capacity. At the IPO and annual report, respectively, only 29% and 13% of the former business plan CEOs remain with the firms, suggesting, for the most part, that former CEOs leave the sample companies.

We then look at whether the other top four executives at the business plan remain among the top four executives at the IPO and at the annual report. Turnover of the other top four executives is greater with only

[5] Kaplan and Minton (2006) find CEO turnover for large U.S. companies of 16% per year over the period 1998 to 2005. The rates are not directly comparable because turnover increases with poor performance. Because they were able to go public, all of the companies in our sample performed well before the IPO and should have experienced lower turnover.

54% remaining in place from business plan to IPO, and only 25% remaining in place from the business plan to the annual report. In those cases where top four executives are no longer top four executives, the last row of panel B indicates that most of those executives leave the firm, with only 26% of the former executives remaining by the IPO and only 6% remaining at the annual report.[6]

Overall, therefore, turnover is substantial. From the business plan to the annual report, only 42% of the CEOs and 25% of the other top five executives remain the same.

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 C of table 10. The first part of panel C shows that we can identify subsequent jobs or activities for roughly half of the departing founders and non-founders. The second part of panel C indicates that relatively few of these individuals subsequently are founders of new companies. The third part of panel C 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 C, therefore, indicate that relatively few of the departing founders and executives are founders of 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

[6] Although not reported in the table, members of the board of directors also turn over. At the IPO, 71% of directors at the business plan are still directors; at the annual report, only 46% of the directors at the business plan remain.

of the individuals to emerge in other companies. These results are consistent with Bengtsson (2006) who finds a similarly low incidence of repeat entrepreneurs in VC-backed firms.[7]

I. 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 10 summarizes company ownership. Ownership data at the business plan reflects 32 firms as we do not have ownership data at that time for 18 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 31.7% at the business plan to 12.5% just before the IPO to 9.0% 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 3.2% 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 15.8% of the company at the business plan, 7.0% pre-IPO, 5.4% post-IPO, and 3.2% 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,

[7] For related work, see Gompers et al. (2006).

however, biotech founders own significantly less of the firms than non-biotech founders. Biotech CEOs own significantly 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). Contrary to the prediction or argument in Zingales (2000), specific human capital in our sample of "new" firms does not capture more of the rents (but less) than the specific human capital in the earlier sample. We believe that ownership just before the IPO is an appropriate time to do this measurement because it is the time at which success has been established, the entrepreneur can begin to sell, and it can be measured.

Panel B of table 10 reports how firm ownership is divided immediately before the IPO. VCs own 53.0% of the median company at the IPO. Founders retain a median 12.5%. When non-founders, CEOs own a median 4.2%; non-founder managers other than the CEO collectively own a median 2.1%. Business partners, such as original parent companies and strategic alliance partners, own none of the median firm and 3.7% of the average firm. Others, which include non-VC investors and non-founder employees, collectively, own a median of 22.8%. Panel B also indicates that the founders and management team have significantly 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 $19.3 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 14.7% (median 12.5%). 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 16.4%). 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, 3.4%, to get a total of 8.4%. Subtracting this 8.4% from the ownership of founders and top five managers of 20.3% yields an estimate of 11.9% as the value of the specific human capital provided by the founders.

In an untabulated 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%.

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 10 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 19.6% (median of 14.8%) 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 16.6% and 14.9%.

Overall, the calculations in panels B and C indicate a range of 10.8% to 19.6% as the value that founders retain of the firm for their idea or initial contributions that is not related to ongoing incentives.

III. Cross-sectional Analysis

In this section, we describe 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 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 11, 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. 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 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. The last regression also includes the founder ownership stake at the business plan, which is 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.[8]

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). The dependent variable is pre-IPO founder ownership. The independent variables are the asset dummies used in table 11, and the age of the firm at the business plan. Unlike the results in table 11, none of the asset dummy variables is significant in the regressions.[9] While it may reflect a paucity of observations or that there are many other determinants of founder ownership, the results 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. Robustness: Non-financial start-up IPOs in 2004

[8] 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.
[9] Because none of the variables is significant and to conserve space, we do not report these regressions in a table.

As we mentioned earlier, there are a number of reasons that our main sample may be special in some way. All the firms are VC-backed by VCs with whom we have a relationship and most went public during the tech boom of the late 1990s and early 2000. In this section, we consider the robustness of the results for our main sample by repeating the analyses of the business idea, top management, and ownership structure for all "start-up" IPOs in 2004.

A. Sample

Panel A of table 12 illustrates how we obtain the sample of 2004 "start-up" IPOs. We begin with all 306 IPOs in 2004 listed in the Securities Data Corporation database. We eliminate 200 of these for the following reasons: 4 companies are already listed on a foreign exchange at the time of their U.S. IPO and are not "true" IPOs; 122 are REITs, closed-end funds, trusts or other purely financial companies; 21 are holding companies, some of which were formed solely to acquire other companies; 1 was formed as a joint venture; 1 company is controlled by a foreign government; 21 are spinoffs of existing companies; and 30 are IPOs of companies that had undergone a buyout at some point in their histories. The latter two groups – spinoffs and reverse buyouts – are excluded because they are not directly comparable to "start-ups" and it is difficult, if not impossible, to follow their histories from founding.

The omissions leave a sample of 106 non-financial "start-up" IPOs. Interestingly, 88 or 83% are VC-backed, suggesting that a very substantial fraction of "start-up" IPOs is VC-backed.

The median time from founding to IPO for the 2004 sample is 7 years, longer than the 5 years for our main sample. This implies that the typical 2004 company existed before the tech bust and then survived it.

Panel B of table 12 presents financial information on the entire sample and separately for VC- and non-VC-backed firms. The financial measures are economically similar for VC- and non-VC-backed firms although non-VC backed firms have statistically significantly higher EBIT and lower market capitalization. Compared to our main sample of 50 VC-backed firms, both sets of firms in the 2004 IPO sample have greater revenues, more book assets, greater – i.e., and less negative – EBIT. This is consistent with the post-

technology bust 2004 sample representing a set of companies with different characteristics from our pre-bust sample. The equity market capitalizations and the median number of employees are similar in magnitude.

B. Line of Business Changes

For the 106 start-up IPOs from 2004, we identify whether they changed their original line of business at some point in their histories. We do so by reading the company business descriptions and histories provided in their S-1 (IPO) filings. We then compare the descriptions at the IPO to earlier information gleaned from Lexis Nexis, Venture Source, google, and the companies' web sites. The earlier information considers any changes from the company's birth to the IPO. When we apply this methodology to our main sample of 50 VC-backed firms, we are able to identify the one (and only the one) change we can identify using our more detailed business plan documents.

We report the results of this methodology in panel C of table 12. We find that 8 (7.5%) of the 106 firms changed their original line of business or business idea. While greater than the 2% in our main sample, 7.5% seems small in an absolute sense. Furthermore, for the 8 companies that change, the median date of the change is 7 years before the IPO. When we distinguish between VC-backed and non-VC-backed IPOs, we find qualitatively and statistically similar results for both groups: 7 of the 88 VC-backed firms (8.0%) and 1 of the 18 non-VC-backed firms (5.6%) change their lines of business.

The results in table 12 are strongly consistent with the results in our main sample concerning the stability of business lines. This suggests that the business line results generalize beyond the specific time period of the main sample and beyond the universe of VC-backed firms.

C. Management

Panel A of table 13 provides statistics on the management teams at the IPO of the 106 non-financial start-up firms that went public in 2004. A founder is the CEO in 54 companies, or 51%. This figure is similar to the 58% for our main sample. While the point estimates suggest that non-VC backed firms are

more likely to have a founder CEO than VC-backed firms (61% vs. 49%), the difference is not statistically significant. Clearly, founder departures over time are not unique to VC-backed firms.

A founder is CEO or a director in 78% of firms, and is an employee or a director in 84%. Both figures are virtually identical across the VC-backed and non-VC-backed subsamples. The corresponding figures for our main sample (from table 10) are 88% and 94%.

Again, the turnover results are strongly consistent with the results in our main sample that specific human capital is less stable than the business idea. These results for the 2004 sample also suggest that the main sample results generalize beyond the specific time period of the main sample and beyond the universe of VC-backed firms.

D. Ownership

Panel B shows statistics on the firms' ownership structure just before their IPOs. In general, the ownership percentages for VC-backed firms in 2004 IPOs are similar to those for the VC-backed firms in our main sample. While the median founder ownership is 10.0% and the average is 20.5%, there is a large and statistically significant difference between VC-backed (median of 8% and average of 15.9%) and non-VC-backed firms (median of 44.4% and average of 42.6%). The VC-back ownership numbers are similar in magnitude to those for our main sample of 50 companies (median of 12.5% and average of 14.7%).

Panel B also reports that the CEOs of VC-backed firms own a median 5.7% and an average 11.8% of their firms' equity. These are similar in magnitude to the CEO ownership in our main sample of 50 firms (median 7.0% and average 9.8%). The 52 non-founder CEOs own a median 3.5% and average 6.1%. The 45 non-founder CEOs of VC-backed firms own a median of 3.4% and average of 5.7%. These ownership percentages are similar to the median 4.2% and average 5.0% of non-founder CEOs in our main sample.

Furthermore, as in our main sample, the CEO and founder ownership percentages are certainly not higher than, but appear rather lower than the ownership percentages reported in Baker and Gompers (1999) for VC-backed IPOs in the 1980s. Again, these results do not support the notion that CEO human capital has become more important to "new" firms.

V. Summary and Discussion

In this paper, we study the evolution of firm characteristics from early business plan to initial public offering to public company for 50 VC financed companies. We repeat some of the analyses for all "start-up" IPOs in 2004 and obtain qualitatively similar results. This exercise had three goals: to provide a systematic description of the early life and evolution of an important sample of firms; to inform existing theories of the firm; and to inform a long and ongoing debate among venture capitalists (VCs) concerning the relative importance of the business and management to a company's success.

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

While the business idea, points of differentiation, alienable assets, customers, and competitors remain relatively constant, the stated importance of expertise declines and the human capital of the sample firms changes substantially.

We believe that these results are useful in understanding several prominent theories of the firm. Consistent with the Hart-Moore-Holmström view that a firm must be organized around non-human capital assets, our results suggest 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. 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, the "web of specific investments built around the founder(s)" itself becomes the critical resource relatively early in a firm's life.

The cross-sectional analysis provides further support to these 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, suggesting 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).

Finally, we believe our results inform the VC debate about the relative importance of the business / horse and the management team / jockey. We think the results call into question, if not reject the claim that "a great management team can find a good opportunity even if they have to make a huge leap from the market they currently occupy." The results for the main sample and the 2004 IPO sample indicate that firms that go public rarely change or make a huge leap from their initial business idea or line of business. An initial strong business, therefore, may not be sufficient, but appears to be almost necessary for a company to succeed. On the other hand, it is common for firms to replace their founders and initial managers with new ones and still be able to go public, suggesting that VCs are regularly able to find management replacements or improvements for good businesses.

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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 50 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 May 2006.

	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	23	34	34	70
Average	40	40	36	73
St. dev.	51	25	4	25
Num. Obs.	50	50	31	31

Number of companies with Business Plan dated prior to or concurrent with first VC financing: 20

Number of companies with one founder:	21
Number of companies with two co-founders:	17
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	10	8	3	1
1996	5	11	3	
1997	2	10	3	
1998	6	9	5	3
1999		2	14	1
2000			12	4
2001		1		3
2002			1	9
2003			1	6
2004			4	1
2005			1	
2006				1

Industry breakdown:

	Biotechnology	Software/IT	Telecom	Healthcare	Retail	Other
#firms	17	15	3	5	6	4

Status as of 5/4/2006:

	Active	Acquired / Merged	Bankrupt
#firms	25	18	7

Table 2
Financials and Employees

Median, average, and standard deviation of revenue, assets, earnings before interest and taxes (EBIT), market capitalization, market capitalization to book assets ratio, number of employees, and revenue per employee at the business plan (BP), IPO, and annual report (AR) for 50 VC financed companies that subsequently went public. Revenue, net income, and assets are reported as of the end of the most recent, but prior fiscal year.

	All firms			Biotechnology firms			Non-biotechnology firms		
Revenue ($M)									
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	0	7.3	64.3	0	2.9	20.7	0.6	12.9	113.4
Average	5.5	42.3	243.4	0.7	4.9	30.1	8.2	61.6	366.3
St. dev.	13.5	153.4	521.9	1.6	5.3	14.8	16.2	186.8	620.7
Num. Obs.	48	50	31	17	17	11	31	33	20
Revenue percentage change									
	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	485	418	3,020	140	419	209	634	507	3,415
Average	2,955	4,430,694	76,770	131	18,249	821	3,358	7,127187	94,297
St. dev.	7,426	23,800,000	262,025	224	56,443	1,229	7,876	30,200,000	289,908
Num. Obs.	24	29	16	3	11	3	21	18	13
Number of employees									
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	22	129	414	10	71	134	31	212	616
Average	91	362	1,592	17	87	195	134	504	2,361
St. dev.	199	671	2,730	13	67	141	242	791	3,164
Num. Obs.	43	50	31	16	17	11	27	33	20
Number of employees percentage change									
	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	520	116	1,900	528	62	1,170	510	157	2,477
Average	765	328	4,508	579	128	1,803	875	439	6,099
St. dev.	852	539	8,425	544	183	1,970	984	637	10,291
Num. Obs.	43	31	27	16	11	10	27	20	17
Assets ($M)									
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	2.5	19.7	118.9	1.8	18.5	91.7	2.7	22.1	154.6
Average	5.8	44.7	352.8	3.3	23.7	96.7	6.6	55.6	493.7
St. dev.	10.7	69.0	750.4	3.9	18.3	64.5	12.1	82.2	910.0
Num. Obs.	36	50	31	9	17	11	27	33	20

Table 2 (continued)

	All firms			Biotechnology firms			Non-biotechnology firms		
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	444	361	1,727	689	361	1,077	416	370	3,304
Average	2,573	1,105	65,039	1,231	646	3,505	3,041	1,357	87,016
St. dev.	6,034	1,990	176,382	1,557	994	5,877	6,927	2,354	202,705
Num. Obs.	31	31	19	8	11	5	23	20	14
EBIT ($M)									
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	-0.8	-6.6	-26.6	-1.4	-10.3	-32.8	-0.8	-5.1	-24.3
Average	-1.5	-7.5	-52.7	-1.9	-11.7	-30.4	-1.4	-5.3	-65.0
St. dev.	2.5	13.5	106.2	2.0	7.5	18.1	2.6	15.4	131.1
Num. Obs.	37	50	31	8	17	11	29	33	20
% positive	19%	20%	19%	13%	6%	0%	21%	27%	30%
EBIT percentage change									
	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR	BP to IPO	IPO to AR	BP to AR
Median	182	189	528	538	239	755	128	173	518
Average	1,392	-2,684	11,678	969	182	2,938	1,506	-4,260	14,955
St. dev.	3,247	17,194	49,328	1,554	212	6,157	3,585	21,434	57,896
Num. Obs.	33	31	22	7	11	6	26	20	16
Market capitalization ($M)									
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Median	18.6	233.4	224.5	14.1	254.9	265.8	18.7	232.4	221.4
Average	28.8	690.1	602.1	16.2	388.3	257.6	32.9	845.5	801.5
St. dev.	32.5	1,901.3	1,552.0	11.9	368.2	216.2	36.0	2,322.5	1,933.9
Num. Obs.	41	50	30	10	17	11	31	33	19
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	1,569	-37	1,101	2,064	-53	2,370	1,348	6	903
Average	7,614	139	13,679	7,101	14	2,830	7,779	212	19,423
St. dev.	18,659	395	42,042	16,631	139	3,146	19,521	475	51,533
Num. Obs.	41	30	26	10	11	9	31	19	17

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 50 VC financed companies that subsequently went public.

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	
6	●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	
16	●Specialty retailer	● Specialty retailer	
17	●Sales and marketing automation software automation software	●Sales, marketing, and customer support	

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
18	●Wireless data communications	(N) Wireless communication and information systems for health information	
19	●Web-based enterprise application software	(N) Live business collaboration software and services	●Application software and services for real-time enterprise collaboration
20	●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
21	●Combinatorial chemistry	(N) Computational drug discovery	
22	●Software and services to industries transformed by human genome research	(N) Software products and services to accelerate drug discovery and development	
23	●Implantable hearing devices	(B) Implantable and semi-implantable hearing devices	●Implantable and semi-implantable hearing devices
24	●Drug screening and discovery	(B) Drug candidate development	●Drug candidate development
25	●Drug target discovery	(B) Drug target discovery and small molecule drug development	●Small molecule drug discovery and development
26	●Products for the treatment of abnormal uterine bleeding	(B) Surgical systems for the diagnosis and treatment of gynecological disorders	
27	●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
28	●Internet-based micropayments system and incentive currency	(B) Internet-based direct marketing and advertising services combined with programs that reward consumers with cash	
29	●Treatment for psychotic major depression	(B) Drug development for severe psychiatric and neurological diseases	
30	●Discovery and development of drugs for memory-related disorders	(B) Development of drugs for a broad range of central nervous system disorders	
31	●Development of treatments for pulmonary inflammatory diseases	(B) Discovery and development of treatments for allergies, infectious diseases, and chronic inflammatory diseases	
32	●Internet marketing software	(B) Internet marketing and data aggregation software	
33	●E-commerce solutions	(N) E-commerce and direct marketing services	

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
34	●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
35	●Internet data delivery software	●Internet data delivery software	(B) E-business infrastructure software and services
36	●Microfluidics	●Microfluidics	(B) Novel assay chemistry solutions for drug discovery and development
37	●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
38	●Disease prevention	(N) Live-virus vaccines	(B) Disease prevention through vaccine technology
39	●Novel antimicrobial compounds	(B) New antibacterial and antifungal drugs	(N) Prevention of ventilator-associated pneumonia
40	●Internet communication services	(B) Internet system and network management	(B) Internet infrastructure outsourcing
41	●Website production software	(B) Web content management software	(B) Enterprise content management software
42	●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
43	●Market research	(B) Market research and polling	(B) Market research and consulting
44	●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
45	●Local switched telecommunications services	(B) Competitive local exchange carrier	(B) National communications provider
46	●Basic local telephone services	(B) Facilities-based competitive local exchange carrier	(B) Facilities-based operator of a fiber optic communications infrastructure
47	●Customer interaction software	(B) E-business infrastructure software	(B) Enterprise software vendor
48	●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
49	●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)

Company	Business Plan	IPO
50	●New computing platform	(C) Computer operating system

Table 3 (cont.)

All Firms	BP to IPO	IPO to AR	BP/IM to AR
Percent whose line of business changes	2	0	0
Number observations	50	31	31

All Firms			
Percent whose line of business	BP to IPO	IPO to AR	BP/IM to AR
Stays about the same	43	45	32
Broadens	45	48	55
Narrows	12	6	13
Number observations	49	31	31

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	50	40	40
Broadens	44	60	60
Narrows	6	0	0
Number observations	32	20	20
KW test of Biotech vs. non-biotech, p-value	0.18	0.13	0.02**

Table 4
Points 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 50 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). P-values refer to non-parametric tests of equality of proportions across BP and IPO, IPO and AR, and BP and AR samples, respectively. ***, **, * refer to statistically significant differences between biotechnology and non-biotechnology firms at the 1%, 5%, and 10% levels, respectively..

	BP	IPO	AR		BP	IPO	AR		BP	IPO	AR	
	All firms				*Biotechnology firms*				*Non-biotechnology firms*			
Unique product/technology	100	98	90		100	100	91		100	97	90	
Comprehensive products	8	14	16		6	6	0		9	18	25	
Customer service	10	18	29		0	6	9		15	24	40	
Alliances/partnerships	14	12	10		0	12	0		21*	12	15	
Expertise	46	16	16		47	12	18		45	18	15	
Scientific advisors	4	2	6		6	0	0		3	3	10	
Reputation	6	8	10		0	6	9		9	9	10	
Number of observations	50	50	31		17	17	11		33	33	20	

	BP to IPO					IPO to AR					BP to AR				
	Yes to yes	Yes to no	No to yes	No to no	P-val	Yes to yes	Yes to no	No to yes	No to no	P-val	Yes to yes	Yes to no	No to yes	No to no	P-val
Unique product/technology	98	2	0	0	0.31	90	6	0	3	0.21	90	10	0	0	*0.04*
Comprehensive products	6	2	8	84	0.29	10	0	6	84	0.93	3	3	13	81	0.28
Customer service	10	0	8	82	0.22	16	3	13	68	0.28	6	0	23	71	*0.03*
Alliances/partnerships	8	6	4	82	1.00	3	10	6	81	0.48	6	6	3	84	0.48
Expertise	10	36	6	48	*0.00*	10	3	6	81	0.84	10	39	6	45	*0.00*
Scientific advisors	2	2	0	96	0.56	3	0	3	94	0.43	3	3	3	90	0.81
Reputation	4	2	4	90	0.69	10	0	0	90	0.93	3	3	6	87	0.77
Number of observations	50	50	50	50		31	31	31	31		31	31	31	31	

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 50 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). ***, **, * refer to statistically significant differences between biotechnology or retail vs. other firms at the 1%, 5%, and 10% levels, respectively..

	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	28	48	61	53***	76***	91**	15	33	45	0	0**	0***	19	40	56
Physical assets	20	28	42	6	6**	9**	27	39	60	100***	100***	100***	11	26	50
Alienable assets	44	68	84	59	76	91	36	64	80	100***	100	100	22	56	75
Proprietary IP	82	84	81	94	100**	100*	76	76	70	0***	0***	0***	93	93	88
Number of observations	50	50	31	17	17	11	33	33	20	6	6	4	27	27	16

	All firms											
	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
Patents	28	0	20	52	45	0	16	39	29	0	32	39
Physical assets	20	0	8	72	35	0	6	58	22	0	19	58
Alienable assets	44	0	24	32	71	0	13	16	48	0	35	16
Proprietary IP	82	0	2	16	81	0	0	19	77	0	3	19
Number of observations	50	50	50	50	31	31	31	31	31	31	31	31

Table 6
Management

Table 6 describes firm management for 50 VC-financed companies that subsequently went public. Panel A describes the 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). Panel B reports turnover of the top executives. Panel C reports subsequent activities of departing top executives. ***, **, * refer to statistically significant differences between biotechnology and non-biotechnology firms at the 1%, 5%, and 10% levels, respectively.

Panel A:

	All firms			Biotechnology firms			Non-biotechnology firms		
	BP	IPO	AR	BP	IPO	AR	BP	IPO	AR
Has a CEO(%)	86	100	100	71***	100	100	94	100	100
Num. Obs.	50	50	31	17	17	11	33	33	20
A founder is CEO (%)	66	58	39	53	53	36	73	61	40
Num. Obs.	50	50	31	17	17	11	33	33	20
% of CEOs that are a founders	77	58	39	75	53	36	77	61	40
Num. Obs.	43	50	31	12	17	11	31	33	20
A founder is a director if none is the CEO (%)	92	71	47	83	75	71	100	69	33
Num. Obs.	13	21	19	6	8	7	7	13	12
A founder is a top 5 manager or a director	100	94	68	100	94	82	100	94	60
Num. Obs.	48	50	31	15	17	11	33	33	20
Has a CFO or similar (%)	43	80	81	35	71	100*	47	85	70
Num. Obs.	49	50	31	17	17	11	32	33	20
Has a CMO or similar (%)	35	38	42	12**	12***	9**	47	52	60
Num. Obs.	49	50	31	17	17	11	32	33	20
Has a CTO or similar (non-retail) (%)	77	77	44	76	82	55	77	74	38
Num. Obs.	43	44	2	17	17	11	26	27	16

Table 6 (continued)

Panel B:

	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 (%)	72	58	42	65	64	45	76	55	40
Num. Obs.	50	31	31	17	11	11	33	20	20
CEO remains the same (%)	84	58	46	92	64	56	81	55	42
Num. Obs.	43	31	28	12	11	9	31	20	19
Former CEO still at co. (%)	29	23	13	0	25	25	33	22	9
Num. Obs.	7	13	15	1	4	4	6	9	11
Next 4 top execs remaining (%)	54	37	25	41***	36	22	61	37	27
Num. Obs.	50	31	31	17	11	11	33	20	20
Former next 4 execs still at co. (%)	26	8	6	29	18*	3	24	2	8
Num. Obs.	42	31	31	14	11	11	28	20	20

Table 6 (continued)

Panel C: 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	48	50	50	50	48
Num. Obs.	6	14	2	4	4	10
Non-founder CEOs	0	33		100	0	0
Num. Obs.	1	3		1	1	2
Non-founder other top 5	40	40	33	53	44	35
Num. Obs.	33	27	12	8	21	19
Founded new company (%):						
Founders	17	11	50	0	0	15
Num. Obs.	6	14	2	4	4	10
Non-founder CEOs	0	0		0	0	0
Num. Obs.	1	3		1	1	2
Non-founder other top 5	11	5	4	4	15	5
Num. Obs.	33	27	12	8	21	19
Top executive of startup company (%):						
Founders	33	29	50	0	25	40
Num. Obs.	6	14	2	4	4	10
Non-founder CEOs	0	40		0	0	50
Num. Obs.	1	2		1	1	2
Non-founder other top 5	36	35	21	40	45	32
Num. Obs.	33	27	12	8	21	19

Table 7
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 for 50 VC-financed companies that subsequently went public. 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 assuming that none of them paid consideration to the company. ***, **, * refer to significant differences between biotech and others at 1%, 5%, and 10% levels, respectively.

Panel A – Beneficial ownership of common stock

	All firms				Biotechnology firms				Non-biotechnology firms			
Founder(s) (%)		Pre-	Post-			Pre-	Post-			Pre-	Post-	
	BP	IPO	IPO	AR	BP	IPO	IPO	AR	BP	IPO	IPO	AR
Median	31.7	12.5	9.0	3.2	28.9	4.3**	3.5**	5.1	34.5	13.2	10.5	3.2
Average	37.1	14.7	11.3	6.3	34.4	11.4	8.6	8.0	38.2	16.4	12.6	6.1
St. dev.	25.7	12.3	9.6	7.7	30.8	12.7	9.5	9.2	24.1	11.9	9.5	7.2
Num. Obs.	32	50	50	31	9	17	17	10	23	33	33	19

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	-46	-55	-88	-51	-51	-70.5	-38	-77	-91
Average	-40	-64	-76	-42	-56	-68.6	-39	-69	-79
St. dev.	40	28	26	46	24	27.3	38	30	25
Num. Obs.	32	30	23	9	11	8	23	19	15

CEO (%)		Pre-	Post-			Pre-	Post-			Pre-	Post-	
	BP	IPO	IPO	AR	BP	IPO	IPO	AR	BP	IPO	IPO	AR
Median	15.8	7.0	5.4	3.2	6.8	4.3**	3.1*	3.2	17.4	8.0	6.4	3.4
Average	20.1	9.8	7.5	5.1	15.5	8.2	6.2	6.1	22.0	10.6	8.2	4.6
St. dev.	15.9	8.9	6.9	6.5	14	9.9	7.1	8.7	16.5	8.5	6.8	5.4
Num. Obs.	27	50	50	30	8	17	17	10	19	33	33	20

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	-56	-79	-19	-36	-72.2	-38	-64	-81
Average	-31	-56	-71	-15	-48	-62.9	-38	-60	-75
St. dev.	37	23	24	45	27	32.8	32	20	19
Num. Obs.	27	30	20	8	10	7	19	20	13

Table 7 (continued)

Non-founder CEO (%)	All firms				Biotechnology firms				Non-biotechnology firms			
	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	2.0	4.2	3.6*	2.8	1.2	6.5	6.6	5.0	2.1
Average	5.1	5.0	4.0	2.1	4.2	3.5	2.7	1.6	5.5	6.0	4.8	2.3
St. dev.	2.0	3.1	2.5	1.4	0.7	1.2	0.9	1.3	2.4	3.5	2.9	1.4
Num. Obs.	6	21	21	18	2	8	8	6	4	13	13	12

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	-71	-20	-33	-86	-30	-56	-64
Average	-23	-55	-75	-20	-45	-86	-24	-60	-64
St. dev.	27	26	18	50	37	20	20	20	8
Num. Obs.	6	12	4	2	4	2	4	8	2

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	12.5	4.2	2.1	53.0	0.0	22.8	53.2	16.4	6.2	19.3
Average	14.7	5.0	3.4	53.1	3.7	23.1	55.8	20.3	6.0	103.2
St. dev.	12.3	3.1	4.4	16.9	8.2	12.8	22.3	12.9	3.4	394.3
Num. Obs.	50	21	50	50	50	50	50	50	6	50
					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	13.2	6.6	2.7	55.7	0.0	20.1	56.6	19.6	6.2	27.2
Average	16.4	6.0	4.1	54.0	3.2	20.2	59.0	22.9	6.0	141.0
St. dev.	11.9	3.5	5.1	17.3	845	12.1	24.2	12.5	3.9	482.7
Num. Obs.	33	13	33	33	33	33	33	33	4	33

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	14.8	5.3	3.0	20.6	9.8
Average	18.6	6.6	4.3	25.8	9.2
St. dev.	16.1	3.9	4.9	16.9	4.4
Num. Obs.	49	21	49	49	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	3.5
Num. Obs.	16	8	16	16	2
		Non-biotechnology firms			
Median	17.1	7.8	3.0	21.2	8.1
Average	20.6	7.4	4.8	28.4	7.9
St. dev.	16.6	4.5	5.6	17.8	4.6
Num. Obs.	33	13	33	33	4

Table 8
Determinants of Founder remaining CEO at the IPO or Annual Report

Probit regressions of the likelihood of the founder remaining CEO of the company either at IPO or at the annual report closest to three years 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 errors are 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	-0.116	(0.147)						
Physical assets at BP			-0.286	(0.212)	-0.649	(0.195)**	-0.979	(0.045)**
Patents at BP			-0.067	(0.164)	-0.562	(0.228)**	-0.839	(0.207)**
Non-pat. IP at BP					-0.538	(0.192)**	-0.725	(0.176)**
Age (months) at BP	0.002	(0.002)	0.003	(0.002)	0.006	(0.003)**	0.007	(0.003)**
Fdr ownership at BP							0.014	(0.005)**
Constant	0.132	(0.269)	0.087	(0.270)	1.336	(0.608)**	1.291	(0.990)
Number of obs.	50		50		50		30	
Pseudo R-squared	0.03		0.04		0.10		0.35	

Panel B: Founder remains CEO at the Annual Report.

	Coeff.	(STDE)	Coeff.	(STDE)	Coeff.	(STDE)	Coeff.	(STDE)
Alienable assets at BP	-0.466	(0.245)*						
Physical assets at BP			-0.263	(0.328)	-0.453	(0.300)	-0.798	(0.203)**
Patents at BP			-0.315	(0.204)	-0.554	(0.221)**	-0.551	(0.294)
Non-pat. IP at BP					-0.398	(0.248)	-0.579	(0.272)*
Age (months) at BP	0.010	(0.005)**	0.009	(0.005)*	0.011	(0.006)**	0.012	(0.005)**
Fdr ownership at BP							0.011	(0.006)*
Constant	-0.638	(0.358)*	-0.701	(0.367)*	0.004	(0.610)	-0.453	(0.844)
Number of obs.	31		31		31		23	
Pseudo R-squared	0.26		0.22		0.27		0.40	

Table 9
Sample selection, financial data and line of business changes for non-financial start-up IPOs in 2004

Non-financial start-ups are a subset of all the IPOs in Thomson's Securities Data Corporation (SDC) database in 2004. ***, **, * refer to statistically significant differences between venture- (VC-) and non-venture- (non-VC-) backed start-ups at the 1%, 5%, and 10% levels, respectively.

A. Sample selection

Total number of IPOs in SDC = 306.
- 4 companies already listed on a foreign exchange.
- 122 REITs, closed-end funds, trusts, other financials.
- 21 holding companies (including companies formed solely to acquire other companies).
- 1 company formed as a joint venture.
- 1 company controlled by foreign government.
- 21 spinoffs (some of which had buyouts in their histories).
- 30 buyouts.

= 106 IPOs of non-financial start-ups.

VC Funded = 88 / 83%
Non-VC Funded = 18 / 17%

Median 7 years from founding to IPO.

B. Financial data at IPO ($ million)

	Revenue	EBIT	Book Assets	# Employees	Equity market cap.
			All firms		
Median	25.1	-1.7	34.4	137	261
Ave.	121.6	-0.5	122.5	928	705
Num. obs.	106	106	106	106	106
			VC-Backed firms		
Median	25.1	-3.1**	35.2	145	300**
Ave.	95.3	0.5	114.9	728	784
Num. obs.	88	88	88	88	88
			Non-VC-Backed firms		
Median	27.6	1.3	23.2	72	190
Ave.	250.2	-5.0	159.8	1901	320
Num. obs.	18	18	18	18	18

C. Line of business changes in IPOs of non-financial start-ups.

	All IPOs	VC-Backed	Non-VC Backed
Number of line of business changes	8	7	1
Percent of line of business changes	7.5%	8.0%	5.6%
Number observations	106	88	18

Median time from change to IPO 7 years

Table 10
Management and ownership at IPO for 106 non-financial start-up IPOs in 2004

For all 106 non-financial start-ups that went public in 2004, management at IPO describes various aspects of the CEO, founders, and top five managers at the time of the IPO as described in the firm's S-1 statement. For those 106 non-financial start-ups, division of ownership pre-IPO describes the division of common stock ownership immediately before the IPO. VC-backed firms list a VC firm as a shareholder in the S-1 statement while non-VC-backed firms do not.

Management at IPO:	Overall	VC-backed	Not VC-backed
A founder is CEO:	51%	49%	61%
A founder is CEO or is a director:	78%	78%	78%
A founder is employed or a director:	84%	84%	83%
Has a CFO as a top 5 manager:	90%	88%	94%
Has a CTO or similar as a top 5 manager:	64%	67%	47%
Has a CMO or similar as a top 5 manager:	41%	44%*	22%
Obs. (other than CTO)	106	88	16
Obs. (CTO, excludes retail)	99	82	17

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	CEO	Founder $M pre-IPO
					All firms						
Median	10.0	3.5	2.0	43.5	0.0	22.8	59.3	15.9	6.8	6.2	17.3
Average	20.5	6.1	3.0	41.7	4.2	27.7	57.6	26.5	9.7	16.1	160.9
St. dev.	24.3	7.4	4.7	29.7	11.6	23.2	23.7	24.8	10.5	21.9	813.8
Num. Obs.	106	52	106	106	106	106	104	106	34	106	106
					VC-backed firms						
Median	8.0***	3.4	2.1	51.1***	0.0	20.3**	57.7	14.7***	6.0	5.7	19.5
Average	15.9	5.7	2.6	50.2	3.8	24.5	57.6	21.4	9.0	11.8	164.6
St. dev.	19.0	6.3	2.7	25.1	9.4	18.9	21.9	19.3	8.9	15.4	884.3
Num. Obs.	88	45	88	88	88	88	86	88	28	88	88
					Non-VC-backed firms						
Median	44.4	4.6	1.2	0	0.0	43.2	62.6	53.2	7.7	30.5	13.4
Average	42.6	8.9	5.1	0	6.0	42.9	57.8	51.2	12.9	36.9	142.9
St. dev.	34.1	12.7	9.5		19.1	34.6	31.5	33.7	16.9	34.7	296.7
Num. Obs.	18	7	18	18	18	18	18	18	6	18	18