Different Problem, Same Solution: Contract-Specialization in Venture Capital

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Abstract

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Abstract

Real-world financial contracts vary greatly in the combinations of cash flow contingency terms and control rights used. Extant theoretical work explains such variation by arguing that each investor finely tailors contracts to mitigate investment-specific incentive problems. We provide overwhelming evidence from 4,561 venture capital (VC) contracts that this tailoring is over-stated: even though there is broad variation in contracting across VCs, each individual VC tends to specialize, recycling familiar terms. In fact, a VC typically restricts contracting choices to a small set of alternatives: 46% of the time, a VC uses the same exact cash flow contingencies as in one of her previous five contracts. We document specialization in both aggregated downside protection, and in each individual cash flow contingency term and control rights. Such specialization remains economically and statistically significant even after *extensively* controlling for VC and company characteristics. We also find that VCs learn to use new contractual solutions from other VCs in her syndication network. Our findings challenge the traditional premise that each investor selects from the universe of combinations of terms to match an investment's unique contracting problem. Rather, the cumulative evidence indicates that contract-specialization arises because investors better understand payoff consequences of familiar terms, and are reluctant to experiment with unknown combinations.

1 Introduction

Specialization is a wide-spread and economically important phenomenon in capital markets. Existing research has established that investors specialize investment along some shared characteristic, e.g. industry, development stage or geographical location, because they want to be familiar with the types of companies in which they invest. We document a previously-unexplored dimension of investor specialization: financial contracting. Using a large and detailed sample of contracts between venture capitalists (VCs) and entrepreneurial companies, we document how investors recycle cash flow contingency terms and control rights from prior investments.

It is well-documented that VCs use financial contracts that span a large contractual space, using several state-contingent and interrelated terms (Kaplan and Stromberg, 2003). In our data, we find that collectively VCs employ hundreds of distinct combinations of terms, each of which implies a unique payoff split with the entrepreneur. At first impression, this enormous variety seems to suggests that the standard optimal contract-theoretic approach may well describe real-world practice. That is, entrepreneurial firms are highly differentiated, each with its own idiosyncratic moral hazard and adverse selection issues to address; and VCs are sophisticated investors who stand much to gain—compensation, reputation, and future fund-raising ability—from designing appropriately-tailored financial contracts. Accordingly, optimal contract theory would suggest that the enormous variation in economic primitives of different companies should drive enormous variation in contracting.[1]

This impression is wrong. In fact, we document that a *given* VC selects contracts from a sharply-limited universe of combinations. That the entire universe of contract combinations employed by VCs is so large just reflects that different VCs select from different limited universes of contract designs. We find that each VC employs neither boiler-plate contracts nor finely-tailored contracts, but rather specializes in contract designs with which she is familiar.

One might still posit that the VC contract-specialization we find is consistent with standard optimal contracting approaches: It could be that each VC uses a limited subset of contracts simply because she specializes in certain types of investments (e.g. industries, locations and stages of financing) for which such terms are optimal. We present strong evi-

[1]Consistent with this perspective, Kaplan and Stromberg (2003) evaluate VC contracting under the premise that "VCs are real world entities who closely approximate the investors of theory." (p281)

dence against this explanation. Contract-specialization remains statistically significant and economically important even after controlling for a large battery of company and investor characteristics, including 340 industry dummies that allow us to control for narrow industry distinctions such as "Voice Recognition" vs. "Voice Synthesis", or "Legal Info/Content" vs. "Legal Products". In fact, we show that VCs spread themselves more narrowly across combinations of contracting terms than they do across across different industries. Moreover, VCs recycle contracts from one industry into other industries. We also show that VCs learn to use new contract designs from syndication partners, a finding difficult to reconcile with an investment-specialization explanation.

Collectively, the evidence indicates that VCs may incur significant costs when they experiment with unfamiliar contract terms, much as VCs incur costs experimenting with new areas of investment opportunities (Sorenson, 2008), or firms do when experimenting to learn demand (McLennan 1984, Aghion et al., 1991; Keller and Rady 1999). In a VC context, the costs of experimenting with unfamiliar contract terms reflect the possibly unforeseen impacts on incentives or divisions of payoffs. In turn, these experimentation costs lead VCs to select from contracts whose payoff and incentive consequences they understand from experience.

Experimentation costs are broadly relevant to all areas of contract design. However, there are several reasons why the VC financing setting is particularly well-suited for exploring the topic. While the literature indirectly highlights the large potential gains from experimentation (due to learning to tailor contracts appropriately to meet the idiosyncratic moral hazard or adverse selection in entrepreneurial companies), the potential costs of mis-experimentation are also quite high. Ameliorating incentive problems can require especially complicated contracts whose payoff implications can be difficult to decipher. Concretely, a VC must first estimate how the contract creates or destroys overall surplus via its impact on incentives, transfers surplus between contracting parties, affects renegotiations; and then aggregate these effects by estimating the distributions of intermediate and final investment outcomes. The VC may get things badly wrong.

In practice, a VC can derive several benefits from specializing in a small subset of possible contract terms. Familiarity helps her better understand a contract's incentive implications for both the entrepreneur's and the VC's actions. Familiarity also allows her to better estimate the pricing implications of included terms, which is important because an entrepreneur may demand a higher pre-money valuation in exchange for investor-friendly contract terms.

Taub et al. (2011) study similar decision-making by physicians, documenting that a physician tends to focus on a few prescription alternatives with which he/she is most familiar. They find that, on average, a physician's most preferred antipsychotic drug represents 59% of his/her antipsychotic prescriptions; but that different physicians concentrate on different drugs. To reconcile these findings, Taub et al. develop a model of learning-by-doing in which, from experience with a particular drug, physicians learn which actions to take to complement the drug. Using a similar theoretical framework, one can reconcile our empirical findings on VC contract-specialization: VCs specialize on a few familiar contract terms in order to better exploit learning-via-experience about how those terms affect optimal post-contracting actions by the entrepreneur and VC in different states of the world.

To test the extent of contract-specialization by VCs, we analyze how cash flow contingency terms and control rights are included, using a large and detailed sample of U.S. contracts. We collect data on cash flow contingency terms from legal documents called "Certificates of Incorporation". Because these documents are mandatory filings, our data are free from self-reporting biases that often plague studies of contracts. We study six cash flow contingency terms: participation rights, liquidation preference, cumulative dividends, anti-dilution, redemption right, and pay-to-play.[2] We complement this data with information from *VentureEconomics* on board rights and variables that we use as controls. Our final dataset comprises 4,561 contracts from 804 unique VCs and 1,783 unique companies, covering a broad cross-section of VCs, industries, geographical locations, and investment types.

Our empirical strategy is straightforward. We first compare how a VC uses terms in a new contract with how she uses terms in previous contracts. To preclude inertia in contracting between different investment rounds for the same company from influencing findings, we require the new and previous contracts be from different companies.

As initial striking evidence on the nature of contract-specialization, we uncover that a VC is about twice as likely to use the *exact same* combination of cash flow contingency terms in her previous and new contrast as occurs in two randomly selected contracts from our sample. The fact that the probability of complete recycling is only 10% shows that VCs do not mindlessly recycle terms, but rather they also select contract terms based on the

[2]Broughman and Fried (2011) show that these contract terms matter for how payoffs are ultimately split between VCs and entrepreneurs, in practice.

particular attributes of a company. More remarkably, for 46% of "current" contracts, the VC completely recycles the exact same combination of cash flow contingences from one of the previous five contracts. This highlights the extent to which VCs select contract combinations from sharply limited sets, so that the probability of matching exact terms in just five contracts is quite high. The likelihood of complete recylcing is even higher, 54%, for first-round contracts. This is consistent with the notion that when negotiating first-round contracts, a VC is not constrained by historical precedent (terms included in a company's earlier contracts), and is freer to select a combination of terms whose payoff consequences she understands from past experience.

Another benchmark of the extent to which we find that VCs both recycle and tailor contracts is that VCs with at least 10 investments in our sample average 1.7 investments per unique combination of cash flow contingencies, which *exceeds* their average of 1.3 investments per unique industry segment. Thus, the typical VC engages in *more* contract-specialization than in investment-specialization within narrowly-defined industries.

In our formal tests, we control for a VC's investment experience, track record, age, investment specialization, location and fund sequence. This controls for the possibility that VC characteristics may affect contracting through other channels such as screening, staging, monitoring, or abilities to add value. We also include large battery of controls for company and round characteristics, including our highly-refined industry dummies in order to preclude the possibility that findings are driven by VC investment-specialization.

We first aggregate the six cash flow contingency terms into a downside protection index, which takes a higher value if the VC uses more contractual protections. We show a VC who uses more downside protection in her previous contract uses more downside protection in her new contract.[3] This recycling is substantially more pronounced for first-round contracts.

We also document that, conditional on a given level of downside protection in consecutive contracts (presumably mandated by company or VC attributes), the probability a VC uses the same contract is 47% vs. the 34% likelihood for two randomly selected contracts with the same level of DPI. These findings suggest that VCs do not pursue a standard contracting solution, but rather exhibit a preference for some familiar solutions.

Evidence on contract-specialization also shows up at the separate cash flow contingency

[3]The magnitude is large: a VC with above median downside protection in its previous contract is 5 percentage points more likely to have above median downside protection.

term level: for five of the six terms, a VC who uses more of one contingency term in her previous contract is significantly more likely to use the same term in her new contract. These results obtain after controlling for VC, company and investment characteristics, and are robust to different subsamples (different industries, ages, investment stages, location, just lead VC) or broader industry definitions (e.g., 61-segment classifications).

We also find contract-specialization in how VCs use board rights—arguably the key contractual control right in VC investments—VCs who take board seats in a previous contract are far more likely to use a board seat in her new contract. The very large marginal increase in the probability of 19% indicates that some VCs typically are involved in the board of directors, whereas others are not. Importantly, this result holds after controlling for our battery of VC, company and investment characteristics.

We then conduct a principal component analysis to identify two orthogonal factors that describe the cross-sectional variation in the six cash flow contingency terms and board rights. We find path-dependence *within* each factor (i.e., if the previous contract loaded on one factor then the new contract loads on the same factor), but not *across* factors (i.e. if the previous contract loaded on one factor then the new contract does not load on the other factor). This reinforces our conclusion that VCs specialize in specifically how they use financial contracts.

We conclude by investigating whether and how VCs learn to use different contract designs.[4] Analyzing how the use of contract terms changes over time, we find that when more time has elapsed between the two contracts, a VC is less likely to use the same cash flow contingency terms and the path dependence in downside protection is weaker. This result is consistent with investors learning how to structure contracts from their own experimenting (Murfin, 2010). More importantly, one might expect VCs to learn to use new combinations of terms when the costs of experimentation are less. In fact, we find direct evidence of learning from trusted syndicate partners: for four of the six cash flow contingency terms, a VC is more likely to include the term subsequently if her syndication partners from the preceding round used such terms more in their other contracts. This suggests that syndication networks in the VC market help transmit knowledge about contracting solutions, and *cannot* be explained by omitted controls for VC or entrepreneur characteristics.[5] Thus, our

[4]Bengtsson and Bernhardt (2011) document that inexperienced entrepreneurs can learn about the payoff implications of contracts by hiring lawyers with VC contract expertise. Such a learning channel is likely irrelevant for VCs, as their knowledge is typically comparable with that of expert lawyers.

[5]Kaplan, Stromberg and Martel (2007) also provide evidence of learning about VC contract terms.

analysis suggests that VCs *do* learn about contract terms, via both their experiences and their syndication partners. However, our findings of massive contract-specialization indicate that the costs of such learning are generally non-trivial.

One might posit that the contract-specialization that we uncover matters little in practice because different combinations of terms may substitute for each other. This is not the case for the six cash flow contingency terms that we study. Only two of them—liquidation preference and cumulative dividends–are similar in the sense that they affect the size of the VC's fixed payoff.[6] Other terms are distinct: participation affects the shape of the VC's payoff curve, anti-dilution gives the VC more shares only if the company subsequently has a financing round at lower valuation, redemption allows the VC to withdraw her investment, and pay-to-play forces the VC to invest in future rounds in order to maintain key contractual rights. Hence, the terms have very different impacts in different states of the world, making their substitutability implausible.[7] Moreover, we find that VCs specialize in the aggregate extent of downside protection that they use, where this substitution is even less plausible.

Our paper contributes to the vast literature on financial contracting, by suggesting important insights. Firstly, our findings hard to reconcile with the basic premise that there is a vast universe of possible contracts whose payoff implications are always well-understood. Secondly, our findings challenge the approach of many financial contracting models that identify economic primitives that deliver simple contracts such as equity or debt as optimal contracts. While we find investors specialize in certain contract solutions, these solutions are simple only in that they are drawn from sharply-limited universes of contracts—the contracts themselves do not have simple structures. Rather, our analysis suggests that investors specialize in certain contract solutions because it facilitates their understanding of the likely consequences.

We also contribute to the VC literature by highlighting a new dimension of investor specialization, adding to papers documenting that VCs specialize extensively in which type of companies they invest (Norton and Tenenbaum, 1993; Bygrave, 1987, 1998; Gupta and Sapienza, 1992; Sorensen and Stuart, 2001; Hochberg et al. 2007; Gompers et al. 2009). We also add to the research analyzing cross-sectional differences in VC contract designs

Studying non-US VCs, they find that past exposure to US investments increases the likelihood of implementing US style contractual terms.

[6]Even these terms differ in an important way: with cumulative dividends, the fixed payoff increases with the investment time, in contrast with liquidation preference.

[7]Our interviews with VC partners and lawyers confirm this assessment.

(Sahlman, 1990; Kaplan and Stromberg, 2003, 2004; Bengtsson and Sensoy, 2011a, b; Bengtsson and Ravid, 2011), and to theoretical papers seeking to explain such differences (Admati and Pfleiderer, 1994; Berglof, 1994; Hellmann, 1998, 2002, 2006; Schmidt, 2003; Cornelli and Yosha, 2003; Casamatta, 2004; Repullo and Suarez, 2004)).

Finally, we contribute to the law and economics literature that studies the rationale for standardized contract solutions. Korobkin (1998) discusses how inertia, a mechanism similar to the difficulty of understanding, can bias contracting parties toward using terms defined by legal default rules, or included in standard forms and preliminary drafts. Kahan and Klausner (1997) underscore the learning benefits from using standardized contract terms, and Choi and Gulati (2004) find supportive evidence from the sovereign bond market. In contrast, we do *not* find standardized contracting. Rather, we find extensive across-VC variation in which terms are used, and that each VC often tailors her contract to the economic circumstances, albeit drawing from a subset of familiar contract designs.

The paper's outline is as follows. Section 2 describes our data. Section 3 discusses our empirical strategy. Section 4 presents results on contract-specialization, and Section 5 explores learning about contractual solutions. In Section 6, we discuss why our results are hard to reconcile with alternative explanations. The paper concludes with a brief discussion.

2 Data

We collected a large and representative sample of VC contracts from US venture-backed companies. We first collected contract data from mandatory legal filings, called "Certificates of Incorporation", from which we obtain information on cash flow contingency terms. Although cost and time considerations preclude extracting legal filings from all recent venture-backed companies, our sample is random in the sense that we do not systematically extract data from certain types of contracts, entrepreneurs, companies, or VCs . We then complemented this data with information from *VentureEconomics*, one of most comprehensive databases on VC investments (Kaplan, Stromberg and Sensoy, 2002), on board rights,[8] and variables that capture company, investment and VC characteristics, which we use as controls in our regressions. *VentureEconomics* hand-collects data on board rights using publicly available

[8] The "Certificates of Incorporation" do not list the name of the VC firm (or individual VC partner) who holds a board seat. Similarly, *VentureEconomics* has no information about cash flow contingencies.

information from press-releases, web-pages, etc., as well as from directly contacting venture-backed companies.

The unit of observation in our analysis is a company-VC pair for which we have data on contract terms. To study contract-specialization, we restrict our attention to VCs who fund at least two companies in our sample. This restriction should not bias results since we do not deliberately sample on any VC characteristic. We also restrict our sample by removing duplicate company-VC pairs. Such duplicates exist because we sometimes have contracts from multiple investment rounds of the same company, with the same VC investing in both rounds. In such cases, we include only the first company-VC pair to avoid confounding contract-specialization with other reasons for inertia in a company's contracting solutions.[9]

2.1 Sample Overview

Table 1 summarizes the sample. Panel A shows that we have 4,561 unique company-VC pairs from 2,066 unique investment rounds. The sample covers 1,783 unique companies and 804 unique VCs. Panel B tabulates the sample by how many company-pairs we have for each VC. For about a quarter of the VCs in our sample, we have exactly two company-pairs (i.e., the VC has one observation in our tests). For another quarter of VCs, we have three or four company-pairs, and 11% of VCs in our sample have 13 or more contract-pairs.

Panel C tabulates the sample by year of investment round. Although the "current" contract in each pair exclusively comes from the years 2005-2009, we have no reason to believe that this period is special with regard to contract-specialization. If anything, one would expect more specialization in earlier out-of-sample years when it was presumably more difficult to obtain information and gain expertise about VC contracts.

Panel D summarizes the sample, reporting the mean and standard deviation for variables pertaining to company, investment and VC characteristics. For dummy variables, we only report means. We note that 96% of our sample involve US VCs, key distinction from Kaplan, Martel and Stromberg (2007) who study only non-US VCs. Our data include many observations from each US geographical areas with a well-developed VC market (i.e., California, Massachusetts, Texas and New York) and from the Life Science and High Technology groups, which are often associated with VC investments.

[9] See Bengtsson and Sensoy (2011a) for an analysis of within-company differences in VC contracts.

2.2 Comparison of Consecutive Investment Characteristics

Panel E of Table 1 reports summary statistics of variables that compare a VC's previous and new company for each contract pair in our sample. We calculate "Difference in Time (months)" to measure the time difference between consecutive contract-pairs for the same VC. The average time difference is 4.4 months, signifying that VCs negotiate contracts relatively often. We also calculate "Absolute Difference in Company Age", create the dummy "Difference in Company Stage" to capture whether a VC's two consecutive companies are in different stages (e.g. early or later stage), and create the dummy "Difference in Company State" to capture whether a VC's two consecutive companies are located in different U.S. states. Analyzing the mean of these variables, we find that consecutive investments typically differ with regard to age, stage and geographical location. For example, 60% of companies in consecutive investments are in different states, and the average difference in their ages is 3.6 years. We also create three dummies, "Difference in Company Industry", that capture whether if a VC's two consecutive companies are in different industries, using different levels of industry aggregation reported in *VentureEconomics*. The unconditional likelihood that a VC's successive investments are in different broadly-defined 10-segment industries is quite high at 0.72. This unconditional likelihood is distinctly higher at 0.86 for the narrower 61-segment classification, and it is 0.96 for our fine 340-segment industry classification. In other words, *only 4%* of a VC's consecutive investments are in the same narrowly-defined industry subsegment, which is the classification we use for industry fixed effects in most regressions. The relatively high figures of state and industry switching reflect the fact that even though many VCs specialize along these dimensions, they nevertheless span several different states and industries.[10]

These comparisons of the characteristics of consecutive investments reveal that the companies receiving investments are typically quite different along multiple dimensions—dimensions that we control for in our regressions. Thus, although VCs engage in some degree of investment-specialization (otherwise the figures measuring differences would be much higher), they do *not* specialize to such a degree that it can explain why they so often recycle contract designs, i.e. engage in contract-specialization. Indeed, our robustness tests reveal that a

[10]A VC that randomizes investments across 3 different states would have a 6/9=67% probability of a state switching between two consecutive investments.

VC recycle contract designs *even* when two consecutive investments differ with respects to location, industry, age and stage.

2.3 Contract Terms

Table 2 reports summary statistics for six cash flow contingency terms: participation, cumulative dividends, liquidation preference, anti-dilution, redemption rights, and pay-to-play provisions. Although VC contracts also include other terms, we focus on these terms because they (a) have important cash flow implications, (b) are consistently reported in the filings, and (c) are negotiable terms in the sense that they are used selectively by VCs and are not included as boiler-plate protections. Our interviews with lawyers and VC partners confirm that the terms we study are among the most important ones.[11]

We code redemption rights as 0 or 1, and each other cash flow contingency term as 0, 1 or 2. Panel A of Table 2 provides a detailed description of the contingency terms and their coding. For tests on separate terms, we recode each term to 0 and 1 for the probit regressions. Following Bengtsson and Sensoy (2011b), we sum all coded cash flow contingency terms into a downside protection index (DPI). A higher DPI value indicates that the VC is entitled to higher cash flow rights when a company is sold or otherwise exited (except if the company undertakes an IPO above a certain valuation, see Hellmann 2006), and particularly so if the company's performance has been bad. Panel B tabulates DPI. The median DPI is 5 and about 90% of contracts have a DPI between three and seven.

Panel C outlines our coding of board rights. About 39% of all VC investments give the investor at least one board seat. The *VentureEconomics* board data only reveals whether a VC held a board seat in a company in which she invested at *some* point in time. In companies with the same VC investing in multiple rounds (which is common) we cannot distinguish which specific contract gave the VC her board seat. In such cases, we assume that the VC received the board seat as part of her first investment in the company. This assumption is also unlikely to affect our results, save that it may introduce noise to the board rights variable. The only econometric implication of the assumption is that for some observations we include the wrong control variables pertaining to the investment round, for example "Round

[11] Wilson & Sonsini and Fenwick & West—reputable law firms in the VC area—emphasize these terms in their analyses of VC contracts. See www.wsgr.com/publications/PDFSearch/entreport/1H2011/private-company-financing-trends.htm and www.fenwick.com/publications/6.12.1.asp?vid=19.

Number" or "Round Number of VCs", and VC characteristics that are updated annually, for example "VC Age" or "VC IPO Fraction". Other VC control variables, as well as company control variables, remain exactly the same across rounds.

3 Empirical Strategy

Our goal is to document evidence of contract-specialization by VCs. To detect such behavior, we first test for re-use of contracting choices across a given VC's investments holding other contract determinants fixed, running regressions of the form:

$$Contract_{j,i} = \beta \times Contract_{j,i-1} + \gamma_1 \times Investment_i + \gamma_2 \times Company_i + \gamma_3 \times VC_j + \epsilon_{j,i+1} \quad (1)$$

where j denotes a VC and i a contract. A positive coefficient is evidence that the VC re-uses her contract solution from a previous investment, i.e., she engages in contract-specialization. Vectors $\gamma_1 - \gamma_3$ capture coefficients on investment, company, and VC characteristics (updated to match the contract year). As we discuss in Section 6, the rich set of controls for VC characteristics—investment experience, track record, age, investment specialization, location and fund sequence—are to preclude the possibility that VC characteristics influence contracting via other channels such as screening or monitoring abilities, staging, and so on. So, too, our large battery of controls for company and round characteristics are designed to control for the impact of VC investment-specialization. Although our empirical strategy is straightforward, it presents three issues that we now discuss.

3.1 Classification of Contract Terms

One issue is how to classify contracts, i.e., how to define $Contract_{j,i}$. Our data includes detailed information on six different cash flow contingency terms, and board rights. Whether and how we should aggregate terms depends on how a VC makes contracting choices, but this is precisely the phenomenon we want to study. We address this by analyzing the contracts in several ways. First, we aggregate the cash flow contingency terms into a downside protection index. Second, we separately analyze each cash flow contingency term, as well as board rights. Third, we study whether a VC uses exactly the same cash flow contingencies. Finally, we do a principal component analysis that lets the data identify two orthogonal factors that explain how VCs use cash flow contingency terms and board rights in combination.

The pattern of contract-specialization found holds *independently* of the precise way in which we classify contract terms.

3.2 Lead and Non-Lead VCs

Another issue is whether to study only lead VCs (the principal investor in a round) or also to study non-lead VCs. We include all VCs in most tests because this is the most conservative approach. To see this, suppose that only lead VCs influence contract solutions. Then, one would expect no path-dependence in a non-lead VC's contracting choices: the estimated β should be zero. Thus, including all VCs would bias our tests *against* finding contract-specialization (i.e., a positive β). Another way to think about this issue is to recognize that the extent of a non-lead VC's influence on contracting is ultimately an empirical question. Our results suggest that VC contracts are influenced by contract-specialization of both non-lead and lead VCs.

3.3 Missing Contracts

As mentioned in the data description, our random selection of contracts implies that for a given VC our sample includes instances where we miss one or more contracts that the VC negotiates inbetween $Contract_{j,i}$ and $Contract_{j,i-1}$ that are consecutive *in our sample*. Such missing contracts do not pose a problem for two reasons. First, as we discuss in Section 4.2, the path-dependence is robust to non-sequential pairs. Second, to the extent that the relation between non-sequential contracts is weaker because more time elapsed has between the contract negotiations (see Section 5.1), it only serves to bias our tests *against* finding a positive β consistent with contract-specialization.

4 Results on Contract-Specialization

4.1 Downside Protection Index

We document recycling in the level of downside protection that VCs employ. Table 3 presents results. Specifications 1-4 are OLS regressions where the dependent variable is "DPI" and the focal independent variable is "Previous Contract DPI", which is the downside protection used in a VC's previous investment. Specification 1 includes no controls, specification 2 adds controls for company characteristics and year dummies, and specification 3 adds controls for investment and VC characteristics. In particular, we include 340 industry dummies that absorb much differences between the companies we analyze. We estimate standard errors by clustering residuals on both VC firm and company (Petersen, 2009).

The coefficient on "Previous Contract DPI" is positive and highly significant in all specifications. This result is consistent with contract-specialization: some VCs always use contracts with more downside protection, while other VCs use contracts with less. The fact that we control extensively for VC characteristics means that our finding of contract-specialization is distinct from the findings of other studies on the impacts of particular VC attributes.[12]

Specification 4 includes "Previous Contract DPI X First Round", which interacts "Previous Contract DPI" with a dummy that is 1 if the contract was from the first round of a company, and is 0 otherwise. The positive significant coefficient on this interaction variable is roughly equal in magnitude to that on "Previous Contract DPI", indicating that VCs are about *twice* as likely to recycle downside protection for first round contracts. This finding is consistent with the notion that a VC is more constrained by a company's past contract terms when negotiating a follow-up contract (see Bengtsson and Sensoy, 2011a). In contrast, first round contracts are "blank slates", giving the VC more flexibility in contract design, and allowing her to choose the downside protection with which she is most familiar.

To highlight the extent of contract-specialization in downside protection, specification 5 presents a regression where the dependent variable is 1 if "DPI" exceeds the sample median of 5, and is 0 otherwise. The unconditional mean of the dependent variable is 0.33. The focal independent variable, "Previous Contract DPI Above Median", is 1 if the VC's previous contract DPI exceeds the sample median, and is 0 otherwise. The estimation method is probit with coefficients normalized to reflect variable means. Using the same controls as specification 3, we find that a VC with above median DPI for her previous contract is 4.8 percentage points more likely to have above median "DPI" in her new contract.[13] This difference highlights that contract-specialization is an economically important determinant of downside protection in VC contracts. Comparing significant coefficients reveals that the im-

[12]The estimated coefficients on the control variables suggest that downside protection is more prevalent for less experienced VCs, and is significantly less common for companies and VCs located in California, consistent with Bengtsson and Sensoy, 2010b; and Bengtsson and Ravid, 2011.

[13]33.3% of contracts have above median DPI, so this difference corresponds to a 14 (=4.6/33.3) percentage difference.

pact of "Previous Contract DPI Above Median" is greater than a doubling of the company's age, and is about equal to a doubling of round amount. Hence, the practical importance of contract-specialization is on par with other major determinants of contract solutions.

4.2 Robustness of Recycling of Downside Protection

Robustness tests confirm recycling of downside protection from a VC's previous investment. Panel A of Robustness Table 1 presents results using all controls, for different subsamples of contracts. The coefficient on "Previous Contract DPI" remains positive and significant when the preceding and new companies are in different states (specification 1), in different industries (specification 2), at different ages (specification 3), and investment stages (specification 4). The result also holds for VCs who invest in locations outside and inside California (specifications 5 and 6): contract-specialization in downside protection is thus unrelated to the "California effect" in VC contracting found by Bengtsson and Ravid (2011). Finally, specification 7 reveals contract-specialization by VCs organized as independent private partnerships, who may be more sophisticated and flexible than VCs organized under financial institutions, corporations or government organizations.

Next, in Robustness Table 2 we redefine the unit of observation for our tests. Specifications 1 and 3 limit the sample to investments made by a lead VC, i.e., the VC making the largest investment in a round. We confirm the result on "Previous Contract DPI". We also study contracting by an individual VC partner instead of the VC firm. We can only determine a partner's identity using supplemental data from *VentureEconomics* of partners who hold board seats. For such partners, specification 2 reveals recycling of downside protection.

We then show that contract-specialization in DPI extends to contracts before the previous one. We redefine "Previous Contract DPI" as the downside protection of other previous contracts for the same VC. Specifications 1-4 in Robustness Table 3 presents results for 2 to 5 lags. All specifications yield a positive and significant coefficient on "Previous Contract DPI".

In untabulated regressions, we include a variable that measures how many years a VC's fund has been active at the time of the investment. One may posit that fund maturity could shape a VC's incentives, and hence the use of contract terms. We also include variables that capture whether the VC's "previous" and "current" companies were in different states or different industries, or at different ages or investment stages. The coefficients on these added variables are all insignificant, and including them do not affect the coefficient on "Previous Contract DPI".

Finally, in another set of untabulated regressions, we used coarser industry classifications, such as the *VentureEconomics* 61-segment, 10-segment or 3 dummies capturing whether the company is in a Life Science, High-Technology or Other industry group. Importantly, our findings of contract-specialization are *reinforced* when we use these coarser controls—the coefficient on "Previous Contract DPI" is even larger and more statistically significant. This robustness rules out the possibility that our findings are driven by measurement error introduced by industry controls that are too refined.

4.3 Separate Cash Flow Contingency Terms

We next determine whether the pattern of contract-specialization holds for the separate contingency terms that comprise the downside protection index. Were VCs to specialize in certain contract solutions, one would expect across-investment similarity in which precise terms are included. Accordingly, we run separate probit regressions for each of the six cash flow contingency terms. Coefficients are normalized to reflect variable means. In each regression, the dependent variable is 1 if an investor-friendly version of the term was included and is 0 otherwise. The focal independent variable, "Previous Term", is defined in the same way for the VC's previous contract. Table 4 presents results. We cluster residuals by VC firm.[14] We include our full battery of year dummies, and controls for VC, company, and investment characteristics. We find that for all terms save anti-dilution (specification 4), the VC recycles the term from the previous contract.

4.4 Complete Recycling of Cash Flow Contingency Terms

We conduct a univariate comparison of how often a VC recycles the *exact same* combination of cash flow contingencies. We create a dummy "Same Cash Flow Contingencies" that equals 1 if the six cash flow contingencies had exactly the *same* coding in the VC's new and previous contracts, and is 0 otherwise. We find that VCs recycle exactly the same combination of cash flow contingencies 10% of the time.[15] To benchmark this figure, we calculate the probability

[14]In untabulated tests, we cluster on company and obtain very similar results.

[15]Virtually identical figures obtain when comparing with up to four more lags of other previous contracts for the same VC.

that two random contracts from different VCs in our sample have exactly the same coding for the six cash flow contingencies. This benchmark probability is 6%: a VC is about twice as likely as predicted by chance to recycle all cash flow contingencies. Remarkably, for the subsample of VCs with at least five contracts, we find that for 46% of "current" contracts, the VC completely recycles the exact same combination of cash flow contingences from one of the previous five contracts.[16] The benchmark figure is 25% for the probability of matching one of five randomly selected contracts from different VCs. Collectively, these figures add further evidence that VCs often recycle contingencies, i.e. engage in contract-specialization, and that they do so by selecting from a small subset of possible contract designs.

One can also get at the extent of recycling relative to intensity of investments within an industry by examining the concentration of investments. Among VCs that make at least 10 investments in our sample, on average they have 1.7 contracts with a unique coding of all contingencies (vs. 1.3 contracts per distinct fine industry classification). This greater recycling of contract terms shows up when we have VCs with relatively few contracts (VCs with 10-19 contracts have 1.5 contracts per unique set of terms vs. 1.3 per unique industry), intermediate amounts of contracts (VCs with 20-29 contracts have 1.8 vs. 1.3) and many contracts (VCs with more than 29 contracts have 2.2 vs. 1.4). Importantly, while our limited sampling of contracts from a given VC reduces the average number of investments per unique coding of terms, its random nature means that it does *not* affect any of our other analyses which compare selected *pairs* of investments—sample selection is *not* an issue.

We next redo the univariate comparison of how often VCs recycle the same exact cash flow contingencies, but we condition our sample on cases where a VC uses the same exact level of DPI in her new and previous contracts. The idea behind this comparison is that other factors (i.e., investment-specialization or investor characteristic) could possibly explain why some VCs use high DPI. However, such factors cannot explain why a VC recycles the exact same combination of cash flow contingencies. The average for "Same Cash Flow Contingencies" is 47% when DPI is the same across the two contracts.[17] The benchmark probability, which we calculate by comparing the cash flow contingencies for two random contracts with

[16]If we condition the sample on first round contracts, we find that the probability of complete term recycling is 54%. The higher figure suggests that the VC is not constrained in the first round by historical precedent (terms that were included in a company's earlier contracts).

[17]Virtually identical figures obtain when comparing with up to four more lags of other previous contracts for the same VC.

the same DPI but from different VCs, is 33%. Thus, a VC is over 40 percentages (0.47/0.34-1=0.4) more likely to recycle the exact same combination of cash flow contingencies that deliver the same DPI as would two randomly selected VCs who use the same DPI.

Collectively, these findings show that VCs recycle contract terms in quite specific ways. Not only do VCs specialize in how they use aggregate downside protection, but they also specialize in how *specific* cash flow contingency terms are used. Such a detailed pattern of recycling suggests VCs engage in contract-specialization to overcome difficulties understanding the payoff implications of most combinations of terms.

4.5 Board Rights

We now turn to recycling in contracts of residual control rights, in the form of board seats. Our econometric approach is the same, save that the dependent variable is 1 if the VC held at least one board seat, and 0 otherwise. Table 5 presents results of probit regressions with coefficients normalized to reflect variable means. We estimate standard errors by clustering residuals on VC firm (and on company in untabulated tests). Specification 1 includes no controls, specification 2 adds controls for company characteristics and year dummies, and specification 3 adds controls for investment and VC characteristics.

The coefficients on control variables reveal that VCs are more likely to take board seats in younger companies ("Company Age") and when the investment amount is larger ("Round Amount"), possibly because the need for monitoring is then greater. Moreover, VCs are more likely to take board seats when there are fewer VCs in the round ("Round Number of VCs"). This is not surprising—a board's size is limited for practical reasons.[18] Our analysis also confirms the finding of Wonsungwai (2009) that experienced VCs ("VC Number of Portfolio Companies") are more likely to take board seats, and the finding of Bottazzi et al. (2008) that independent VCs ("VC Private Partnership Type") are more likely to take board seats.

More importantly from our perspective, the coefficient on the focal independent variable "Previous Board" is positive in all specifications: VCs tend to replicate board seat decisions in their investments. The same robustness tests as for downside protection validate this finding for various subsamples (Panel B of Robustness Table 1), for lead VCs (specification 2 in Robustness Table 2), and for lags of a VC's previous contract (specifications 5-8 in

[18]VCs receive observer board seats, which gives them the right to participate in board meetings without formally voting. We do not have data on observer board seats.

Robustness Table 3).

One might ask whether the contract-specialization finding for board seats is subject to a reporting bias. Board seat data come from *VentureEconomics*, which collects its information from press-releases, announcements, web-pages, interviews, surveys and other self-reported sources. Conceivably, some VCs could report when they hold board seats, whereas others are more secretive. Such differences in reporting could bias the coefficient on "Previous Board" in the direction of our result. Yet, this bias—were it to exist—would have to be *quite* substantial to render the coefficient on "Previous Board" insignificant. The variable has a large coefficient (0.169) that is highly statistical significant (t-stat of 6.8). Moreover, such a bias cannot drive our results on downside protection and separate cash flow contingency terms, because this data is collected from mandatory legal filings that are free from reporting issues.

4.6 Principal Component Analysis

To investigate further details on VC contract-specialization, we conduct a principal component analysis of the six cash flow contingency terms and board seat. We let the data identify two orthogonal factors that describe differences in how VCs use contract terms. The first factor has high positive correlations with participation rights, cumulative dividends and redemption rights. The second factor has high positive correlations with liquidation preference and pay-to-play, and a high negative correlation with board seats. For each factor, we run a separate regression with the factor as the dependent variable. Table 6 presents the results for the OLS regressions, where residuals clustered by both VC firm and company. Each regression includes the two factors from the VC's previous contract as the focal independent variables, as well as year dummies and our full battery of VC, company and investment controls.

We find that VCs whose previous contract has a high loading on factor one also have a new contract with a high loading on factor one (specification 1). A similar pattern is found for factor two (specification 2). This principal component analysis also reveals that the loading on one factor in the previous contract does *not* correlate with the loading on the other factor in the new contract. *The fact that the cross-correlations are zero is important, because it highlights that some VCs do not use more of all contract terms, whereas others use less of all. Rather, VCs tend to specialize in how they contract along different dimensions.* This indicates that VCs exhibit quite refined contract-specialization.

5 Learning About Contract Solutions

5.1 Learning Over Time

We conclude our empirical analysis by studying whether and how a VC learns about new contract solutions. We first examine the extent to which less recent previous contracts have less influence on a VC's new contract than more recent ones. For this test, we augment our sample to include all of a VC's lagged contracts that precede the focal contract. This allows us to study how a VC recycles terms from all preceding contracts, thereby identifying temporal effects associated with learning. Concretely, to augment the sample with observations of more temporally distant contracts, we add non-sequential pairs (i.e., 3-1, 4-2, 4-1) to the sequential pairs (i.e., 2-1, 3-2, 4-3, etc) that we used previously. In total, we have 38,472 such contract pairs. Table 7 presents results. We first study recycling of aggregate downside protection. Specifications 1 is a OLS regressions with "DPI" as the dependent variable, and it includes year dummies and all controls. On the focal independent variable, the interaction between "Difference in Time" and "Previous Contract DPI, we find a negative and significant coefficient, suggesting a VC is less likely to recycle downside protection from investments that occurred longer ago.[19]

We next investigate temporal aspects of recycling of the *same exact combination* of cash flow contingencies. Specifications 2-3 are probit regressions where the dependent variable, "Same Cash Flow Contingencies", is 1 if all six cash flow contingencies are exactly the same in the VC's new and previous contracts. These regressions include year dummies and all controls. The focal independent variable, "Difference in Time", has a negative impact both in the whole sample and in the subsample in which a VC's new and previous contracts have the same level of DPI. That is, a VC is significantly less likely to recycle the same combination of cash flow contingency terms when the time between investments is longer.

Specification 4 looks at the use of board rights changes over time using a probit regressions with "Board Seat" as the dependent variable, and including year dummies and all controls. The focal independent variable is the interaction between "Difference in Time" and "Previous Contract Board Seat". Its coefficient is negative and significant, suggesting

[19] An potential issue with this augmented sample is that the same contract is now included multiple times as both a new and previous contract. As a more conservative approach, one can study only a VC's last contract, so that, for example, for a VC with 4 contracts, one only includes pairs 4-3, 4-2 and 4-1. Thus, each contract only enters the sample once. Untabulated regressions reveal qualitatively identical results.

that a VC is less likely to recycle board rights from an investment that occurred longer ago.

5.2 Learning From Syndication Network

We next investigate whether VCs learn to use new combinations of contract terms via interaction with other VCs in a syndication network. *VentureEconomics* has detailed data on past investments, so we can recreate syndication networks and analyze whether syndication partners help a VC learn about contract designs. For each observation, we create a list of co-investors in a VC's previous investment. To determine whether the contract choices of these other investors subsequently affect the VC's choices, we calculate the use of each of the six cash flow contingency terms by a VC's co-investors' in all past contracts in our sample. To isolate the effect of learning, we exclude cases where (a) a syndication partner is also a co-investor in the VC's new investment, or (b) the VC herself invested in a syndication partner's previous contract. The first restriction rules out that a co-investor has a direct impact on the new contract, and the second rules out that the VC reuses her own past contract solutions, i.e. exhibits contract-specialization. The surviving sample has 3,722 unique contracts.

For each cash flow contingency term, we test whether a VC is more likely to use the term if her co-investors used the term more often in past contracts. Table 8 presents results of probit regressions. All specifications include year dummies and all VC, company and investment controls. To achieve convergence in all specifications, we use the *VentureEconomics* 10-segment industry fixed effects rather than the full battery of 340 industry fixed effects. In specification 1, the dependent variable is 1 if the contract has a participation feature, and 0 otherwise. The focal independent variable, "Learning Contract Participation", is the fraction of all co-investors contracts that include a participation feature. Specifications 2-6 consider the other contingencies. The coefficients on participation, cumulative dividends, redemption right, and pay-to-play are positive and significant in all specifications, and *no* specification has a significant negative coefficient. This is strong evidence that VCs learn from syndication partners to use contract terms, and seems difficult to reconcile with alternative explanations.

6 Alternative Explanations

Our analysis presents evidence consistent with the premise that VCs specialize in how they use contracts, selecting contracts from a small but distinctly non-trivial subset of feasible contracts, because they are familiar with their payoff consequences, or because they become familiar with them via interactions with others. We next discuss alternative explanations, and why we believe these explanations are hard to reconcile with our collective findings.

6.1 Investor Investment-Specialization

One might alternatively posit that our findings that VCs use similar combinations of contract terms in successive investments are driven by the fact that different VCs specialize in different types of investments. A VC may, for example, focus investments in an industry or a company development stage for which less downside protection is typical (Kaplan and Stromberg, 2003). A VC may also invest primarily in a geographical area in which downside protection is less typical for some reason (Bengtsson and Ravid, 2011).

One convincing econometric way to rule out influence of investment-specialization would be to include a unique fixed effect for each investment. One cannot do this because all VCs obviously receive the same contract in each investment round. Instead, we instead rule out investment-specialization by including a huge battery of controls for company and investment characteristics. These controls are location (50 U.S. states) fixed effects, company age, early stage dummy, serial founder dummy, serial founder with IPO dummy, serial founder with merger dummy, round number, round dollar amount, and round number of investors. Importantly, we also include industry fixed effects, defined using the narrowest industry classification in *VentureEconomics*. This industry classification allows us to make fine distinctions between different industries—to such an extent that (as discussed in Section 4.4) in our sample, on average, VCs invest in more (1.7) companies per unique combination of cash flow contingencies than companies (1.3) per unique industry invested in: VCs specialize *more* in how they use contract terms than how they focus in the narrow industry sub-segments that we use as controls.[20] Collectively, our control variables capture substantial variation in how VC contracts are structured. For example, regressing aggregate downside protection on controls and the contract-specialization variable, yields an R-squared of 0.33. With these controls in place, investment-specialization remains a viable explanation for our findings only were a VC to specialize investments along some other unobserved company or investment characteristic, and were the characteristic to have a large and systematic correlation with

[20] And recall, our findings of contract-specialization are reinforced when we use coarser controls.

how the VC uses contract terms.

Moreover, the omitted investment characteristic must be able to reconcile more than just the extent to which VCs specialize only in aggregate downside protection; the omitted characteristic must also explain the use of *each* separate cash flow contingency term and board rights, and the frequent use of *identical* combinations of terms. More direct evidence against the investment-specialization explanation is that a VC recycles previous contract solutions even when she invests in companies in different industries, locations, stages or ages. Finally, for investment specialization to reconcile our findings on learning to use contract terms from *other* VCs, that interaction would have had to cause the VC to change the nature of her specialization.

6.2 Investor Characteristics

Our explanation is, in essence, an omitted investor characteristic explanation—each particular VC, via experience, training, interaction with other VCs, etc. becomes familiar with the consequences of a small, but non-trivial, subset of contract terms. The VC then selects contracts from that small set, reusing familiar terms and incorporating terms that they become familiar with over time because she better understands their payoff consequences.

One might alternatively posit that contract recycling arises because VCs differ along some other characteristic that explains how contracts are written. For example, some VC may not need to use a contract with much downside protection because she has superior monitoring or selection skills (Bengtsson and Sensoy, 2011b). Such a VC may consistently select contracts with less downside protection, because contractual and non-contractual solutions to agency problem are substitutes. With this alternative explanation, the VC has no difficulty to understand payoff consequences and can choose from the universe of possible combinations of terms, but some characteristic makes her optimally choose similar contract solutions.

We adopt a multi-pronged approach to precluding such alternative an investor characteristic explanation for our entire body of evidence. Our regressions control for a battery of VC characteristics that capture plausible determinants other than familiarity for how VCs should optimally use contract terms. The controls are VC investment experience (number of unique portfolio companies), VC age, VC IPO fraction (% of all investments), VC merger fraction (% of all investments), VC fund sequence (dummy that takes the value 1 for a follow-up fund and 0 otherwise), VC industry focus (Herfindahl index), VC location focus (Herfindahl index), VC location fixed effects (U.S., California, Massachusetts, New York and Texas), and VC organizational type fixed effects (private partnership, financial or corporate). With these controls in place, an alternative omitted investor characteristic explanation is only valid were a VC to possess some characteristic that (a) is not captured by our controls, and (b) has a large and systematic correlation with how a VC uses contract terms.

Moreover, the omitted investor characteristic that must reconcile not only the recycling of the aggregate downside protection but the recycling of *each* separate cash flow contingency term and board rights, and the frequent use of *identical* combinations of terms. Most challengingly, the alternative explanation must strain to reconcile our finding on learning via the syndication network—it must explain a VC beginning to adopt the contracting choices of past co-investors. In sharp contrast, familiarity with the implications of a small set of combinations of contract terms represents a omitted investor characteristic that provides a simple explanation for *each* of our findings. In particular, a VC is familiar with the consequences cash flow contingencies used in the past, causing him to recycle them across investments, and a VC naturally gains familiarity to the implications of new terms via exposure to syndication partners, and hence learns to use new contract solutions.

7 Concluding Discussion

This paper presents a set of empirical findings that collectively point to one conclusion: VCs, who are sophisticated and strongly incentivized investors facing large agency problems in their contracting, recycle terms with which they are familiar from prior investments. This contract-specialization is pervasive. It explains how VCs use separate cash flow contingency terms and board rights, as well as how VCs aggregate such terms. These results remain economically important and statistically significant after we control for company, investment and VC characteristics that affect how VCs use financial contracts. We also show that VCs learn about new contractual solutions over time and as they interact with other VCs.

Our evidence challenges a central premise of contract theory that investors choose contracting solutions from the vast universe of possible combinations of terms. A more accurate description of real-world contracting—at least in the VC industry—appears to be that the costs of experimentation with unfamiliar contract terms lead investors to make path-dependent choices that restrict contract solutions to a narrow subset of possible combinations of terms. Most striking evidence of this is that 46% of the time, a VC completely recycles the exact same combination of cash flow contingences from one of her previous five contracts. Our findings highlight that learning and experimentation costs associated with unfamiliar contracting terms is an important economic force that must be considered in future work on financial contracting.

Importantly, VCs do *not* use boiler-plate contracts in which all terms would simply be copied from an earlier contract. Rather, VCs tailor their contract solutions to mitigate problems specific to each investment situation, but do so by selecting from familiar solutions. This familiarity bias is plausibly optimal given the challenges of computing payoff consequences of many combinations of terms. But the contract-specialization that emerges due to experimentation costs may well amplify agency problems, because value-enhancing terms may be excluded and value-destroying terms included; or give rise to underinvestment, because it can cause the VC and entrepreneur to fail to agree on terms.

An important implication of our analysis is that contract-specialization affects the effective pricing of VC investments. Most studies of VC pricing analyze pre-money valuation, a measure that does not account for pricing effects of cash flow contingency terms.[21] Because these terms transfer surplus (i.e., exit proceeds) from the entrepreneur to the VC, their inclusion lowers the effective price the VC pays for her equity ownership. Our findings demonstrate that some VCs use persistently more of certain types of cash flow contingency terms, which gives rise to investor fixed effects in the effective VC pricing.

[21] Pre-money valuation is a negotiated figure that determines what fraction of the outstanding equity the VC receives for its investment in the round. The inclusion of cash flow contingency terms (e.g., participation or cumulative dividends) in a negotiated contract has no impact on the pre-money valuation figure.

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Table 1 - Sample Overview and Summary Statistics

The sample includes contracts for which we collect data on (i) cash flow contingencies from mandatory legal filings, (ii) board rights from VentureEconomics, and (iii) control variables that capture investment, company and VC characteristics from VentureEconomics. We eliminate contracts for which we cannot observe a contract used by the same VC in a previous investment. We remove duplicate VC-company pairs in order to rule out within-company inertia as a possible explanation. Each contract is matched by company name and round date with an investment round listed in VentureEconomics. In Panel C, all VC variables are updated to match the year of the contract. In Panels D and E, variables without reported standard deviation are dummies.

Panel A: Sample Overview

Unique Contracts	4,561
Unique Investment Rounds	2,066
Unique Companies	1,783
Unique VCs	804

Panel B: Number of Company-Pairs per VC (N=804 VCs)

Nr of Pairs	Nr of VCs	Fraction
2	233	29%
3	121	15%
4	88	11%
5	57	7%
6	59	7%
7	35	4%
8	39	5%
9	22	3%
10	21	3%
11	17	2%
12	13	2%
13 or more	89	11%

Panel C: Year of the Investment Round (N=4,561 Contracts)

Year	Nr of Contracts	Fraction
2005	323	7%
2006	1,507	33%
2007	1,768	39%
2008	748	16%
2009	215	5%

Panel D: Company, Investment and VC Characteristics (N=4,561 Contracts)

Company Characteristics	Mean	Standard Dev.
Company in California	0.42	
Company in Massachusetts	0.16	
Company in Texas	0.06	
Company in New York	0.04	
Company in Life Science	0.33	
Company in High Technology	0.36	
Company at Early Stage	0.25	
Company Age (years)	5.00	3.96
Serial Founder	0.20	
Serial Founder with IPO	0.06	
Serial Founder with Merger	0.08	
Investment Characteristics		
Round Number of VCs	5.36	3.12
Round Number	3.21	1.53
Round Amount ($ million)	15.30	14.70
VC Characteristics		
VC in US	0.96	
VC in California	0.38	
VC in Massachusetts	0.17	
VC in Texas	0.03	
VC in New York	0.09	
VC Number of Portfolio Companies	139.91	165.33
VC IPO Fraction	0.12	0.09
VC Merger Fraction	0.25	0.12
VC Follow-up Fund	0.89	0.32
VC Age (years)	15.52	11.43
VC Private Partnership Type	0.64	
VC Financial Type	0.05	
VC Corporate Type	0.06	
VC Industry Focus	0.27	0.19
VC Location Focus	0.37	0.30
VC and Company in Same State	0.46	

Panel E: Comparison of Previous and New Investment (N=4,561 Contracts)

Difference in Time (months)	4.38	6.77
Difference in Time, More than 1 year	0.09	
Absolute Difference in Company Age (years)	3.56	3.86
Difference in Company Stage	0.34	
Difference in Company State	0.60	
Difference in Company Industry (10-segment)	0.72	
Difference in Company Industry (61-segment)	0.86	
Difference in Company Industry (340-segment)	0.96	

Table 2 - Contractual Terms

Table 1 describes the sample. This table presents details on the six cash flow contingency terms (Panel A), Downside Protection Index (Panel B), and board rights (Panel C). Downside Protection (DPI) is calculated by adding the coding of each cash flow contingency term. Data on cash flow contingencies and DPI come from mandatory legal filings, and data on board rights come from VentureEconomics.

Panel A: Cash Flow Contingency Terms

Participation

With participation the investor receives both a liquidation preference and a fraction of common stock when the company is sold or liquidated. With no participation the investor holds convertible preferred stock. As an illustration of convertible preferred stock, suppose the VC invests $2 million at a $10 million post-money valuation with a 1X liquidation preference. When the company is sold the VC can either claim $2 million in liquidation preference or 20% (2/10) of the common stock. The VC would choose to convert if and only if the proceeds from the company are above $10 million. If the preferred stock is instead participating, the VC does not have to choose between the liquidation preference and converting the preferred stock to common stock but instead receives both. Building on the example, participating preferred stock would give the VC both $2 million and 20% of the common equity. If the company is sold for $7 million then the VC receives $2 million in liquidation preference and $1 million in common stock (20% of the remaining $5 million). With "Capped" participation the investor only receives the liquidation preference if his investment IRR is below a certain hurdle.

	Not Capped = 2	Capped = 1	Not Included = 0
Contracts	1,934 (22%)	1,104 (24%)	1,523 (33%)

Cumulative Dividends

Dividends that the investor earns annually until the company is sold or liquidated. Cumulative means that the dividends are not paid out annually but when the company is sold or liquidated. Cumulative dividends are senior to common stock. The dividend rights are expressed as a percentage of the VC's investment and are typically compounding, meaning that investors also earn dividends on accumulated, unpaid dividends. As an illustration, suppose the VC invests $2 million and receives 8% in compounding cumulative dividends. If the company is sold after 5 years for $10 million, then the VC receives (1.085 – 1) × $2 million = $0.94 million in dividends.

	Above 8% = 2	8% or Below = 1	Not Included = 0
VC-Company Contract Pair	1,228 (28%)	188 (4%)	3,105 (68%)

Liquidation Preference

The multiple of the investor's investment that is paid back to the investor when the company is sold or liquidated. Liquidation preference is senior to common stock. As an illustration,, for an investment of $2 million, a liquidation preference of 2X means that the VC gets the first $4 million of proceeds in liquidation. Unlike cumulative dividends, the amount of the VC's liquidation preference does not increase over time.

	Above 2X = 2	Above 1X, To 2X = 1	1X = 0
Contracts	61 (1%)	220 (5%)	4,276 (94%)

Table 2, continued

Anti-Dilution

The investor is issued additional shares if the company raises a new financing round at a lower valuation than what the investor paid (down round). "Full Ratchet" gives the investor more additional shares than "Weighted Average", especially if the new financing round is small.

	Full Ratchet = 2	Weighted Average = 1	Not Included = 0
Contracts	4,115 (90%)	361 (8%)	85 (2%)

Redemption

The investor has the right to sell his shares back to the company after a specified time period. A typical redemption right provision gives the investor the right to sell back 1/3 of his shares after 5 years, 1/3 after 6 years and the 1/3 after 7 years.

	Included = 1	Not Included = 0
Contracts	2,474 (54%)	2,087 (46%)

Pay-To-Play

Pay-to-play provisions specify what contractual rights that the investor loses if he does not invest in a follow-up financing round of the company. With "Convert to Preferred" the investor loses some contractual rights that are attached to his preferred stock. With "Convert to Common" the investor loses all contractual rights that are attached to his preferred stock.

	Not Included = 2	Convert to Pref. = 1	Convert to Common = 0
Contracts	3,635 (79%)	283 (6%)	643 (14%)

Panel B: Downside Protection Index - DPI (N=4,571 Contracts)

DPI Value	Nr Contracts	Fraction
0	2	0%
1	31	1%
2	182	4%
3	946	21%
4	930	20%
5	948	21%
6	777	17%
7	529	12%
8	169	4%
9	44	1%
10	0	0%
11	3	0%

Panel C: Board Rights

Board rights give a VC one or more seats at the company's board of directors. A board seats allows the VC to vote on almost all corporate matters, and enables the VC to better monitor the management.

	Board Seat=1	No Board Seat=0
Contracts	1,777 (39%)	2,784 (61%)

Table 3 - Contract-Specialization and DPI

*See Table 1 for sample overview, and Table 2 for details on the computation of DPI. One observation is one contract. Specification 1-4 are OLS regressions with the Downside Protection Index (DPI) as the dependent variable. Standard errors clustered by both company and VC firm using the two-way method of Petersen (2009). The focal variable is "Previous Contract DPI" which is the DPI of the same VC's previous contract. Specification 5 is a probit regression in which the dependent variable takes the value 1 if DPI is above 5 (sample median) and 0 otherwise. In this specification, marginal effects (dP/dX) are reported and standard errors are clustered by company. The focal variable is "Previous Contract Above Median DPI" which takes the value 1 if the previous contract DPI is above the 5 (sample median) and 0 otherwise. All VC variables are updated to match the year of the contract. "VC Number of Portfolio Companies" is a count of the number of unique companies that the VC has invested in, "VC IPO Fraction" is the percentage of all investments with a realized IPO outcome, "VC Merger Fraction" is the percentage of all investments with a realized merger outcome, "VC Follow-up Fund" is a dummy that takes the value 1 if the VC has raised a follow-up fund, and 0 otherwise. "VC Age (years)" is the difference between the investment round year and the year the VC's first investment. VC Private Partnership Type is a dummy that takes the value 1 if the VC is organized as an independent GP/LP partnership, and 0 otherwise. VC Financial Type is a dummy that takes the value 1 if the VC is organized as part of a bank, insurance company or financial institution, and 0 otherwise. VC Corporate Type is a dummy that takes the value 1 if the VC is organized as part of a corporation, and 0 otherwise. "VC Location Focus" is sum of the squared number of investments in a U.S. state divided by the squared number of all investments. "VC Industry Focus" is sum of the squared number of investments in a industry (VentureEconomics 10-segment classification) divided by the squared number of all investments. A high value on these VC focus variables captures a VC that is more of a specialist investor, whereas a low value captures a VC that is more of a generalist investor. All specifications include fixed effects for VC firm state (California, Massachussets, Texas, New York, and other), company state, company industry (VentureEconomics 340-segment classification), and round year. Constant is estimated but not reported. Standard errors in brackets. Significance at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.*

Specification	1	2	3	4	5
Estimation Technique	OLS	OLS	OLS	OLS	Probit
Dependent Variable	DPI	DPI	DPI	DPI	DPI Above Median
Previous Contract DPI	0.181***	0.105***	0.076***	0.061***	
	[0.020]	[0.017]	[0.016]	[0.017]	
Previous Contract DPI X First Round				0.068**	
				[0.034]	
Previous Contract DPI Above Median					0.056***
					[0.016]

Specification	1	2	3	4	5
Company at Early Stage	-0.044	-0.137	-0.294**	-0.042	-0.042
	[0.100]	[0.113]	[0.114]	[0.041]	[0.041]
Company Age (years)	0.049***	0.045***	0.049***	0.013***	0.013***
	[0.014]	[0.014]	[0.014]	[0.004]	[0.004]
Serial Founder	0.02	-0.015	-0.014	-0.032	-0.032
	[0.152]	[0.150]	[0.150]	[0.046]	[0.046]
Serial Founder with IPO	-0.515**	-0.444**	-0.468**	-0.042	-0.042
	[0.227]	[0.223]	[0.225]	[0.072]	[0.072]
Serial Founder with Merger	0.021	0.111	0.116	0.08	0.08
	[0.192]	[0.189]	[0.190]	[0.069]	[0.069]
Round Number of VCs		-0.008	0.001	0.001	0.001
		[0.020]	[0.019]	[0.006]	[0.006]
Round Number		0.037		0.007	0.007
		[0.041]		[0.014]	[0.014]
First Round			-0.121		
			[0.213]		
ln Round Amount ($ million)		-0.144***	-0.144***	-0.061***	-0.061***
		[0.052]	[0.052]	[0.017]	[0.017]
ln VC Number of Portfolio Companies		-0.151***	-0.145***	-0.050***	-0.050***
		[0.042]	[0.042]	[0.012]	[0.012]
VC IPO Fraction		-0.664*	-0.641*	-0.161	-0.161
		[0.355]	[0.351]	[0.116]	[0.116]
VC Merger Fraction		-0.058	-0.055	0.067	0.067
		[0.278]	[0.278]	[0.093]	[0.093]
VC Follow-up Fund		0.172**	0.153**	0.03	0.03
		[0.073]	[0.073]	[0.025]	[0.025]
VC U.S.		0.059	0.081	0.001	0.001
		[0.104]	[0.103]	[0.039]	[0.039]
VC Age (years)		0.004	0.004	0.001	0.001
		[0.004]	[0.004]	[0.001]	[0.001]
VC Private Partnership Type		-0.084	-0.089	-0.02	-0.02
		[0.089]	[0.089]	[0.030]	[0.030]
VC Financial Type		-0.209*	-0.210*	-0.053	-0.053
		[0.125]	[0.126]	[0.041]	[0.041]
VC Corporate Type		0.104	0.102	0.006	0.006
		[0.137]	[0.137]	[0.042]	[0.042]
VC Industry Focus		-0.067	-0.064	0.016	0.016
		[0.157]	[0.157]	[0.054]	[0.054]
VC Location Focus		-0.189	-0.186	-0.064	-0.064
		[0.178]	[0.176]	[0.055]	[0.055]
VC and Company in Same State		0.163**	0.161**	0.049*	0.049*
		[0.081]	[0.081]	[0.028]	[0.028]
Year Fixed Effects	No	Yes	Yes	Yes	Yes
Company Location Fixed Effects	No	Yes	Yes	Yes	Yes
Company Industry Fixed Effects	No	Yes	Yes	Yes	Yes
VC State Fixed Effects	No	No	Yes	Yes	Yes
Number of Observations	4,561	4,561	4,561	4,561	4,561
R-squared	0.03	0.30	0.32	0.33	0.20

Table 4 - Contract-Specialization and Cash Flow Contingency Terms

*See Table 1 for sample overview, Table 2 for details on the cash flow contingency terms, and Table 3 for details on control variables. One observation is one contract. All specifications are probit regressions, with marginal effects (dP/dX) reported and standard errors clustered by company. In each specification, the dependent variable takes the value 1 if a cash flow contingency term is included, and 0 otherwise. The focal variable takes the value 1 if the same term was included in the VC's previous contract, and 0 otherwise. All specifications include our full battery of company, investment and VC controls, fixed effects for VC firm state (California, Massachussets, Texas, New York, and other), company state, company industry (VentureEconomics 340-segment classification), and round year. Constant is estimated but not reported. Standard errors in brackets. Significance at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.*

Specification	1	2	3	4	5	6
Estimation Technique	Probit	Probit	Probit	Probit	Probit	Probit
Dependent Variable	Participation	Liq.Pref.	Cum.Div.	Anti-Dil.	Redemption	No Pay-to-Play
Previous Contract Participation Rights	0.041***					
	[0.010]					
Previous Contract Liquidation Preference		0.063***				
		[0.014]				
Previous Contract Cumulative Dividends			0.022***			
			[0.009]			
Previous Contract Anti-Dilution				-0.012		
				[0.014]		
Previous Contract Redemption Rights					0.079***	
					[0.020]	
Previous Contract No Pay-to-Play						0.040***
						[0.009]
Company, Investment and VC Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Company Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Company Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
VC State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	4,561	4,561	4,561	4,561	4,561	4,561
R-squared	0.16	0.25	0.27	0.21	0.24	0.18

Table 5 - Contract-Specialization and Board Rights

*See Table 1 for sample overview, Table 2 for details on the computation of DPI, and Table 3 for details on control variables. One observation is one contract. All specification are probit regressions in which the dependent variable takes the value 1 if the VC holds at least one board seat and 0 otherwise. Marginal effects (dP/dX) are reported and standard errors clustered by company. The focal variable is "Previous Contract Board Seat" which takes the value 1 if the VC had a board seat in the previous company and 0 otherwise. All specifications include fixed effects for VC firm state (California, Massachussets, Texas, New York, and other), company state, company industry (VentureEconomics 340-segment classification), and round year. Constant is estimated but not reported. Standard errors in brackets. Significance at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.*

Specification	1	2	3
Estimation Technique	Probit	Probit	Probit
Dependent Variable	Board Seat	Board Seat	Board Seat
Previous Contract Board Seat	0.330***	0.260***	0.185***
	[0.014]	[0.023]	[0.023]
Company at Early Stage		-0.045	-0.056
		[0.035]	[0.036]
Company Age (years)		-0.011***	-0.013***
		[0.004]	[0.004]
Serial Founder		0	-0.002
		[0.035]	[0.037]
Serial Founder with IPO		-0.055	-0.074
		[0.051]	[0.051]
Serial Founder with Merger		0.006	-0.004
		[0.040]	[0.042]
Round Number of VCs		-0.038***	-0.034***
		[0.005]	[0.005]
Round Number		-0.013	-0.016
		[0.010]	[0.010]
ln Round Amount ($ million)		0.058***	0.046***
		[0.014]	[0.014]

Specification	1	2	3
ln VC Number of Portfolio Companies			0.049**
			[0.021]
VC IPO Fraction			-0.115
			[0.172]
VC Merger Fraction			0.412***
			[0.128]
VC Follow-up Fund			0.019
			[0.038]
VC U.S.			0.111*
			[0.066]
VC Age (years)			0.002
			[0.002]
VC Private Partnership Type			0.200***
			[0.049]
VC Financial Type			0.091
			[0.073]
VC Corporate Type			-0.184**
			[0.087]
VC Industry Focus			0.190***
			[0.072]
VC Location Focus			0.026
			[0.078]
VC and Company in Same State			0.006
			[0.037]
Year Fixed Effects	No	Yes	Yes
Company Location Fixed Effects	No	Yes	Yes
Company Industry Fixed Effects	No	Yes	Yes
VC State Fixed Effects	No	No	Yes
Number of Observations	4,561	4,561	4,561
R-squared	0.08	0.12	0.18

Table 6 - Contract-Specialization and Principal Component Factors

*See Table 1 for sample overview, Table 2 for details on the computation of DPI, and Table 3 for details on control variables. One observation is one contract. We compute two orthogonal principal component factors from our data on the six cash flow contingency terms and the board rights. The first factor has high positive correlations with participation rights, cumulative dividends and redemption rights. The second factor has high positive correlations with liquidation preference and pay-to-play, and high negative correlation with board seats. All specification are OLS regressions in which the dependent variable is the first (specification 1) or the second (specification 2) principal component factor. Standard errors clustered by both company and VC firm using the two-way method of Petersen (2009). The focal variables are "Previous Contract Principal Component Factor 1" and "Previous Contract Principal Component Factor 2". All specifications include our full battery of company, investment and VC controls, fixed effects for VC firm state (California, Massachussets, Texas, New York, and other), company state, company industry (VentureEconomics 340-segment classification), and round year. Standard errors in brackets. Constant is estimated but not reported. Significance at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.*

Specification	1	3
Estimation Technique	OLS	OLS
Dependent Variable	Principal Component Factor 1	Principal Component Factor 2
Previous Contract Principal Component Factor 1	0.053***	-0.011
	[0.016]	[0.016]
Previous Contract Principal Component Factor 2	0.013	0.078***
	[0.014]	[0.016]
Company, Investment and VC Controls	Yes	Yes
Year Fixed Effects	Yes	Yes
Company Location Fixed Effects	Yes	Yes
Company Industry Fixed Effects	Yes	Yes
VC State Fixed Effects	Yes	Yes
Number of Observations	4,561	4,561
R-squared	0.40	0.32

Table 7 - Contract-Specialization and Learning Over Time

*See Table 1 for sample overview, Table 2 for details on the computation of DPI, and Table 3 for details on control variables. One observation is one contract, defined as follows: for each VC, we restrict the sample to include only all contracts in our dataset. We then include all previous contracts of the VC. For example, suppose we have 5 contracts for a VC. We then include pairs 5-1, 5-2, 5-3, 5-4, 4-1, 4-2, 4-3, 3-1, 3-2, and 2-1. Specification 1 is a OLS regression with the Downside Protection Index (DPI) as the dependent variable and standard errors clustered by both company and VC firm using the two-way method of Petersen (2009). The focal variable is "Previous Contract DPI X Difference in Time". Specifications 2-3 are probit regressions in which the dependent variable takes the value 1 if the allocation of the six cash flow contingency terms was exactly the same in the VC's new and previous contracts, and 0 otherwise. Marginal effects (dP/dX) are reported and standard errors are clustered by company. The focal variable is "Difference in Time". Specification 4 is a probit regression in which the dependent variable takes the value 1 if the VC holds at least one board seat and 0 otherwise. Marginal effects (dP/dX) are reported and standard errors clustered by company. The focal variable is "Previous Contract Board Seat X Difference in Time". All specifications include our full battery of company, investment and VC controls, fixed effects for VC firm state (California, Massachussets, Texas, New York, and other), company state, company industry (VentureEconomics 340-segment classification), and round year. Constant is estimated but not reported. Standard errors in brackets. Significance at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.*

Specification	1	2	3	4
Estimation Technique	OLS	Probit	Probit	Probit
Dependent Variable	DPI	Same Cash Flow Cont.	Same Cash Flow Cont.	Board Seat
Difference in Time (months)	0.008***	-0.002***	-0.005***	0.002***
	[0.003]	[0.000]	[0.001]	[0.001]
Previous Contract DPI X Diff. in Time	-0.001***			
	[0.000]			
Previous Contract DPI	0.065***			
	[0.012]			
Previous Contract Board Seat X Diff. in Time				-0.002**
				[0.001]
Previous Contract Board Seat				0.148***
				[0.024]
Sample	Full	Full	DPI Same	Full
	VC's All Contracts			
Company, Investment and VC Controls	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Company Location Fixed Effects	Yes	Yes	Yes	Yes
Company Industry Fixed Effects	Yes	Yes	Yes	Yes
VC State Fixed Effects	Yes	Yes	Yes	Yes
Number of Observations	0.22	0.06	0.10	0.16
R-squared	38,472	38,472	38,472	38,472

Table 8 - Contract-Specialization and Learning from Syndication Partners

*See Table 1 for sample overview, Table 2 for details on the cash flow contingency terms, and Table 3 for details on control variables. One observation is one contract. All specifications are probit regressions, with marginal effects (dP/dX) reported and standard errors clustered by company. In each specification, the dependent variable takes the value 1 if a cash flow contingency term is included, and 0 otherwise. The focal variable "Learning Contract..." is the average number of times the term is included in past contracts used by the VC's previous syndication partners (in rounds where the VC herself did not invest). Specifications 2, 4, 6, 8, 10 and 12 include our full battery of company, investment and VC controls, fixed effects for VC firm state (California, Massachussets, Texas, New York, and other), company state, company industry (VentureEconomics 10-segment classification), and round year. Constant is estimated but not reported. Standard errors in brackets. Significance at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.*

Specification	1	2	3	4	5	6
Estimation Technique	Probit	Probit	Probit	Probit	Probit	Probit
Dependent Variable	Participation	Liq.Pref.	Cum.Div.	Anti-Dil.	Redemption	No Pay-to-Play
Learning Contract Participation	0.079**					
	[0.038]					
Learning Contract Liquidation Preference		-0.014				
		[0.027]				
Learning Contract Cumulative Dividends			0.060*			
			[0.035]			
Learning Contract Anti-Dilution				-0.007		
				[0.028]		
Learning Contract Redemption					0.066**	
					[0.032]	
Learning Contract No Pay-to-Play						0.072**
						[0.036]
Learning Contract Board						
Company, Investment and VC Controls	No	Yes	No	Yes	No	Yes
Year Fixed Effects	No	Yes	No	Yes	No	Yes
Company Location Fixed Effects	No	Yes	No	Yes	No	Yes
Company Industry Fixed Effects (10 seg.)	No	Yes	No	Yes	No	Yes
VC State Fixed Effects	No	Yes	No	Yes	No	Yes
Number of Observations	3,722	3,722	3,722	3,722	3,722	3,722
R-squared	0.08	0.16	0.16	0.12	0.18	0.12

Robustness Table 1 - Contract-Specialization, Subsamples

*See Table 1 for sample overview, Table 2 for details on the computation of DPI and Board Rights, and Table 3 for details on control variables. One observation is one contract. In Panel A, all specifications are OLS regressions with the Downside Protection Index (DPI) as the dependent variable and standard errors clustered by both company and VC firm using the two-way method of Petersen (2009). The focal variable is "Previous Contract DPI" which is the DPI of the same VC's previous contract. In Panel B, all specifications are probit regressions in which the dependent variable takes the value 1 if the VC holds at least one board seat and 0 otherwise. Marginal effects (dP/dX) are reported and standard errors clustered by company. The focal variable is "Previous Contract Board Seat" which takes the value 1 if the VC had a board seat in the previous company and 0 otherwise. Specifications 1-4 limits the sample to contracts for which the new and the previous company are different (location, 10-segment industry, age and round amount, respectively). Specifications 5 and 6 limit the sample to companies outside and inside California, respectively. Specification 7 limits the sample to VCs that are organized as independent private partnerships. All specifications include our full battery of company, investment and VC controls, fixed effects for VC firm state (California, Massachussets, Texas, New York, and other), company state, company industry (VentureEconomics 340-segment classification), and round year. Constant is estimated but not reported. Standard errors in brackets. Significance at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.*

Panel A: DPI

Specification	1	2	3	4	5	6	7
Estimation Technique	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Dependent Variable	DPI	DPI	DPI	DPI	DPI	DPI	DPI
Previous Contract DPI	0.069***	0.063***	0.097***	0.073***	0.072***	0.051**	0.058***
	[0.018]	[0.018]	[0.027]	[0.024]	[0.021]	[0.022]	[0.020]
Subsample	Previous Company Different State	Previous Company Different Industry	Previous Company Different Age	Previous Company Different Stage	Company Outside California	Company Inside California	VC Private Partnership Type
Company, Investment and VC Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Company Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Company Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VC State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	2,734	3,302	2,087	1,534	2,655	1,906	2,907
R-squared	0.35	0.34	0.41	0.39	0.37	0.35	0.36

Robustness Table 1 continued

Panel B: Board Seats

Specification	1	2	3	4	6	7	8
Estimation Technique	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Dependent Variable	Board Seat	Board Seat	Board Seat	Board Seat	Board Seat	Board Seat	Board Seat
Previous Contract Board Seat	0.449***	0.457***	0.389***	0.376***	0.516***	0.407***	0.389***
	[0.076]	[0.066]	[0.099]	[0.100]	[0.073]	[0.096]	[0.066]
Subsample	Previous Company Different State	Previous Company Different Industry	Previous Company Different Age	Previous Company Different Stage	Company Outside California	VC Outside California	VC Private Partnership Type
Company, Investment and VC Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Company Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Company Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VC State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	2,734	3,302	2,087	1,534	2,655	1,906	2,907
R-squared	0.2	0.18	0.19	0.2	0.20	0.20	0.14

Robustness Table 2 - Contract-Specialization and DPI, Lead VCs and VC Partners

*See Table 1 for sample overview, Table 2 for details on the computation of DPI and Board Rights, and Table 3 for details on control variables. In specifications 1 and 3 , the unit of observation is one contract by a lead VC. In specification 2 , the unit of observation is one contract by a individual VC partner. Specifications 1-2 are OLS regressions with the Downside Protection Index (DPI) as the dependent variable and standard errors clustered by both company and VC firm using the two-way method of Petersen (2009). The focal variable in each specification is the DPI of a previous contract. Specification 3 is a probit regression in which the dependent variable takes the value 1 if the VC holds at least one board seat and 0 otherwise. Marginal effects (dP/dX) are reported and standard errors clustered by company. The focal variable is "Previous Contract Board Seat" which takes the value 1 if the VC had a board seat in the previous company and 0 otherwise. All specifications include our full battery of company, investment and VC controls, fixed effects for VC firm state (California, Massachussets, Texas, New York, and other), company state, company industry (VentureEconomics 340-segment classification), and round year. Constant is estimated but not reported. Standard errors in brackets. Significance at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.*

Specification	1	2	3
Estimation Technique	OLS	OLS	Probit
Dependent Variable	DPI	DPI	Board Seat
Lead VC's Previous Contract DPI	0.080**		
	[0.034]		
VC Partner's Previous Contract DPI		0.106***	
		[0.038]	
Lead VC's Previous Contract Board Seat			0.128**
			[0.055]
Subsample	Lead VC	VC Partner	Lead VC
Company, Investment and VC Controls	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Company Location Fixed Effects	Yes	Yes	Yes
Company Industry Fixed Effects	Yes	Yes	Yes
VC State Fixed Effects	Yes	Yes	Yes
Number of Observations	1,329	1,126	1,329
R-squared	0.40	0.42	0.30

Robustness Table 3 - Contract-Specialization and DPI, Other Lags of Previous Contracts

*See Table 1 for sample overview, Table 2 for details on the computation of DPI and Board Rights, and Table 3 for details on control variables. One observation is one contract. Specifications 1-4 are OLS regressions with the Downside Protection Index (DPI) as the dependent variable and standard errors clustered by both company and VC firm using the two-way method of Petersen (2009). The focal variable is the DPI of a previous contract, with different lags. Specifications 5-8 are probit regressions in which the dependent variable takes the value 1 if the VC holds at least one board seat and 0 otherwise. Marginal effects (dP/dX) are reported and standard errors clustered by company. The focal variable is "Previous Contract Board Seat" which takes the value 1 if the VC had a board seat in the previous company and 0 otherwise, with different lags. All specifications include our full battery of company, investment and VC controls, fixed effects for VC firm state (California, Massachussets, Texas, New York, and other), company state, company industry (VentureEconomics 340-segment classification), and round year. Constant is estimated but not reported. Standard errors in brackets. Significance at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.*

Specification	1	2	3	4	5	6	7	8
Estimation Technique	OLS	OLS	OLS	OLS	Probit	Probit	Probit	Probit
Dependent Variable	DPI	DPI	DPI	DPI	Board Seat	Board Seat	Board Seat	Board Seat
Previous Contract DPI - 2 lags	0.059***							
	[0.015]							
Previous Contract DPI - 3 lags		0.047***						
		[0.017]						
Previous Contract DPI - 4 lags			0.052**					
			[0.021]					
Previous Contract DPI - 5 lags				0.072***				
				[0.021]				
Previous Contract Board - 2 lags					0.141***			
					[0.029]			
Previous Contract Board - 3 lags						0.161***		
						[0.029]		
Previous Contract Board - 4 lags							0.178***	
							[0.034]	
Previous Contract Board - 5 lags								0.153***
								[0.036]
Company, Investment and VC Con	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Company Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Company Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VC State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	3,767	3,196	2,747	2,386	3,767	3,196	2,747	2,386
R-squared	0.36	0.38	0.39	0.39	0.19	0.19	0.19	0.19