

# Venture Capital Financing in Germany The Role of Contractual Arrangements in Mitigating Incentive Conflicts

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JEL-Classification: D23, G24, G32

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## **1 Introduction**

Kaplan and Strömberg (2004) seem to be the first to utilize specific investment proposal information from venture capital (“VC”, henceforth) finance to examine the relevance of different theories in corporate finance. Generally, investment proposals are some 20-page-long memoranda written by an investment manager that offer a description of the potential investment as well as a list of arguments supporting or rejecting a proposed investment. Based on empirical evidence for the US VC market, Kaplan and Strömberg (2004) show the superiority of direct measures of the relevance of incentive problems over indirect measures previously employed in Kaplan and Strömberg (2003). With respect to the German VC market and following to some degree the approach of Kaplan and Strömberg (2003), Antonczyk et al. (2007) examine whether indirect measures are able to explain the presence of certain covenants in VC contracts. Compared to Kaplan and Strömberg (2003, 2004) and Antonczyk et al. (2007), our paper contributes to the literature in the following three ways. First of all, the empirical data set used in Antonczyk et al. (2007) for the German VC market is increased from 52 VC investments to 91 and empirical regressions are extended to control for additional aspects like the stock market crash in 2000 and the dominant influence of some major lead venture capitalists in our sample. Moreover, we contrast our results with those of Kaplan and Strömberg (2003) in order to examine potential differences across countries.

Secondly, the approach of Kaplan and Strömberg (2004) of direct measuring the relevance of incentive problems by looking in detail into VC investment proposals is utilized for the German case so that the cross-country robustness of the Kaplan and Strömberg (2004) results can be analyzed. Thirdly, we extend the Kaplan and Strömberg (2004) approach by defining a set of four instead of three influential factors that determine the relevance of incentive problems. In contrast to Kaplan and Strömberg (2004) we identify each incentive problem (hidden information, hidden action, hold-up) and the amount of exogenous risk as one separate influential factor, while Kaplan and Strömberg (2004) undertake no clear-cut distinction

between hidden action and hold-up problems. Moreover, in some cases we change the assignment of certain investment proposal statements to a specific influence factor.

The main conclusions of our analysis are as follows: Firstly, our descriptive analysis shows there are some contractual differences for the German and the US market which seem mainly to stem from the different role of debt and dormant holdings on the one side and convertible preferred shares on the other side. This may be caused by differences in the respective legal systems. In addition, we suggest that there might be some kind of “cultural” influence that may help explain our finding. Secondly, we are generally able to verify the results of Antonczyk et al. (2007) with respect to the (restricted) relevance of indirect measures of incentive problems in spite of our refined regression analysis. Moreover, there are considerably less significant results than reported by Kaplan and Strömberg (2003) for the US case. As a consequence of this, and thirdly, the superiority of direct measures is more pronounced for the German VC market than for the US VC market based on the results of Kaplan and Strömberg (2004). Fourthly, our rigorous distinction of four influential factors unambiguously related to the three kinds of incentive problems and the amount of exogenous risk not only verifies several previous findings, but also offers additional insight into the role of certain VC covenants in order to alleviate hidden action or hold-up problems. Moreover, looking at the findings of all three approaches simultaneously, it becomes evident that almost all clauses can be explained by at least one of them.

The rest of the paper is organized as follows. In the following Section 2 we give an overview of contractual arrangements used in VC finance and their contribution to the mitigation of various incentive problems. The latter are described by four dimensions which we call hidden information, hidden action, hold-up, and exogenous risk. We present in detail from a theoretical point of view the relationship between these four dimensions and the usefulness of different covenants in VC relationships. This analysis opens up a potential avenue for empirical research based on the examination of VC contracts which may be contrasted to the one by

Kaplan and Strömberg (2004) and that of Antonczyk et al. (2007). Our database is presented in Section 3. Thereby, we are already able to identify and explain some statistically significant differences between VC contracts in Germany and in the US. Section 4 relates our four-factor approach of direct measurement of incentive problems to the three-factor approach of Kaplan and Strömberg (2004). Section 5 is devoted to our main empirical analysis that aims at identifying the potential reasons for several covenants in VC contracts. Besides our own approach based on the structure presented in Section 2, we apply the approaches of Kaplan and Strömberg (2004) as well as of Antonczyk et al. (2007) and compare the results. Once more, we examine country-specific differences between Germany and the US. Section 6 concludes.

## **2 Characteristics of VC relationships and suitable contractual agreements**

As outlined in Section 1, the main goal of our paper is to analyze the relevance of covenants in VC contracts to handle hidden information and hidden action problems as well as hold-up problems regarding the (so-called) portfolio company to be financed. Hidden information problems refer to informational asymmetries between the venture capitalist and the entrepreneur initially owning the portfolio company that exist even before the contracts have been established. The reason for this pre-contractual informational asymmetry lies in the venture capitalist's inability to reliably assess the quality of the entrepreneur and of his or her entrepreneurial idea. Since the entrepreneur will primarily act in his or her own interest, he or she will not be willing to disclose unfavourable information. The venture capitalist thus has to cope with the problem of not being exactly informed about the quality of the firm to be financed. From the entrepreneur's point of view, hidden information problems regarding the venture capitalists should generally be of negligible importance. Unlike him- or herself, venture capitalists repeatedly provide capital and thus their quality can be judged by observing their track record.

In addition, hidden action problems arise after the VC contract is in effect as a consequence of a lack of observability of the actions chosen by the entrepreneur. Once again, a self-

ish entrepreneur will take measures to fulfil his or her own goal which need not be in line with those of the venture capitalist. Moreover, it should be noted that hidden action problems do exist on the venture capitalist's side as well when he or she is expected to support the entrepreneur (Casamatta, 2003; Schmidt, 2003). However, their intensity should be of less importance for two reasons. First, just like in the hidden information case, the venture capitalist will make sure to sustain his or her reputation. Second, the impact of his or her effort on the success of the portfolio company will most likely be less than the impact of the entrepreneur's effort. For the time being, we therefore will refrain from taking these hidden action problems into closer consideration. However, we will come back to this issue during the discussion of our results.

Thirdly, even if all actions are perfectly observable, but contracts are incomplete, because they do not take into account all possible future problems and states of nature (see, e.g., Hart and Holmström, 1987), the entrepreneur might threaten the venture capitalist in future periods with leaving the firm, with not complying to necessary changes in firm strategy (including liquidation), or with refusing to choose a certain exit-channel preferred by the venture capitalist in order to improve his or her contractual terms. Such threats are called hold-up (Hart and Moore, 1994). The threat of leaving the firm is a major problem for the venture capitalist if the entrepreneur's knowledge is highly specific in the sense of Williamson (1985) so that he or she cannot be replaced quite easily. The other two threats are based on general asset specificity. Once the VC has been brought "into" the portfolio company, the investment is largely sunk and the parties' (residual) control rights decide how to use the funds. These two hold-up problems seem to matter *ex ante* in any VC relationship and thus cannot be related to particular features of a certain entrepreneur or his or her firm at the time of funding. In what follows, we thus will rely only on the first kind of these three hold-up problems.

In a similar manner, the venture capitalist might threaten the entrepreneur to end the financing relationship. Since it is generally almost impossible to find a new investor when the

old one has quit because of differences in opinions, the threat of terminating the financing relationship is most dangerous for the entrepreneur when his or her human capital is highly specific. Therefore, shifts of control towards the venture capitalist may endanger the venture's success, because the entrepreneur's willingness to invest in specific human capital is reduced. From the venture capitalist's point of view we may call this an indirect hold-up problem, while threats by the entrepreneur may be labelled as direct hold-up problems for the venture capitalist. The relevance of indirect hold-up problems is closely related to direct hold-up problems stemming from specific human capital. Therefore, direct and indirect hold-up problems have to be considered simultaneously. Also, in what follows, hidden information, hidden action and hold-up problems are all called "incentive problems", while the term "agency problems" shall only refer to hidden information and hidden action problems.

In general, exogenous risk aggravates incentive problems, as it becomes more difficult to assess the entrepreneur's capabilities and the quality of his or her project. Moreover, with increasing exogenous risk it becomes more complicated to distinguish between bad luck and lacking effort as possible causes for poor firm performance. Thirdly, in more uncertain environments incomplete contracts and thus hold-up problems are more often relevant.

There are several possible ways to reduce hidden information, hidden action, and hold-up problems. These contractual arrangements are listed and defined in Table 1. In addition, in this table and the following one it is described by a "+" which incentive problems from the venture capitalist's point of view can be mitigated by their utilization. A "-" represents a negative consequence of this clause with respect to the reduction of a certain problem, a "0" characterizes a neutral influence, and "?" indicates that no statement is possible due to the existence of different theoretical aspects which should have different empirical implications at the same time (not present in Table 1). As already sketched, "direct hold-up" will take into account only hold-up conflicts related to the threat of leaving the firm. As the effective-

ness of measures against incentive problems may be affected by the amount of exogenous risk, this influential factor is also taken into account in Table 1.

Apparently, the higher the entrepreneur's equity share, the more lacks of entrepreneurial and project quality will influence his or her welfare position (mitigation of hidden information problems, see Leland and Pyle, 1977). Moreover, the incentive to work hard for firm success will be increased (reduction of hidden action problems), although incentive effects for the venture capitalist are reduced. The prospect of receiving a substantial part of the future cash flows of the portfolio company reduces the entrepreneur's incentives to leave the company (reduction of direct hold-up). Also, the control rights attached to equity increase the entrepreneurs' incentives to specifically invest (lower indirect hold-up). With the entrepreneur's risk aversion being typically higher than that of the venture capitalist due to diversification considerations, increasing exogenous risk will reduce the incentive advantages of a high entrepreneur's equity share (Holmström, 1979).

Also, debt financing can be utilized to reduce hidden information (Ross, 1977). Furthermore, through the issuance of debt, the entrepreneur's equity stake will get stronger and this mitigates hidden action problems. Because control rights of debt holders are limited, debt financing does not lead to reduced incentives to invest in human capital on the entrepreneur's side (reduction of indirect hold-up). As in the case of the entrepreneur's shareholding, the prospect of receiving a substantial part of the earnings reduces the entrepreneur's incentives to leave the company (reduction of direct hold-up). In VC financing relationships, equity and debt financing are mostly combined. Pure debt financing seldom proves to be a good alternative, since in an environment with high volatility the entrepreneur may have great risk shifting incentives. Also, in VC relationships one would expect extraordinarily high costs of financial distress. The evaluation of debt financing in Table 1 therefore is based on the assumption of debt not being excessively relied on. Moreover, possible problems in the case of debt financing get stronger with increasing exogenous risk.

Hidden information and hidden action conflicts may also be mitigated by venture capitalists' control rights which prove helpful in particular for pronounced exogenous risk. "Broad" control may be exercised through the board of directors. Venture capitalists typically possess the right to appoint a certain number of directors irrespective of their actual shareholdings. Unfortunately, strong control rights on the venture capitalist's side dilute the entrepreneur's incentives to specifically invest (indirect hold-up).

Besides these three "conventional" ways of tackling incentive problems, venture capitalists employ a great variety of additional covenants which all help to mitigate certain aspects of incentive problems. They are already ranked in Table 1 according to their relative empirical importance in Germany, although this issue will be discussed in detail not before Section 3.

In order to lower the extent of pre-contractual informational asymmetry, entrepreneurs have to sign guarantees of revealed information. In the same spirit, venture capitalists typically have special information rights to reduce hidden action problems. Latter rights are complemented with veto rights held by the venture capitalist. Those rights are all particularly useful when exogenous risk is high. Moreover, instruments that aim at reducing hidden action problems can also be utilized to reduce hidden information problems. For latter purpose, the covenants have to be structured as a menu of different contracts being offered to the entrepreneur. The entrepreneur's choice among the contracts establishes a self-selection mechanism. Such an argument, for example, holds true for venture capitalists' information and veto rights.

Some clauses are almost always included in VC contracts, because they are useful in mitigating VC specific hold-up conflicts. Competition clauses prevent the entrepreneur from walking away with his or her strongly needed human capital. This reduces a direct hold-up conflict on the entrepreneur's side because the termination of the relationship between the entrepreneur and the venture capitalist is expensive from the entrepreneur's point of view. Rights of first refusal and tag-along rights may avoid indirect hold-up problems caused by exit conflicts. This becomes more important with increasing exogenous risk. As mentioned

above, hold-up problems related to exit conflicts can hardly be identified at the start of the financing relationship. Therefore, we will not consider these provisions further.

There are several additional covenants that are primarily used to reduce hidden action problems (and possibly hidden information problems as generally explained above). Drag-along rights induce incentives for the entrepreneur to exert effort, since in the case of a forced trade sale of the portfolio company the continuation of his or her employment will depend on his or her track record. On the other hand, the threat of dismissal reduces his or her incentives to invest in human capital (indirect hold-up). Moreover, such an arrangement will be less helpful the greater exogenous risks are.

Liquidation preferences have debt-similar characteristics and therefore can be used to alleviate informational incentive conflicts. Unlike debt, liquidation preferences have no time limit and do not trigger insolvency. Therefore, they are a somewhat “gentler” instrument than debt. As in the case of debt financing, the entrepreneur’s risk aversion makes liquidation preferences more costly with increasing exogenous risk. Another debt-like feature is replicated by redemption rights. Such covenants strongly reduce hidden information and hidden action problems, as the entrepreneur has to earn the cash flows necessary to repay the venture capitalist. Furthermore, the possibility to redeem shifts power towards the venture capitalist and hampers human capital investments (indirect hold-up). Redemption rights lose effectiveness if exogenous risks become more intense because of the entrepreneur’s risk aversion.

A common practice in VC finance is the ex ante staging of funds (Sahlman, 1990; Bergemann and Hege, 1998). First of all, staging limits the financial facilities at the entrepreneur’s disposal and hence impedes wasting the resources of the portfolio company. Second, ex ante staging provides incentives for the entrepreneur to exert sufficient effort in order to trigger additional funding. The option of not continuing the project may hamper the entrepreneur’s incentive to invest in specific human capital. Stage financing is often combined with

anti-dilution rights. Latter rights protect the venture capitalist from losses in future financing rounds and thus enhance the incentive effects of staging.

If prohibition of sale provisions are agreed upon, the entrepreneur is not able to dissolve the established connection between his or her welfare and the portfolio company's success (via shareholding). This mitigates all discussed agency and direct hold-up problems even for high exogenous risk. Similarly, time vesting provisions increase the entrepreneur's costs of leaving the company and therefore enhance his or her bonding to the growth company. However, both clauses may increase indirect hold-up conflicts.

Ratchet provisions induce incentives that are similar to bonus agreements since the entrepreneur is awarded if he or she fulfils the milestones contractually agreed upon. Unlike bonus agreements, ratchet provisions also change the structure of control rights depending on firm success. Once again, the prospect of receiving a substantial part of the future cash flows of the portfolio company might reduce the entrepreneur's incentives to leave the company and enhance his or her incentive to invest (reduction of direct and indirect hold-up). Pure control effects are induced by control switch provisions.

>>> Insert Table 1 about here <<<

Table 1 already states the main hypotheses of our paper. As explained in more detail in Section 3, we will focus on the shaded lines of Table 1. Moreover, we concentrate on the properties of portfolio companies and their consequences for the intensity of incentive problems and financial contracting. It now only remains necessary to operationalize the different variables summarized in that Table. Thereby, the first column of Table 1 describes our dependent variables with the first three ones being measured numerically, while for the other ones we are only able to distinguish between "utilization" and "no utilization" of the respective covenant in a certain VC contract. Therefore, we will apply a linear regression to examine the role of the first three variables and logistic regressions for the other clauses. The main remaining problem refers to the issue how to measure the independent variables "hidden infor-

mation”, hidden action”, “hold-up”, and “exogenous risk”. Thereby, we will combine findings for direct and indirect hold-up with an overall “+” or “-” only when both hold-up conflicts exhibit the same sign. Otherwise, a “?” will be assigned to the overall hold-up problem. When we talk of hold-up from now on, we will mean this combined hold-up perspective.

In fact, there are two different avenues which one might follow. The independent variables of Table 1 might be proxied by some kind of indirect measures or they might be directly identified by a close examination of statements in VC investment proposals. Examples for the first way are approaches by Kaplan and Strömberg (2003) and Cumming (2005). However, we will follow Antonczyk et al. (2007) by introducing the independent variables “HIGHTECH” with a value of 1 for a firm that operates in a high-tech industry and 0 otherwise, “EARLYSTAGE” with a value of 1 for a firm that had no positive revenues until the date of the VC investment in question and 0 otherwise, and “1<sup>st</sup>ROUND” with a value of one when it is the first time that a firm obtains VC funding and 0 otherwise. Antonczyk et al. (2007) explain that all incentive problems (hidden information, hidden action, hold-up) should (on average) be worse for “HIGHTECH = 1” than for “HIGHTECH = 0” because of industry peculiarities, while – as a consequence of the missing track record – “EARLYSTAGE = 1” only indicates greater problems of hidden action and hidden information in comparison to situations with “EARLYSTAGE = 0”, because the specificity of the entrepreneur’s human capital seems unrelated to this variable. “1<sup>st</sup>ROUND = 1” only hints at ceteris paribus greater hidden information problems than for “1<sup>st</sup>ROUND = 0” because of the lack of the venture capitalist’s experience with the portfolio company. Under the additional assumption that greater incentive problems foster the utilization of contractual agreements which might help to mitigate these problems, we are already able to derive the hypotheses in the lines “HIGHTECH”, “EARLYSTAGE”, and “1<sup>st</sup>ROUND” of Table 2. For example, there is a “+” for EQU with respect to HIGHTECH, because according to Table 1, we expect EQU to be helpful against all three incentive problems and all of them are addressed by HIGHTECH. For

a similar reason, there is also a “+” for RAT in the case of EARLYSTAGE, because according to Table 1, we expect RAT to be helpful against agency problems and both of them are addressed by EARLYSTAGE. In contrast, we have a “?” for NVCB with respect to HIGHTECH, because according to Table 1 NVCB reduces the entrepreneur’s incentives to specifically invest (indirect hold-up) – which should be very important for the portfolio firm’s success in high-tech branches. In the same way, we determined the other entries in Table 2.

The variable “fraction of board members nominated by the venture capitalist” is measured in three different ways: directly without any further modification in the regression (NVCB (1)), with additionally controlling for the equity share of the venture capitalist (NVCB (2)), as one might conjecture a strongly positive relationship between these two variables, and via the difference between NVCB (1) and the venture capitalist’s equity share (NVCB (3)).

Nevertheless, the variables HIGHTECH, EARLYSTAGE, and 1<sup>st</sup>ROUND are only very rough proxies for the true amount of incentive problems prevailing in a certain VC relationship. Therefore, Kaplan and Strömberg (2004) suggested the direct analysis of VC investment proposals to find out which considerations have mainly driven the contractual arrangements chosen by the contracting parties. To be more precise, they distinguish three different groups of influential factors that determine the utilization of certain contract designs. Internal factors comprise management quality, performance to date, downside risk, influence of other investors, VC investment fit and monitoring costs, and valuation. Apparently, these factors are directly related to hidden information problems as described above.

Examples for external factors are market size, customer adoption, competition and exit conditions. These factors are external to the firm and largely beyond the control of the management so that this category corresponds to the one that we called “exogenous risks”.

The third group may be named execution factors and focuses on aspects that are related to difficulties in executing or implementing products, technologies and business strate-

gies. These factors aim at describing the complexity of the task and the reliance on the entrepreneur's human capital. Kaplan and Strömberg (2004) suggest these factors to be directly related to (direct and indirect) hold-up conflicts. However, there are also statements in investment proposals assigned to this factor which – in our opinion – hint at hidden action problems. For example, when venture capitalists mention that for the innovation to be successful, real sales effort need to be mounted, Kaplan and Strömberg (2004) identify this also as cases referring to hold-up conflicts. We believe those investment proposal entries indicate that venture capitalists worry about a lack of effort by the entrepreneur so that hidden action problems are addressed. However, according to Table 1 the effectiveness of certain clauses may be different with respect to hidden action problems on the one side and hold-up problems on the other side. Moreover, even if hypotheses are the same for both incentive problems, it seems interesting to identify empirically which effect is more relevant for the utilization of a certain contracting arrangement. We deem it therefore reasonable to explicitly distinguish between a hidden action problem indicator and an indicator for hold-up problems.

Summarizing, we extend the approach of Kaplan and Strömberg (2004) by splitting the execution factor into a hidden action factor and a hold-up factor. Also, we partially link the investment proposals' contents differently to the various factors. In cases where our shaded hypotheses of Table 1 are not contradictory for hidden action and hold-up, we are directly able to deduce corresponding hypotheses for the execution factor of Kaplan and Strömberg (2004). Nevertheless, for the variables NVCB, ADR, EASF, PSP, TVP, and DAR there can be no clear-cut hypothesis derived regarding the execution factor of Kaplan and Strömberg (2004). With respect to the internal factor we can directly refer to our hypotheses derived for hidden information problems. The same holds true for the relationship between the external factor and the exogenous risk of our approach.

>>> Insert Table 2 about here <<<

### **3 The empirical data set and general differences in VC between Germany and the US**

The data employed in this paper consists of 91 VC investments and was provided by five venture capitalists. The 91 data sets comprise investment proposals and financing contracts. The data entails only investments in German young innovative firms and only the first investment of the respective venture capitalist. It was supplemented by general information about the venture capitalists. Contracts were written between May 1997 and December 2004. Though information was provided only by five venture capitalists, a sample selection bias can be neglected insofar, as in 20 cases the venture capitalists only acted as co-investors. In these cases, another venture capitalist analyzed the growth companies and designed the contract. Therefore, we have reached a satisfying sample as, altogether, 19 different venture capitalists acted as lead investors. In addition, characteristics of the data set prove to be similar to the corresponding results of other empirical surveys for the German VC market like the ones of Schefczyk (2004), those published by the German private equity and venture capital association BVK (Bundesverband deutscher Kapitalbeteiligungsgesellschaften), and those provided by VentureXpert (for additional information see Addendum 1). Nevertheless, as pointed out above, in our regressions we will control for the influence of the four most relevant venture capitalists.

>>> Insert Table 3 about here <<<

Table 3 offers an overview of the utilization of different kinds of equity and debt financing as well as supporting financial clauses in comparison to the results of Antonczyk et al. (2007) and Kaplan and Strömberg (2003). On the whole, the findings of Antonczyk et al. (2007) remain valid. In particular, the minor role of convertibles in contrast to their relevance in the US is verified (see also Schefczyk, 2004; Bascha and Walz, 2007). German firms make more often use of debt financing and (debt-like) dormant holdings. A potential cause for these differences in VC contracting might be the different legal systems in Germany and the US. According to the analysis by LaPorta et al. (1998) civil law countries like Germany or France

rely more heavily on debt financing because minority shareholder rights are not protected in the same way as in common law countries like the US and the UK. However, only recently another strand of literature has arisen that focuses on cultural differences among countries and their consequences for corporate finance (see the empirical studies by de Jong and Semenov, 2002; Stulz and Williamson, 2003; Kwok and Tadesse, 2006). This newly developing field of “cultural corporate finance” is somewhat related to another quickly growing body of literature that is called behavioral corporate finance and accounts for the consequences of bounded rationality as propagated particularly by Kahneman and Tversky (1979) for financial decision making. For example, in Breuer (2006) it is formally shown that differences in loss aversion and mental accounting may explain the different relevance of equity rights issuances in Germany and the US. Thereby, mental accounting refers to the phenomenon that under certain conditions payoff consequences are split up in several parts which are separately evaluated (the case of “segregation”) instead of being added up as a fully rational subject would always do (the case of “integration”). The concept of loss aversion means that investors assess payment consequences relative to certain “reference points” with disutility effects from “losses” being more pronounced than utility increases from “gains” of the same magnitude. Thereby, loss aversion may be related to Hofstede’s (1980) cultural dimension “uncertainty avoidance”. In general, mental accounting might only result if there are at least two different financial instruments simultaneously used. As mental accounting may lead to *ceteris paribus* higher utility levels, this might give rise to the issuance of a combination of equity and debt/dormant holdings instead of the utilization of just a single financial instrument like convertible preferred shares, even if resulting overall payment schemes are nearly identical (for additional information see Addendum 2). Country-specific differences in the relevance of mental accounting for investors may thus (also) be responsible for the different relevance of convertible preferred shares in Germany and the US.

Correspondingly to the higher relevance of debt and dormant holdings in German VC finance, several clauses are thus – from a theoretical point of view – not as important in Germany as in the US. This apparently holds true for the rights of first refusal, anti-dilution rights as well as tag-along and drag-along rights and prohibition of sales provisions, because all these covenants aim at securing the value of equity shares. It also holds true for liquidation preferences, which are a genuine component of debt financing but not of equity. For the same reason, redemption rights are necessary only in the case of equity financing. Moreover, a higher portion of debt finance or dormant holdings makes it possible to grant the entrepreneur a higher portion of the firm's equity. This in turn will render additional incentive instruments to increase his or her efforts less relevant. In order to elaborate on such considerations somewhat more we divided our sample into two groups with the first one comprising only firms with only equity financing and the latter one being characterized by equity financing as well as debt financing or dormant holdings. In fact, we identify significant differences as expected for almost all covenants mentioned above (see Table 3). The only (remarkable) exemption seems to be the finding for the prohibition of sale provisions. Moreover, ex ante stage financing apparently may help to compensate for weaker control rights in the case of (partial) debt financing and thus is more relevant in Germany than in the US.

Finally, it should be noted that some of the clauses of Table 3 are almost always part of VC contracts in Germany (guarantees of revealed information, venture capitalist's information and veto rights, and competition clauses), while control switch provisions are only rarely used. Only clauses that are neither used too seldom nor too frequently will be the objects of our regressions because otherwise we cannot expect to identify meaningful relationships between firm characteristics and the emerging financial arrangements. Other clauses (tag-along rights and rights of first refusal) are not analyzed in more detail because they are primarily used to mitigate (only) indirect hold-up (exit) conflicts which should not particularly be linked to the independent variables under consideration in this paper. Redemption rights are used by

only very few venture capitalists (3 out of a total of 19) and therefore are also excluded. All remaining clauses are shaded in Table 3 (and in Table 1).

#### **4 VC investment proposals and direct measures of incentive problems**

The main part of our paper is devoted to the analysis of potential relationships between various measures of incentive problems on the one side and certain contractual agreements in VC financing on the other side. In particular, in order to employ direct measures of incentive problem intensity, we have to assign observed contractual statements to the four factors identified in Section 2. To be more precise, we distinguish twelve different groups of statements as described in Table 4 (specific examples of statements corresponding to these twelve groups are presented in Addendum 3). These groups are fine-tuned according to the contents of investment proposals in Germany and do not necessarily coincide with groups used by Kaplan and Strömberg (2004). However, it is possible to identify for each group of Table 4 an unambiguous indicator variable which is connected to this group by Kaplan and Strömberg (2004). Thereby, Table 4 reveals that – in addition to the consideration of four factors instead of only three – we change the assignment of “entrepreneur’s charisma” and “input factors” in comparison to Kaplan and Strömberg (2004). Every once in a while, the venture capitalists emphasize the entrepreneur’s charisma. We believe that venture capitalists recognize that by funding the portfolio company, they become dependent on the entrepreneur. Latter could use this dependency to hold-up the venture capitalist. Kaplan and Strömberg (2004), on the other hand, associate such content with their internal factor. Moreover, statements with respect to input factors like “Acquisition of employees may prove to be difficult” are interpreted by us as indicators for exogenous risk and not – as in Kaplan and Strömberg (2004) – as examples for execution risks. In addition, we find statements not listed by Kaplan and Strömberg (2004) regarding “marketing activities”, “the speed of implementation of entrepreneurial idea,” “the complexity of the applied technology”, and “input factors”. In Table 4 our four factors and

their corresponding subgroups as well as their relative frequencies in our sample are summarized.

>>> Insert Table 4 about here <<<

We derive quantitative measures of our four factors in the same manner as Kaplan and Strömberg (2004) proceeded in their three-factor approach, that is, if any of the subgroups listed in Table 4 is mentioned in an investment proposal, the respective dummy takes the value of one. In a second step, the subgroup dummies are added and finally divided by the number of subgroups per factor. By this method, we get for each factor a quantitative indicator between zero and one. In the same way we employ the original three factors of Kaplan and Strömberg (2004) by applying their own categorization of subgroups as presented in their article.

### **5 VC financial arrangements and their empirical relationship to measures of incentive conflicts**

In what follows, we now want to explore in somewhat more detail the relevance of our hypotheses of Table 2. To this end, we firstly present the correlation matrix of the main indicator variables of Table 2. According to Table 5, correlations are only high between the factors applied by Kaplan and Strömberg (2004) and those propagated by us. This is not too surprising as HIDDEN INFORMATION and INTERNAL FACTOR are almost identically defined. The same holds true with respect to EXOGENOUS RISK and EXTERNAL FACTOR. Apparently, we have been successful in splitting up EXECUTION FACTOR into HIDDEN ACTION and HOLD-UP, as is also signified by the low correlation between HIDDEN ACTION and HOLD-UP. In fact, correlations between variables that are simultaneously applied in regression analyses are always (considerably) lower than 50 % which may serve as a justification of our approach (see, e.g., Gujarati, 1995, p. 336).

>>> Insert Table 5 about here <<<

As mentioned above, we additionally account for the major lead investors in our regressions. Furthermore, we have been told by VC managers that German VC firms generally adjusted their contractual terms in the aftermath of the stock market crash in 2000. We control for this aspect by another dummy variable which indicates whether a certain contract has been written before or after the crash. Thirdly, from the analysis in Table 3 it has been learnt that debt is a potential substitute for several of the VC covenants in question. Therefore, we add another binary variable to recognize the utilization of debt instruments when examining covenants from Table 3. Our main results are displayed in Table 6, while additional details are available in Addendum 4. Table 6 presents the outcomes of three *alternative* ways of regression in order to explain contractual arrangements in venture capital financing. First of all, we use the three indirect measures for the relevance of incentive problems discussed above (HIGHTECH, EARLYSTAGE, and 1<sup>st</sup>ROUND), secondly we replace those indirect measures by the three direct indicators for incentive problems as introduced by Kaplan and Strömberg (2004) (INTERNAL FACTOR, EXECUTION FACTOR, and EXTERNAL FACTOR), and thirdly we make use of the four measures for incentive problems suggested in this paper (HIDDEN INFORMATION, HIDDEN ACTION, HOLD-UP, and EXOGENOUS RISK) instead of those three of Kaplan and Strömberg (2004).

>>> Insert Table 6 about here <<<

Our findings of Table 6 can be discussed in two different ways. On the one hand, we can try to explain our empirical findings for our sample regarding the three different approaches introduced in this paper. Our focus thus mainly rests on understanding our empirical results and on highlighting interesting aspects of the utilization of certain clauses. On the other hand, we may conduct several comparisons in order to find out the statistical relevance of the different approaches and to identify differences between the findings for Germany and the US. In particular, we may contrast our results with those of Antonczyk et al. (2007) with respect to the relevance of indirect factors. We can do the same regarding our direct factors as

an alternative to the direct factors of Kaplan and Strömberg (2004). Finally, we can compare the findings of Kaplan and Strömberg (2003, 2004) for the US case with those of us for the German case. The original empirical results of Antonczyk et al. (2007) and Kaplan and Strömberg (2003) are presented in brackets in the lines belonging to the regressions on the three indirect measures HIGHTECH, EARLYSTAGE, and 1<sup>st</sup>ROUND in Table 6. The original empirical outcomes of Kaplan and Strömberg (2004) are presented in brackets in the lines referring to the second group of regressions, i.e. those regressions that are based on the direct measures INTERNAL FACTOR, EXECUTION FACTOR, and EXTERNAL FACTOR.

### **5.1 Explaining covenants in German VC financing relationships**

In fact, the empirical results of all three approaches for the German VC market are quite interesting. The fraction of equity held by the entrepreneur (EQU) is negatively related to EXTERNAL FACTOR and HIDDEN INFORMATION. The first finding may be caused by the entrepreneur's risk aversion, the latter one could indicate that venture capitalists are unsure about the entrepreneur's quality and reduce the value of the portfolio company to reflect this.

Regarding 1<sup>st</sup>ROUND and EQU, an additional influence may result from the fact that the allocation of the firm's equity might largely be determined by the relationship between firm value and the amount of funding provided by the venture capitalist. The entrepreneur's equity stake could thus also decline in later financing rounds simply because the venture capitalist claims additional shares for additional funding. The somewhat surprising significantly negative relationship between EARLYSTAGE and EQU may be caused by the fact that the venture capitalist's support for the entrepreneur is more relevant for firms just having started to operate than for portfolio companies on later stages of their lifecycle. The reduction of hidden action problems on the venture capitalist's side would then require lower values for EQU.

Only HOLD-UP is related to NVCB according to our hypotheses. The negative influence is supportive of the theory that venture capitalists' control rights hamper the entrepreneur's incentive to specifically invest. Again, the result for 1<sup>st</sup>ROUND seems to be driven by

other factors than agency or hold-up problems, this time the venture capitalists' shareholding. When controlling for the latter one in the regression of NVCB (2), this result is eliminated.

None of the indicators affect the use of debt or debt-like financing instruments (DBT).

Ratchet provisions (RAT) are more often used when EXTERNAL FACTOR or HIDDEN ACTION is high. Latter result is as expected. The influence of external risk may be related to EQU. RAT might reinforce the entrepreneur's incentives that are diluted by a low value of EQU.

As expected, the use of liquidation preferences (LP) is significantly related to variables indicating agency conflicts. Furthermore, LP is strongly used when the entrepreneur's human capital is important. This may be due to the fact that instruments without any effect on control rights do not reduce the entrepreneur's investment incentives.

Anti-dilution provisions (ADR) seem to be used to mitigate agency as well as hold-up conflicts. The correlation between ex ante stage financing (EASF) and EARLY-STAGE/1<sup>st</sup>ROUND supports the view that EASF can alleviate agency conflicts.

Clauses usable to alleviate direct hold-up conflicts – prohibition of sale provision (PSP) and time vesting provisions (TVP) – are strongly and positively affected by EXECUTION FACTOR and HOLD-UP. Therefore, the indirect hold-up problem related to these provisions seems to be of secondary matter only.

Noteworthy, only the indicators of Kaplan and Strömberg (2004) show significant results in the case of drag-along rights (DAR). The findings suggest that DAR should be used less when external risk is high. Because EXECUTION FACTOR refers to hidden action as well as hold-up problems, it is not clear, which conflict triggers the use of DAR.

## **5.2. Comparison of different approaches and between Germany and the US**

From a pure statistical point of view, the predictive power of HIGHTECH, EARLYSTAGE, and 1<sup>st</sup>ROUND regarding the amount or the use of the analyzed covenants is not very high. Only seven coefficients reach results on a significant level with three of them contradicting

our hypotheses. By enlarging the sample of Antonczyk et al. (2007) to 91 cases, some of their results have been changed. This may partly be a consequence of the fact that the present study controls for the largest venture capitalists in our sample. However, overall results remain similar. In fact, in Antonczyk et al. (2007), there are six significant relationships (two of them contradicting our hypotheses). As mentioned before, indirect indicators may not precisely enough direct to specific agency or hold-up conflicts. The indicator variables of Kaplan and Strömberg (2004) already reach eleven times significant coefficients (with one contradiction to our theoretical hypotheses). Our four-factor approach even leads to fourteen coefficients on a low level of failure probability (twice contradicting our theoretical exposition). However, for the clauses analyzed in this paper this difference between the effectiveness of direct and indirect risk measurement is not evident with respect to the US: Kaplan and Strömberg (2003) found ten significant results for indirect risk measures (with only two of them contradicting our initial hypotheses), while the findings of Kaplan and Strömberg (2004) end up in ten significant coefficients as well with only seven not contradicting our hypotheses. The reason for this country-specific difference is mainly rooted in the better explanatory power of the variable EARLYSTAGE in the US than in Germany.

When comparing the approaches of Kaplan and Strömberg (2004) and ours, it certainly has to be taken into account that we increased the number of independent variables by one. However, the division of EXECUTION FACTOR into HIDDEN ACTION and HOLD-UP helps in identifying significant relationships in numerous situations. First of all, with respect to NVCB (3), RAT, and EASF, always one of our variables HIDDEN ACTION and HOLD-UP proves significant, while the other is insignificant as is the case regarding EXECUTION FACTOR. Secondly, in the cases of PSP and TVP our analysis reveals the relevance of only hold-up considerations, while the significance of the EXECUTION FACTOR leaves it open whether it is caused by hidden action or hold-up problems. A third group of findings is represented by those in the case of LP and ADR, as for these variables EXECU-

TION FACTOR, HIDDEN ACTION, and HOLD-UP all exhibit the same (positive) sign, but while EXECUTION FACTOR is for both variables in line with our hypotheses, there are deviations with respect to the other ones which could not have been detected by a three-factor approach. In comparison to these results, the consequences of our slight modifications from INTERNAL FACTOR to HIDDEN INFORMATION and from EXTERNAL FACTOR to EXOGENOUS RISK seems to be of only minor importance. The first modification results in two more significant relationships (see EQU and ADR), but one of them contradicts our theoretical considerations. The second modification implies three less significant relationships (see EQU, RAT, and DAR), with one of these three relationships not having been in line with our forecasts.

Summarizing, based on all three approaches it is almost always possible to find factors with significant explanatory power for each financial clause under consideration (with DBT being the only exception). Thereby, the indirect measures prove mostly useful to explain EQU. The direct measures suggested in this paper are best suited for the explanation of NVCB (3), LP, ADR, and EASF, while the direct measures by Kaplan and Strömberg (2004) prove superior with respect to DAR. For the other clauses both sets of direct measures seem to be of similar effectiveness.

## **6 Conclusion**

Following Kaplan and Strömberg (2003, 2004) the main task of our paper was to empirically examine the application of several financial contracting arrangements in German VC financing relationships. We find out that the superiority of direct measures for incentive problems is more pronounced for our sample than for the US. Our extension of the three-factor approach by Kaplan and Strömberg (2004) to a four-factor approach proves particularly useful to distinguish between hidden action and hold-up considerations. After all, the approaches presented in this paper are fairly well suited to explain the application of almost all financial covenants under consideration. Summarizing, we have been able to detect 18 significant rela-

tionships that are in line with our hypotheses. There are seven more significant results for cases where we have not been able to derive an unambiguous theoretical forecast. Only in six cases we arrived at significant relationships that contradict our theoretical derivations. After all, financial theory and financial practice do not seem to differ too much. However, the reasons for existing differences should be thoroughly examined by further research.

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Contractual arrangement	Description	Helps against				Becomes more helpful with increasing exogenous risk
		Hidden information	Hidden action	Direct hold-up	Indirect hold-up	
Entrepreneur's equity share (EQU)	Entrepreneur's share of firm equity	+	+	+	+	-
Number of VC board members in firm (NVCB)	The number of board members of the portfolio firm nominated by the venture capitalist	+	+	0	-	+
Debt financing (DBT)	The issuance of debt to finance the firm	+	+	+	+	-
Guarantees of revealed information	Entrepreneur guarantees the correctness and comprehensiveness of the information he or she disclosed during the contracting phase.	+	0	0	0	+
Venture capitalist's information rights	Venture capitalist has several superior information rights (e.g. monthly updated financial statements, ad-hoc disclosure of important business transactions).	+	+	0	0	+
Venture capitalist's veto rights for important business activities	Venture capitalist has to approve of important business activities.	+	+	0	0	+
Competition clauses	Entrepreneur must not work for a company in the same or a related industry for a period of two years after leaving the portfolio company and selling his or her shares.	0	0	+	-	+
Right of first refusal	Shareholders of the portfolio company are entitled to buy the shares of any willing seller.	0	0	0	+	+
Tag-along right	Shareholders of the portfolio company must not sell their shares unless the prospective buyer also agrees to purchase the shares of any other shareholder wishing to sell.	0	0	0	+	+
Drag-along right (DAR)	The entrepreneur must sell his or her shares as well if the venture capitalist sells his or her share.	+	+	0	-	-
Liquidation preferences (LP)	Revenues from the sale or the liquidation of the firm are firstly utilized to satisfy venture capitalists' claims as external investors.	+	+	0	0	-
Anti-dilution right (ADR)	The venture capitalist is protected against the dilution of his or her equity share due to the issuance of further shares.	+	+	0	-	-
Prohibition of sale provision (PSP)	The entrepreneur is not allowed to sell his or her firm share without permission by the venture capitalist.	+	+	+	-	+
Ex ante stage financing (EASF)	The entrepreneur gets additional capital, when certain milestones are reached.	+	+	0	-	-
Time vesting provision (TVP)	The entrepreneur loses equity shares if he or she leaves the firm.	+	+	+	-	+
Redemption right	Venture capitalist may redeem shares at predefined purchase price.	+	+	0	-	-
Ratchet provision (RAT)	Entrepreneur's equity share is adjusted to economic success.	+	+	+	+	-
Control switch provision	When certain milestones are missed, the venture capitalist may name additional directors or officers in order to assume control.	+	+	0	-	+

A "+" indicates which incentive problems can be mitigated by the utilization of the respective provision. A "-" represents a negative consequence of this clause with respect to the reduction of a certain problem, a "0" characterizes a neutral influence, and "?" indicates that no statement is possible due to the existence of different theoretical aspects with different empirical implications at the same time. Shaded lines indicate contractual arrangements that are analyzed empirically in more detail.

Table 1: Contractual arrangements and incentive problems

	<b>EQU</b>	<b>NVCB (1)</b>	<b>NVCB (2)</b>	<b>NVCB (3)</b>	<b>DBT</b>	<b>RAT</b>
<b>HIGHTECH</b>	+	?	?	?	+	+
<b>EARLYSTAGE</b>	+	+	+	+	+	+
<b>1<sup>st</sup> ROUND</b>	+	+	+	+	+	+
<b>INTERNAL FACTOR</b>	+	+	+	+	+	+
<b>EXECUTION FACTOR</b>	+	?	?	?	+	+
<b>EXTERNAL FACTOR</b>	-	+	+	+	-	-
<b>HIDDEN INFORMATION</b>	+	+	+	+	+	+
<b>HIDDEN ACTION</b>	+	+	+	+	+	+
<b>HOLD-UP</b>	+	-	-	-	+	+
<b>EXOGENOUS RISK</b>	-	+	+	+	-	-
	<b>LP</b>	<b>ADR</b>	<b>EASF</b>	<b>PSP</b>	<b>TVP</b>	<b>DAR</b>
<b>HIGHTECH</b>	+	?	?	?	?	?
<b>EARLYSTAGE</b>	+	+	+	+	+	+
<b>1<sup>st</sup> ROUND</b>	+	+	+	+	+	+
<b>INTERNAL FACTOR</b>	+	+	+	+	+	+
<b>EXECUTION FACTOR</b>	+	?	?	?	?	?
<b>EXTERNAL FACTOR</b>	-	-	-	+	+	-
<b>HIDDEN INFORMATION</b>	+	+	+	+	+	+
<b>HIDDEN ACTION</b>	+	+	+	+	+	+
<b>HOLD-UP</b>	0	-	-	?	?	-
<b>EXOGENOUS RISK</b>	-	-	-	+	+	-

Expected influence of agency and hold-up risk factors on the maximum shareholding of the entrepreneur (EQU), on the maximum share of the board of directors (NVCB (1, 2)), on the difference between NVCB (1) and the share of the venture capitalist's shareholding (NVCB (3)) and on the dummy variables DBT, RAT, LP, ADR, EASF, PSP, TVP, and DAR. DBT takes the value of one, if financial vehicles with debt-like features are used (debt, dormant holding, convertible bond), and zero otherwise. RAT takes the value of one, if ratchet provisions are used, and zero otherwise. LP takes the value of one, if liquidation preferences are used, and zero otherwise. ADR takes the value of one, if anti-dilution rights are used, and zero otherwise. EASF takes the value of one, if ex ante staging is used, and zero otherwise. PSP takes the value of one, if prohibition of sale provisions are used, and zero otherwise. TVP takes the value of one, if time vesting provisions are used, and zero otherwise. DAR takes the value of one, if drag-along rights are used, and zero otherwise. HIGHTECH, EARLYSTAGE, and 1<sup>st</sup> ROUND are dummies indicating that the portfolio company operates in a high-tech industry, has no revenues yet, or is VC funded for the first time. INTERNAL FACTOR, EXTERNAL FACTOR, and EXECUTION FACTOR are measures of agency and hold-up conflicts suggested by Kaplan and Strömberg (2004). HIDDEN INFORMATION, HIDDEN ACTION, HOLD-UP, and EXOGENOUS RISK are measures of agency and hold-up conflicts suggested in this paper. A "+" indicates which incentive problems can be mitigated by the utilization of the respective provision. A "-" represents a negative consequence of this clause with respect to the reduction of a certain problem, a "0" characterizes a neutral influence, and a "?" indicates that no statement is possible due to the existence of different theoretical aspects with different empirical implications at the same time.

Table 2: Expected influences of measures for agency and hold-up problems

Financing instrument	Relative frequency in own sample	Relative frequency in Antonczyk et al. (2007)
Only ordinary shares	36.3 %	49.0 %
Only preferred shares	24.2 %	
Ordinary shares and dormant holding	22.0 %	41.1 %
Ordinary shares and debt	14.3 %	5.9 %
Ordinary shares and convertible debt	2.2 %	2.0 %
Preferred shares and convertible debt	1.1 %	
Only dormant holding	0 %	2.0 % <sup>1</sup>

Covenants	Relative frequency in own sample				Relative frequency in Antonczyk et al. (2007)	Relative frequency in Kaplan and Strömberg (2003)
	(1) all	(2) only equity	(3) equity and debt (-like)	(4) difference (2)–(3)		
Guarantees of revealed information	98.9 %	98.2 %	100.0 %	−1.8 %	-----	-----
Venture capitalist’s information rights	98.9 %	100.0 %	97.1 %	+2.9 %	100 %	-----
Venture capitalists’ veto rights for important business activities	97.8 %	96.4 %	100.0 %	−3.6 %	96 %	-----
Competition clauses	96.7 %	96.4 %	97.1 %	−0.7 %	100 %	70.4 %
Right of first refusal	87.9 %	91.1 %	82.9 %	+8.2 %	87 %	-----
Tag-along right	75.8 %	<b>83.9 %</b>	<b>62.9 %</b>	<b>+21.0 %**</b>	59 %	-----
Drag-along right	73.6 %	<b>91.1 %</b>	<b>45.7 %</b>	<b>+45.4 %***</b>	53 %	-----
Liquidation preferences	64.4 %	<b>85.7 %</b>	<b>31.4 %</b>	<b>+54.3 %***</b>	47 %	99.5 %
Anti-dilution right	60.4 %	<b>80.4 %</b>	<b>28.6 %</b>	<b>+51.8 %***</b>	41 %	95 %
Prohibition of sale provision	54.9 %	51.8 %	60.0 %	−8.2 %	51 %	-----
Ex ante stage financing	48.4 %	<b>37.5 %</b>	<b>65.7 %</b>	<b>−28.2 %***</b>	43 %	14.6 %
Time vesting provision	39.6 %	<b>50.0 %</b>	<b>22.9 %</b>	<b>+27.1 %***</b>	29 %	41.2 %
Redemption Right	24.2 %	<b>37.5 %</b>	<b>2.9 %</b>	<b>+34.6 %***</b>	2 %	78.7 %
Ratchet provision	23.1 %	19.6 %	28.6 %	−9.0 %	16 %	53 %
Control switch provision	11.0 %	8.9 %	14.3 %	−5.4 %	20 %	17.8 %

“-----” means that this information is not reported by Antonczyk et al. (2007) or Kaplan and Strömberg (2003). Asterisks indicate that differences are significant at 1 %\*\*\*- or 5 %\*\*-level (two-sided), using Mann-Whitney U-test. Shaded lines indicate covenants that are analyzed empirically in more detail.

Table 3: Overview of financing instruments and covenants used by German venture capitalists

<sup>1</sup> This value is caused by a mistake. The correct value would have been 0 % as in the left column.

<b>Indicator for incentive problems</b>	<b>Groups of investment proposal statements (relative frequency)</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
Hidden information	<ul style="list-style-type: none"> <li>▪ Incomplete management team (47.3 %)</li> <li>▪ Young/inexperienced management team (18.7 %)</li> </ul>	Internal factor Internal factor
Hidden action	<ul style="list-style-type: none"> <li>▪ Marketing activities (17.6 %)</li> <li>▪ Speed of implementation of the entrepreneurial idea (18.7 %)</li> </ul>	Execution factor Execution factor
Hold-up	<ul style="list-style-type: none"> <li>▪ Entrepreneur's charisma (4.4 %)</li> <li>▪ On-going development process (39.6 %)</li> <li>▪ Complexity of the applied technology (19.8 %)</li> </ul>	Internal factor Execution factor Execution factor
Exogenous risk	<ul style="list-style-type: none"> <li>▪ Competition (53.8 %)</li> <li>▪ Market potential (26.4 %)</li> <li>▪ Customer adaption (19.8 %)</li> <li>▪ Input factors (8.8 %)</li> <li>▪ Exit conditions (2.2 %)</li> </ul>	External factor External factor External factor Execution factor External factor

Table 4: Measures of incentive problems and assignments of investment proposal statements

	HIGHTECH	EARLY-STAGE	1 <sup>st</sup> ROUND	INTERNAL FACTOR	EXECUTION FACTOR	EXTERNAL FACTOR	HIDDEN INFORMATION	HIDDEN ACTION	HOLD-UP	EXOGENOUS RISK
<b>HIGHTECH</b>	1									
<b>EARLYSTAGE</b>	0.100	1								
<b>1<sup>st</sup> ROUND</b>	0.024	<b>0.257**</b>	1							
<b>INTERNAL FACTOR</b>	0.065	0.111	-0.130	1						
<b>EXECUTION FACTOR</b>	0.024	0.122	-0.021	-0.014	1					
<b>EXTERNAL FACTOR</b>	-0.002	0.067	-0.129	0.130	<b>0.290**</b>	1				
<b>HIDDEN INFORMATION</b>	-0.037	0.148	-0.087	<b>0.655***</b>	0.059	<b>0.203*</b>	1			
<b>HIDDEN ACTION</b>	0.096	0.033	-0.041	<b>-0.267***</b>	<b>0.231**</b>	0.048	-0.166	1		
<b>HOLD-UP</b>	0.116	<b>0.259**</b>	0.004	0.081	<b>0.533***</b>	<b>0.218**</b>	0.022	0.024	1	
<b>EXOGENOUS RISK</b>	-0.035	0.069	-0.121	0.163	-0.031	<b>0.897***</b>	<b>0.231**</b>	-0.031	<b>0.222**</b>	1

Sample size: 91, correlation coefficients are significant at 1 %\*\*\*-, 5 %\*\*- or 10 %\* level (two-sided)

Table 5: Correlation matrix

	EQU (OLS)	NVCB (1) (OLS)	NVCB (2) (OLS)	NVCB (3) (OLS)	DBT (log)	RAT (log)
<b>HIGHTECH</b>	+** ✓ (0, 0)	0 (+, n/a)	0 (n/a, n/a)	0 (n/a, n/a)	- (** x, n/a)	0 (+* ✓, +* ✓)
<b>EARLYSTAGE</b>	-** x (-, -)	0 x (0, +** ✓)	0 (n/a, n/a)	0 (n/a, n/a)	0 (0, n/a)	0 (0, +** ✓)
<b>1<sup>st</sup> ROUND</b>	+*** ✓ (+*** ✓, +*** ✓)	-** x (-** x, -*** x)	0 (n/a, n/a)	+ (n/a, n/a)	0 (+** ✓, n/a)	0 (-, +** ✓)
<i>Adjusted/Nagelkerke R<sup>2</sup></i>	0.354 (0.259, 0.31)	0.151 (0.254, 0.17)	0.299 (n/a, n/a)	0.212 (n/a, n/a)	0.418 (0.369, n/a)	0.188 (0.186, 0.40)
<b>INTERNAL FACTOR</b>	0 (-)	0 (+** ✓)	0 (n/a)	0 (n/a)	0 (n/a)	0 (+** ✓)
<b>EXECUTION FACTOR</b>	0 (0)	0 (0)	0 (n/a)	- (n/a)	0 (n/a)	0 (0)
<b>EXTERNAL FACTOR</b>	-** ✓ (-)	0 (+** ✓)	0 (n/a)	0 (n/a)	0 (n/a)	+** x (+** x)
<i>Adjusted/Nagelkerke R<sup>2</sup></i>	0.278 (0.39)	0.111 (0.33)	0.315 (n/a)	0.182 (n/a)	0.404 (n/a)	0.217 (0.40)
<b>HIDDEN INFORMATION</b>	-** x	0	0	0	0	0
<b>HIDDEN ACTION</b>	-	0	0	0	0	+** ✓
<b>HOLD-UP</b>	0	0	-	-** ✓	0	0
<b>EXOGENOUS RISK</b>	-	0	0	0	0	+
<i>Adjusted/Nagelkerke R<sup>2</sup></i>	0.320	0.112	0.327	0.202	0.405	0.291

Table 6: Influence of agency and hold-up factors and comparison with expected influence (to be continued on the following page)

	LP (log)	ADR (log)	EASF (log)	PSP (log)	TVP (log)	DAR (log)
<b>HIGHTECH</b>	0 (0, n/a)	0 (+, n/a)	0 (0, n/a)	0 (0, n/a)	<b>-** !</b> (0, 0)	0 (n/a, n/a)
<b>EARLYSTAGE</b>	0 (0, 0)	0 (0, n/a)	+ ( <b>+*** ✓</b> , 0)	0 (n/a, n/a)	+ (n/a, <b>+*** ✓</b> )	0 (n/a, n/a)
<b>1<sup>st</sup> ROUND</b>	0 (0, n/a)	<b>-** ✗</b> (-, <b>-*** ✗</b> )	<b>+* ✓</b> (+, <b>+* ✓</b> )	0 (n/a, n/a)	0 (n/a, <b>+* ✓</b> )	0 (n/a, n/a)
<i>Nagelkerke R<sup>2</sup></i>	0.692 (0.009, 0.25)	0.627 (0.136, n/a)	0.387 (0.246, 0.39)	0.167 (0.064, n/a)	0.323 (0.009, 0.30)	0.649 (n/a, n/a)
<b>INTERNAL FACTOR</b>	<b>+* ✓</b> ( <b>+*** ✓</b> )	0 ( <b>+*** ✓</b> )	<b>+*** ✓</b> ( <b>+*** ✓</b> )	0 (n/a)	- (0)	0 (n/a)
<b>EXECUTION FACTOR</b>	<b>+*** ✓</b> ( <b>-* ✗</b> )	<b>+*** !</b> (0)	0 (0)	<b>+*** !</b> (n/a)	<b>+*** !</b> ( <b>+* !</b> )	<b>+*** !</b> (n/a)
<b>EXTERNAL FACTOR</b>	0 ( <b>+*** ✗</b> )	0 (+)	0 (0)	0 (n/a)	<b>+* ✓</b> (+)	<b>-** ✓</b> (n/a)
<i>Nagelkerke R<sup>2</sup></i>	0.725 (0.38)	0.633 (0.13)	0.400 (0.48)	0.274 (n/a)	0.463 (0.17)	0.710 (n/a)
<b>HIDDEN INFORMATION</b>	<b>+* ✓</b>	<b>+*** ✓</b>	<b>+*** ✓</b>	0	0	0
<b>HIDDEN ACTION</b>	<b>+* ✓</b>	<b>+*** ✓</b>	<b>+*** ✓</b>	0	0	0
<b>HOLD-UP</b>	<b>+*** ✗</b>	<b>+*** ✗</b>	0	<b>+*** !</b>	<b>+*** !</b>	0
<b>EXOGENOUS RISK</b>	0	0	0	0	<b>+*** ✓</b>	0
<i>Nagelkerke R<sup>2</sup></i>	0.820	0.735	0.514	0.347	0.386	0.635

Ordinary least squares (OLS) and logistic (log) regressions are employed to analyze the empirical influence of agency and hold-up risk factors on the maximum shareholding of the entrepreneur (EQU), on the maximum share of the board of directors (NVCB (1, 2)), on the difference between NVCB (1) and the share of the venture capitalist's shareholding (NVCB (3)) and on the dummy variables DBT, RAT, LP, ADR, EASF, PSP, TVP, and DAR. DBT takes the value of one, if financial vehicles with debt-like features are used (debt, dormant holding, convertible bond), and zero otherwise. RAT takes the value of one, if ratchet provisions are used, and zero otherwise. LP takes the value of one, if liquidation preferences are used, and zero otherwise. ADR takes the value of one, if anti-dilution rights are used, and zero otherwise. EASF takes the value of one, if ex ante staging is used, and zero otherwise. PSP takes the value of one, if prohibition of sale provisions are used, and zero otherwise. TVP takes the value of one, if time vesting provisions are used, and zero otherwise. DAR takes the value of one, if drag-along rights are used, and zero otherwise. HIGHTECH, EARLYSTAGE, and 1<sup>st</sup> ROUND are dummies indicating that the portfolio company operates in a high-tech industry, has no revenues yet, or is VC funded for the first time. Numbers in brackets display the results of Antonczyk et al. (2007) and of Kaplan and Strömberg (2003). INTERNAL FACTOR, EXTERNAL FACTOR, and EXECUTION FACTOR are measures of agency and hold-up conflicts suggested by Kaplan and Strömberg (2004). Numbers in brackets display the results of Kaplan and Strömberg (2004). HIDDEN INFORMATION, HIDDEN ACTION, HOLD-UP, and EXOGENOUS RISK are measures of agency and hold-up conflicts derived by relating investment proposal content to transaction attributes. Each of the three sets of risk measures is applied in a separate regression. Moreover, in all regressions, dummy variables for the four most important venture capitalists in the sample and for the time of investment (after 2000 or not) are utilized. DBT as a dummy variable is part of all regressions excluding regressions with EQU, NVCB (1), NVCB (2), NVCB (3), or DBT as dependent variables. In the regressions of NVCB (2), the shareholding of the venture capitalist is taken into account as another independent variable. Coefficients are at 1 %\*\*\*-, 5 %\*\*-, or 10 %\*- level (two-sided) significantly different from zero (t- or Wald-statistic). Significant results that do not contradict our hypotheses are shaded in lighter gray (and marked by "✓" ("confirmation) or "!" (no clear-cut theoretical hypothesis)). Significant results that contradict our hypotheses are shaded in darker grey (and marked by "✗").

Table 6 (continued): Influence of agency and hold-up factors and comparison with expected influence

**Addendum 1 (NOT for publication, ONLY for referees' information!): see line 15 on page 13**

<b>Characteristic</b>	<b>Value in sample</b>	<b>Value in population or other samples</b>
1) Average number of venture capitalists investing	On average 3.1, syndication quota: 61.5 %	Average share of syndicated investments in Germany between 1997 and 2004: 34.2 % (own calculation; BVK, 1999-2005).
2) Kind of venture capitalist	10.3 % of volume is invested by public venture capitalists, 11.7 % by corporate venture capitalists	Average share of German public venture capitalists between 1997 and 2004: 9.2 %; average share of German corporate venture capitalists: 14.2 % (own calculation; BVK, 1999-2005)
3) Legal form of portfolio company	54.9 % AGs, 44.0 % GmbHs, 1.1 % GmbH Co. KGs	51 % GmbHs, 35 % AGs (Schefczyk, 2004, "Sample 2002/2003")
4) Life cycle stage of portfolio company	51.6 % seed- and start-up-stage, 48.4 % expansion stage	41.0 % seed- and start-up stage, 59.0 % expansion stage (average values for 1997-2004; own calculation; BVK, 2005, 2006, statistics on venture capital), or 46.2 % seed- and start-up stage, 53.8 expansion stage (VentureXpert)
5) Time of investment	On average 2.0 years after foundation, about 16.1 employees at time of financing, in 67.0 % first time VC financing	-----
6) Industry of portfolio company	81.3 % high-tech industry	67.3 % (BVK, 2005, statistics on early stage venture capital), or 76.9 % (VentureXpert)

Table Add1: Characteristics of the sample compared to other sample

Table Add1 summarizes main characteristics of our sample and compares them with the results of other studies. Existing differences may be explained by the fact, that the study of Schefczyk (2004), the statistics of VentureXpert, as well as most statistics from the German venture capital and private equity association are related to the whole private equity market or to a broader defined venture capital market which also includes the financing of later stages and excludes only buy-outs, and not only to the venture capital subsample as defined here, only comprising young companies. The volume of private equity deals usually is much bigger than those of venture capital deals, therefore such studies are seldom useful for direct comparison. Whenever possible, comparable numbers are derived from these studies. Taking this difficulty into account, the different numbers do not disprove the representativeness of our sample. The noteworthy differences can be attributed to the fact that our study relates to venture capital only.

**Addendum 2 (NOT for publication, ONLY for referees' information!): see lines 22-23 on page 14**

Although the resulting payment characteristics are quite similar for the utilization of equity shares in combination with debt and/or dormant holdings compared to the issuance of convertible preferred shares (see Figure Add1), for boundedly rational investors with mental accounting there might be a considerable difference in assessing both financing schemes. Apparently, in the case of convertible preferred shares there will be no segregation of the payment pattern, as there is only one, while the simultaneous use of equity and additional dormant holdings or debt financing might give rise to an application of Thaler's (1980) hedonic framing rule. This rule implies that segregation will occur in cases in which it leads to a higher overall utility than an integrated consideration. In the case of a utility function that is – according to the prospect theory of Kahneman and Tversky (1979) – convex in the domain of losses and concave in the domain of gains and exhibits loss aversion, segregation will therefore in particular occur for cash flow components in the domain of gains. To highlight this phenomenon, let us assume that there are only three possible outcomes of a VC financing according to Figure Add1. In most cases there will be a total loss of the capital invested, i.e. firm value  $V$  amounts to  $V_0 = 0$ . Very rarely, the portfolio firm turns out to be a high-flyer with a firm value  $V$  of  $V_2$ . In the rest of all cases the firm becomes a living dead with a firm value of  $V_1$ . In such a situation, a rational investor would value convertible preferred shares on the one side and debt and equity on the other side in the same way. This would also hold true for decision making according to the prospect theory if there were no hedonic framing. With hedonic framing, however, things change. Assume that  $V^{(R)} < V_2$  is the venture capitalist's reference point to distinguish between losses and gains from his or her investment in the portfolio firm under consideration in the case of the integration of mental accounts. Apparently, a situation with  $V^{(R)} > V_2$  would hardly be reasonable, as  $V_2$  is the highest possible outcome according to our assumptions. Moreover, let us assume reference points  $V^{(R,eq)}$  for equi-

ty and  $V^{(R,db)}$  for debt in the case of segregate mental accounts to sum up to  $V^{(R)}$  and to be smaller than the respective market values  $V_2^{(eq)}$  of equity and  $V_2^{(db)}$  of debt. Once again, the relationships  $V^{(R,eq)} < V_2^{(eq)}$  and  $V^{(R,db)} < V_2^{(db)}$  appear to be plausible. With a subjective utility  $U$  according to prospect theory, we then have  $U(V_2 - V^{(R)}) < U(V_2^{(eq)} - V^{(R,eq)}) + U(V_2^{(db)} - V^{(R,db)})$ , because of the concavity of  $U$  in the domain of gains and the relationship  $V_2 - V^{(R)} = V_2^{(eq)} - V^{(R,eq)} + V_2^{(db)} - V^{(R,db)}$ .

Since it is always possible to reproduce the payment structures of convertible preferred shares by a combination of debt and equity, when there are only the three idealized outcomes of a total loss, a living dead, and a high-flyer, a boundedly rational investor with hedonic framing according to Thaler (1980) will certainly prefer the latter financial arrangement to the former one. The differences between Germany and the US thus might hint at the possibility that mental accounting is of different relevance in both countries and thus “cultural” aspects may form a possible second line of explanation for country-specific financing schemes besides legal aspects. For the time being, such an idea might seem to be highly speculative, however it complies fairly well to the theoretical analysis in Breuer (2006). In any case, this issue does not form the main focus of the analysis of this paper although it seems worthwhile to examine this question in more detail in future.

>>> Insert Figure Add1 about here <<<

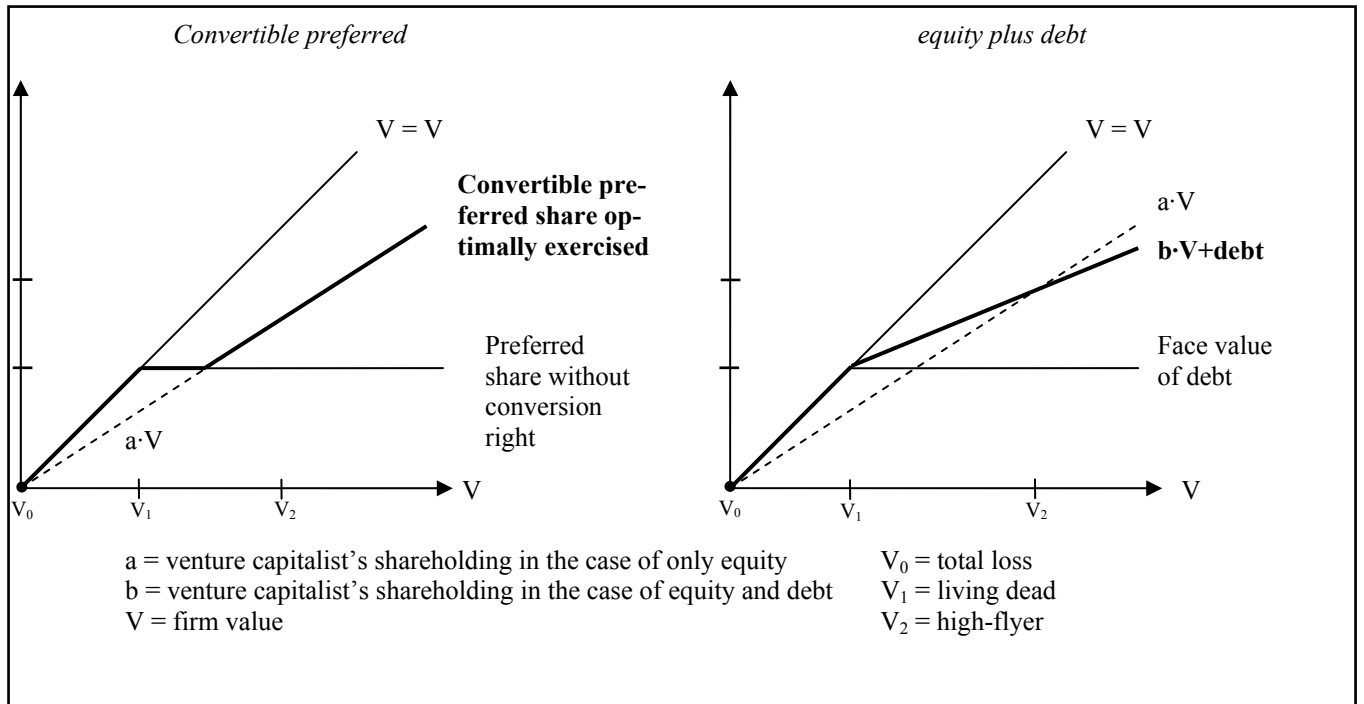


Figure Add1: Pay-off structures of convertible preferred and a combination of debt and equity (bold lines)

**Addendum 3 (NOT for publication, ONLY for referees' information!): see lines 9-10 on page 16**

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
Marketing officer still missing	Hidden information	Internal factor
No CEO found yet	Hidden information	Internal factor
No CFO	Hidden information	Internal factor
No complete management team	Hidden information	Internal factor
CEO and CFO will have to be found soon.	Hidden information	Internal factor

Table Add2: Examples for “incomplete management team”

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
The relatively young team has hardly any industry experience.	Hidden information	Internal factor
Young management team which may need to be strengthened	Hidden information	Internal factor
Inexperienced management team	Hidden information	Internal factor

Table Add3: Examples for “young/inexperienced management team”

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
Decisive to push internationalization	Hidden action	Execution factor
Marketing activities important	Hidden action	<i>Apparently no assignment</i>
Delay of cooperation and sale would be critical	Hidden action	<i>Apparently no assignment</i>
Product has to be established ASAP.	Hidden action	<i>Apparently no assignment</i>
Fast building of sale channels decisive	Hidden action	<i>Apparently no assignment</i>

Table Add4: Examples for “marketing activities”

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
Patent application could take too long.	Hidden action	Execution factor
Further development of products important for success of investment	Hidden action	Execution factor
Success depends on first-mover advantage.	Hidden action	Execution factor
Maybe alternative products faster in the market	Hidden action	<i>Apparently no assignment</i>
In time development decisive	Hidden action	<i>Apparently no assignment</i>

Table Add5: Examples for “speed of implementation of entrepreneurial idea”

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
Company is dominated by CEO.	Hold-up	Internal factor
Too focussed on entrepreneur	Hold-up	Internal factor
Fixated on the founder	Hold-up	Internal factor

Table Add6: Examples for “entrepreneur’s charisma”

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
Development threshold just met	Hold-up	Execution factor
Product has yet to be finished.	Hold-up	Execution factor
Field trial not accomplished yet	Hold-up	Execution factor
No prototype so far	Hold-up	Execution factor
Project is still in stadium of development.	Hold-up	Execution factor

Table Add7: Examples for “on-going development process”

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
Very complex development process	Hold-up	Execution factor
Company has impressive know-how regarding the programming of machines.	Hold-up	<i>Apparently no assignment</i>
Company is technology leader.	Hold-up	<i>Apparently no assignment</i>
Complex technology	Hold-up	Execution factor
Own software development	Hold-up	<i>Apparently no assignment</i>

Table Add8: Examples for “complexity of the applied technology”

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
Big competitors are in the market.	Exogenous risk	External factor
Product may be easily copied.	Exogenous risk	External factor
Competitors could discover and replicate technology.	Exogenous risk	External factor
Maybe aggressive marketing policy of competitors	Exogenous risk	External factor
Established companies are about to enter market.	Exogenous risk	External factor
Big pressure by large groups	Exogenous risk	External factor
Fierce competition	Exogenous risk	External factor
Low entry barriers	Exogenous risk	External factor

Table Add9: Examples for “competition”

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
Market growth could be delayed.	Exogenous risk	External factor
Maybe unexpected development in the market	Exogenous risk	External factor
No sufficient product market data available	Exogenous risk	External factor
Real market potential might be much smaller than projected.	Exogenous risk	External factor
Future direction of the health system in Germany unknown	Exogenous risk	External factor

Table Add10: Examples for “market potential”

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
Customers need to invest considerable amount.	Exogenous risk	External factor
Maybe reluctantly to change organizational structure	Exogenous risk	External factor
Conservative target market	Exogenous risk	External factor
Discerning customers	Exogenous risk	External factor

Table Add11: Examples for “customer adaption”

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
Input factors very important	Exogenous risk	<i>Apparently no assignment</i>
Acquisition of employees may prove to be difficult.	Exogenous risk	Execution factor
R&D-staff is scarce.	Exogenous risk	<i>Apparently no assignment</i>
Staff has to have knowledge in certain industries, so hiring could be slow.	Exogenous risk	<i>Apparently no assignment</i>

Table Add12: Examples for “input factors”

<b>Statement in investment proposal</b>	<b>Assignment to indicator for incentive problems in this paper</b>	<b>Assignment in Kaplan and Strömberg (2004)</b>
IPO may be postponed.	Exogenous risk	External factor
Actual high expectations may lead to lower than expected returns.	Exogenous risk	External factor

Table Add13: Examples for “exit condition”

**Addendum 4 (NOT for publication, ONLY for referees' information!): see lines 8-9 on page 18**

	<b>EQU (OLS)</b>	<b>NVCB (1) (OLS)</b>	<b>NVCB (2) (OLS)</b>	<b>NVCB (3) (OLS)</b>	<b>DBT (log)</b>
constant	0.378*** (0.000)	0.442*** (0.000)	0.199** (0.027)	- 0.084 (0.237)	1.611 (0.584)
<b>HIGHTECH</b>	<b>0.103** (0.048)</b>	-0.033 (0.532)	- 0.005 (0.912)	0.021 (0.711)	0.371 (0.172)
<b>EARLYSTAGE</b>	<b>-0.087** (0.031)</b>	0.023 (0.562)	- 0.020 (0.592)	- 0.050 (0.248)	1.748 (0.332)
<b>1<sup>st</sup> ROUND</b>	<b>0.134*** (0.002)</b>	<b>-0.081** (0.050)</b>	- 0.013 (0.747)	0.063 (0.148)	1.206 (0.757)
Lead-Investor 1	-0.017 (0.758)	0.008 (0.885)	- 0.038 (0.479)	- 0.083 (0.175)	0.057** (0.013)
Lead-Investor 2	-0.010 (0.860)	0.021 (0.727)	0.020 (0.772)	0.048 (0.460)	1.020 (0.979)
Lead-Investor 3	-0.015 (0.794)	0.056 (0.309)	0.051 (0.307)	0.087 (0.135)	1.560 (0.532)
Lead-Investor 4	0.262*** (0.000)	-0.092 (0.250)	0.013 (0.867)	0.097 (0.253)	7.030** (0.041)
Post 2000	-0.064 (0.129)	0.107** (0.011)	0.087** (0.024)	0.094 (0.036)	0.251** (0.021)
Shareholding of venture capitalist	-----	-----	0.471*** (0.000)	-----	-----
<i>Adjusted/Nagelkerke R<sup>2</sup></i>	<i>0.354</i>	<i>0.151</i>	<i>0.299</i>	<i>0.212</i>	<i>0.418</i>
<i>F-Statistic</i>	<i>7.171*** (0.000)</i>	<i>2.601** (0.016)</i>	<i>4.414*** (0.000)</i>	<i>3.387*** (0.003)</i>	<i>33.611*** (0.000)</i>
<i>sample size</i>	<i>91</i>	<i>73</i>	<i>73</i>	<i>73</i>	<i>91</i>

Ordinary least squares (OLS) and logistic (log) regressions on the maximum shareholding of the entrepreneur (EQU), on the maximum share of the board of directors (NVCB (1, 2)), on the difference between NVCB (1) and the share of the venture capitalist's shareholding (NVCB (3)), and on DBT. DBT takes the value of one, if financial vehicles with debt-like features are used (debt, dormant holding, convertible bond), and zero otherwise. HIGHTECH, EARLYSTAGE, and 1<sup>st</sup> ROUND are dummies indicating that the portfolio company operates in a high-tech industry, has no revenues yet, or is VC funded for the first time. "Lead-Investor i" (i = 1, 2, 3, 4) takes the value of one, if the respective venture capitalist acts as a lead investor, and zero otherwise. "Post 2000" takes the value of one, if the investment took place after the year 2000, and zero otherwise. Coefficients are at 1 %\*\*\*-, 5 %\*\*-, or 10 %\*- level (two-side) significantly different from zero (t- or Wald-statistic). p-values are in brackets.

Table Add14: Results of regression analyses for indirect measures of the relevance of incentive problems

	RAT (log)	LP (log)	ADR (log)	EASF (log)	PSP (log)	TVP (log)	DAR (log)
constant	0.154* (0.084)	1.300 (0.836)	1.632 (0.660)	0.427 (0.374)	1.240 (0.798)	0.839 (0.858)	8.828 (0.129)
<b>HIGHTECH</b>	2.396 (0.290)	3.919 (0.247)	1.354 (0.732)	0.807 (0.767)	0.790 (0.718)	<b>0.187** (0.037)</b>	0.939 (0.954)
<b>EARLYSTAGE</b>	0.899 (0.856)	0.825 (0.811)	2.182 (0.266)	2.002 (0.199)	0.562 (0.251)	2.204 (0.153)	2.262 (0.332)
<b>1<sup>st</sup> ROUND</b>	0.501 (0.254)	0.342 (0.214)	<b>0.208** (0.044)</b>	<b>2.947* (0.084)</b>	1.102 (0.857)	1.042 (0.941)	0.313 (0.238)
Lead-Investor 1	0.379 (0.311)	----	14.671** (0.030)	0.194** (0.041)	1.388 (0.641)	4.494* (0.053)	1.458 (0.741)
Lead-Investor 2	0.496 (0.411)	0.447 (0.390)	0.663 (0.646)	0.120** (0.014)	0.756 (0.687)	2.602 (0.226)	2.863** (0.324)
Lead-Investor 3	0.918 (0.907)	0.731 (0.771)	0.981 (0.983)	1.946 (0.394)	2.249 (0.271)	8.410*** (0.008)	----
Lead-Investor 4	0.425 (0.385)	0.052** (0.048)	0.578 (0.608)	0.578 (0.532)	0.165** (0.035)	0.204 (0.205)	0.050** (0.041)
Post 2000	2.728 (0.101)	58.900*** (0.002)	12.486*** (0.001)	1.621 (0.434)	1.619 (0.372)	1.563 (0.446)	3.475 (0.264)
DBT	2.590 (0.133)	0.215* (0.053)	0.239** (0.045)	2.332 (0.179)	2.570 (0.104)	0.434 (0.184)	0.079*** (0.007)
<i>Nagelkerke R<sup>2</sup></i>	<i>0.188</i>	<i>0.692</i>	<i>0.627</i>	<i>0.387</i>	<i>0.167</i>	<i>0.323</i>	<i>0.649</i>
<i>F-Statistic</i>	<i>12.084 (0.209)</i>	<i>53.980*** (0.000)</i>	<i>56.615*** (0.000)</i>	<i>31.147*** (0.000)</i>	<i>12.131 (0.206)</i>	<i>24.804*** (0.003)</i>	<i>44.365*** (0.000)</i>
<i>sample size</i>	<i>91</i>	<i>73</i>	<i>91</i>	<i>91</i>	<i>91</i>	<i>91</i>	<i>70</i>

Logistic (log) regressions on the dummy variables RAT, LP, ADR, EASF, PSP, TVP, and on DAR. RAT takes the value of one, if ratchet provisions are used, and zero otherwise. LP takes the value of one, if liquidation preferences are used, and zero otherwise. ADR takes the value of one, if anti-dilution rights are used, and zero otherwise. EASF takes the value of one, if ex ante staging is used, and zero otherwise. PSP takes the value of one, if prohibition of sale provisions are used, and zero otherwise. TVP takes the value of one, if time vesting provisions are used, and zero otherwise. DAR takes the value of one, if drag-along rights are used, and zero otherwise. HIGHTECH, EARLYSTAGE, and 1<sup>st</sup> ROUND are dummies indicating that the portfolio company operates in a high-tech industry, has no revenues yet, or is VC funded for the first time. “Lead-Investor i” (i = 1, 2, 3, 4) takes the value of one, if the respective venture capitalist acts as a lead investor, and zero otherwise. “Post 2000” takes the value of one, if the investment took place after the year 2000, and zero otherwise. DBT takes the value of one, if financial vehicles with debt-like features are used (debt, dormant holding, convertible bond), and zero otherwise. Coefficients are at 1 %\*\*\*-, 5 %\*\*-, or 10 %\*- level (two-side) significantly different from zero (Wald-statistic). p-values are in brackets.

Table Add15: Results of regression analyses for indirect measures of the relevance of incentive problems

	<b>EQU (OLS)</b>	<b>NVCB (1) (OLS)</b>	<b>NVCB (2) (OLS)</b>	<b>NVCB (3) (OLS)</b>	<b>DBT (log)</b>
constant	0.558*** (0.000)	0.409*** (0.000)	0.215*** (0.005)	0.014 (0.834)	2.017 (0.408)
<b>INTERNAL FACTOR</b>	- 0.157 (0.373)	- 0.205 (0.234)	- 0.150 (0.324)	- 0.092 (0.594)	1.045 (0.986)
<b>EXECUTION FACTOR</b>	0.036 (0.547)	- 0.024 (0.676)	- 0.053 (0.295)	- 0.082 (0.151)	0.907 (0.903)
<b>EXTERNAL FACTOR</b>	<b>- 0.233** (0.032)</b>	0.025 (0.816)	- 0.025 (0.792)	- 0.077 (0.480)	0.153 (0.205)
Lead-Investor 1	- 0.009 (0.875)	0.008 (0.888)	- 0.038 (0.460)	- 0.086 (0.142)	0.049*** (0.009)
Lead-Investor 2	0.027 (0.679)	- 0.007 (0.915)	0.003 (0.952)	0.014 (0.828)	0.649 (0.576)
Lead-Investor 3	0.040 (0.500)	0.040 (0.455)	0.057 (0.231)	0.074 (0.174)	1.410 (0.621)
Lead-Investor 4	0.261*** (0.000)	- 0.142* (0.083)	- 0.002 (0.982)	0.142* (0.084)	6.676** (0.042)
Post 2000	- 0.074 (0.100)	0.139*** (0.002)	0.107*** (0.007)	0.074* (0.093)	0.303** (0.043)
Shareholding of venture capitalist	-----	-----	0.493*** (0.000)	-----	-----
<i>Adjusted/Nagelkerke R<sup>2</sup></i>	<i>0.278</i>	<i>0.111</i>	<i>0.315</i>	<i>0.182</i>	<i>0.404</i>
<i>F-Statistic</i>	<i>5.337*** (0.000)</i>	<i>2.122** (0.046)</i>	<i>4.682*** (0.000)</i>	<i>3.006*** (0.006)</i>	<i>32.222*** (0.000)</i>
<i>sample size</i>	<i>91</i>	<i>73</i>	<i>73</i>	<i>73</i>	<i>91</i>

Ordinary least squares (OLS) and logistic (log) regressions on the maximum shareholding of the entrepreneur (EQU), on the maximum share of the board of directors (NVCB (1, 2)), on the difference between NVCB (1) and the share of the venture capitalist's shareholding (NVCB (3)), and on DBT. DBT takes the value of one, if financial vehicles with debt-like features are used (debt, dormant holding, convertible bond), and zero otherwise. INTERNAL FACTOR, EXTERNAL FACTOR, and EXECUTION FACTOR are measures of agency and hold-up conflicts suggested by Kaplan and Strömberg (2004). "Lead-Investor i" (i = 1, 2, 3, 4) takes the value of one, if the respective venture capitalist acts as a lead investor, and zero otherwise. "Post 2000" takes the value of one, if the investment took place after the year 2000, and zero otherwise. Coefficients are at 1 %\*\*\*-, 5 %\*\*-, or 10 %\*- level (two-side) significantly different from zero (t- or Wald-statistic). p-values are in brackets.

Table Add16: Results of regression analyses for direct measures of the relevance of incentive problems (as proposed by Kaplan and Strömberg, 2004)

	RAT (log)	LP (log)	ADR (log)	EASF (log)	PSP (log)	TVP (log)	DAR (log)
constant	0.102** (0.025)	0.186 (0.186)	0.207 (0.150)	0.238 (0.0114)	0.153** (0.037)	0.031*** (0.002)	10.054 (0.130)
<b>INTERNAL FACTOR</b>	0.125 (0.440)	<b>1291.073* (0.095)</b>	9.675 (0.454)	<b>244.402** (0.022)</b>	1.952 (0.754)	0.029 (0.161)	0.134 (0.623)
<b>EXECUTION FAC- TOR</b>	0.853 (0.847)	<b>11.093** (0.047)</b>	<b>8.952** (0.026)</b>	2.556 (0.234)	<b>11.071*** (0.004)</b>	<b>16.299*** (0.002)</b>	<b>13.785** (0.047)</b>
<b>EXTERNAL FACTOR</b>	<b>20.287** (0.046)</b>	1.878 (0.779)	0.997 (0.999)	3.890 (0.375)	1.194 (0.895)	<b>14.952* (0.097)</b>	<b>0.003** (0.041)</b>
Lead-Investor 1	0.551 (0.545)	----	24.938** (0.012)	0.161** (0.030)	1.624 (0.521)	8.521** (0.013)	1.829 (0.628)
Lead-Investor 2	0.744 (0.737)	1.229 (0.845)	1.415 (0.707)	0.148** (0.027)	2.360 (0.274)	8.003** (0.029)	4.103 (0.248)
Lead-Investor 3	0.926 (0.916)	0.663 (0.719)	1.058 (0.953)	1.670 (0.507)	2.324 (0.267)	7.639** (0.015)	----
Lead-Investor 4	0.346 (0.285)	0.076* (0.093)	0.573 (0.613)	1.049 (0.954)	0.278 (0.137)	0.495 (0.584)	0.022*** (0.017)
Post 2000	2.918* (0.087)	41.249*** (0.002)	14.394*** (0.001)	0.722 (0.606)	1.467 (0.500)	1.929 (0.290)	11.509 (0.061)
DBT	2.605 (0.136)	0.160** (0.044)	0.234** (0.043)	3.161* (0.072)	3.139* (0.068)	0.696 (0.577)	0.033*** (0.003)
<i>Nagelkerke R<sup>2</sup></i>	<i>0.217</i>	<i>0.725</i>	<i>0.633</i>	<i>0.400</i>	<i>0.274</i>	<i>0.463</i>	<i>0.710</i>
<i>F-Statistic</i>	<i>14.050 (0.121)</i>	<i>56.884*** (0.000)</i>	<i>57.395*** (0.000)</i>	<i>32.474*** (0.000)</i>	<i>20.881** (0.013)</i>	<i>38.066*** (0.000)</i>	<i>50.453*** (0.000)</i>
<i>sample size</i>	<i>91</i>	<i>73</i>	<i>91</i>	<i>91</i>	<i>91</i>	<i>91</i>	<i>70</i>

Logistic (log) regressions on the dummy variables RAT, LP, ADR, EASF, PSP, TVP and DAR. RAT takes the value of one, if ratchet provisions are used, and zero otherwise. LP takes the value of one, if liquidation preferences are used, and zero otherwise. ADR takes the value of one, if anti-dilution rights are used, and zero otherwise. EASF takes the value of one, if ex ante staging is used, and zero otherwise. PSP takes the value of one, if prohibition of sale provisions are used, and zero otherwise. TVP takes the value of one, if time vesting provisions are used, and zero otherwise. DAR takes the value of one, if drag-along rights are used, and zero otherwise. INTERNAL FACTOR, EXTERNAL FACTOR, and EXECUTION FACTOR are measures of agency and hold-up conflicts suggested by Kaplan and Strömberg (2004). “Lead-Investor i” (i = 1, 2, 3, 4) takes the value of one, if the respective venture capitalist acts as a lead investor, and zero otherwise. “Post 2000” takes the value of one, if the investment took place after the year 2000, and zero otherwise. DBT takes the value of one, if financial vehicles with debt-like features are used (debt, dormant holding, convertible bond), and zero otherwise. Coefficients are at 1 %\*\*\*-, 5 %\*\*-, or 10 %\*- level (two-side) significantly different from zero (Wald-statistic). p-values are in brackets.

Table Add17: Results of regression analyses for direct measures of the relevance of incentive problems (as proposed by Kaplan and Strömberg, 2004)

	<b>EQU (OLS)</b>	<b>NVCB (1) (OLS)</b>	<b>NVCB (2) (OLS)</b>	<b>NVCB (3) (OLS)</b>	<b>DBT (log)</b>
constant	0.583*** (0.000)	0.374*** (0.000)	0.185*** (0.010)	- 0.002 (0.978)	1.006 (0.993)
<b>HIDDEN INFORMATION</b>	<b>- 0.162** (0.016)</b>	- 0.048 (0.450)	- 0.060 (0.277)	- 0.073 (0.254)	3.079 (0.225)
<b>HIDDEN ACTION</b>	- 0.088 (0.146)	0.063 (0.287)	0.036 (0.493)	0.008 (0.887)	1.415 (0.674)
<b>HOLD-UP</b>	0.085 (0.335)	- 0.060 (0.457)	- 0.117 (0.106)	<b>- 0.173** (0.035)</b>	1.051 (0.968)
<b>EXOGENOUS RISK</b>	- 0.190 (0.101)	0.069 (0.546)	0.027 (0.788)	- 0.015 (0.898)	0.284 (0.423)
Lead-Investor 1	- 0.007 (0.898)	0.015 (0.791)	- 0.033 (0.524)	- 0.081 (0.167)	0.048*** (0.009)
Lead-Investor 2	0.013 (0.830)	0.001 (0.990)	0.016 (0.767)	0.030 (0.615)	0.748 (0.688)
Lead-Investor 3	0.044 (0.446)	0.046 (0.395)	0.067 (0.158)	0.088 (0.105)	1.198 (0.799)
Lead-Investor 4	0.281*** (0.000)	- 0.142* (0.089)	- 0.012 (0.877)	0.116 (0.162)	7.746** (0.030)
Post 2000	- 0.073* (0.095)	0.131*** (0.003)	0.099** (0.011)	0.067 (0.115)	0.277** (0.029)
Shareholding of venture capitalist	-----	-----	0.504*** (0.000)	-----	-----
<i>Adjusted/Nagelkerke R<sup>2</sup></i>	<i>0.320</i>	<i>0.112</i>	<i>0.327</i>	<i>0.202</i>	<i>0.405</i>
<i>F-Statistic</i>	<i>5.715*** (0.000)</i>	<i>2.011* (0.053)</i>	<i>4.497*** (0.000)</i>	<i>3.021*** (0.005)</i>	<i>32.386*** (0.000)</i>
<i>sample size</i>	<i>91</i>	<i>73</i>	<i>73</i>	<i>73</i>	<i>91</i>

Ordinary least squares (OLS) and logistic (log) regressions on the maximum shareholding of entrepreneur (EQU), on the maximum share of the board of directors (NVCB (1, 2)), on the difference between NVCB (1) and the share of the venture capitalist's shareholding (NVCB (3)), on DBT. DBT takes the value of one, if financial vehicles with debt-like features are used (debt, dormant holding, convertible bond), and zero otherwise. HIDDEN INFORMATION, HIDDEN ACTION, HOLD UP, and EXOGENOUS RISK are measures of agency and hold-up conflicts derived by relating investment proposal content to transaction attributes. "Lead-Investor i" (i = 1, 2, 3, 4) takes the value of one, if the respective venture capitalist acts as a lead investor, and zero otherwise. "Post 2000" takes the value of one, if the investment took place after the year 2000, and zero otherwise. Coefficients are at 1 %\*\*\*-, 5 %\*\*-, or 10 %\*- level (two-side) significantly different from zero (t- or Wald-statistic). p-values are in brackets.

Table Add18: Results of regression analyses for direct measures of the relevance of incentive problems (as proposed in this paper)

	RAT (log)	LP (log)	ADR (log)	EASF (log)	PSP (log)	TVP (log)	DAR (log)
constant	0.037*** (0.002)	0.034** (0.040)	0.050*** (0.013)	0.179* (0.058)	0.133** (0.017)	0.065*** (0.003)	7.593* (0.097)
<b>HIDDEN INFORMATION</b>	1.181 (0.868)	<b>58.391* (0.056)</b>	<b>24.068** (0.029)</b>	<b>71.361*** (0.001)</b>	2.161 (0.385)	1.049 (0.958)	0.471 (0.623)
<b>HIDDEN ACTION</b>	<b>8.871** (0.011)</b>	<b>20.980* (0.051)</b>	<b>20.527** (0.014)</b>	<b>6.754** (0.049)</b>	2.020 (0.387)	1.329 (0.722)	1.967 (0.595)
<b>HOLD-UP</b>	2.404 (0.492)	<b>24402.464** (0.017)</b>	<b>374.168*** (0.008)</b>	3.348 (0.409)	<b>185.688*** (0.001)</b>	<b>21.444** (0.013)</b>	0.276 (0.485)
<b>EXOGENOUS RISK</b>	14.169 (0.111)	1.746 (0.832)	2.105 (0.724)	1.593 (0.807)	0.827 (0.903)	<b>18.276** (0.079)</b>	0.470 (0.786)
Lead-Investor 1	0.649 (0.672)	-----	49.351*** (0.007)	0.119** (0.020)	1.987 (0.391)	6.018** (0.027)	2.646 (0.393)
Lead-Investor 2	0.843 (0.848)	0.722 (0.807)	0.835 (0.867)	0.097** (0.011)	1.372 (0.669)	3.083 (0.156)	2.180 (0.468)
Lead-Investor 3	0.914 (0.907)	0.115 (0.211)	0.292 (0.282)	1.686 (0.565)	1.592 (0.555)	4.444** (0.049)	-----
Lead-Investor 4	0.421 (0.400)	0.062 (0.113)	0.731 (0.797)	0.997 (0.997)	0.342 (0.229)	0.589 (0.672)	0.030** (0.014)
Post 2000	3.294* (0.072)	475.833*** (0.001)	44.183*** (0.000)	0.901 (0.882)	2.182 (0.194)	1.524 (0.472)	6.590 (0.102)
DBT	2.483 (0.183)	0.120* (0.073)	0.135** (0.026)	2.683 (0.168)	3.777* (0.051)	0.616 (0.439)	0.090** (0.006)
<i>Nagelkerke R<sup>2</sup></i>	0.291	0.820	0.735	0.514	0.347	0.386	0.635
<i>F-Statistic</i>	19.454** (0.035)	69.093*** (0.000)	71.248*** (0.000)	44.329*** (0.000)	27.284*** (0.002)	30.503*** (0.001)	43.090*** (0.000)
<i>sample size</i>	91	73	91	91	91	91	70

Logistic (log) regressions on the dummy variables RAT, LP, ADR, EASF, PSP, TVP, and DAR. RAT takes the value of one, if ratchet provisions are used, and zero otherwise. LP takes the value of one, if liquidation preferences are used, and zero otherwise. ADR takes the value of one, if anti-dilution rights are used, and zero otherwise. EASF takes the value of one, if ex ante staging is used, and zero otherwise. PSP takes the value of one, if prohibition of sale provisions are used, and zero otherwise. TVP takes the value of one, if time vesting provisions are used, and zero otherwise. DAR takes the value of one, if drag-along rights are used, and zero otherwise. HIDDEN INFORMATION, HIDDEN ACTION, HOLD UP, and EXOGENOUS RISK are measures of agency and hold-up conflicts derived by relating investment proposal content to transaction attributes. “Lead-Investor i” (i = 1, 2, 3, 4) takes the value of one, if the respective venture capitalist acts as a lead investor, and zero otherwise. “Post 2000” takes the value of one, if the investment took place after the year 2000, and zero otherwise. DBT takes the value of one, if financial vehicles with debt-like features are used (debt, dormant holding, convertible bond), and zero otherwise. Coefficients are at 1 %\*\*\*-, 5 %\*\*-, or 10 %\*- level (two-side) significantly different from zero (Wald-statistic). p-values are in brackets.

Table Add19: Results of regression analyses for direct measures of the relevance of incentive problems (as proposed in this paper)

**References in addition to those of the manuscript  
(Addendum; NOT for publication, ONLY for referees' information!)**

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