Principal-Agent Problems in Venture Capital Finance

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Abstract

Capital market frictions and especially asymmetric information pose significant problems concerning the financing of young growth companies. I first blind out the existence of any intermediaries and use this simplified situation to systematically show these financing problems and relate them to their underlying theories. I then give an overview of potential mitigations for these problems, considering static mitigations in more detail and then giving an outlook at dynamic mitigations. Using the results of this analysis I reintroduce financial intermediaries such as venture capitalists to show their value to the improvement of the situation. The paper intends to give an overview of the most important aspects to the topic, showing its relevance to researchers as well as practitioners.

I would like to thank Wolfgang Drobetz, Andreas Hack and Heinz Zimmermann for helpful comments and suggestions. I also thank the seminar audience at the PhD colloquium in Meiringen.

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List of Abbreviations

AVCO  Austrian Private Equity and Venture Capital Organization
BVCA  British Venture Capital Association
BVK  Bundesverband deutscher Kapitalbeteiligungsgesellschaften
       German Venture Capital Association
c.p.  Ceteris paribus
e.g.  For example (exempli gratia)
EVCA  European Venture Capital Association
GmbHG  GmbH-Gesetz
i.e.  That is (id est)
IPO   Initial Public Offering
KIW  Kreditanstalt für Wiederaufbau
SECA  Swiss Private Equity and Corporate Finance Association
VC    Venture capitalist

List of Symbols

α  Share of entrepreneurs/projects of type H
β  Share of informed investors
γi Share of residual claims to outside investors in situation i
δ  Share of investors using intermediaries
η  Search costs of informed investors
θ  Search costs of uninformed investors
λ  Share of superior projects of all projects
µi Additional component to firm value/returns in situation i
σx Volatility of the underlying
σy Volatility of firm value/returns
Σ  Non-pecuniary sanction
Φi Distribution function of stochastic firm value/returns in situation i
ω  Share of informed investors using intermediaries
a  Fixed part of agent remuneration
A  Auxiliary point
ACi Agency cost in situation i
ASi Auxiliary points
b  Variable part of agent remuneration
B  Auxiliary point
B*  Number of intermediaries in equilibrium
ci Consumption of non-pecuniary benefits/Perk consumption in situation i
C  Control costs
C¯ Price of the call option
d  Intermediary remuneration per project
D  Auxiliary point
e  Effort by the entrepreneur
f(Y) Density function of firm value/returns in situation i
F(δ)  Investors’ willingness to pay per screened project
H   High quality project/entrepreneur
h*   Number of projects screened by one intermediary
h(δ)   Number of projects screened by all intermediaries
i   Index
I   Necessary investment (per project)
j   Index
K_i  Combination of firm value and perk consumption in situation i
L   Low quality project/entrepreneur
L(e)  Costs of effort
m   Number of entrepreneurs financed/Index for intermediary activities
M   Number of entrepreneurs
MB  Substitution line with monitoring and bonding
N   Number of investors
N(*)  Function of the normal standard distribution
O_i  Reservation Utility/Utility of outside option in situation i
p_i  Probability that risky projects return R
P_i  Fixed payback amount in situation I
PB  Payoff to bondholders
PE  Payoff to equity shareholders
TP  Total payback amount
r  Riskless rate of return
R  Risky project/Possible return from risky project
RS  Projects in which the entrepreneur can choose between a risky and a safe version
s  Agent remuneration
S  Safe project/Return from safe project
S^-  Price of the underlying
T^-  Time until expiry
T  Revenue per intermediary
T_i  Revenue of all intermediaries
U  Entrepreneur utility
V^-  Investor utility in equilibrium
V*  Investor utility of superior projects
V(δ)  Investor utility of inferior projects
W_i  Rent in situation i
X^-  Strike Price
Y_i  Firm value/Returns in situation i
Y^-  Maximum firm value/return
Z  Opportunity cost
1 Introduction

1.1 Relevancy of the Topic

Young growth companies and ventures have always been essential for the development of a country’s economy and its society. The society of the 16th century e.g. was shaped by the great expeditions of the Portuguese and the Spanish, which pushed out the edges of the known world: Polo, Cão, Díaz, Columbus, Vespucci, da Gama, Cabral, de Balboa and de Magallanes are just the most famous names amongst the discoverers (see Kay (2000), pp. 698-705).

Obtaining finance for these risky ventures has always been problematic, especially since in the beginning of the project a significant investment without immediate return is necessary. Despite being a highly uncertain venture, Fernando de Magallanes’ expedition for the first circumvention of the globe 1519-1522 was partly privately financed by Cristóbal de Haro, a Dutch Trader, and a consortium of investors, headed by the Fugger family (see Kay (2000), p. 359).

“Before the profit, there is risk”, as de Haro states (Kay (2000), p. 359), still holds centuries later, as the venture capital industry offers equity finance to risky ventures, i.e. young growth companies. This risk is not only due to the venture’s innate risk but also to the danger that the entrepreneur/discoverer may behave in a selfish and undesirable way.

Throughout this work the relationship between the investor and the investee will be further examined. In addition to the problems that come with any economic transaction, there are special problems of asymmetric information: de Haro could not know whether de Magallanes really intended to circumvent the globe, or whether he just wanted the prestige of being captain of three ships. He could not know whether de Magallanes really spent all of the money on the expedition. He could not know whether de Magallanes would fairly share profits upon his return. He could not know whether de Magallanes really was able to navigate well enough to make it. Only de Magallanes knew all these things.

These problems relate to many of the aspects that are discussed in this paper as conflicts arise from delegating tasks, particularly in a financial context: “The directors of such [joint-stock] companies, however, being managers rather of other people’s money than of their own, it cannot well be expected, that they should watch over it with the same anxious vigilance with which the partners in a private copartnery frequently watch over their own” (Smith (1776), p. 741). Berle/Means (1932) even argue that managers could engage in corporate plundering due to incomplete control by the shareholders (see Berle/Means (1932), pp. 207-232). Still it took an additional half a century before these approaches had developed into the agency theory that will be used in this paper to analyze the problems in the relationship between investors and investees, the investees being young growth companies that involve a lot of uncertainty.

The finance of young growth companies that have the potential to become giant corporates influencing our daily lives is a very current issue. The Internet boom in the 1990s opened the door for the transition to the information society. Big corporates that we perceive as established players today not long ago were start-ups: Microsoft, Dell, AOL, Virgin, Wal-Mart or SAP are just some examples for that. Most of these companies were funded with venture capital, i.e. external equity.

Although currently experiencing a setback in its development, venture capital has been a growing market for the past three decades and plays an important role in financing young high risk companies, especially in the innovative high-tech sectors, such as biotech or nanotech.
1.2 Objectives of the Study

This study intends to give an overview over the financing of young growth companies with a focus on the relational problems, that exist due to imperfect information between the parties involved. In the literature the resulting problems have been discussed extensively. However, there are no commonly accepted definitions of the problems or the mitigations; there is no accepted framework that allows a clear classification. Many authors use terms inconsistently or they set different terms to be equal. Even worse are the differences between authors. In this paper the many different approaches to financing relationships and the thereby identified problems are to be systemized and put into a consistent framework.

At the same time, the identified issues and solutions to these issues will be applied to the context of financing young growth companies with a focus on venture capital as one form of financing that is particularly important for the most promising, high expected growth ventures. It will be shown which mechanisms should be used in financial contracting between investors and young growth companies in order to deal with the existing informational asymmetries. This paper does not intend to exclusively take on the perspective of either of the two sides, but to give general recommendations on how to improve the relationship.

This study will not formally model all aspects of the relationship to analyze them mathematically. For the overview intended to be given here, the generality and applicability of the statements are more important than building a mathematical model that can only be applied given some very specific assumptions.

1.3 Layout of the Study

The basis of the study is laid in chapter 2. After first highlighting the economic importance of young growth companies, their alternatives to obtain finance are discussed. Then external equity finance as most viable alternative is considered in the form of venture capital. After describing the workings of venture capital, it is inferred that the financial relationships venture capitalists engage in deserve to be analyzed in more detail.

Chapter 3 gives an overview of the different theories that can be used to analyze financial relationships. After an introduction into the neoclassic financial theory, its shortcomings are pinpointed and the alternative theories of the economics of institutions and information are introduced. The chapter ends with the identification of the agency theory as especially suitable for the analysis of such financial relationships.

In chapter 4 the different imaginable problems in the relationship between external equity investors and investees are discussed using the agency theory. They are not only introduced verbally but they are also shown in easy models to enhance the understanding without losing too much generality. At the end of the chapter these general problems are applied to the financing of young growth companies.

Chapter 5 then proposes a catalogue of possible measures to solve or at least to mitigate the problems introduced in chapter 4. The focus of this paper is to systemize these problems and solutions for the investor-investee relationship in order to develop a consistent view of the equity financing of young growth companies. After discussing possible solutions, the competitive role of information as an inhibiting factor for these solutions is discussed.

Chapter 6 then introduces the venture capitalist as a financial intermediary between investors and investees. The problems and solutions are applied to the by intermediation derived relationships between investor and venture capitalist and between venture capitalist and venture. Then the advantageousness of the intermediary is analyzed and its value-creating activities are shown.
Finally chapter 7 concludes the paper and presents an outlook for topics yet to be explored and questions yet to be answered.

## 2 Sources of Capital for Young Growth Companies

This chapter demonstrates the importance of young growth companies for an economy. It introduces the basic options for financing such companies and then describes venture capital as a financing concept for young growth companies. It lays the basis for the further analysis of the financing relationships.

### 2.1 Characterization of Young Growth Companies

Corporate finance is about financing attractive projects in a least inefficient way. Especially problematic are the information asymmetries between firms and capital markets and the limited ability of the two parties to communicate credibly. This situation is especially severe for firms that need relatively large amounts of capital, while not being able to offer any collateral, reputation or history to investors – i.e. for young companies facing significant growth opportunities. Since any big corporate at some point has to start as a small growth company, financing such companies is crucial to the economy as a whole.

In the following paragraphs, the term “young growth company” will be defined and related to the company life cycle concept. Also, the importance of such young growth companies for the economy as a whole will be demonstrated.

#### 2.1.1 Stages of Company Development

Even though small businesses in general clearly are very diverse in size, growth capacity or organizational structure, some aspects of their growth and development can be formalized. Newly founded companies grow and go through a company life cycle with typical characteristics and problems at certain stages. This company life cycle is very similar to product life cycles (see e.g. Kotler/Bliemel (1999), pp. 563-573) or market life cycles (see Schumpeter (1939), pp. 130-192).

A first and very rough company life cycle model was proposed by Mueller (1972, pp. 199-209). Starting from the idea of a one-product profit-maximizing firm, he developed a model consisting of four major stages, which he distinguished mainly with regard to the growth rate and the profitability of the investment projects available to the firm.

In a first stage the company is founded. This is possible due to the uncertainty-reducing insight of an entrepreneur, who has an innovative idea. This entrepreneur has to finance the firm externally. If the initial idea is a good one, the firm will expand in an S-shaped growth pattern. In the first part of this expansion stage, the firm grows more and more as there are many very profitable investment opportunities and it keeps all profits and reinvests them at very favorable rates. In the second part of the expansion stage competition evolves, the market begins to be saturated, growth opportunities begin to decline and the firm starts to pay out dividends to the equity holders. In the final phase growth opportunities have been used up and the company reduces its size by paying out all profits and depreciation until it dissolves.

However, Mueller emphasizes that this final dissolution of the firm is not realistic and he introduces empire-building by managers in the late stage of his life cycle (see Mueller (1972), pp. 205-209). He argues that managers of large firms do typically not hold enough equity for them to identify themselves with the owners. Especially considering their typically relatively high level of personal wealth, non-pecuniary
benefits, that highly correlate with firm size, are very important incentives for managers. In combination
with the assumed dispersed ownership of large corporations, managers therefore tend to deviate from
profit-maximization to growth-maximization and they overinvest. This implies that firm size declines
slower than optimal in the last stage; in many cases it even continues to grow.

This perspective on the company life cycle is very much driven by the product lifecycle. However, it
can be generalized for multi-product firms (see Mueller (1972), p. 205). Given the firm’s innovative ad-
vantage, it expands into related fields until it reaches a point when further expansion can only reduce its
internal efficiency. At this point, it should start to dissolve and be broken into smaller independent parts, if
management acts in the interest of the shareholders. But as mentioned above, empire-building by manag-
ers may slow down this process. Figure 1 gives an overview of Mueller’s model of the company life cycle.

Figure 1: Mueller's Company Life Cycle Model

![Company Life Cycle Model](image)

There are several problems related to the use of such a view of the company life cycle for the analysis
of young growth companies. Even though this life cycle model is a good foundation for further develop-
ments, it is too simple in four major aspects (see e.g. Churchill/Lewis (1983), p. 31): 1) It uses time of ex-
istence as the only measure of progress. 2) Also, the use of company growth and financing relationships as
the only characteristics of the stages is little satisfying. 3) The model is not able to differentiate well be-
tween the complex stages and mechanisms at the beginning of a firm’s existence. 4) The maybe most im-
portant criticism is the idea, that a company has to pass through the entire life cycle or it has to die on the
attempt to do so. There are no options for different developments; company development is seen in a
rather deterministic way, independent of the owner’s choices. Despite these drawbacks there are two cru-
cial insights from Mueller’s model: Companies’ growth rates typically first increase and then decrease and
they go through certain stages throughout their finite life (see Zimmer (1998), pp. 42-43).

A more advanced model of a company life cycle that builds on these criticisms is the cycle model by
Churchill/Lewis (1983, pp. 31-40). It structures the cycle into five stages: existence, survival, success,
take-off and resource maturity. This model does not measure the progress of a company solely on sales
figures or time of existence but uses several factors, such as management style, organization, extent of
formal systems, major strategy and role of the entrepreneur.
Particularly appealing is the division of the third stage, success, into two alternative parts: success-growth with the entrepreneur striving to enlarge the company, and success-disengagement, with the entrepreneur retreating from the company. Figure 2 shows the main characteristics of the stages.

**Figure 2: Company Life Cycle**

- **Existence**
  - Company foundation
  - Creation of business plan
  - Building expectations
  - Construction of prototypes, basic R&D
- **Survival**
  - Getting the product ready for the market
  - Finishing product development
  - First sales
  - Financing as important activity
  - Gaining trust
- **Success**
  - Disengagement
  - Stable status
  - Retreat of the entrepreneur
  - Decision for further growth
  - Taking on debt to finance growth is necessary
  - Direct control by the entrepreneur is replaced by delegation
- **Take-off**
  - Economies of scale
  - Consolidate business after rapid growth
  - Bureaucratic routines
  - The young company has become an established company

**Source:** adapted from Curchill/Lewis (1983), p. 38

This distinction in stage three makes already clear that small businesses do not go linearly through this life cycle model. They can skip stages, repeat stages, fall back stages or they can be forced to exit the market when trying to move on. This non-linear movement through the lifecycle should be kept in mind; it highlights the highly uncertain future development of companies in the early stages of the cycle. The development of a company depends on draws by nature (i.e. there is uncertainty in the development) as well as deliberate decisions by management and the owners.

**Figure 3: Typical Cash Flow Evolution of Growing Small Businesses**

- **Existence**
  - Initial Costs
  - R&D
  - Organizational Growth
- **Survival**
  - Typical Cash Flow
  - Typical Earnings
- **Success**
  - Sales
  - Stable Returns
- **Take-off**
  - Lower Amplitude of Earnings due to Depreciation

**Source:** adapted from Schefczyk (2000), p. 37

This distinction between success-disengagement and success-growth is very important for the following definition of young growth companies. Given that entrepreneurs decide to follow the growth path the
Principal-Agent Problems in Venture Capital Finance

6

cash flow development over the stages can be shown. After relatively small initial costs, expenditures rise to a higher level as R&D is undertaken to make the product available. When the first sales are achieved, and the offer is a success, the company will typically have to incur high costs for rapid growth of the organization. Only after some time, sales will surpass expenditures and cash flows will become positive as shown in Figure 3.¹

This life cycle model can now be used to define the term “young growth companies” before the economic importance of such companies is discussed.

2.1.2 Common Attributes of Young Growth Companies

“Newly founded companies are companies that newly enter the market and offer products or services in competition to other firms for the first time” (Schulz (2000), p. 6). This definition excludes e.g. established players starting a new business unit since the product offering of the corporate parent contradicts the requirement of offering products for the first time. However it is important to define the term competition in terms of customer needs in order to prevent such cases as the privatization of the Deutsche Telekom counting as newly founded company; the former monopoly had to compete with other forms of information transmission already. This is the start of the company lifecycle described above. These newly founded companies (existence stage) get older and grow to young companies (survival and success stages).

A company in its early development can be considered a young company as long as specific age characteristics allow differentiating it from established companies; a characterization purely based on time of existence would not be satisfactory (see Audretsch (1995), p. 106-108).² This keeps this definition in line with the chosen life cycle model, which also uses a number of criteria (see chapter 2.1.1). There the term “young” does not only refer to time of existence; in the context of the company lifecycle model explained above, “young” refers much more to the state of a company with respect to many factors, such as management style, organization, extent of formal systems, major strategy or role of the entrepreneur. A young company can in this context be seen as somewhere between the second half of the existence stage and the first half of the success stage.

Typical criteria that distinguish young companies from more mature companies are their small size, missing past, need for equity, negative cash flows, high risks and strong focus on the founder (see Weimerskirch (1999), pp. 6-8). Table 1 describes the characteristics in more detail.

Finally, young growth companies are young companies that have the will, the ability and the opportunity to engage in growth in the success stage.

On their way to becoming established companies, these young growth companies then advance in the lifecycle and many of them experience similar problems and challenges as they grow. Therefore there are certain statements that can be claimed to be generally relevant for the whole group of young growth companies.

¹ There may be stable levels of firm size in the survival, success and take-off stages as well. This of course is only possible with cash flows and profits being positive in these states. The developments shown in Figure 3 are only applicable if the success growth path is chosen.

² Even though Audretsch (1995) recognizes this problem and uses survival probability as a measure, in order to be able to work empirically, he then goes back and uses an interval based on time of firm existence to measure entrepreneurship.
Table 1: Characteristics of Young Companies

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company Size</td>
<td>Size is limited by some bottleneck factors (wealth, personnel, market access). Foundation at the smallest size, then growth by investment.</td>
</tr>
<tr>
<td>Company Past</td>
<td>No significant experience or track record that help an evaluation. Decisions are made on expectations.</td>
</tr>
<tr>
<td>Financing Potential</td>
<td>No cash flows for self-finance are available. Debt finance is limited by missing collateral.</td>
</tr>
<tr>
<td>Time of Amortization</td>
<td>Product development and market introduction take time and money without positive cash flows. Losses need to be financed.</td>
</tr>
<tr>
<td>Chances and Risks</td>
<td>High chances and risks due to an innovative business idea, few possibilities for diversification and uncertain predictions</td>
</tr>
<tr>
<td>Person Focus</td>
<td>The entrepreneur is the driving force in the development process. Without him the business has little value.</td>
</tr>
</tbody>
</table>


2.1.3 Importance of Young Growth Companies

When considering the importance of young growth companies for a society as a whole, their role in innovation has to be discussed. Do young growth companies innovate more? Are they more effective in it? Are they important employers? The answers to these questions are everything but self-evident.

Already in his early works Schumpeter recognized the important role of entrepreneurs as the initiators of innovations and granted them an entrepreneurial profit (see Schumpeter (1911), pp. 88-139). However, as Schumpeter became aware of the R&D performed by large corporations in the twentieth century, he moved on from this model of entrepreneurial innovation to a model of innovation as routinized process within large firms (see Cantwell (2002), pp. 216-217): “As soon as we go into details and inquire into the individual items in which progress was most conspicuous, the trail leads not to the doors of those firms that work under conditions of comparatively free competition but precisely to the large concerns […]” (Schumpeter (1942), p. 82).

This has lead to the “Schumpeterian hypothesis”, i.e. the hypothesis that there is a positive relationship between monopoly power and innovation. A second and closely related hypothesis is that there is a more than proportional relationship between firm size and innovation. These hypotheses are closely related because 1) monopoly power and absolute size are highly (but certainly not perfectly) correlated and 2) size is often meant in terms of market share rather than in absolute terms.

Both hypotheses imply a limited importance of young growth companies; yet, in the following paragraphs it will be shown that their theoretical and empirical support is limited.

Innovation and Monopoly Power

There are three major reasons why monopolists are hypothesized to be more innovative (see Kamien/Schwartz (1982), pp. 27-29). One reason is the ability to extend the existing market power to new products using existing distribution channels or brands. This not only ensures the new products of the monopolist to be profitable, the ability to respond quite quickly to a rival’s innovation also discourages innovation in this field by less powerful rivals. The second reason is a monopolist’s ability to finance innovations internally due to the existence of monopoly profits. That avoids the disclosure of information to investors lowering the danger of early imitation and it avoids process of raising capital, which may be long, difficult and costly (see chapter 5.7) since new economic ideas are inherently hard to communicate (see
Audretsch (1995), p. 40). The third reason is a monopolist’s ability to hire the most innovative people, due to the monopoly profits.

Still there are also effects slowing innovation by monopolists. Because of the very profitable situation of a monopolist, such a firm can show signs of satisfaction with profits and value leisure higher than additional profits or it may be more interested in protecting the current monopoly situation than creating a new one (see Kamien/Schwartz (1982), pp. 29-30). A second slowing effect is the lower incentive to innovate for monopolists, since monopolists can only gain the difference between current and innovative profits while newcomers can gain all of the innovative profits as can be shown in an easy model with licensing of innovations (see Arrow (1962), pp. 175-179; Kamien/Schwartz (1982), pp. 36-46). A third retarding factor is the organizational atmosphere of monopolists that often lacks entrepreneurial spirit and flexibility (see Frisch (1993), pp. 109-117). This idea also leads to doubts about a monopolist’s ability to attract the most innovative people; it is not clear whether these innovative people are more attracted by high remuneration or by the freedom of action in entrepreneurial organizations.

Empirically, results tend not to support the positive relationship between monopoly power and innovation. The opposite is the case: empirical studies in fact give rather good support to the hypothesis that monopoly power diminishes innovation. An overview of the empirical literature can be found in Frisch (1993, pp. 50-130).

The existence of monopoly power for a limited period of time is certainly important (i.e. the existence of patents) in order to incentivize potential innovators (see Kamien/Schwartz (1982), p. 27). This may lead to simultaneity problems with simple empirical research; yet also studies taking this into account support the more innovative role of firms without market power (see Koeller (1995), pp. 259-269).

It is worth noticing that financing advantages do in fact play a significant role in determining a company’s innovative capabilities. The availability of profits to be used internally for R&D is in fact empirically advantageous (see Frisch (1993), pp. 93-109).

**Innovation and Firm Size**

The main idea behind the hypothesis that large firms are more than proportionally more innovative than small firms rests on the concept of economies of scale in three aspects (see Kamien/Schwartz (1982, pp. 32-33): 1) Economies of scale in R&D are seen in several aspects: Expensive machines needed for R&D are often not divisible and a big R&D department can use them more efficiently. Scientists usually work better in groups in which they can constantly interchange ideas and results, i.e. the creation of atmosphere is important to spur R&D success. Advantages of specialization in large R&D departments can lead to a more efficient handling of R&D projects. Still, these ideas are often disputed; large R&D groups could be subject to an institutional blindness as less promising research approaches are quickly disregarded. In fact, often it is argued that the relative R&D output depends quite strongly on the number of independent R&D approaches (see Frisch (1993), pp. 236-255). This reasoning would favor small companies as a group as the main source of innovation. As a whole economies of scale in R&D probably do exist, but to a much lesser extent than often is argued. 2) Large and diversified firms can better take advantage of unexpected discoveries since they can use these discoveries in-house in other lines of business. 3) Large firms can profit from advances in R&D, especially from process innovations, more than smaller firms because of the larger number of produced items, i.e. the fix total cost needed for the development of the innovation can be spread over a larger number of produced units. Still, it is important to notice that these last two reasons assume an at least limited transferability of innovations; otherwise, licensing could cure these problems easily.
However, these alleged positive effects of firm size are countered by the tendency of large firms to be bureaucratic, to have communication problems, their indolence and their conservative decision making (see Schumpeter (1939), pp. 87-102; Frisch (1993), pp. 109-117). This leads to the question, whether small enterprises are simply able to get all good projects and leave the large corporations with the bad projects due to their slow decision making, or whether small and large companies simply get different projects because of their different decision making structures.

Considering the relevancy of the above arguments, empirics can again help to determine what effects are particularly important; again an overview is given by Frisch (1993, pp. 73-127). Considering the economies of scale of R&D, the empirical literature provides support for this argument in very few cases and industries (i.e. the chemical industry); in general however, the argument is refuted: Constant or decreasing returns to scale are much more common and R&D productivity decreases with size (see Frisch (1993), pp. 78-82). The advantage of diversified firms cannot be supported empirically either; diversified companies are more engaged in fundamental research, but an increased R&D productivity cannot be observed (see Frisch (1993), pp. 95-93).

Empirical results concerning the size advantage of large firms when putting R&D results to work and the results concerning the organizational structure lead to the insight that small firm and large firm R&D is quite different. Inspired by empirical results (see Cohen/Klepper (1996a), pp. 925-930) Cohen and Klepper created a model concerning the use of R&D for large firms and small firms, in which they distinguished between product and process R&D. Hypothesizing a better transferability of product innovations, which can (partly) be licensed out, in comparison to process innovations, which are mainly exploited by the firm itself, their model suggests that large firms are more involved in process innovations while small firms are more interested in product innovations (see Cohen/Klepper (1996a), pp. 930-935). Empirically this model, and in particular the distinction between firm sizes and research types is strongly supported (see Cohen/Klepper (1996b), pp. 236-241).

Empirical studies concerning the effects of the organizational conservatism and indolence suggest that small firms are typically the source for major innovations, while large firms typically are better at constant improvements and at the systematic research along a discovered path of technology (see Frisch (1993), pp. 117-127).

This hypothesis can also be supported by models of R&D competition between firms; e.g. a model by Rosen (1991, pp. 413-421) shows the competitive behavior leading to small firms making a more than proportionate share of major innovations while large firms spend effort on improving existing technologies (see Rosen (1991), 422-423).

With improving data availability, more recent studies have turned towards patent data for the measurement of innovation. Using U.S. data from 1965 to 1992 Kortum and Lerner (2000, pp. 674-692) found a clear advantage of venture-capital backed companies in comparison to not VC-backed corporations in innovation. While venture capital investments between 1983 and 1992 was on average less than 3% of corporate R&D expenditures, venture capital-backed companies were responsible for about 8% of U.S. industrial innovations. This implies that venture capital is approximately three times as potent in inducing innovation as corporate R&D (see Kortum/Lerner (2000), pp. 686-689). The link between the number of

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3 One can safely assume that the venture capital-backed companies were rather small companies as evidence in chapter 2.3 shows.
patents and innovation can be made, since Kortum and Lerner (2000, pp. 689-691) demonstrate that venture capital-backed patents are of at least equal quality as corporate patents.\footnote{It cannot stay unmentioned that this advantage can be due to three effects: 1) good screening by venture capitalists, 2) good monitoring and consulting by venture capitalists and/or 3) an advantage of small companies over larger companies. Therefore the study by Kortum and Lerner cannot be seen as direct and irrefutable proof of the link between firm size and innovation.}

**Benefits of Young Growth Companies to Society**

Young growth companies as they are defined in chapter 2.1.2 are certainly small companies that have a potential innovation at hand and now wish to finish developing it and capitalize on it.

The above evidence shows that these firms surely play a crucial role in innovation in an economy. Not only are they as a group extremely good in innovation, they even are the engine behind the truly radical innovations that have the potential to move a society ahead and change its lifestyle and perceptions (see Florida/Kennedy (1988), pp. 126-129, 135).

This role of young growth companies is also supported by the fact that they are more competitively potent in the marketplace: their monthly sales per employee are approximately 20% higher than for an average company as Hax (1989, p. 380) shows for Germany in 1985. He also found a clear movement of economic activity caused by fluctuation (foundations and liquidations) from the manufacturing and construction industries to the service industries in the early 1980s. Similar results are reported by the EVCA: Venture-backed firms’ sales (which are typically young firms’ sales (see EVCA (2002), p.3)) grow at about 35% per year in comparison to an average 14% per year for the FT Top 500 Europe firms; they improve international competitiveness with an export growth rate of approximately 30 % per year and they drive innovation with R&D investments of 8.6% of sales in comparison to an average 1.3% for the FT Top 500 Europe firms (see EVCA (2002), p. 5).\footnote{The cautionary words from footnote 4 stay valid for this study as well. In addition the low response rate of the questionnaire (22.8%), the strong survivor bias and the fact that the publisher has an interest in promoting the advantages of venture capital should be kept in mind. Still, the study provides further hints towards the advantages of young growth companies.}

The importance of large corporations for R&D should not be underestimated, they make many inventions ready for the market and exploit their true potential, but the true impulse for structural change in a society can be assumed to come from young growth companies. A recent example for such a quantum leap initiated by an entrepreneur and his young growth company is Netscape. The development of the Netscape Navigator to browse the Internet clearly changed the way we live and work today in a revolutionary way. This idea of young growth companies spurring structural change is also supported by population ecology approaches that suggest a natural selection process for organizational progress (see e.g. Hannan/Freeman (1977), pp. 929-964). Young companies try out new organizational ideas; given their validity they grow and establish themselves in the economy and thereby strongly support the structural change in a society.

With this ability to innovate and to induce structural change automatically comes the ability provide employment to a large number of people. This claim can be corroborated by analyzing employment flows or employment levels.

From a flow perspective the evidence is impressive: Data from the State of Maryland in the USA shows that approximately one quarter of all new jobs is created by firms within the first three years of their existence (see Burgess/Lane/Stevens (1997), p. 6). These firms are the most active in hiring (corrected for
firm size) and amongst all firm ages the net job creation rate is highest for firms within the first 1.5 years of firm existence (see Burgess/Lane/Stevens (1997), Table 2 and Figure 3).

For Germany (1977-1985), Hax (1989, p. 378) reports a total rise in employment of 2.3%. While existing firms accounted for only 0.4%, fluctuation (foundations minus liquidations) accounted for 1.7% of the effect. The difference is due to rounding. The EVCA (2002, p. 5) reports an employment growth in venture-backed companies of 15% per year in comparison to only 2% for the FT Top 500 Europe firms.

At first glance, from a level perspective, employment seems to be very high as well: After all, almost half of Germany’s employees work in companies with less than 50 employees (see Albach/Hunsdiek (1987), pp. 569-573). But this data is put into perspective by the employment figures of recently founded companies. Using the Small Business Administration Data Base, Audretsch (1995, pp. 110-111) showed that in the United States in the mid-eighties, dependent on the industry, between 25% and 49% of all existing firms were recently founded (within four years), but these young companies only employed, dependent on the industry, between 1% and 22% of the workforce. Specifically looking at manufacturing industries, as shown in Table 2 he also reports comparatively low employment shares by new firms. Even in the widest definition of new firms, over all manufacturing industries the average employment share by new firms is only 5%.

Table 2: Employment Share of New Firms in US Manufacturing Industries

<table>
<thead>
<tr>
<th>Maximum firm age to be defined as “new firm”</th>
<th>2 years</th>
<th>4 years</th>
<th>6 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of new firms (of all firms) – all manufacturing industries</td>
<td>13%</td>
<td>23%</td>
<td>33%</td>
</tr>
<tr>
<td>Share of employment by new firms (of total employment) – all manufacturing industries</td>
<td>2%</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td>Share of new firms (of all firms) – maximum amongst manufacturing industries</td>
<td>18%</td>
<td>36%</td>
<td>46%</td>
</tr>
<tr>
<td>Share of employment by new firms (of total employment) – maximum amongst manufacturing industries</td>
<td>5%</td>
<td>9%</td>
<td>12%</td>
</tr>
<tr>
<td>Share of new firms (of all firms) – minimum amongst manufacturing industries</td>
<td>11%</td>
<td>18%</td>
<td>26%</td>
</tr>
<tr>
<td>Share of employment by new firms (of total employment) – minimum amongst manufacturing industries</td>
<td>0%</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>


In general employment evidence, even though from different sources and for different entities suggests that small firms are very important for employment. However, from a level perspective this importance is due to firms that choose to stop at a certain point of their development, i.e. typically in the success stage (see chapter 2.1.1); the percentage of employment by young companies is quite low. But this low percentage is particularly relevant, since it accounts for a significant share of new jobs created. Young firms can be considered to have important effects on employment but these effects should not be overestimated.

As a conclusion of this chapter, it can be established that young and newly founded companies with a strong growth potential have significant positive effects on society and a country’s economy. They foster innovation and accelerate structural change. Also, but to a lesser degree, they create employment; higher rates of entrepreneurial activity are associated with faster growth (see Acs/Armington (2002), pp. 4-5).
They are the driving force for the ability of an economy to create wealth to a country’s inhabitants and to compete internationally.

However, to be able to innovate, to grow and to create new jobs, it is a prerequisite for the entrepreneur to obtain resources and in particular financing. As discussed above the ability to finance projects internally from profits is clearly an advantage for monopolists. Financing is the core problem of young growth companies (see Brettel/Jaugey/Rost (2000), pp. 47-55) slowing their ability to innovate; it can even be called “the entrepreneur’s Achilles Heel” (Timmons (1999), p. 411).

2.2 Types of Finance

As reasoned above, financing is a prerequisite to firm survival and growth. Therefore it is important to establish the financing options, firms have in general. Once identified, these options can then be analyzed one by one in order to narrow down the best ways of financing young growth companies.

2.2.1 Types of Finance available to young growth companies

In a first step a firm's financing options can be structured into two main groups: external finance and internal finance (see e.g. Perridon/Steiner (2002), pp. 355-357; Schmidt/Terbeger (1997), pp. 18-25). While external finance is provided to the firm by an investor, internal finance results from the generation of revenues by the firm itself. An overview of the financing options is given in Figure 4.

Figure 4: General Financing Options of Firms

Source: Drukarczyk (1999), p.9

While the options of external finance are quite clear intuitively, the options of internal finance need some more explanations (see Perridon/Steiner (2002), pp. 464-483; Drukarczyk (1999), pp. 3-13). Self-finance in general describes financing activities based on the retention of earnings. Open self-finance refers to the buildup of reserves with measures that are based on formal decisions by management and equity holders. It is called open self-finance since these measures are clearly visible. A second case of self-finance, finance through forcing accounting rules, describes the retention of earnings within the firm based on accounting rules that force the firm to keep these funds. As an example depreciation or reserves for pension commitments lower the earnings that can be distributed to equity owners; they thereby contribute to the firm's financial strength and soundness. Finance through choices in accounting rules refers to activ-
ties by management that aim at the reduction of the earnings. Flexibility in depreciation rules and revaluation of certain assets may enable management to reduce the firm's earnings and thereby detain equity holders from withdrawing cash from the firm.

Besides the different forms of self-finance, internal finance also consists of measures that can be termed as the regrouping of assets. This refers to the sale of assets that are not or not any more crucial for the firm's operations. Such a sale frees cash internally and helps financing other activities.

However, relating these means of internal finance to the specific situation of young growth companies as described above in chapter 2.1 shows, that these measures have little relevance for the young growth company finance. One requirement to engage in self-financing is the existence of earnings, i.e. the cash inflow via revenues that is not matched or even surpassed by cash outflows (see Perridon/Steiner (2002), pp. 464). Until the second half of the take-off stage it is very unlikely that young growth companies make any significant profits; to the contrary, typically such companies incur significant losses in the early stages of the life cycle (see Figure 3). Even if the company achieves positive cash flows it is still restricted by the sustainable growth rate, which often is not enough for the quick growth necessary in competitive innovative environments (see Brettel/Jaugey/Rost (2000), pp. 63-64). A prerequisite to finance by regrouping assets is to own assets that are not or not any more crucial for the firm's operations. However this also is typically not the case for young growth companies. Clearly the relevance of internal financing for young growth companies is very limited and an analysis of financing such ventures can be restricted to external finance.

Financing options can be structured according to many criteria, such as type, maturity, source or reason for finance (see e.g. Perridon/Steiner (2002), pp. 353-357; Woehe/Bilstein (1994), pp. 11-21). To further structure the discussion of young growth companies' financing options, Figure 5 shows the external financing options (see Figure 4) restructured according to type of financing and source of financing.

**Figure 5: External Financing Options for Young Growth Companies**

<table>
<thead>
<tr>
<th>Type of Financing</th>
<th>Source of Financing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Insiders (Entrepreneur)</td>
</tr>
<tr>
<td>Equity Finance</td>
<td>Equity Finance by the Entrepreneur</td>
</tr>
<tr>
<td>Hybrid Finance</td>
<td>( )</td>
</tr>
<tr>
<td>Debt Finance</td>
<td>Borrowing by the Entrepreneur</td>
</tr>
</tbody>
</table>
2.2.2 Viability of the financing options for young growth companies

Financing by the entrepreneur

The easiest case for an entrepreneur to finance a young growth company is of course to use his own funds. He owns the company completely and there is no outsider involved whom the entrepreneur would have to grant any claims to. The financing transaction just means a shift of wealth from his private account to the company's account, which he fully owns as well. There are no risks due to asymmetric information and transaction costs are low (see chapters 3.2.3 and 4).

Still, there are problems with this strategy as well. First and foremost it is not the standard case, that the entrepreneur possesses the funds to finance a young growth company himself; he is strongly wealth-constraint. Especially in the success-growth and the take-off stages, typically significant investments of several million Euros/ Swiss Francs are needed, since the financing needs to cover the cumulative negative cash flows of the young growth company until it reaches the break-even in cash (see Figure 3). Few entrepreneurs are able to pay these amounts. Only in the very early stage (existence stage) of a young growth company, the entrepreneurs (and their families) can fund their ventures by themselves (see Smith/Smith (2000), pp. 34-35). This finance by an entrepreneur who is not wealthy and uses all cash he can get is called bootstrapping; the most common source of funds in this case are personal savings, credit cards, loans from friends and family and loans against property (see Mamis/Hyatt (1997)).

Even though entrepreneurs typically are not able to invest sufficient amounts of money, some may be. But even for them there are high costs involved with it. The entrepreneur will have to accept a (significantly) less perfect diversification of his wealth and his personal fate will be closely tied in with the company. This is especially true since the capital paid in by the entrepreneur is fully liable. If the entrepreneur finances with equity, the money is fully lost in the case of insolvency. If he finances with debt, many legal environments are very restrictive and in a large number of cases, i.e. when the money is loaned in times of crisis, it will be treated as fully liable equity (see Hildebrand (1994), pp. 1-79; GmbHG (1999), §§ 32a, 32b for Germany).

Financing by Public Institutions

To see when finance by public institutions, which typically takes place at for the entrepreneur relatively favorable conditions, makes sense, the economic viability of young companies can be categorized (see Schulz (2000), pp. 15). In a first dimension, it can be discussed whether a venture is microeconomically viable, i.e. whether the entrepreneur and the investors individually get satisfied from the realization of the project and its returns. The second dimension refers to whether a venture is macroeconomically viable. Ventures that are not viable microeconomically can make sense macroeconomically since there may be positive external effects (see chapter 2.1.3) for society as a whole.

There are two very simple cases: 1) Company foundations that neither make sense microeconomically nor macroeconomically are purely driven by an entrepreneur's misestimation or his striving for non-pecuniary advantages and they should not get financed. 2) The other extreme, company foundations that make sense macroeconomically and microeconomically, should easily obtain financing. In these two cases the market for capital makes the right decisions and there is no need for the intervention of public institutions.

---

6 Still, the behavioral risks of external equity finance sometimes make it very expensive to obtain financing (see chapter 4).
However there are two more cases. 3) Company foundations, that make sense macroeconomically and make only sense microeconomically if some of the risk is shifted to external investors, have severe difficulties in obtaining finance due to information asymmetries. Also 4) company foundations that make sense macroeconomically but not microeconomically are not financed since the market doesn't appreciate external effects. These are cases in which the external effects are very important to society and in which it makes sense for a society to have public institutions finance at favorable conditions, i.e. subsidize these foundations (see e.g. Hunsdiek/May-Strobl (1987); European Commission (1997), pp. 3, 9-13). Still, it is difficult to identify such companies in the mass of firms seeking cheap finance and several new problems occur in such a setting (see Hax (1989), pp. 26-35, pp. 381-384): Entrepreneurs who would have founded their companies without subsidies as well would make use of such aids, firms whose survival depends on the subsidies could get financed, and too thorough selection on behalf of the taxpayer could lead to a subsidy allocation tilted towards little risky foundations. This reasoning is valid independent of the actual type of financing chosen; it applies to debt, equity or hybrid instruments likewise.

The question of financing for young growth companies by public institutions is a complex topic that is not to be inquired in this paper; the focus concerning financing by outsiders is to be laid on private institutions.

Financing by Private Institutions

Young growth companies can potentially obtain debt, equity or hybrid finance. While hybrid financing can be described as financing with instruments that have characteristics of both, debt and equity, in a first step of the analysis, it makes sense to compare the two extremes: debt and equity.

Debt can be defined as a "loan agreement that is a liability of the firm. An obligation to repay a specified amount at a particular time" (Ross/Westerfield/Jaffe (2002), p. 921). A bank usually gives the company a certain amount at the time of financing and in exchange gets the right to get this amount paid back at a later point in time, possibly with interest payments in certain intervals in between (see Swoboda (1994), pp. 9-11). Debt financing entitles the investor to a fixed claim, more precisely to a state contingent claim to cover cases of bankruptcy (see Fama/Jensen (1983), pp. 328-330).

Table 3: Characteristics of Equity and Debt

<table>
<thead>
<tr>
<th></th>
<th>Equity</th>
<th>Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claim</td>
<td>Quota share</td>
<td>Nominal claim</td>
</tr>
<tr>
<td>Reward</td>
<td>Success-dependent</td>
<td>Success-independent</td>
</tr>
<tr>
<td>Liability</td>
<td>Limited of full</td>
<td>None</td>
</tr>
<tr>
<td>Maturity</td>
<td>None</td>
<td>Limited</td>
</tr>
<tr>
<td>Management Authority</td>
<td>Exists</td>
<td>None</td>
</tr>
</tbody>
</table>

Source: Schmidt/Terberger (1997), p. 20

Equity on the other hand is the "ownership interest of [...] stockholders in a corporation" (Ross/Westerfield/Jaffe (2002), p. 922). However, this definition of equity, even though surely correct, is somewhat tautological. A more precise definition is that equity capital is defined as capital, "that does not have to be paid back, the creditor has no right of cancellation for, does not grant any right for fixed interest and is lost in the case of bankruptcy" (Albach (1983), p. 6). By paying a certain amount at the time of financing, the investors earn a claim on a share of the company's future profits, i.e. a residual claim. In exchange for this, the equity hold-

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7 For a more detailed description of subsidized firms see Hunsdiek/May-Strobl (1987), pp. 51-114.
ers get the management authority in the firm. These different characteristics of debt and equity are summarized in Table 3.

Having discussed these main characteristics of debt and equity, a perspective of these two instruments as contingent claims on the firm value needs to be introduced (see e.g. Ross/Westerfield/Jaffe (2002), p. 10). This view of debt and equity will be extremely helpful when discussing the problems involved with these types of financing in chapter 4. Figure 6 illustrates this view.

**Figure 6: Debt and Equity as Contingent Claims**

![Debt and Equity as Contingent Claims](image)

Source: Ross/Westerfield/Jaffe (2002), p. 10

P is the face value of debt, i.e. the promised amount to be paid back to creditors. If the firm is worth less than P everything is paid to the creditors, if the firm is worth more than FV creditors do not profit from that upside potential and get P. Their payoff can be written as:

\[
P_B = \min(Y, P)
\]  

(2.1)

Equity holders participate in the firm value only after the creditors' claims have been satisfied. If the firm is worth less than P they get nothing (given limited liability), if it is more they get the entire residual Y – P. Their payoff can be written as:

\[
P_E = \max(0, Y - P)
\]  

(2.2)

A further difference concerning debt equity, especially when discussing young growth companies is the provider of funds. Debt is typically provided by banks, while equity (and hybrid financing) is typically provided by venture capital firms, i.e. there are specialized intermediaries that transfer capital between investors and investees.

**Assessment of the availability of debt capital:** The high uncertainties concerning the development of young growth companies, their missing track record concerning the repayment of credits and their inability to provide a collateral are factors that, in combination with a conservative strategy of the banking industry, lead to a situation in which debt capital for young growth companies, at least in the early stages of their development (see chapter 2.3.3.b), is virtually not available (see Hummel/Ludwig (1994), pp. 3-11; Evans (1998), pp. 228-230). In addition, young growth companies with their at first negative cash flows would not be able to pay interest on a regular basis. Especially dangerous is the case of bankruptcy, when even the fixed claims cannot be paid back. With a rising leverage, bankruptcy risk increases and potential bankruptcy costs make the investment even more expensive. This implies that a significant
bankruptcy costs make the investment even more expensive. This implies that a significant amount of equity would be necessary in order to obtain any debt financing at all. In addition, compared to self-finance there are significant transaction and agency costs involved with debt financing.

**Assessment of the availability of equity capital:** Equity capital can be raised by a capital increase. In the literature, it is often argued that for young growth companies equity capital seems to be very difficult to obtain, especially in the German-speaking area. Even though it is methodically difficult to compare equity ratios internationally, a comparison shows that the average German equity ratio of 18% is extremely low as Figure 7 shows. This causes problems for firm development (see Kaufmann/Kokalj (1996), pp. 14-15; Schroeder (1997), p. 195). However, it is possible that this low equity ratio is a consequence of the deliberate use of the leverage effect (see Bofinger (1990), pp. 264-265). Also it is very questionable whether given the unavailability of debt, the equity ratio for young growth companies also is as low as the average stated above.\(^8\)

**Figure 7: Equity Ratios 1994 - Producing Industry, Commerce and Transportation Industry**

\[\text{Source: see Schefczyk (2000), pp. 24-26}\]

One often heard criticism is the concentration of equity capital investors on the expansion stage of companies and their unwillingness to fund newly founded companies (see e.g. Schefczyk (2000), p. 38). However, this criticism is not undisputed (see e.g. Zemke (1998), p. 212). The facts show that more than 50% of the venture capitalists’ investments are aimed at firms in the seed or start-up phase (see chapter 2.3.3.b). Also the informal venture capital market, i.e. business angels, is very active in that area (see Brettel/Jaugey/Rost (2000), pp. 169-183). A problem of equity finance for young growth companies is the high level of informational asymmetry that makes it difficult to contract due to risks concerning the other party’s behavior. Again transaction and agency costs have to be incurred.

**Inference from the Financing Options**

Obviously it is difficult to obtain financing for young growth companies. As shown above, internal finance as well as finance by the entrepreneur himself are of little relevance for young growth companies.

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\(^{8}\) In this point evidence is inconclusive. Literature states that debt capital is virtually not available and then uses the low equity ratios as hint concerning the unavailability of equity for young growth companies. Further empirical work is necessary here to present actual findings on the availability of the different types of financing for young growth companies.
due to the inherent unavailability of funds. External financing by public institutions is to be given according to macroeconomic criteria that are beyond the scope of this analysis. Here the focus is put on external finance by private institutions. As debt finance is almost impossible to obtain and also in reality one typically observes equity finance, the following analysis will concentrate on equity finance by venture capitalists.

The next chapters first investigate venture capital as the main source of external equity finance for young growth companies before then engaging in an analysis of the conflicts of interest and behavioral problems in the financial relationships. The theory of the firm can explain these problems and propose countermeasures (see chapters 3, 4, 5).

2.3 Venture Capital as Financial Concept

Venture capital as it is defined below is an important source of funds for young growth companies. Still there are other sources of external equity finance for young growth companies such as business angels on the informal venture capital market, business venturing activities of large corporations or state programs. Venture capital is an extremely important source of external equity for young growth companies, especially in innovative industries (see Bygrave/Timmons (1992), pp. 95-123).

Venture capital finance is exclusively an option for young growth companies, since due to the high uncertainty venture capitalists have high return thresholds. This growth aspect only applies to a minority of all young companies. Considering all newly founded companies only one half engages into a growth process and only one half survives the first five years (see Schulz (2000), p. 11). Considering their planned growth path, only 5% of all newly founded companies are potential candidates for venture capital (see Timmons (1999), p. 420); however these companies are those with the best growth perspective and therefore the most important concerning their economic advantages (see chapter 2.1.3).

Venture capital helps closing the equity gap for many young companies, greatly improving their chances for survival because they ease investment constraints and lower the risk of bankruptcy by adding stability, lowering fixed claims and helping the young growth companies with management support. Therefore venture capital has positive effects on the whole economy, such as innovation, structural change and employment as described in chapter 2.1.3 (see Kaminski (1988), pp. 136-138; Schefczyk (2000), pp. 26-27).

2.3.1 Definition and Delimitation of Related Concepts

In the German-speaking area the venture capital industry evolved from the so-called “Kapitalbeteiligungsgeellschaften” (see e.g. Roesner (1968), pp. 74-75). These were mainly founded by banks in order to improve the equity ratio of small and medium-sized enterprises. In the early 1980’s the term “venture capital” was then first introduced to German language (see Nathusius (1979), pp. 194-203; Schmidt (1984a), pp. 281-283).

Following the American literature (see Fast (1982), p. 289), Albach/Hunsdiek/Kokalj (1986, p. 166) characterize venture capital: “(1) Venture capital firms put up equity capital or similar capital for growing, young enterprises as well as for small and medium-sized enterprises. (2) Venture capital financing does not only consist of the provision of funds; the provision of management support to portfolio firms is inseparably related to that. (3) Venture capital firms are long-term investors earning their profits from capital gains”
It is important to note three important features of this definition: (1) The inclusion of similar capital allows for contract designs such as convertible debt. (2) The inclusion of young growth companies as well as small and medium-sized enterprises emphasizes that the term also applies to later stages of a firm’s development. This makes sense since it can be observed that venture capital firms invest in all stages and industries (see BVK (2001), pp. 60-61). However, this paper will focus on venture capital as financing concept for young growth companies, since there the uncertainty is highest and the information-induced problems are the most prominent. (3) The explicit inclusion of management support characterizes venture capital as a compound product (see Sattler (1995), pp. 1094; Schween (1996), p. 16).

The EVCA adds the aspect that the equity capital should be provided by private institutions in order to distinguish between venture capital and funds provided by the public, i.e. state authorities, such as the KfW in Germany. Also the EVCA sees venture capital as investing in the growth phase of young businesses: “Private equity provides equity capital to enterprises not quoted on a stock market. […] Venture capital […] refers to equity investments made for the launch, early development, or expansion of a business” (EVCA (1999), p.5).

Venture capital firms provide this capital as intermediaries for investors (see Schefczyk (2000), p. 55-57). Institutions are called financial intermediaries if they enter independent relationships with investors and investees in the context of a financial transaction (see Scholtens (1993), pp. 114-118; Gerke/Pfeufer (1995), p. 728). Companies financed by a venture capital firm are also called its portfolio companies.

Table 4 shows seven characteristics of venture capital financing, as the term is used in this study:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance of risky ventures</td>
<td>Portfolio companies are small growth companies</td>
</tr>
<tr>
<td>Equity capital finance or similar</td>
<td>Renunciation of fixed claims lowers the risk of early bankruptcy</td>
</tr>
<tr>
<td>Minority shares</td>
<td>The portfolio company’s character as independent enterprise stays alive</td>
</tr>
<tr>
<td>Limited time horizon</td>
<td>The investment is to be drawn out after 5 to 10 years; the venture capital firms profits from capital gains</td>
</tr>
<tr>
<td>Private intermediary</td>
<td>The venture capitalist is a private profit-seeking intermediary between investor and portfolio company</td>
</tr>
<tr>
<td>Control and monitoring rights</td>
<td>These ensure that the portfolio company behaves as planned</td>
</tr>
<tr>
<td>Management support</td>
<td>Active increase in value by assisting the portfolio companies’ management</td>
</tr>
</tbody>
</table>

Venture capital and related concepts need to be properly delimited (see e.g. Schween (1996), pp. 16-23; Brettel/Jaugey/Rost (2000), pp. 66-92). Many firms and individuals providing equity capital cannot be considered venture capitalists since they either are only fake intermediaries, e.g. business angels invest their own capital and captive funds work for primarily one investor (see BVCA (1992), p. 18), or because they have additional intentions, other than achieving capital gains, such as e.g. the strategic goal of getting a window on technology for corporate venture capital (see e.g. Winters/Murfin (1988), pp. 211-214; Schween (1996), pp. 80-87).
Today the venture capital industry has reached a significant size with a fund volume of more than 33 billion Euros in Germany in 2001 (see BVK (2002)) and a total portfolio of almost 17 billion Euros after a time of strong growth especially at the end of the 1990s. This is illustrated in Figure 8.

Figure 9: Cyclical Growth of Venture Capital New Commitments in the US

Source: see Smith/Smith (2000), p. 497

However, the actual market size for venture capital, as being investments into the early stages of young growth companies is only 70% of this number (see BVK (2001), p. 67). Still virtually all figures that can be found about the venture capital market refer in fact to investments in all stages (see chapter 2.3.2 and 2.3.3), since in reality firms typically invest in the early and the late stages. It cannot stay unmentioned that this growth has not been very steady. The volume of venture capital commitments is very volatile and highly dependent on the cycles of the stock market. The drastic decline of the stock markets in the late 1980’s induced, especially in the United States, a significant temporary reduction in venture capital commitments as shown in Figure 9.

Also, with the economic downturn of 2000 to 2002 the venture capital industry has again started a downward cycle with investments in the US having fallen by 62% from 2000 to 2001 (see Venture Economics (2002)). Still, these numbers make the issue look much more drastic than it actually is. Referring back to Figure 8 it can be seen that even in times of severe crashes such as the downfall of the “new economy” from 2000 to 2002, venture capital investments have surpassed divestments and the portfolios have continued to grow. As stock markets are recovering, venture capital is expected to play an important role in the future. Especially for Germany in comparison to other countries, there still is significant growth potential for this market as the comparison in Figure 10 illustrates.

9 In this paper, market sizes and structures for the German-speaking area are given for Germany only, due to the availability of data. The Swiss venture capital market is very similar to the German venture capital market concerning its structure, its development and its size relative to the economy. Recent data for Switzerland is available in SECA (2003). Recent data for Austria is available in AVCO (2003). Also both countries are included in the European market overview by the EVCA (2003).
Still, given all this venture capital is a small market. The 33 billion Euros in fund volume in Germany look tiny compared to e.g. Deutsche Bank’s balance sheet of 918 billion Euros or its equity of 40 billion Euros (see Deutsche Bank (2002)).

2.3.2 Structure of Venture Capital Firms

Basically, capital owners wishing to diversify their investments in order to minimize unsystematic risk (see Markowitz (1952), pp. 77-91; Tobin (1958), pp. 65-86) could invest in small ventures directly. However this would limit the number of ventures they could invest in, and also there would be very high information costs due to the large number of relationships necessary. Therefore venture capitalists, organized as limited partnerships or as stock-companies, are used as intermediaries (see chapter 6). They improve the situation by pooling capital and enabling greater diversification as well as lower information costs.

A limited partnership structure is the prevailing structure in private venture capital firms. In the 80s and 90s, limited partnerships have come to account for 80% of the fund commitments (see Gompers/Lerner (1999), p. 8). Figure 11 presents the structure of a limited partnership.
The investors are called limited partners. There are several investors in a limited partnership and no single investor invests a clear majority of the fund. The limited partners are typically pension plans and life insurance companies but also endowments, banks, corporations and wealthy individuals (see Gompers/Lerner (1999), pp. 7-9). The importance of the groups of investors however, differs considerably between the United States and Germany: While in the US pension funds are the most important investors, in Germany banks and insurances are the most important. Figure 12 shows the investors in venture capital in both countries.

The role of the general partner is to manage the fund, i.e. to be involved in the strategic and operational tasks of the portfolio companies, to raise capital and exit investments (see chapter 2.3.3.a). In order to ensure continuity, most general partners are organized as partnerships themselves (see Smith/Smith (2000), pp. 502). The general partner invests about 1% of the fund’s investment capital, while the limited partners invest 99% of the capital (Smith/Smith (2000), pp. 501).
Compensation to the general partner consists of two parts (Smith/Smith (2000), pp. 502): (1) An annual “management fee” between 2 and 3% of the fund volume: Calculating the minimum annual expenses for a venture capital fund, and assuming that the fixed costs should be covered by the management fee (see Schroeder (1992), pp. 134) it can be derived that a minimum fund size of about 20 million Euros is necessary to pay the administrative costs from the management fee (see Silver (1985), pp. 18-21). The better the track record of the general partner, the higher the fees. (2) “Carried interest” of approximately 20% of the gain of the fund over the committed capital (see Gompers/Lerner (1999), pp. 57-58): This “carried interest” is supposed to create a strong performance incentive for the general partners. Anticipating the danger that general partners may use the management fee for perk consumption (see chapters 4.1.2.b, 6.3) investors wish to shift compensation from the management fee to the carried interest (see Schroeder (1992), p. 138). To protect investors, often hurdle rates of minimum value appreciation before the payment of carried interest starts are negotiated (see Schroeder (1992), p. 141).

Often limited partners use independent investment advisors called gatekeepers, who receive an additional annual fee of 1 to 2% per year. They manage the investors’ venture capital investments, i.e. they choose the best partnerships to invest in (see Bygrave/Timmons (1992), p. 12).

One of the main characteristics of the general partnership is its limited lifespan of typically 10 years, which can be prolonged if needed (see Bygrave/Timmons (1992), p. 13).

2.3.3 Activities of Venture Capital Firms

This chapter describes the venture capital business model and the accordingly necessary activities of venture capitalists. Then it examines what kind of portfolio companies venture capitalists are interested in.

2.3.3.a Venture Capital Business Model

The venture capital business model builds on the selection of young growth companies with a good risk-return profile, financing them with external equity or similar forms of capital and fostering them with management support before selling them at a higher valuation (see Schroeder (1992), pp. 39-43; Zemke (1995), pp. 102-103; Schefczyk (2000), pp. 34-46). The steps to be taken for this business are shown in Figure 13. They are acquisition of capital, generation of deal flow, screening and due diligence of potential portfolio firms, negotiation of deals, provision of monitoring and management support and finally harvesting of the created value.

After having prepared an investment strategy, the capital acquisition is the first step. The venture capitalist tries to collect money from potential investors. He has to convince the investors by clearly communicating his investment strategy (see Silver (1985), pp. 31-45; Schroeder (1992), pp. 122-125). When enough capital is available the fund is closed and the venture capitalist makes his first call of capital, i.e. investors actually pay a first share of the capital they have committed (see Smith/Smith (2000), pp. 502-503). The venture capitalist only calls on the committed capital when there are immediate attractive opportunities for investment thereby ensuring the best performance possible of the fund since there are no opportunity costs that need to be earned on capital that has not been called yet.

After that the venture capitalist starts to make portfolio investments, which typically lasts two or three years (see Smith/Smith (2000), p. 505). He tries to create deal flow; i.e. he actively seeks to find potential investees on the one hand, and he tries to promote the fund in order to attract entrepreneurs on the other hand (see Silver (1985), pp. 47-77).
The next step is the analysis of potential portfolio companies (see chapter 5.4.2). In this staged process, the ventures are first screened whether they fit in the strategy at all. If so they then are compared to a number of explicit and implicit criteria and finally a formal and costly due diligence is conducted (see Pichotta (1990), pp. 35-154; Elkart (1995), pp. 37-58). Venture capitalists seek to choose portfolio companies that provide a good ratio of return and risk by themselves as well as in a portfolio context, i.e. companies with lowly correlated returns (see Diamond (1984), pp. 400-404; Hartmann-Wendels (1987), pp. 27-28). In Germany ex ante expected minimum rates of return for investments are between 15-25% p.a. in order to compensate for market risk, return volatility, need for management support and limited fungibility (see Schroeder (1992), pp. 169-174; Schefczyk (2000), pp. 236-266). This again shows that for venture capital young growth companies and not just any young company are attractive investment targets; without significant growth, young companies would not be able to yield such returns. In addition to these purely financial measures other criteria are relevant. Empirically, in Germany the most important additional criteria are: Management ability, market potential, product differentiation, competitive position, business plan and time horizon (see e.g. Tyebjee/Bruno (1984), pp. 1054-1061; Fendel (1987), pp. 177-183; Zacharakis/Meyer (1998), pp. 68-74).

If both parties are then still interested in the deal, the conditions of the investment are negotiated before the investment is made. These contracts are very complex and include the choice concerning amount and form of finance, covenants, control rights and incentive structures (see Brettel/Thust/Witt (2001), pp. 18-26; chapter 5). Usually venture capitalists make additional capital calls during the investment period to bring in new investors and capital (see Smith/Smith (2000), p. 503).

After the investment has been made, the phase of value creation starts. In this phase the venture capitalist helps the entrepreneur by supporting him with his expertise. Also he monitors the portfolio company to ensure an efficient use of the funds provided (see Gorman/Sahlman (1989), pp. 224-227; Sapienza (1992), pp. 22-23; Schroeder (1992), pp. 232-250). There are three means for the venture capitalist to influence the entrepreneur (see Schefczyk (2000), pp. 41-43; chapter 5.2.1): (1) Being a member of the board with all the information and control rights, (2) management support in strategic questions as well as process support, and (3) operative work as a (shadow) manager in times of crises.
Monitoring and management support take up about 70% of an investment manager’s time (see Smith/Smith (2000), p. 510). However, the involvement with the portfolio companies is not always equally intense. In general, one can identify three groups: Close tracker, moderate, and laissez faire group (see MacMillan/Kulow/Khoylian (1988), pp. 39-41).

Venture capitalists seek to **exit** portfolio companies within approximately ten years after the first closing of the fund. One can classify exits into five groups: IPO, acquisition exit, secondary sale, buyback exit and write-off (see Cumming/MacIntosh (2000), pp. 2-3).

**Figure 14: Importance of Exit Channels in Germany (Number of Exits) 1999**

An **initial public offering** is usually the most profitable way to exit; however administrative costs and requirements for information disclosure are high (see Schmidt (1984b), pp. 297-308; Barry/Muscarella/Peavy/Vetsuypens (1990), pp. 447-471; Oettingen (1995), pp. 898-904). Particularly interesting for the venture is the possibility to raise significant amounts of new equity. The venture capitalist typically sells only a small fraction of his shares at the time of the IPO and sells most of them a couple of months later or after a lock-up period. An **acquisition exit** means selling the entire firm to a third party, who typically is an industrial buyer wishing to obtain synergies through the acquisition. The price will be related to the strategic use of the venture to the buyer and can therefore be very attractive for ventures that could only have limited success alone (see Schefczyk (2000), p. 45). In a **secondary sale** the buyer is a financial investor, who expects to increase the value of the company before exiting it later on. A **buyback exit** means that the venture capitalist sells his shares to the entrepreneur and/or to the company. Valuations however are rather unattractive because there is no new strategic potential for the company, and entrepreneurs often have trouble financing the transaction. Often buybacks take place as highly leveraged MBOs including other creditors. A **write-off** means that the company goes bankrupt and the venture capitalist loses his investment. While the secondary sale is relatively unimportant, the other alternatives are in terms of numbers of exits of similar importance as shown in Figure 14.

2.3.3.b Investment Behavior

Knowing the venture capitalists’ business model, one should have a closer look at their investment behavior. This section therefore connects the concept of the company life cycle introduced above (see chapter 2.1.1) with the financing stages used to characterize investments in the venture capital industry.
Equity capital can be provided to portfolio companies in any stage of their lifecycle (see e.g. Fischer (1987), pp. 12-14). An overview over the company lifecycle, the stages’ characteristics and the type of equity capital needed is given in Figure 15. This figure combines the company life cycle and the financing lifecycle in one model.

**Figure 15: Financing Stages and the Company Life Cycle**

<table>
<thead>
<tr>
<th>Financing Stage</th>
<th>Early Stage</th>
<th>Expansion Stage</th>
<th>Late Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed</td>
<td>Existence</td>
<td>Start-up</td>
<td>Bridge</td>
</tr>
<tr>
<td>Survival</td>
<td>Expansion</td>
<td>MBO/MBI</td>
<td></td>
</tr>
<tr>
<td>Success</td>
<td>Take off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td>Maturity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Company Stage**
- Product concept
- Market analysis
- Basic R&D
- Formal foundation
- Final product development
- Marketing concept
- Start of production
- Market introduction
- Growth
- Preparation of IPO or Trade sale
- Takeover by existing (MBO) or external (MBI) management

**Company’s Expected Profit/Loss**
- Existence
- Survival
- Success
- Take off
- Resource

**Typical Sources of Financing**
- Own capital
- Credit
- Public Funds
- Private Equity
- Venture Capital
- Stock Market

**Typical Management Challenges**
- Building expectations about business idea and market
- Being professional
- Gaining trust from investors
- Search for management and personnel
- Search for creditors
- Building market position and brand
- Increased competition
- Organizational issues
- Financial strength of management
- Dynamism of management team

**Source:** adapted from Schefczyk (2000), p. 37

In addition to the financing stages shown above, LBO’s, replacement capital and turnaround financing are uses for private equity, which cannot be clearly assigned to a certain development stage (see BVK (1999), p. 90; BVK (2000), p. 31). Here however, venture capital is seen as the part of private equity that deals with young growth companies (see chapter 2.3.1).

**Figure 16: Gross Investment in Germany with Respect to Stage 1999**

**Source:** see BVK (2001), p. 67

Financing these stages has become more and more important in relation to the later stages in Germany. While in 1990 only about 6% of the private equity was invested in the early stage, in 1999 it was about 33%. Approximately 68% of the invested amount in 1999 were early and expansion stage invest-
ments. Even 90% of the number of investments were early or expansion stage (see BVK (2001), pp. 59-67) as Figure 16 illustrates. That implies that the investments primarily aim at innovative, technology-intense and growing markets: about 58% of the total investments in 1999 went into industries that can be considered to be innovative (see BVK (2001), pp. 61-69).10

Knowing what venture capitalists do and where they invest, in a next step the relationships between the economic actors will be investigated.

2.3.4 Problems in the Relationships in the Venture Capital Environment

As discussed above, the financing relationship in the case of young growth companies is quite complex. Venture capital firms as specialized intermediaries are active in that market and make it difficult to classify the financial relationships in a simple way. However there are three big groups of actors that participate in the financing of young growth companies: the investors, the investees and intermediaries. Unfortunately, the classification of several acting institutions is rather ambiguous. Figure 17 provides an illustration of the financing relationship and the classifications.

Figure 17: Relationships in Financing Young Growth Companies

In the relationship “individual investors – pension funds – venture capitalists”, the venture capitalist can be seen as the investee, while in the relationship “pension funds – venture capitalists – young growth companies”, the venture capitalist clearly is an intermediary.

To put this into the context of financing young growth companies and in order to discuss the interests of the different parties in the relationship in a structured way, any party that invests in various asset classes shall be considered to be an investor. This group includes individuals, pension funds, investment funds, corporations, insurances, banks, and many more. The young growth companies shall be considered the investees. Finally the venture capitalists that acquire capital from many different investors and invest it solely in young growth companies shall be considered to be intermediaries.

These three main groups involved in financing young growth companies have different objectives.

**Investors** in general have three objectives: high returns, stability and liquidity (see Ruda (1988), pp. 95-101; Sullivan/Miller (1990), pp. 302-304).

1. Concerning the investment in young growth companies high returns are (hopefully) achieved through the positive development of the investees. In the case of equity finance/venture capital, capital gains are the means to realize these returns.

The small firm effect, i.e. that small firms outperform large firms on a risk-adjusted basis (see Banz (1981), pp. 3-18), is sometimes named as one of the reasons to invest in young growth companies. Also in more recent studies, firm size has been suggested as an important and systematic predictor of stock returns (see Fama/French (1992), pp. 427-465; Fama/French (1996), pp. 55-84). However, this may not be the whole story. It is also often argued this small firm effect takes place mainly in January, i.e. the January effect, (see e.g. Reinganum (1983), pp. 89-104) and it may be due to tax loss selling at investor level and therefore it does not apply to the environment of difficult to withdraw financing for young growth compa-

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10 For this analysis, the industries reported have been divided into two clusters. Innovative: Computer software, communication, biotechnology, trade, computer hardware/semiconductors, electronics, medical, financial services. Non-innovative: Mechanical engineering, consumer goods, others.
nies. Also the January effect has been much less pronounced in other countries than the United States and both effects seems to have significantly lost their strength in the last two decades (see Schmid (2003), pp. 379-383). Just as troubling as these arguments are a number of approaches that reason that the size effect is only due to incorrect measurement of betas (see e.g. Roll (1981), pp. 879-888), consider the use of the CAPM as incorrect valuation model (see e.g. Chan/Chen/Hsieh (1985), pp. 451-471) or emphasize transaction costs in small firm investments (see e.g. Roll (1983), pp. 371-386; Amihud/Mendelson (1986), pp. 223-250). Therefore one should be careful when using the small firm effect as a reason for investments in young growth companies.

(2) Stability is served through diversification (see Markowitz (1952), pp. 77-91; Tobin (1958), pp. 65-86). In the context of an existing portfolio of other asset classes, investments in young growth companies are attractive for diversification, because of the further reduction of unsystematic risk. Additionally there clearly are also diversification effects between investments in young growth companies; especially if they are from different industries. Still, compared to other asset classes, i.e. international stocks, the diversification potential between young growth companies is limited.

(3) Liquidity is very hard to be achieved. Typically due to informational problems (see chapter 4), stakes in young growth companies are very hard to sell. It can only be achieved through the use of special intermediaries, i.e. venture capital firms (see chapter 6) that are quoted on the stock market (see Schefczyk (2000), p. 28).

For some investor groups such as banks (see e.g. Schmidtke (1985), pp. 107-109; Stedler (1993), pp. 348-349) or corporations (see e.g. Schween (1996), pp. 78-88; Winters/Murfin (1988), pp. 211-214) there may be additional intentions such as the anticipation of a future banking relationship or access to new technologies; however these will only truly be served if the investor can actively influence the investment decision. This influence is given when these institutions invest directly in young growth companies. If there is a true intermediary between the investor and the investee, i.e. an intermediary that serves many different investors, this influence can be considered negligible. As will be shown below (see chapter 6.4), the use of venture capitalists as intermediary makes sense when financing young growth companies; therefore these additional objectives of investors are of minor importance.

Hence it is clear that investors, who invest in young growth companies, emphasize the return objective and to some extent the stability objective since there are many other alternatives that can better serve the need for liquidity.

**Investees**, i.e. young growth companies, have certain basic needs. Their two main requirements are the reduction of financial constraints as well as the reduction of personnel and organizational problems (see e.g. Klemm (1988), pp. 71-76) at conditions as favorable as possible for them (see e.g. Suechting (1995), pp. 527-543). While reducing the financial problems will lift investment constraints and lower the risk of bankruptcy, the reduction of personnel and organizational problems, which are often caused by a too strong focus of young firms on the founder (see chapter 5.7; Schulz (2000), pp. 188-206), can enhance the chances for market success (see Albach/Bock/Warnke (1985), pp. 412-415).

However, in reality the transaction is not executed with the young growth company but with an entrepreneur-owner. This entrepreneur-owner will want to maximize his personal utility independent of the needs of the young growth company. This difference is significant but not quite as dramatic as it may look at first sight. The entrepreneur’s fate is usually closely related to the fate of his company; therefore his financial future causes him to act not completely against his firm. Also social aspects of his utility maximization, such as independence or status (see e.g. Douglas/Shepherd (2000), pp. 231-251; Dahlqvist/
Davidsson (2000), pp. 46-54; Krueger/Reilly/Carsrud (2000), pp. 411-432) are important aspects and restrict the entrepreneur in acting against the success of his firm. As a consequence it makes sense to believe the entrepreneur to support his company to a certain extent, but at the same time to maximize his utility with e.g. the (limited) consumption of non-pecuniary benefits or the excessive growth of the firm (see chapter 4).

Some operative requirements for the entrepreneur (see Arnold (1989), pp. 207-217, 271-277) are, that the entrepreneur… (1) …holds the majority and controls the company. This is possible as long as not too much finance is asked for. (2) …gets long-term financing. This is either ensured by an equity investment or by debt, that is long-term or can be rolled over. (3) …can avoid fixed claims. This is one of the key characteristics of equity finance.

The young growth companies are controlled by utility-maximizing entrepreneurs, whose interests are not the same as the investors’. While the conflict is obvious when it comes to splitting the pie (the returns), it may not even be in the entrepreneurs’ interest to maximize the pie, since they may have other benefits as well.

**Intermediaries**, i.e. venture capital firms, have derived and innate objectives. Derived objectives are the fulfillment of the investors’ objectives, given the requirements of the investees. In addition there are three innate objectives (see Schefczyk (2000), pp. 31-32): (1) Market objectives concerning the acquisition of capital from investors, usually done through marketing (see Schroeder (1992), pp. 122-125; Zemke (1995), pp. 81-88), (2) efficiency objectives concerning the operation of the venture capital firm, and (3) compensation objectives concerning the venture capital firm’s performance, i.e. the maximization of management fee and carried interest (see chapter 2.3.2).

While it is all parties’ interest that the intermediary works efficiently, again the splitting of the pie, i.e. the conditions of capital acquisition and capital provision is a major and obvious problem. Again, it is not necessarily in the venture capitalists’ interest to maximize the pie; this depends on their other benefits and the design of their remuneration.

It is obvious that there are tensions between the interests of the investors, the intermediaries and the investees. These tensions become even worse when taking the need of the different groups to invest effort into account. These conflicts of interest are further examined in the next chapters.

In a first step, chapter 3 introduces the basic methods that can be used for the analysis of financial relationship. Given this, chapter 4 analyzes the basic relational problems between external equity capital investors and their investees. It is important to realize that in a first step, the intermediary is taken out of the analysis as shown in Figure 18 in order to illustrate the basic problems of debt and equity finance for young growth companies in a simple form.

**Figure 18: Preliminary Simplified View of the Financing Relationships**

Possible solutions and mitigations to these problems are discussed in chapter 5. Only then chapter 6 considers additional positive and negative effects caused by the intermediary role of venture capitalists.
3 Economic Methods for the Analysis of Financial Relationships

Financial relationships can be analyzed with several theoretical approaches that view things from different angles, with a different focus, use different assumptions and therefore sometimes come to different conclusions. This chapter gives an overview over the different “toolkits” that are available. Starting from the neoclassic financial theory, the theory of the firm is introduced, taking deviations from the ideal of perfect capital markets into account. Here the property rights theory, the agency theory, the transaction cost approach and the theory of contracts will be outlined. Table 5 shows an overview over the different perspectives.

Using this analysis, the agency theory as outlined below is chosen to analyze the financing relationship between investor and investee in chapters 4 and 5 as well as the relationship between investor, venture capitalist as intermediary, and investee in chapter 6.
Table 5: Overview of economic perspectives of capital markets

<table>
<thead>
<tr>
<th>Theoretical perspective</th>
<th>Main thesis</th>
<th>Scientific status</th>
<th>Practical relevance</th>
<th>Important papers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Neoclassic Financial Theory</strong></td>
<td>Irrelevancy of financing decisions concerning firm value.</td>
<td>Starting point for further theories.</td>
<td>None.</td>
<td>Modigliani/Miller (1958)</td>
</tr>
<tr>
<td></td>
<td>Independence of investment decisions from consumption, saving and insurance decisions.</td>
<td>Assumptions are completely rejected.</td>
<td></td>
<td>Hamada (1969)</td>
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<td></td>
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<td></td>
<td>Stiglitz (1974)</td>
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<tr>
<td><strong>Property Rights Theory</strong></td>
<td>Goods are connected to bundles of rights.</td>
<td>Important basis for other approaches of the economics of institutions and information, i.e. agency theory and asymmetric information distribution.</td>
<td>Innovation-friendly organizational design.</td>
<td>Demsetz (1967)</td>
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<td></td>
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<td>Cheung (1970)</td>
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<td>Alchian/Demsetz (1973)</td>
</tr>
<tr>
<td><strong>Agency Theory</strong></td>
<td>Independent utility maximization of principal and agent causes conflicts and agency costs.</td>
<td>Highly relevant aspects of long-term thinking and altruistic actions are not considered.</td>
<td>Design of delegation contracts.</td>
<td>Rossi (1973)</td>
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<td></td>
<td>Monitoring and bonding reduce agency costs.</td>
<td></td>
<td></td>
<td>Jensen/Meckling (1976)</td>
</tr>
<tr>
<td><strong>Asymmetric Information Distribution</strong></td>
<td>On markets with asymmetric information average properties are the basis for valuation.</td>
<td>Individual approaches are not yet put together to a consistent theory.</td>
<td>Information provision.</td>
<td>Akerlof (1970)</td>
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<td>Leland/Pyle (1977)</td>
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<td>Campbell/Kracaw (1980)</td>
</tr>
<tr>
<td><strong>Transaction Cost Approach</strong></td>
<td>Transaction costs make financing relationships more expensive and reduce the probability of contracts.</td>
<td>Low degree of specification for financial intermediaries.</td>
<td>Clarification of the relevancy of transaction costs.</td>
<td>Coase (1960)</td>
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<td></td>
<td></td>
<td>Transaction costs hardly measurable.</td>
<td></td>
<td>Benston/Smith (1976)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Williamson (1985)</td>
</tr>
<tr>
<td><strong>Contract Theory</strong></td>
<td>Real contracts usually are incomplete.</td>
<td>Low degree of specification for financial intermediaries.</td>
<td>Clarification of the relevancy of renegotiation and monitoring.</td>
<td>Harris/Raviv (1979)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Renegotiation costs hardly measurable.</td>
<td></td>
<td>Hart/Moore (1988)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Innes (1990)</td>
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</tbody>
</table>

Source: see Schefczyk (2000), p. 102

3.1 Neoclassic Financial Theory

The neoclassic financial theory’s results concerning investments, financing structure and firm value are based on three statements and results:

- The Fisher separation theorem states the independence of investment decisions under certainty from preference-based decisions on consumption, saving and insurance (see Fisher (1930)).
- The maximization of market value is the main objective for company owners.
- The portfolio-selection model splits the investment decision under risk (see Knight (1921), pp. 19-20, 197-232; Bamberg/Coenenberg (1996), p. 17) in two steps: After having chosen a market portfolio of risky assets that is identical for all investors, this market portfolio is then mixed with a riskless asset according to individual risk attitudes (see Markowitz (1952), pp. 77-91; Tobin (1958), pp. 65-86).

These points imply that investors agree on the advantageousness of investment projects and management and investment decisions can be delegated without having to accept utility reductions; all profitable projects are realized independent of the entrepreneurs’ preferences, their risk attitudes, the external financ-
ing, and the investors’ preferences (see Schulz (2000), pp. 19-21). Going even further, the neoclassic financial theory shows that financing decisions, such as dividend policy, capital structure, debt maturity and others, are irrelevant for a company’s market value (see Modigliani/Miller (1958), pp. 261-297; Stiglitz (1974), pp. 851-866). However, financing decisions can lead to welfare shifts between stockholders and bondholders (see e.g. Fama (1978), pp. 282-284).

This allows the separate consideration of financing and investment decisions, which of course implies that profitable projects have a positive value and therefore all are realized, independent of what type of financing they find. The financing of young growth companies should therefore not pose any exceptional problems worth mentioning.

Most of these results are based on arbitrage-type arguments (see e.g. Wilhelm (1985), pp. 40-59). That requires four restrictive assumptions (see Fama (1978), pp. 273-274): (1) perfect capital market, (2) free market access to anyone, (3) identical information levels and homogeneous expectations, and (4) predictable investment strategy according to accepted rules independent of financing decisions.

The now following analysis focuses on showing that the irrelevancy of financing, which includes the statement of the realization of all profitable projects, does not comply with reality. There is a number of arguments for the relevancy of financing decisions (see e.g. Myers (1984), pp. 575-592; Myers/Majluf (1984), pp. 187-221).

It has been shown empirically that capital markets do not process information efficiently (see e.g. Moeller (1985), pp. 500-518); results support weak-form informational efficiency and partially support semi-strong-form efficiency (see e.g. Moeller (1985), pp. 502-504; Fama (1991), pp. 383-417). That implies that there is room for financing decisions to influence a company’s market value. In addition to that, preferential taxation of interest payments in comparison to dividends leads to a significant effect of financing decisions on company value (see Gerke et al. (1995), pp. 68-92). Also insolvency costs speak against the irrelevancy (see e.g. Warner (1977), pp. 337-347; Cutler/Summers (1988), pp. 157-172): In the case of insolvency significant costs arise, direct costs from courts or lawyers, as well as indirect costs from slow decision making and liquidity constraints. These indirect costs often already arise before actual bankruptcy, as tensions between shareholders and bondholders (see Gordon (1971), pp. 347-356; Myers (1977), pp. 147-175) become stronger. Since the risk of insolvency rises with the liabilities due to the fixed claims’ cash flow requirements, this contradicts the irrelevancy of financing decisions.

Empirically, it can be shown that companies owning a lot of immaterial property and aiming for strong growth, as it is typically the case for young growth companies, aim at high equity ratios (see Bradley/Jarrell/Kim (1984), pp. 869-876; Kester (1986), pp. 5-16). The reasons for this are (1) the risk of insolvency, these companies would be hit especially hard by the indirect costs, and (2) the need to be financially flexible in order to invest into attractive opportunities.

The neoclassic financial theory clearly doesn’t reflect the economic reality and the significant deviations from perfect capital markets, especially in terms of information distribution, information efficiency, costliness of transactions and insolvency, require new perspectives to explain financial relationships.

3.2 Theory of the firm

The theory of the firm takes on the criticism against the neoclassic financial theory and deviates from perfect capital markets in terms of information distribution and costly transactions. Economic institutions are seen as “nexus for a set of contracting relationships among individuals” (Jensen/Meckling (1976), p. 310).
The approach of methodological individualism considers economic actors as individuals with their own characteristics and goals (see Heitzer (2000), p. 125), which are not necessarily compatible with the goals of the organization (see Richter/Furubotn (1996), p. 3). The theory of the firm can be subdivided into four approaches (see Picot/Reichwald/Wigand (1996), pp. 38-56), the basic ideas of which are summarized in this chapter: (1) Property rights theory, (2) agency theory and asymmetric information distribution, (3) transaction cost approach, and (4) contract theory.

3.2.1 Property Rights Theory

Property rights theory stands for a group of concepts concerned with legal and institutional thinking that can be applied to finance in a sense that every financing transaction can be seen as a transition of property rights.11 In this situation investors give away their property and receive in return a number of rights and duties (see Schulz (2000), p. 5).

Property rights are rights based on conventions, traditions, laws or contracts that are accepted by society. They are closely connected to goods and allow restrictions of action that enable individuals to overcome the scarcity of goods (see Demsetz (1967), p. 347; Alchian/Demsetz (1973), p. 16). These bundles of rights can be divided into four individual rights (see Picot/Reichwald/Wigand (1996), p. 39): (1) right of usage, (2) right of modification, (3) right of return from usage and (4) right of sale of a good.

This modifies the neoclassic thinking in three major ways (see Schefczyk (2000), p. 110): (1) The assumption of perfect information is replaced by the assumption of costly preparation, execution and monitoring of contracts. (2) The simple ownership of goods is replaced by the more complex property rights. (3) The analysis is based on individuals’ actions, rationally maximizing their own utility.

This makes it possible to compare alternative constellation of property rights. Inefficiencies arise due to transaction costs when property rights are created, assigned, transferred and executed (see Tietzel (1981), p. 211) or due to external effects and problems with exercising rights when property rights are distributed on several institutions (see Picot/Reichwald/Wigand (1996), p. 39). Transaction costs and, in the case of the delegation of property rights, agency costs arise (see chapters 3.2.2 and 3.2.3).

The property rights theory is sometimes seen as the basis for agency theory, transaction cost approach and theory of contracts (see Schmidt (1988), pp. 250-251); sometimes it is seen as independent branch of institution economics (see Perridon/Steiner (2002), pp. 527-529). Here it introduces a basis for deviations from the strong assumptions of the neoclassic theory of finance.

3.2.2 Agency Theory and Asymmetric Information Distribution

The agency theory is concerned with incentive and monitoring problems in cases with asymmetric information.12 It considers problems in which property rights are delegated. The party that delegates is called principal; the delegated to party is called agent. In the context of financing transactions, the investor is typically considered to be the principal and the investee takes on the agent’s role.

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Assuming an independent maximization of their respective utilities, the agent, who is closer to the operative business and therefore better informed, will use this superior information to maximize his own utility often leaving the principal worse off than he optimally could be. This is called opportunistic behavior, i.e. the agent passes over obligations due to contracts, laws or moral standards if he cannot be sufficiently sanctioned (see Franke/Hax (1999), p. 412). The principal will react by anticipating the agent’s opportunities to deviate and by adjusting his claims accordingly (see Kürsten (1999), p. 9). Doing this, the crucial question is not whether the agent actually behaves opportunistically but whether he could possibly do it. The agency theory searches for relationship designs that align the parties’ interests as well as possible.

The split of risks in exogenous risks and behavioral risks can clarify the agency-theoretic approach (see Spremann (1990), pp. 564-565). Exogenous risks are risks present for both partners. They are included into the economic actors’ thinking using the concept of expected utility; the Bernoulli-principle evaluates alternatives according to the state probabilities and the state utilities of all possible future states. It reflects the fact that risk attitudes play an important role in evaluating situations (see e.g. Erlei/Leschke/Sauerland (1999), p. 110; Bamberg/Coenenberg (1996), p. 85). Concerning valuation exogenous risks are reflected by the CAPM (see Sharpe (1964), pp. 425-442; Lintner (1965), pp. 13-37; Mossin (1966), pp. 768-783). Behavioral risks describe the fact that a project’s cash flows are influenced by the agent’s behavior. These behavioral risks for the investor concerning the agent’s characteristics and actions, will lead to the anticipation of potential opportunistic behavior when considering the value of a project.

The agency theory deviates from the neoclassic financial theory by assuming (1) information asymmetries, not homogeneous expectations and (2) information and control costs due to information asymmetries (see Schefczyk (2000), p. 113). These are realistic because information transformation and transmission are in fact costly, and companies anticipate profiting from their superior information, which they therefore control tightly (see chapter 5.7).

Agency problems can be classified in three big categories (see Spremann (1990), pp. 565-572):

- **Moral Hazard** describes situations, in which the agent (a) uses information not observable by the principal (hidden information) or (b) performs actions not observable by the principal (hidden action) in order to increase his own utility against the principal’s best interest (see e.g. Demougin/Jost (2001), 46-67; Jost (2001), pp. 25-27; chapter 4.1). The investor/principal can observe the final company success but he cannot observe the agent’s behavior, infer it from the outcome due to random influences, or prove it to third parties, e.g. courts (see e.g. Kreps (1994), pp. 524-525).

- **Holdup** describes situations in which the agent systematically uses gaps in incomplete contracts, in which not every future state is specified, in his favor (see Goldberg (1976), pp. 439-441). After the closing of the contract and after specific investments have been made and sunk costs have been incurred by the principal, the agent reveals his previously hidden intentions openly interpreting the fulfillment of his commitments in his favor and forcing the principal into renegotiations (see e.g. Spremann (1990), pp. 568-570; chapter 4.2).

- **Adverse Selection** is a problem that appears in markets where one party cannot discriminate between good and bad quality of the other party, i.e. the other party has hidden characteristics (see Akerlof (1970), pp. 490-492; Leland/Pyle (1977), pp. 371-372; Chan/Leland (1982), pp. 499-511). The orientation of the price at an average quality can induce good quality suppliers to leave the market and can ultimately cause a market breakdown. Even though this is not clearly a hierarchical relationship it is often summarized as an agency problem. The company seeking invest-
ment has an information advantage and is seen as the agent, the investor is seen as principal (see chapter 4.3).

Often costly state verification, i.e. the fact that principals have to pay high fees to be able to verify the final result, is named as an additional problem of asymmetric information (see Hartmann-Wendels/Pfingsten/Weber (1998), pp. 98-99). However this problem is not at the same level as the three main problems; it is a problem that is mainly relevant in the final stage of moral hazard situations. In this paper it is addressed in chapter 5.1.4.

The reduction of the asymmetry in the information distribution and the design of mechanisms that incentivize the agent to act in the principal’s interest are the major tools that can reduce agency costs (see chapter 5; Franke/Hax (1999), p. 413).

These problems are particularly relevant in the highly uncertain environment of financing young growth companies. Considering venture capital as an intermediary between investors and investees the agency problems become even more relevant, being a key to the explanation of the intermediary’s existence and occurring in a two-step scenario on both levels – between investor and venture capitalist as well as between venture capitalist and portfolio company.

A problem of the agency theory is the assumption of a short-term utility maximizing agent, leaving long-term thinking and altruistic actions aside. Criticism in that direction aims at incorrect modeling, because important aspects are left out; it should not be seen as fundamental criticism of the approach. One such aspect are potential sanctions for opportunistic behavior by the cultural and social environment (see Erlei/Leschke/Sauerland (1999), pp. 25-26, 539-542), which seem to be particularly strong for entrepreneurs in Germany, since “the German society does not excuse for bankruptcies and failures of firms, neither socially nor legally” (Evans (1998), p. 229).

Another problem is, that for the adverse selection problem per assumption investors and potential investees need alternatives to entering a relationship. Both assumptions are not truly fulfilled in markets for venture capital, where both sides are restricted. Investors are restricted due to their high degree of specialization if the venture capitalist is seen as investor in this case (see Schefczyk (2000), p.124). Entrepreneurs are restricted in their choice due to the impossibility to get debt finance and the negative cash flows (see chapter 2.2).

The basic agency problems are described in more detail in chapter 4. Possible solutions and how to deal with them in investor-investee relationships will be looked into in chapter 5. Chapter 6 then acknowledges venture capital as intermediary and investigates the effects on the then two-step agency relationship investor-venture capitalist and venture capitalist-investee.

3.2.3 Transaction Cost Approach

Transaction costs are the costs of “information and communication for the preparation, negotiation, execution, control and adaptation of an exchange of property rights” (see Picot/Reichwald/Wigand (1996), p. 41).13 The transaction cost approach does not aim at motivational problems or conflicts of interest as the agency theory; it tries to explain the existence of firms and their structure (see e.g. Williamson (1985), pp. 35-41).

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Transaction costs obviously contradict the neoclassic financial theory since there, perfect capital markets without transaction costs are assumed. Financing transactions are accompanied by a number of transaction costs, such as search costs for transaction partners, information costs and costs for negotiation and execution of contracts. These costs make financial relationships more costly and they lower the probability of successful transactions.

Financial intermediation, e.g. by venture capitalists, prolongs the chain between investors and investees causing c.p. additional transaction costs (see Hellwig (1991), p. 42). Therefore an intermediary’s advantages have to overcompensate these disadvantages in transaction costs (see chapter 6).

3.2.4 Contract Theory

Contract theory is a more general way of looking at contracts than the transaction cost approach since it takes more aspects than just the costs into consideration. A contract in this context is “every binding implicit or explicit agreement concerning the exchange of goods or services between people, who consent to it, because they hope to improve their situation” (Wolff (1994), p. 42). Particularly interesting are incomplete contracts, in which not every possible state of the future is covered. Equity financing contracts can be seen as neoclassic contracts that concern a longer period of time or/and as relational contracts that are made to last (see Picot/Reichwald/Wigand (1996), pp. 52-53).

Such incomplete contracts require intense monitoring and constant renegotiation in order to ensure compliance and to fill in gaps (see Chung (1991), pp. 1033-1041). It has to be ensured that the renegotiation process works smoothly by beforehand specifying solutions for the case of (1) failed negotiations and (2) the concentration of negotiation power at one party (see Hermalin/Katz (1991), pp. 1735-1753).

Therefore incomplete contracts can be seen as agency-problem with a focus on mid-term and long-term aspects (see Schefczyk (2000), pp. 127-128). This yields additional insights on how to manage agents (see Hart/Holstroem (1987), pp. 128-148; Hart (1995), pp. 18-21): (1) In repetitive principal-agent-situations due to further transactions, the interest in continued partnership can outweigh short-term thinking. (2) The inclusion of reputation emphasizes this aspect. (3) Competition between several agents mitigates principal-agent-problems. Staged financing and reputation effects reflect this in the reality of venture capital (see chapter 5.5).

3.3 A Clarification of Agency Costs

The term “agency costs” has been used above once before. In accordance with the classic definition of Jensen and Meckling (1976, pp. 308-309), agency costs have been defined as the sum of 1) monitoring costs, 2) bonding costs, and the 3) residual loss, i.e. welfare reductions due to misallocation caused by the agency problem. Monitoring and bonding costs are due to the reduction of behavioral uncertainty while the residual loss shows that the imperfections lead to the abandonment of otherwise welfare-increasing transactions (see Picot/Reichwald/Wigand (1996), p. 56). This definition is appropriate for the hidden action model but it falls short of being a concept that can be applied in an integrated view of the problems and solutions. In this integrated view, agency costs are meant to be the costs that occur due to asymmetric information.

Thinking about what this means in a broader sense, one gets to the conclusion that the concept of agency costs is meant to include 1) the costs of mitigation of the problems (such as monitoring costs and bonding costs) as well as 2) the welfare loss due to the remaining misallocation, which is inefficient to be prevented because costs for that would be too high. For example when discussing the problem of hidden characteristics, agency costs should refer to the costs of signaling and screening as well as the welfare loss due to inefficient project choice. Hence, in short agency costs are the difference between the first best solution under symmetric information and the second best under asymmetric information (see e.g. Hartmann-Wendels/Pfingsten/Weber (1998), p. 99; Amaro de Matos (2001), p. 61).

Agency costs are the criterion that allows comparisons between models of delegation. This allows the use of the theory of the firm for the explanation (positive analysis) and the design (normative analysis) of financial relationships (see Elschen (1991), p. 1006). An important problem is the difficulty involved with measuring these agency costs. The costs of prevention, such as monitoring costs or costs of signaling can usually be measured, but the residual loss is a hard to quantify dimension. Using the difference in welfare between the first-best and the second-best situation is also hard to apply since welfare is a hard to measure, abstract concept. However, there is a way around this measurement of welfare: The participants in a transaction can be asked how much they would be willing to pay for a situation with symmetric information (see e.g. Spremann (1989), pp. 22-26). Summing up these amounts should give a good estimate of the agency costs.

Another important question is which party has to incur these agency costs. The conjecture that the worse informed party has to incur the costs is not correct (see Hartmann-Wendels/Pfingsten/Weber (1998), p. 97). It is often stated that the cost of the opportunistic behavior is fully carried by the agent (see e.g. Kuersten (1999), pp. 8-9). The reasoning for this is, that rational investors anticipate the behavioral problems and the agency costs. They therefore adjust their claims in order to still reach breakeven and hence, the agents have to carry the agency costs. However this is only true if negotiating power is fully on the agent’s side as it is the case if a competitive capital market exists. Many models assume this since it allows to hold the capital market’s expected utility constant at breakeven. Using this as a restriction they maximize the agent’s utility, through the choice of his action (see e.g. Ross (1973), pp. 134-139; Holstroem (1979), pp. 75-80; Franke/Hax (1999), pp. 416-417). If both parties have some negotiating power, i.e. they split profits in a way that both parties get a share of profits greater than zero, they share the agency costs. Therefore both parties are interested in finding a second-best solution for their transaction in order to minimize the agency costs they have to incur given the situation of asymmetric information.

Transaction costs describe the costs that are generally involved with a certain transaction. As mentioned in chapter 3.2.3, transaction costs exist under symmetric information as well as under asymmetric information. The part that exists under symmetric information can be termed as pure transaction costs while the part caused by the asymmetric information is called agency costs as described above. Therefore, transaction costs are the sum of pure transaction costs under symmetric information plus agency costs.

Empirically the relevancy of agency costs and transaction costs is hard to show since observable costs cannot be split into an agency-caused part and a not agency-caused part. However, it can be established that managers behave differently given different capital structures. There is a large body of empirical literature investigating these points such as the study by Drobetz/Fix (2003) for the Swiss case.
3.4 Inference from the Methods

Summarizing, there are many criticisms concerning the relevance of the theory of the firm for financing relationships of young growth companies (see Schefczyk (2000), pp. 129-130). Particularly important seems the notion that these approaches assume extremely inefficient and imperfect situations. Reality may often be more positive than that. Still, the approaches remain highly relevant. The property rights theory as a basis underlies all further reflections. In the next chapters the focus of the analysis lies on the agency theory and asymmetric information distribution allowing the most specific conclusions concerning financial relationships. After a more detailed discussion of the agency problems and their applications to an equity investor-investee relationship in chapter 4, solutions and mitigations are discussed in chapter 5. There, also the contract theory will be addressed, discussing the effects of competition and reputation. In chapter 6 a two-step agency setup investor – venture capitalist – investee will be considered. Then, also the transaction cost theory will be applied when discussing the role of venture capitalists as financial intermediaries.

4 Agency Problems Related to Equity Capital for Young Growth Companies

This chapter focuses on an agency-theoretic analysis of the relationship between principal-investor and agent-investee, the investee being a young growth company. Financing relationships are incomplete and relational contracts. They are characterized by a strong informational asymmetry (see Schmidt/Terberger (1997), p. 69) since the principal often cannot observe the agent’s actions, and the agent who is closer to the market will better be able to assess environmental influences. In consequence the investee can act opportunistically. In general there are three major types of behavioral uncertainty: (1) moral hazard, (2) holdup and (3) adverse selection (see Spremann (1990), pp. 565-572; chapter 3.2.2).

For the following analysis it is unrealistic to aim at discussing the whole field of agency-theoretic approaches due to their numerous existence (see chapter 3.2.2, footnote 12). Here the most important problems and mechanisms relevant to equity finance of young growth companies are presented (see Harris/Raviv (1991), pp. 297-355; Spremann (1996); Schmidt/Terberger (1997)). Even though a lot of the literature is strongly mathematically oriented – sometimes not the solution to economic problems but the possibility of the application of a model seems to be central to the analysis (see Kuersten (1994), p. 3) – here a more intuitive framework is chosen. The basic problems are explained with relatively simple models. The mitigations in chapter 5 are explained mainly verbally. This allows a good balance between analytical foundation and practical relevance and applicability.

The basic agency problems are described in detail in chapters 4.1 to 4.3. Their implications on the financing of young growth companies are discussed in chapter 4.4. Taking this analysis as a basis for further thoughts, possible solutions and mitigations for these agency problems are presented in chapter 5.

4.1 Moral Hazard

Before presenting the different forms of moral hazard that exist, a classic example serves well to demonstrate the basic workings of moral hazard and agency cost.
The many models that exist concerning the phenomenon of moral hazard focus on different forms of moral hazard: Perk Consumption, unprofitable but interesting project choices, reduction of effort, underinvestment or risk shift in the case of debt financing (see chapter 4.1.2).

4.1.1 A Basic Model of Moral Hazard with Outside Equity Investors

One of the classic examples of diverging interests of principal and agent was originally presented by Jensen and Meckling (see Jensen/Meckling (1976), pp. 312-333; Gerke (1995), pp. 19-23; Erlei/Leschke/Sauerland (1999), pp. 76-85). This example is well-suited for the introduction of the basic workings of moral hazard and the according mitigations. It describes the situation of an outside equity investor, who invests in a young growth company with an entrepreneur who manages the firm, owns a significant share of the firm and has his own interests such as e.g. the striving for status (see e.g. Douglas/Shepherd (2000), pp. 231-251; Dahlqvist/Davidsson (2000), pp. 46-54; Krueger/Reilly/Carsrud (2000), pp. 411-432). While an equity investor is interested in maximizing firm value, the manager who owns part of the company is interested in a mix of increasing firm value (investor role) and non-pecuniary benefits (manager role), i.e. perk consumption (lavish office furniture or company cars) or doing business with friends at preferred conditions.

Figure 19 shows the value of the firm $Y$ dependent on the consumption of non-pecuniary benefits $c$ for the case of a manager who owns the whole firm.

**Figure 19: Trade-off for an Owner-Manager**

![Graph showing the trade-off for an owner-manager](image)

Source: adapted from Jensen/Meckling (1976), p. 316

In this case the consumption of non-pecuniary benefits and the reduction in value set each other perfectly off, leading to a substitution line with a slope of $-1$. This substitution line shows all possible combinations of firm value $Y$ and non-pecuniary benefits $c$.\(^\text{15}\) The manager-owner maximizes his utility; $Y$ as well as $c$ are components of a convex utility function of the economic actor, i.e. a positive but decreasing marginal utility for both components and an increasing rate of substitution are assumed. The manager-owner will consume $c_0$ in non-pecuniary benefits, which equals the caused loss in company value com-

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\(^{15}\) This analysis focuses on certain values. Random variables and expected values can replace these without changes in results (see Schulz (2000), p. 41). When visualizing possible solutions and mitigations in chapter 5 however, uncertainty in the development of firm value has to be introduced.
pared to the maximum possible value $Y\ (c_0 = Y - Y_0)$, because the combination $K_0$ results from the substitution line and the owner-manager’s utility function, i.e. $K_0$ is at the tangency point between the substitution line and the indifference curve. This yields the level of utility $U_0$. Consumption $c_0$ is relatively small and can be caused by a number of reasons, e.g. personal interest in unprofitable projects, status thinking, consumption on the job (perk consumption), or taxation.

If external investors invest equity and own the company share $\gamma$, the share of equity of the manager is reduced to $(1 - \gamma)$. If the external investors believed in a constant consumption in any case, they would be willing to pay $\gamma * Y_0$ for these shares. The substitution line would then still go through $K_0$. For the manager and his decision, the substitution ratio changes in favor of consumption. While only benefitting with share $(1 - \gamma)$ from the firm value, he fully benefits from the non-pecuniary benefits. That lowers his subjective substitution line’s slope to $-(1 - \gamma)$ as shown in Figure 20. The lower share of equity leads to an increased incentive for the consumption of non-pecuniary benefits. In this situation the manager profits from the non-pecuniary benefits while firm value stays high. The entrepreneur’s utility is increased clearly to the disadvantage of the outside equity investor who would still pay the high price based on the low consumption by the manager.

**Figure 20: Trade-off with Naïve External Investors**

![Diagram showing trade-off with naive external investors](source: adapted from Jensen/Meckling (1976), p. 316)

Investors would incur a loss. However, this valuation of the firm would be naïve; rational outside investors anticipate this consumption incentive for the manager and they reduce the price they are willing to pay for the shares accordingly. For them the original substitution line for the firm value stays relevant. At the high level of consumption of non-pecuniary benefit $c_1$, they will only pay $\gamma * Y_{1b}$. This significantly reduces the manager’s utility. However, this cannot be an equilibrium either, since the manager’s indifference curve crosses the subjective substitution line as illustrated in Figure 21; there are combinations in which the entrepreneur could reach a higher utility.

In order to find a stable equilibrium the maximization rationale of both parties has to be integrated. The manager maximizes his utility after the financing process. His maximization depends on the substitution line that is determined by the slope $-(1 - \gamma)$ and the price paid by the investors. In an iterative process investors can assume different consumption levels, determine their valuation on that basis and they can find an equilibrium when the tangency point of the subjective substitution line and the manager’s indiffer-
ence curve lies on the original substitution line (see Jensen/Meckling (1976), pp. 318-319). No one has an incentive to deviate from this situation: The expected company value equals the realized company value, and the manager achieves his maximum utility possible at the valuation. $K_2$ in Figure 22 illustrates this point.

**Figure 21: Instability of the Situation with Naïve External Investors**

Source: adapted from Jensen/Meckling (1976), p. 316

**Figure 22: Trade-off in Equilibrium with Rational External Investors**

Source: adapted from Jensen/Meckling (1976), p. 316

The company value $Y_2$ is clearly higher than in $K_{1b}$, while the consumption of non-pecuniary benefits $c_2$ is clearly lower. Still the manager achieves a higher utility $U_2$. Comparing this situation to the original setup, significant agency costs have to be accepted in $K_2$. This is reflected in the reduction in firm value $Y_0 – Y_2$ and the loss of utility for the manager $U_0 – U_2$. This is due to the effect that a utility-maximizing manager with a low share of equity more willingly substitutes non-pecuniary benefits for firm value. The lower the manager’s share of equity the stronger the problem will be due to the less steep subjective substitution line, i.e. the subjective substitution line deviates more clearly from the objective substitution line.
Starting from these thoughts, there are two basic possibilities to reduce these agency costs: (1) monitoring and (2) bonding (see Jensen/Meckling (1976), p. 323). The division of solutions and mitigations into just these two types has to be seen as incomplete. They are only some aspects that mitigate only some problems, e.g. the perk consumption or the effort problem (see chapter 5).

(1) For monitoring, the agent’s interests are aligned with the principal’s interests via contracts. Monitoring is the process of the principal controlling compliance with and sanctioning deviation from these contracts. (2) When bonding, the agent proves at his own cost (bonding cost), that his behavior is in compliance with the principal’s interest. Auditing by external firms at the agent’s expense is a good example for that. This causes monitoring and bonding costs that have to be incurred as a price for the reduction in agency cost.

The effects of monitoring and bonding can easily be shown when integrated in the example presented above (see Jensen/Meckling (1976), pp. 323-326). The equilibrium in \( K_2 \) serves as a starting point as Figure 23 points out.

**Figure 23: Equilibrium Situation**

![Equilibrium Situation](image)

*Source: adapted from Jensen/Meckling (1976), p. 316*

Before integration, the assumptions have to be clarified. In relation to the monitoring intensity the monitoring cost rises more than proportionally, while the benefit rises linearly or at a decreasing rate only. The marginal monitoring benefit in relation to the marginal monitoring cost decreases. The marginal compound effect of monitoring on the firm value is typically positive at first until marginal monitoring benefit and marginal monitoring cost are identical and then becomes negative. In order to be able to integrate this setup into the model, the monitoring effect on \( Y \) needs to be related to the level of non-pecuniary benefits. This yields a curve that shows that the reduction of non-pecuniary benefits by monitoring (or bonding) typically has a positive marginal effect on firm value at first that turns negative with a stronger reduction due to the exponentially rising monitoring (bonding) cost illustrated in Figure 24. Figure 25 then introduces the effect of monitoring and bonding as explained above.

Starting from the equilibrium without monitoring and bonding \( K_2 \), the substitution line to the left changes. Monitoring and bonding are costly, implying that the slope of the substitution line is no longer – 1, but it is replaced by the curve shown in the lower right corner in Figure 24. The tangency point of the manager’s indifference curve with this new substitution line MB determines the new equilibrium combi-
nation $K_M$. In comparison to $K_2$ firm value is increased from $Y_2$ to $Y_M$ and the manager’s utility is increased from $U_2$ to $U_M$ as well, even though there is less consumption of non-pecuniary benefits $c_M$. The monitoring costs can be seen as the deviation of $MB$ from the original substitution line, i.e. in equilibrium $K_M$ they are shown as the difference in value $Y$ between $A$ and $K_M$.

**Figure 24: Setup of the Monitoring Effects**

![Monitoring Effects Diagram](image)

**Figure 25: Trade-off with Monitoring Effects**

![Trade-off Diagram](image)

Source: adapted from Jensen/Meckling (1976), p. 324

The monitoring and bonding’s positive effect is very dependent on the monitoring costs. The lower these costs are the more monitoring will improve the situation (see chapter 6.4.1). In a worst case with very high monitoring costs, the renunciation of monitoring may even be optimal.

### 4.1.2 Forms of Moral Hazard

In general there are four types of moral hazard problems (see Kuersten (1995), p. 230): (1) the effort problem, (2) the perk consumption problem, (3) the risk incentive problem and (4) the underinvestment problem.
4.1.2.a The Effort Problem

The effort problem occurs in situations, in which the effort by the entrepreneur after the financing influences the project outcome (see Schulz (2000), pp. 57-58). While the entrepreneur has to share the project return with the external investors, he has to incur the costs of effort, e.g. less leisure, all by himself. This causes the danger that he may choose a lower level of effort than it would be optimal for the project value. The problem applies to debt financing as well as equity financing. Here equity financing will be the center of the analysis.

Analytically the entrepreneur’s incentive to work less can easily be shown (see Kuersten (1995), pp. 247-248; Schulz (2000), p. 57). The project return is a combination of a stochastic variable Y and the return µ(e), which is dependent on the effort e by the investor. A contractual agreement about the project input is not possible since the investor can neither observe Y nor e. The effort causes costs L(e) for the entrepreneur with L'(e) > 0 and L''(e) > 0, while the return µ(e) rises only with µ'(e) > 0 and µ''(e) < 0. The project can either be financed internally (γ = 0) or externally, giving away the share γ of the firm (0 < γ < 1). An additional definition of γ=1, a purely externally financed venture without incentive structure, is omitted for simplicity; especially in the context of financing young growth companies that setup is very improbable.

The entrepreneur maximizes his return:

\[
\max_e E[(1 - \gamma) \cdot (Y + \mu(e)) - L(e)] \text{ with } 0 \leq \gamma < 1 \tag{4.1}
\]

The first order condition yields the optimal effort e:

\[
\frac{\partial E[\bullet]}{\partial e} = (1 - \gamma) \cdot \mu'(e) - L'(e) = 0 \quad \Leftrightarrow \quad (1 - \gamma) \cdot \mu'(e) = L'(e) \tag{4.2}
\]

Figure 26 shows this graphically.\(^{16}\) Internal financing (γ = 0) leads to an effort e* where the marginal utility loss from effort is identical to the marginal gain from effort, as seen in the slopes of µ(e) and L(e). The entrepreneur as sole actor chooses the efficient level of effort e*\(\gamma=0\), i.e. the total rent W_0 is maximized. For a partly externally financed project (γ > 0) to the entrepreneur, only his personal gain (1 - γ)*µ(e) is relevant for his decision. He maximizes his own rent W_{1a} choosing e*\(\gamma>0\) in a way that the slopes of the two functions are identical (see Equation (4.2)). Since (1 - γ)*µ'(e) is at any time smaller than µ'(e) and L''(e) > 0, e*\(\gamma>0\) must be smaller than e*\(\gamma=0\). The total rent W_1 in the situation with external financing is smaller than W_0 and also the investors’ return W_{1b} is smaller than it could be. The higher the share of external capital γ the lower the effort level will be (see Kuersten (1995), p. 247). To improve the situation investors have to find designs that motivate the entrepreneur to raise his effort to the from a welfare-perspective optimal level. They can use the additional rent at higher levels of effort to design incentive structures accordingly.

The question whether this is relevant for young growth companies is not easily answered. On the one hand the problem exists clearly for all firms financed with external equity, on the other hand especially in young growth companies and family-owned businesses the close social network (see chapter 3.2.2) pre-

\(^{16}\) In fact the effects of the effort problem can be shown graphically in the framework presented in chapter 4.1.1. To see this, the problem has to be reinterpreted. The entrepreneur’s decision on how much effort to put in, could be reinterpreted as a decision on how much leisure time to consume. Replacing non-pecuniary benefits by leisure time will make it possible to interpret the analysis as the graphical representation of the effort problem. This will prove to be very helpful in chapter 5, where the mitigations that are explained with these graphs can be seen to work for both problems. There is one drawback however: The properties of µ and L will change the form of the substitution lines, that are no longer linear. Therefore the interpretation of the model as representing the effort problem as well, is good for understanding the basic workings, but not exact enough for a detailed analysis.
vents slacking off by the workers (see Erlei/Leschke/Sauerland (1999), p. 99), which also can be applied to the entrepreneur. Entrepreneurs tend to even be too involved in daily business (see Schmidt/Terberger (1997), p. 439) and they tend to put in more effort than managers of big companies. This is possibly due to the non-financial objectives of entrepreneurs, such as the realization of personal ideas, independence or the will to fill a market gap (see Dahlqvist/Davidsson (2000), p. 53), that motivate the entrepreneur intrinsically and that can only be insufficiently modeled by the agency approach.

Figure 26: The Effort Problem

4.1.2.b Perk Consumption

After the closing of the financing contract the entrepreneur has the choice of using the obtained capital for value-creating investments or for investments yielding him personally a direct utility (see Schulz (2000), p. 59). This direct utility can come from perk consumption, e.g. lavish office furniture, company cars or high travel expenses (see Jensen/Meckling (1976), p. 312; chapter 4.1.1).

An easy model setup can explain this problem analytically (see Kuersten (1995), p. 244). A project can be financed internally ($\gamma = 0$) or externally ($0 < \gamma < 1$). The entrepreneur’s utility consists of the direct utility $U(c)$ ($U'(c) > 0$, $U''(c) < 0$) from perk consumption $c$, and his share $(1 - \gamma)$ of the stochastic project return $Y$ corrected for the perk consumption $c$. To get the for the entrepreneur optimal level of perk consumption $c^*$ he maximizes his gain:

$$\max_c E[(1 - \gamma)(Y - c) + U(c)] \text{ with } c \geq 0 \text{ and } 0 \leq \gamma < 1$$

The first order condition yields the optimal perk consumption $c^*$:

$$\frac{\partial E[u]}{\partial c} = -(1 - \gamma) + U'(c) = 0 \iff (1 - \gamma) = U'(c)$$

For the entrepreneur the optimal level of perk consumption $c^*$ is reached when the marginal utility of consumption equals the implied reduction in firm value given the distribution of the returns. For an exclusively internally financed project ($\gamma = 0$), $c^*$ is the efficient level of perk consumption. For partially externally financed ventures ($0 < \gamma < 1$), the incentive for the entrepreneur to consume is higher, due to the lower value of $(1 - \gamma)$ and the positive but decreasing marginal utility of consumption. Graphically this problem has already been shown in the classic example by Jensen/Meckling (1976) in chapter 4.1.1.
This problem is a general problem of equity finance. The answer to the question of whether it applies to young growth companies is again twofold. On the one hand, in young growth companies the entrepreneur typically holds a large share of the firm’s equity; therefore the problem exists only moderately. On the other hand in young growth companies, project success is typically closely related to the entrepreneur’s person, which makes it difficult to prevent such behavior (see chapter 5.7, Schulz (2000), p. 60).

4.1.2.c The Underinvestment Problem

The underinvestment problem concerns the optimal project size under asymmetric information (see Myers (1977), pp. 147-175). The investor cannot observe the actual size of the entrepreneur’s investment. In cases of debt financing, he has an incentive to reduce project size by reducing his own investment after having obtained external capital. However, different models yield different results here (see Holstroem/Weiss (1985), pp. 403-425; Shah/Thakor (1988), pp. 41-59; Noe/Rebello (1992), pp. 347-375).

This problem is much more important in cases of debt finance (see Kuersten (1995), p. 230), but it cannot completely be ignored in equity settings. On the one hand it can be shown that the investment of external equity leads to managers lowering their assessment of optimal firm size (see Jensen/Meckling (1976), pp. 319-330; Erlei/Leschke/Sauerland (1999), pp. 78-85). On the other hand the additional cash entering the firm with external equity may lead to managers overinvesting, i.e. investing in projects with negative present value (see Jensen (1986), pp. 323-329). The effects are of secondary importance for equity finance and they will not be further considered in detail here.

4.1.2.d The Risk Incentive Problem

The risk incentive problem deals with the investees’ incentive to deviate from the agreed investments and turn to more risky investments in situations when parts of the company are financed with debt due to the option-like payoff scheme of equity (see Stiglitz/Weiss (1981), pp. 393-410; Kuersten (1994)). The quicker growth of a company would be one example for such a risky shortcut that could pay off well, but could also involve huge losses. This is to some extent mitigated by the imperfect diversification of the entrepreneur, who has a large part of his private wealth invested in the company, leading to a risk averse attitude in contrast to the perfectly diversified and therefore risk-neutral investor.

This problem shall not be considered here in detail. Even though it is very relevant for young growth companies who still have a large degree of freedom for their future development, it is a problem that mainly concerns debt financing. If the young growth company is purely equity financed, the entrepreneur may even invest less risky than the investor would like him to.

Concerning moral hazard, in this paper the focus of the analysis will be on the effort and the perk consumption problem.

4.2 Holdup

In general, holdup describes the opportunistic usage of gaps in incomplete contracts and the agent’s ability to force the principal into renegotiations after the closing of the contract because of the principal’s sunk costs based on the specificity of his investment (see Goldberg (1976), pp. 439-441; Spremann (1990), p. 568). Due to the infinite possibilities of future developments, contracts cannot be complete and the gaps that are left must be filled. Fairness is an important principle for filling these gaps but such behavior cannot be taken for granted, especially if the behavioral options for one party change, e.g. in financial
distress. One party cannot fulfill the commitment and can force the other party into renegotiations getting a better deal for itself (see e.g. Erlei/Leschke/Sauerland (1999), pp. 177-192).

Open betrayal and denial of performance during a project also fall under the scope of holdup (see Hartmann-Wendels/Pfingsten/Weber (1998), p. 109). Even though at first glance this looks like a completely different issue in comparison to the opportunistic usage of gaps in incomplete contracts, it is in fact very similar. Again the agent acts against the principal’s interests without him being able to truly prevent that due to the sunk costs. Again it is unfair behavior that causes the problem.

Not only the phenomena are similar; the prerequisites are similar, too. The risk of holdup is caused by the coincidence of three factors (see Krahnen (1991), pp. 21-70):

- A delegational relationship is a presupposition for holdup risks. Informational asymmetries are not necessary for a conflict of interest, but they strongly aggravate the conflict.
- Sunk costs are irreversible investments one party has made into a project, that lock it into the relationship with the other party. Sunk costs are the difference between the usage of the investment in the current project and the next best opportunity. The more specific the investments are, the higher the costs when trying to leave the project, the more dependent are the two parties.
- The moment external capital is invested the situation changes. The investee can now threat to act against the investor in the situations the contract doesn’t cover and in renegotiations he can force a redistribution of rents in his favor.

Rational investors estimate these risks before the contractual relationship. They anticipate the dangers and include them into their decision rationale.

There are several models that describe the holdup problem in relatively simple settings (see e.g. Grossman/Hart (1986), pp. 691-719; Hart/Moore (1988), pp. 755-786; Erlei/Jost (2001), pp. 59-69). Still showing a formal model would go too far here. The basic idea is that once the investor has incurred sunk costs, the entrepreneur has the possibility of forcing renegotiations with strong negotiating power on his side. Again this is anticipated by the investor. Therefore some projects will not be financed. Vertical integration or the posing of collateral can be potential ways out of the problem. Even though holdup problems mainly applied to debt finance settings (see e.g. Hart/Moore (1988), pp. 755-786), equity finance cannot cure the problem. Contracts are still incomplete and can be interpreted against the investor’s interests.

### 4.3 Adverse Selection

Adverse selection is a problem that exists in markets with asymmetric information distribution (see Akerlof (1970), pp. 492-494). In markets where the buyer cannot judge the quality of the offered products prior to the contractual agreement, i.e. these products have hidden characteristics, he has to orient the price he is willing to pay at the average quality in the market. The buyer’s insecurity about the product’s quality leads therefore to a situation in which the suppliers of good quality products will leave the market, because they do not see their superior product quality appreciated. This will lead to a drop of the average quality of products on the market that again has to be anticipated by rational buyers inducing even more suppliers to leave the market, entering a vicious circle of lower prices and successively leaving suppliers. This process of adverse selection can even lead to the breakdown of a complete market. Adverse selection always causes a loss in welfare when compared to a situation with symmetric information distribution (see Schmidt (1988), pp. 251-252).
4.3.1 An Easy Framework

The problem can be shown in an easy analytical framework (see Schulz (2000), pp. 64-69). Two types of entrepreneurs are considered: H and L. Type H implies a higher expected value of stochastic project returns $Y$ with density function $f(Y)$; high returns are more probable than in the project of entrepreneur L, i.e. entrepreneur H’s project is stochastically dominant; the concept of stochastic dominance is illustrated in Figure 27.

**Figure 27: Stochastic Dominance**

![Stochastic Dominance Diagram](image)

With this condition the economic actors, who for simplicity are here assumed to be risk-neutral, prefer project H over project L. The projects can only be realized with external equity capital. When picking the ventures to invest in, investors have a sorting problem because they cannot determine whether the potential investee is of high or of low quality. From past data they know however the average quality as well as the probability distribution of all ventures (see Richter/Furubotn (1996), p. 221). The share of entrepreneurs H is $\alpha$; the share of entrepreneurs L is $(1 - \alpha)$.

If the projects are not realized the entrepreneurs can choose an outside option, e.g. they can be employed elsewhere, giving them a utility of $O$. The necessary investment is $I$ and in order to be profitable, a project must yield at least the riskless rate of return $r$. Only project H economically makes sense:

$$\int_{0}^{\infty} Y \ast f_{H}(Y)dY \geq (1 + r) \ast I + O \quad \text{and} \quad \int_{0}^{\infty} Y \ast f_{L}(Y)dY \leq (1 + r) \ast I + O \quad (4.5)$$

External investors receive a share of the profits $\gamma_i$ ($i \in \{L; H\}$), which yields an expected rate of return of $r$. With this constellation there are four possible solutions: (1) market separation under symmetric information, (2) pooling equilibrium, (3) separation under asymmetric information, or (4) migration of good quality entrepreneurs.

(1) **Separation under symmetric information:** Under symmetric information the situation is efficient. Both parties know about the expected returns. Investors offer different adjusted contracts with different shares $\gamma_i$. In this case $\gamma_H$ must be smaller than $\gamma_L$ due to stochastic dominance:
\[ \gamma_i = \frac{(1 + r) \cdot I}{\int_0^\infty Y \cdot f_i(Y) dY} \quad \text{with } i \in \{L; H\} \quad (4.6) \]

Only the good entrepreneurs will realize their projects; for the bad entrepreneurs the return from the project would be lower than the utility of being employed elsewhere as Equation (4.7) shows:

\[ (1 - \gamma_H) \cdot \int_0^\infty Y \cdot f_H(Y) dY \geq O \quad \text{and} \quad (1 - \gamma_L) \cdot \int_0^\infty Y \cdot f_L(Y) dY < O \quad (4.7) \]

(2) **Pooling Equilibrium:** If the investors at the time of investment cannot tell which type they are investing in, they will demand a common share of profits \( \gamma_{\text{Pool}} \) for both projects, they set in a way that their expected rate of return equals \( r \) as shown in Equation (4.8):

\[ \gamma_{\text{Pool}} = \frac{I \cdot (1 + r)}{\alpha \cdot \int_0^\infty Y \cdot f_H(Y) dY + (1 - \alpha) \cdot \int_0^\infty Y \cdot f_L(Y) dY} \quad (4.8) \]

This means subsidizing the L entrepreneurs at the expense of the H entrepreneurs (\( \gamma_H < \gamma_{\text{Pool}} < \gamma_L \)). In this pooling equilibrium the financing of the project with this offer is the best alternative for all entrepreneurs as shown in Equation (4.9):

\[ (1 - \gamma_{\text{Pool}}) \cdot \int_0^\infty Y \cdot f_i(Y) dY \geq O \quad \text{with } i \in \{L; H\} \quad (4.9) \]

It is possible, dependent on the distribution of the entrepreneurs that projects that are unprofitable in solution (1) are still financed. This is true under the condition in Equation (4.10):

\[ \gamma_{\text{Pool}} \leq 1 - \frac{O}{\int_0^\infty Y \cdot f_L(Y) dY} \leq \gamma_L \quad (4.10) \]

(3) **Separation under asymmetric information:** This solution exists if the entrepreneurs’ decisions reveal their type. Investors could increase the required share of profits to a level \( \gamma_{\text{Sep}} \) where all projects L become unattractive but all projects H are realized as shown in Equation (4.11):

\[ (1 - \gamma_{\text{Sep}}) \cdot \int_0^\infty Y \cdot f_H(Y) dY - O \geq 0 \quad \text{and} \quad (1 - \gamma_{\text{Sep}}) \cdot \int_0^\infty Y \cdot f_L(Y) dY - O < 0 \quad (4.11) \]

The share of profits \( \gamma_{\text{Sep}} \) fulfills this for identical reservation utilities (\( O_H = O_L \)). However, since \( \gamma_{\text{Sep}} > \gamma_H \), condition (4.12) is no longer fulfilled:

\[ \gamma_{\text{Sep}} \cdot \int_0^\infty Y \cdot f_H(Y) dY = (1 + r) \cdot I \quad (4.12) \]

Too high rates of return are realized by investors; competition amongst them will lower \( \gamma_{\text{Sep}} \) to \( \gamma_H \), which in turn will attract the entrepreneurs L again. The situation is not stable.

(4) **Migration of good quality entrepreneurs:** A pooling equilibrium causes additional costs to the high-return entrepreneurs H in comparison to a situation with symmetric information. This may induce them to leave the market. The migration decision depends on whether the additional costs of pooling in comparison to the situation with symmetric information are greater than the value of the investment at the low cost of capital. This implies that the alternative utility \( O_H \) is greater than the project value at \( \gamma_{\text{Pool}} \) as investors’ share of profits, leading to a migration of the good qualities:
(\gamma_{\text{Pool}} - \gamma_H) \int_0^\infty Y \cdot f_H(Y) dY \geq (1 - \gamma_H) \int_0^\infty Y \cdot f_H(Y) dY - O_H
\Rightarrow (1 - \gamma_{\text{Pool}}) \int_0^\infty Y \cdot f_L(Y) dY \leq O_L
(4.13)

This adverse selection will in turn raise the cost of capital for the staying entrepreneurs until only the entrepreneurs of inferior quality stay in the market as shown in Equation (4.14):

\[ (1 - \gamma_{\text{Pool}}) \int_0^\infty Y \cdot f_L(Y) dY \geq O_L \]
\[ (4.14) \]

Given that the reservation utility of entrepreneurs H is higher than that of entrepreneur L (OH > OL), the lacking ability to tell good entrepreneurs from bad entrepreneurs can cause a situation of market breakdown. This assumption of OH > OL makes sense since good entrepreneurs could e.g. get a higher salary. Identical reservation utilities can lead to entrepreneurs L leaving the market first due to lower project return. If in addition to OH > OL, projects by entrepreneurs L would still be profitable at \( \gamma_L \), an adverse selection equilibrium would exist (see Amit/Glosten/Muller (1990), pp. 1238-1243).

### 4.3.2 Applicability to the Financing of Young Growth Companies

In contrast to the classic examples for adverse selection on the markets for used cars or insurances, it is not quite clear whether the issue is highly relevant on the market for private equity for young growth companies. This question cannot be solved empirically, since empirical studies on adverse selection usually require stock quotes, which obviously are not available for young growth companies.

The reasoning that capital suppliers (buyers of investment projects) and entrepreneurs (suppliers of investment projects) are subject to the adverse selection issue is intuitive, especially given the importance of a proper evaluation of the entrepreneur as a success factor for future success (see Cooper/Gimeno-Gascon/Woo (1994), pp. 374-386; chapter 5.7). However, this reasoning builds on two critical assumptions (see Schefczyk (2000), pp. 123-124): (1) The investees must have alternatives to private equity finance in order to be able to leave the market. However access to debt capital and the ability to self-finance is very limited for young growth companies (see chapter 2.2). The only alternative is to give up the project. (2) The investors must also have alternatives in order to be able to invest their capital in times of decreasing demand for capital due to adverse selection. Such investment in other asset classes would work against the investors’ intentions of better diversification and profiting of high returns. Other alternatives are the subsidized investment in below average projects or the active mitigation of adverse selection problems.

It therefore becomes clear that especially assumption (1) is not very realistic. Young growth companies have almost no alternative other than equity capital. In the model in chapter 4.3.1 this can be reflected by a very low value for O, making the migration decision improbable (see Equation (4.13)). Investors on the other hand have other alternatives, that are unattractive to them, and they will take measures against adverse selection. Still it is important to understand the problem and to think about how such countermeasures could look like.

### 4.4 Actual Agency Problems in the Investor – Investee Relationship

Concerning equity finance, three major agency costs were identified in chapter 3.2.2: (1) Overemphasis of growth and sales due to the agents striving for power and remuneration, (2) exaggeration of the agent’s qualification and motivation and the costs of the misestimation by the principal, including the costs of deliberate deception as well as errors in valuation, and (3) exaggeration of or deception concerning the
business development. These can be regrouped in order to fit the categorization of agency problems from above as well as the setting of financing young growth companies with external equity.

Literature names four major problems that exist in the relationship between a young growth company and its outside equity investor as shown in Table 6 (see Hartmann-Wendels (1987), pp. 18-22; Spremann (1990), pp. 567-572; Zemke (1995), pp. 49-59, 166-168): (1) Taking advantage of non-pecuniary benefits, (2) the conscious and unconscious deception of the principal by the agent concerning his qualification and motivation, (3) expectations concerning project return, risk and feasibility and (4) the necessary resources.

Taking advantage of non-pecuniary benefits is a typical moral hazard situation (see chapter 4.1.1). The entrepreneur could buy a friend’s products, pursue for him personally interesting but unprofitable projects or he could do “perk consumption”, e.g. by buying unnecessarily expensive office furniture, cars or travels.

When deceiving the investor concerning his and his team’s qualification and motivation, the agent can have three different objectives. (1) If he intends to acquire additional capital in order to then maximize his utility by reducing his effort when unobserved, this is a moral hazard situation. (2) If he intends to reduce his effort after signing of the contract taking advantage of the investors sunk costs, it is a holdup situation. (3) If he intends to acquire as much capital as he can at for him favorable conditions, it is a adverse selection problem, since all entrepreneurs will try that and investors can’t tell the good from the bad ventures.

Table 6: Important agency effects in equity investor - investee relationships

<table>
<thead>
<tr>
<th>Type of Agency Problem</th>
<th>Agent Intention</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taking advantage of non-pecuniary benefits</td>
<td>Personal wealth, status thinking, satisfaction of</td>
<td>• Investee pursues interesting but unprofitable projects</td>
</tr>
<tr>
<td></td>
<td>curiosity (Moral Hazard)</td>
<td>• Investee does “Perk Consumption”</td>
</tr>
<tr>
<td>Deception concerning an agent’s qualification and motivation</td>
<td>Reduction of effort and performance (Moral Hazard)</td>
<td>• External investment reduces effort incentives (effort problem)</td>
</tr>
<tr>
<td>Deception concerning project return, risk and feasibility</td>
<td>Reduction or denial of effort and performance (Holdup)</td>
<td>• Investee openly neglects activities in incomplete contracts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Investee forces renegotiations</td>
</tr>
<tr>
<td>Deception concerning necessary resources</td>
<td>Exaggeration in order to get large quantities of cheap capital (Adverse Selection)</td>
<td>• Investee exaggerates administrative and market-related qualifications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Investee projects a too high profitability to get more/cheaper capital</td>
</tr>
</tbody>
</table>

Source: adapted from Schefczyk (2000), p. 120

By deceiving the investor concerning project return, risk and feasibility and by deceiving him concerning the necessary resources the agent tries to acquire a large amount of capital at for him favorable conditions. The main danger that emerges from that situation is the investors getting a general feeling of distrust leading to a systematic undervaluation of ventures on the market for equity finance due to the investors’ mistrust of the ventures’ quality. This can lead to young growth companies trying to self-finance themselves and accepting the limits in growth in order to evade that distrust (see Ibbotson/Sindelar/Ritter (1988), pp. 37-45; Megginson/Weiss (1991), pp. 879-903).
5 Solutions and Mitigations to the Agency Problems

This chapter gives a perspective on how to solve and mitigate the agency problems identified above. The next sections introduce a number of approaches. They analyze how these approaches influence the agency problems concerning the financing of young growth companies (see chapter 4.4, Table 6).

First methods to align interests between the entrepreneur and outside equity investors are discussed; aligning interests generally works for all agency problems. After that designs to solve each of the more specific problems introduced in chapter 4 are discussed. Then the static perspective is expanded by including a company past and a future into the analysis and thereby reputation, staging and the real option perspective are introduced as concepts to deal with agency issues. Also the effects of competition between agents and between principals are quickly addressed. Finally the role of information as a competitive discriminator is considered. This can reduce the effectiveness of the previously discussed solutions and mitigations, but it can be dealt with if conscious about the problem. An overview of the concepts discussed and their applicability is given in Table 7.

Table 7: Overview of Solutions and Mitigations to the Agency Problems

<table>
<thead>
<tr>
<th>Approach</th>
<th>Problems Addressed</th>
<th>Actual Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aligning Interests</td>
<td>Moral Hazard, Holdup, Ad-</td>
<td>• Partly success-dependent remuneration</td>
</tr>
<tr>
<td></td>
<td>verse Selection</td>
<td>• Sanctions, e.g. earn-outs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Entrepreneur has to provide a collateral</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use of convertible debt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Majority share held by the entrepreneur</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Moral Hazard, Holdup</td>
<td>• Control rights to investors</td>
</tr>
<tr>
<td>Bonding</td>
<td>Moral Hazard, Holdup</td>
<td>• Budgeting of major investee expenses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sanctions are necessary to get an effect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Facilitated through management support</td>
</tr>
<tr>
<td>Vertical Integration</td>
<td>Holdup</td>
<td>• Reporting to investor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Voluntary third party auditing</td>
</tr>
<tr>
<td>Signaling</td>
<td>Adverse Selection</td>
<td>• Investee partly self-finances the venture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Investor-friendly dividend politic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Investee initiates auditing by third party</td>
</tr>
<tr>
<td>Information Disclosure</td>
<td>Adverse Selection</td>
<td>• Investee accepts thorough screening by investor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Investee accepts auditing by third party</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Participation in information exchanges</td>
</tr>
<tr>
<td>Creating a Dynamic</td>
<td>Moral Hazard, Holdup, Ad-</td>
<td>• Building and defending reputation</td>
</tr>
<tr>
<td>Relationship</td>
<td>verse Selection</td>
<td>• Staging of investments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Inclusion of growth options</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Financing with convertibles</td>
</tr>
<tr>
<td>Influence</td>
<td>Problem Influenced</td>
<td>Actual Effects</td>
</tr>
<tr>
<td>Competition</td>
<td>Can influence in positive and negative ways: Moral Hazard, Holdup, Adverse Selection</td>
<td>• Distribution of negotiating power (outside options)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Inhibits choice of costs of capital</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Disciplining effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Creates new problems such as winner’s curse</td>
</tr>
<tr>
<td>Information as Competitive</td>
<td>Influences in negative ways: Moral Hazard, Holdup, Adverse Selection</td>
<td>• Makes measures that disclose information more difficult</td>
</tr>
<tr>
<td>Discriminator</td>
<td></td>
<td>• Inhibits credible threats of sanctions</td>
</tr>
</tbody>
</table>
Of course in reality it makes sense to use a number of these mitigations and to combine them. For a structured discussion in this chapter they are considered separately. The integration with each other often is a small step, since they do not exclude or contradict each other.

5.1 Aligning Interests

Aligning interests refers to a group of measures that can be taken to assimilate the agent’s personal utility maximization and the principal’s interest. Before presenting the actual measures that can be used to align interests, the effect of such an alignment on the agency problems is shown. It can help in situations of moral hazard, of holdup as well as in situations of adverse selection:

(1) **Moral hazard** is mitigated since now the agent will not use his information advantage against the principal’s interest. Even though the principal may not be able to control the agent’s action, he can trust that the agent will not act opportunistically, because the agent will maximize his individual utility which is aligned with acting in the principal’s interest.

(2) In **holdup** situations the agent will still interpret incomplete contracts in his favor; however in a situation with aligned interests that is aligned with interpreting them in the principal’s favor, i.e. conflicts of interests are solved.

(3) **Adverse selection** is due to the fact that the principal cannot discriminate between the investees’ qualities. It is possible for the principal to design a menu of contracts, or as a special case one contract (see Demougin/Jost (2001), p. 71), which is only acceptable to investees of high quality, while investees of low quality are turned away. Such contract offers cause a self-selection of the potential investees according to their quality (see Rothschild/Stiglitz (1976), pp. 629-649); success-oriented remuneration or potential sanctions will make it costly for bad quality investees to accept the offered contract since this would lead to a situation where the agent would never profit from the upside potential. The interests can be considered aligned in this situation since then it is in the interest of the investee and the investor, that only high-quality agents enter a financing relationship. For this to work, three conditions must be fulfilled however (see Kreps (1994), pp. 574-575): (a) Every agent chooses the contract optimal for him, (b) there is no cross-subsidization between contracts, and (c) there is no contractual solution that yields a higher profit to the investor. It needs to be mentioned, that in this case the alignment of interests comes from offering the contract before its closing, while in the other two cases, the contract’s consequences in the following relationship after the closing are considered.

5.1.1 Success-Dependent Remuneration

One possible measure to be taken in order to align interests is a partly success-dependent remuneration for the entrepreneur of the young growth company (see Zemke (1995), p. 231). Fixed salaries for the entrepreneur-manager can be negotiated to be below expectations if the disadvantage is more than compensated by success-based remuneration components. Typically milestones for the venture’s development are set. Upon reaching these milestones the entrepreneur gets significant additional remuneration.

The effect of success-dependent remuneration on the perk consumption problem can be shown using the example concerning the non-pecuniary benefits from chapter 4.1.1. Starting from the basic equilibrium derived there (see Figure 23) the introduction of success-dependent remuneration is equivalent to steepening the entrepreneur’s subjective substitution line in the relevant area as shown in Figure 28.
As an example a remuneration design is chosen that grants the entrepreneur additional shares if he reaches a company value of at least $Y_2$; the substitution line is kinked. $Y_2$ in this case could be interpreted as the strike price of stock options (see chapter 5.5.3) given to the entrepreneur. Given this new slope of the substitution line in the relevant area, the entrepreneur adjusts his behavior, and reduces his consumption to the level $c_{Ra}$, where his indifference curve is tangent to the new substitution line. This is again anticipated by the entrepreneur, who is then willing to pay more for his shares. An adjustment process starts that ends with the equilibrium situation $K_{Rb}$ as depicted in Figure 29.

The investors have changed the incentive design; the new strike price is at $Y_{R1}$. The entrepreneur’s indifference curve is tangent to the relevant substitution line, indicating optimal behavior. The introduction of a success-dependent remuneration scheme has led to a higher firm value $Y_{Rb}$ at a lower level of consumption $c_{Rb}$ and at a higher utility $U_{Rb}$ than in the initial equilibrium $K_2$.

In this situation one needs to ask, why the investors don’t give the entrepreneur the higher share of stocks in the first place. It would lead to the same result due to the slope of the substitution line. However,
getting a smaller share, their capital may actually be undervalued then. Also, no agency costs appear in the graph.

These questions can be answered when remembering that this analysis focuses on certain values (see chapter 4.1.1, footnote 15). Options that are written on an underlying without any volatility are either always out of the money, at the money or in the money. Their option character only really develops if the underlying is volatile (see e.g. Ross/Westerfield/Jaffe (2001), pp. 612-633). Therefore the graph can only give a rough intuition of why success-dependent remuneration improves the perk consumption problem. It cannot serve as a detailed analysis of the exact effects of these measures.

In fact, all dangers identified in Table 6 are addressed, not only the perk consumption problem. Concerning the effort problem the line of reasoning is very similar (see chapter 4.1.2.a, footnote 16). The holdup situation, in which the entrepreneur intentionally reduces his effort after closing of the contract, is mitigated as well, since such behavior clearly decreases the chances to still reach realistically set milestones and getting the financial rewards. The deception concerning project return, risk and feasibility as well as concerning the necessary resources or management’s ability leads to milestones impossible to achieve, leaving the entrepreneur with moderate financial rewards; therefore he reduces such behavior. Adverse selection can also be addressed with a partly success-dependent remuneration. By setting the milestones for the success-dependent components so high, that only good quality ventures have a realistic perspective of reaching them, entrepreneurs with bad quality ventures will be turned away and the offered contract is able to select the good-quality investees only.

5.1.2 Sanctions

Sanctions can also play an important role in aligning interests. They are basically incentives to restrain from actions against the principals interest. There are four important sanctions that are worth to be mentioned in particular.

(1) A cut in the remuneration of the investee’s management if certain negative events, e.g. minimum sales are not met, take place has the same effect as a partly success-dependent remuneration. Again this reduces moral hazard, and again only entrepreneurs of high quality ventures can afford to accept such contracts, that thereby reduce adverse selection.

(2) The contractual agreement that in later rounds of financing, if necessary, the entrepreneurs have to carry a more than proportional burden, i.e. the financing institution gets a more than proportional share for the capital investment is called “earn-out”. It is a measure that particularly aims at the deception concerning necessary resources. Also, if the amount of financing is oriented at an expected business development that investors expect as a result of being deceived concerning risk, return and feasibility, the company will need further financing, hurting the entrepreneur. This mitigates the deception concerning project return and feasibility. However in a weaker form, it also works against other moral hazard or holdup issues such as the deception concerning the agent’s qualification and motivation or the consumption of non-pecuniary benefits since they take resources out of the firm that may have to be put back in a subsequently necessary round of financing.

The basic workings of sanctions (1) and (2) can again be easily illustrated at the basic framework introduced in chapter 4.1.1. The entrepreneur’s subjective substitution line again changes slope. In the area of the lower firm values, the entrepreneur has to carry more of the marginal changes in firm value, due to losses in salary or the anticipation of discrimination in later rounds of financing. This can be seen as the
entrepreneur selling put options on the value of the company. As an example he sells these puts at two strike prices that comply with the firm values in points $AS_1$ and $AS_2$ in Figure 30.

**Figure 30: Immediate Effect of “Put-type” Sanctions**

The entrepreneur reacts to the introduction of these sanctions by adjusting his level of consumption to $c_{Sa}$. There his indifference curve is tangent to the new substitution line. However, rational investors anticipate this behavior and adjust their sanction design until the equilibrium shown in Figure 31 is reached.

In this equilibrium it is interesting to notice that the entrepreneur’s indifference curve now touches the substitution line in one of the kinks due to the sanctions. Again the situation is improved since in comparison to $K_2$ at a lower level of consumption $c_{Sb}$, a higher firm value $Y_{Sb}$ and a higher entrepreneur utility $U_{Sb}$ are reached. This again shows the intuition of the workings but due to the lack of uncertainty in the model it cannot accurately reflect the real situation.

**Figure 31: Equilibrium Situation with “Put-type” Sanctions**

(3) Often it is argued that the market for corporate control is an important instrument for the reduction of agency costs (see Jensen (1988), pp. 21-48). If the managers lead a company in a bad way and they behave opportunistically, this will be reflected in the valuation of the company by the investors. Such a cheap company is an easy takeover target for other investors who could install a new management or who
Principal-Agent Problems in Venture Capital Finance

could break up the company and sell its parts. This threat of being made obsolete can discipline the management (see Perridon/Steiner (2002), p. 534). Unfortunately, for young growth companies this market does not work, since shares are virtually not fungible and outside investors do not have enough insight to be able to judge whether the bad performance is due to bad luck or a bad management team. Therefore the market for corporate control could be replaced by giving the venture capitalist the right to force entrepreneurs to leave the venture and to install new management instead. At first this sounds as if the entrepreneur should never agree to such a contract, but it can be expected that due to the importance of the entrepreneur for the venture (see chapter 5.7) the venture capitalist will only use this measure as a last resort. Also, the reduction in agency issues increases not only the company valuation but also the entrepreneur’s utility.

(4) Managers, who exit the young growth company, possibly because forced to by the venture capitalist, are forced to sell their shares below value. This on the one hand increases value by ensuring a continuous management (see chapter 5.7), but it also ties the fate of the management more closely to the venture’s success. Low effort or a high level of consumption of non-pecuniary benefits lead to a risk of being removed from the venture and losing a big part of the firm value, thereby disciplining the management.

In the context of the model explained in chapter 4.1.1 sanctions (3) and (4) mean a stronger emphasis on the firm value in comparison to e.g. the consumption of non-pecuniary benefits in the entrepreneur’s utility function. Actually, the entrepreneur’s utility function does not change; the inclusion of thinking such as the fear of the danger of being fired is actually not included in the utility function that is only dependent on firm value and the consumption of non-pecuniary benefits. However this fear can be reflected by increasing the weight of the firm value in the function. As illustrated in Figure 32, the entrepreneur will c.p. be willing to give up more non-pecuniary benefits in order to increase the firm value.

Figure 32: Immediate Effect of “Preference-changing” Sanctions

Again this causes an adjustment process in which the entrepreneur adjusts his level of consumption of non-pecuniary benefits and the investors adjust their valuation of the firm until again a new equilibrium situation is derived, as it is depicted in Figure 33.

Once again, the situation is improved since in comparison to K2 at a lower level of consumption cEb, a higher firm value YEb and a higher entrepreneur utility UEb are reached.
Of course sanctions can only work if the trigger can clearly be identified. Clear triggers require a certain amount of monitoring by the investor and if necessary they guarantee the sanctions’ enforceability via court order.

Figure 33: Equilibrium Situation with "Preference-changing" Sanctions

Contracts including sanctions that are prohibitively high, thereby completely preventing opportunistic behavior are called forcing contracts (see Neus (1995), p. 36). However, such contracts are rarely used in the financing of young growth companies due to the entrepreneur’s missing wealth and the fact that such boiling-in-oil contracts (or shifting support schemes) are morally questionable if the sanctions cannot be averted with certainty by behaving correctly (see Rasmusen (1994), pp. 177-181; Erlei/Leschke/Sauerland (1999), p. 163).

5.1.3 Collateralized Investments

Collaterals are mechanisms that strengthen the trust of the investor in the ability of the investee to pay back the investment (see Schmidt/Terberger (1997), p. 429). This collateral is only used if an agreement is broken. Usually collateral is mentioned in combination with debt financing and is to be used in cases of default when the loan cannot be fully paid back (see Schulz (2000), p. 87). It also can make sense in the case of equity investments, however. If the investee acts against the contract, e.g. the acceptance of new investors against existing contracts (see Zemke (1995), p. 255), the call of the collateral can be used as potential sanction.

Since the collateral is typically valued lower by the investor than by the investee, the redistribution from calling the collateral may seem inefficient at first (see Bester (1987), pp. 225). Still, considering the damage diminution effect, due to the deterrence of opportunistic behavior, the concept can make sense.

Collateral concepts can be divided into three types (see Schulz (2000), pp. 87-90):

1. Situations in which the investor gains and the investee suffers from the mechanism: Moral hazard effects are mitigated, due to the sanctioning character (see Kuersten (1994), p. 98). In renegotiations due to holdup situations the collateral can be seen as an outside option shifting negotiating power to the investor, therefore reducing the problem. Adverse selection can be mitigated (see Bester (1987), pp. 226) since only good quality investors can afford to enter contracts where they have to fulfill high collateral requirements. However this requirement can potentially create the adverse selection problem in the first
place because the high quality entrepreneurs do not see their quality appreciated when forced into a contract with collateral as a requirement (see Milde (1980), pp. 266-285).

(2) Situations in which only the investor gains from the mechanism: These mechanisms reduce the risk for the investor without affecting the entrepreneur’s behavior in a positive way. In contrast, these mechanisms can even lower the monitoring effort by the investors and worsen the behavioral problems (see Schulz (2000), p. 89).

(3) Situations in which only the entrepreneur suffers from the mechanism: These mechanisms clearly reduce agency problems in the same way as described for sanctions in chapter 5.1.2.

Clearly collaterals are a method to lower agency costs that does not only apply to debt financing. Collateralization can work as a good sanction tool for detected opportunistic behavior, i.e. in open holdup situations; it is not a tool to ensure a certain payback amount. Also due to the limited wealth of entrepreneurs, it is often difficult to use.

5.1.4 Convertible Debt

The design of the financing contract, i.e. the rule concerning the division of returns between the outside equity investor and the entrepreneur has important effects on incentives and agency issues. The literature typically uses LEN models for the analysis (see e.g. Franke/Hax (1999), pp. 431-437; Weimerskirch (1999), pp. 85-164): the agent gets linear remuneration \( s=a+b\cdot Y \), the actors have exponential utility functions, and stochastic project returns \( Y \) are normally distributed. The principal’s claims are connected to the entrepreneur’s remuneration. A parameterization of \( b=0 \) and \( a>0 \) implies a completely with external equity financed company without incentives; \( b=1 \) and \( a<0 \) implies debt financing. A major drawback of this approach is the inability to cover the case of bankruptcy, making the analysis incomplete. Therefore, here this approach will not be followed.

In the chapters above, the positive implications of success-dependent remuneration were introduced. However, one problem, which arises in cases where success-dependent remuneration or sanctions are agreed on, is the measurement of the actual result, the firm value. In the costly state verification approach, Townsend assumes that investors can measure the value but at high costs (see Townsend (1979), pp. 265-293; Hillier (1997), pp. 57-74). The resulting contract that causes the entrepreneur to voluntarily report correctly is the debt contract (see chapter 6.4.2.b; Diamond (1984), p. 397; Gale/Hellwig (1985), pp. 647-663). The standard debt contract punishes untruthful reporting while at the same time limiting measurement (and the implied costs) to cases where the entrepreneur cannot repay the whole amount. Even if measurements are made as random samples, due to bankruptcy costs, the standard debt contract stays optimal (see Ying Yan (1996), pp. 8-17).

This applies particularly to young growth companies since a high volatility of returns will lead to high measurement costs (see Erlei/Leschke/Sauerland (1999), pp. 101-104), leading to strong agency problems (see Ying Yan (1996), pp. 14-15). This speaks in favor of debt financing for young growth companies. However debt financing is virtually not available for young growth companies (see chapter 2.2). Therefore it is to be tried to connect these advantages of debt financing with the advantages of equity financing, such as the mitigation of the holdup aspects, risk incentive and underinvestment problem, the performance incentives given or the lowering of the fixed financing costs due to the growth potential (see Schulz (2000), pp. 80-81).
Convertible debt can be considered debt capital that grants the holder the right to receive a fixed amount or alternatively to convert the claim into a share of the residual claims. This right to convert can relate to a certain point in time or to a time period.

Convertible debt is highly relevant for the financing of young growth companies. Empirically, the issuance of convertible debt is correlated with many characteristics of young enterprises (Essig (1992), pp. 22-58): volatility of cash flow, growth potential, share of intangible investments, R&D spending, and need for equity, i.e. low equity ratios. These characteristics hint towards a strong growth potential and at the same time a high risk of bankruptcy (see Stein (1992), pp. 13-14; Gompers (1994), p. 32), implying strong information asymmetries.

Convertibles as a financing tool in general connect many of the strengths of equity with the strengths of debt. Due to the possibility to convert if the entrepreneur’s investment strategy becomes too risky, the for debt capital typical risk incentive problem is solved (see e.g. Brennan/Schwartz (1988), pp. 55-64). Also the issuance of convertible debt can be seen as a signal for an investee’s quality, leading to an equilibrium in which high quality firms issue debt, medium quality firms issue convertible debt and low quality firms issue equity (Stein (1992), pp. 3-21). The applicability of this result to young growth companies is questionable however (Schulz (2000), p. 105), especially given the unavailability of debt financing to young growth companies.

A comparison between equity finance, debt finance, finance using convertibles, and finance using a debt-equity mix with a special focus on young growth companies is made by Gompers (1994), whose model connects the adverse selection and the risk incentive problems. His model setup uses two fixed types of entrepreneurs (welfare-increasing, high quality (H) versus low quality (L), i.e. \( i \in \{H, L\} \)) who seek finance and then choose between two types of projects (welfare-optimizing, save projects (S) versus risky projects (R), i.e. \( j \in \{S, R\} \)). The entrepreneur has an information advantage concerning both aspects in comparison to the external investors.

1) **Financing with equity capital:** The risk incentive problem is solved, i.e. the entrepreneurs cannot improve their situation by choosing project R. The only possibility to distinguish between the types of entrepreneurs is to raise the costs of capital (see Equation (4.11) in chapter 4.3.1). However, higher costs of capital may cause not only the L entrepreneurs to leave, but also some of the H entrepreneurs and the situation may not be stable due to competition amongst investors.

2) **Financing with debt capital:** Since entrepreneurs only gain if the expected returns \( Y \) surpass the amount to be paid back \( P_{DC} \), only good quality entrepreneurs H will be financed. However the entrepreneurs will choose the project R due to the asymmetric distribution of bankruptcy costs:

\[
\int_{P_{DC}}^{\infty} (Y - P_{DC}) \cdot f_{H,R}(Y) dY > \int_{P_{DC}}^{\infty} (Y - P_{DC}) \cdot f_{H,S}(Y) dY
\]  

(5.1)

This is true even if project S has the higher expected value. This project choice is anticipated by the investors, who expect to earn their opportunity costs \( Z \) and therefore increase the amount to be paid back, since Equation (5.2) must be true in the long run. A welfare loss exists due to the inefficient choice of project.

\[
\int_{0}^{P_{DC}} Y \cdot f_{H,J}(Y) dY + P_{DC} \cdot \int_{P_{DC}}^{\infty} f_{H,J}(Y) dY = Z
\]  

(5.2)

3) **Financing with convertible debt:** In this case the payoff to the investor is divided in three segments. The first segment goes from \( Y = 0 \) up to the point where \( Y \) is high enough to repay \( P_{CD} \); in this segment the entire return goes to the investor. The second segment goes then up to the critical conversion
point at which $\gamma_{CD}^* Y = P_{CD}$; here all marginal gains go to the entrepreneur. Above that, the third segment starts, where investors and entrepreneur share the residual claims. These segments are shown in Figure 34.

**Figure 34: Payoff Scheme of Convertible Debt for the Investors**

![Payoff Scheme of Convertible Debt for the Investors](image)


The amount to be repaid in the case of convertible debt is lower than for debt financing, and the participation in total gains after conversion is lower than for equity financing. The investors can profit from the respective other instrument’s characteristics as well, in order to get their opportunity costs as expected return.

Since investors expect to get their opportunity costs $Z$, Equation (5.3) must be true in the long run. The three segments mentioned above are reflected in the three terms.

$$\int_0^{P_{CD}} Y \ast f_{H,S}(Y) dY + P_{CD} \ast \int_{P_{CD}}^{P_{CD}/\gamma_{CD}} f_{H,S}(Y) dY + \gamma_{CD} \ast \int_{P_{CD}/\gamma_{CD}}^\infty Y \ast f_{H,S}(Y) dY = Z \quad (5.3)$$

Convertible debt works in a way that only entrepreneurs of type $H$ apply for finance, since only for them, the project surpasses their alternative utility $O$ as shown in Equations (5.4):

$$\int_{P_{CD}/\gamma_{CD}}^{P_{CD}} (Y - P_{CD}) \ast f_{H,S}(Y) dY + (1 - \gamma_{CD}) \ast \int_{P_{CD}/\gamma_{CD}}^\infty Y \ast f_{H,S}(Y) dY > O \quad (5.4)$$

$$\int_{P_{CD}/\gamma_{CD}}^{P_{CD}} (Y - P_{CD}) \ast f_{L,S}(Y) dY + (1 - \gamma_{CD}) \ast \int_{P_{CD}/\gamma_{CD}}^\infty Y \ast f_{L,S}(Y) dY < O$$

Also they choose the save and welfare-conform project $S$ as shown in Equation (5.5):

$$\int_{P_{CD}/\gamma_{CD}}^{P_{CD}} (Y - P_{CD}) \ast f_{H,S}(Y) dY + (1 - \gamma_{CD}) \ast \int_{P_{CD}/\gamma_{CD}}^\infty Y \ast f_{H,S}(Y) dY >$$

$$> \int_{P_{CD}/\gamma_{CD}}^{P_{CD}} (Y - P_{CD}) \ast f_{H,R}(Y) dY + (1 - \gamma_{CD}) \ast \int_{P_{CD}/\gamma_{CD}}^\infty Y \ast f_{H,R}(Y) dY \quad (5.5)$$

There are five effects that explain the ability of convertible debt to solve the adverse selection as well as the risk incentive problem (see Schulz (2000), pp. 108-109): (a) The fact that $P_{CD}$ is lower than $P_{DC}$ leads to a larger segment of performance-related remuneration for the entrepreneur, reducing his incentive to choose the risky project. (b) In segment two, the “normal” firm development, the entrepreneur gets all of the residual claims and therefore is very motivated to perform reducing the effort and the perk consumption problem. (c) In the case of very positive development, the sharing of profits beyond the conver-
sion point reduces the entrepreneurs’ participation in the upside and the incentive for the “bad” entre-
preneurs to still participate in a project. (d) This argument at the same time reduces the incentive for “good”
entrepreneurs to choose the risky project. (e) Even though measurement costs are not part of the model,
convertible debt reduces the need for measurement; only in extreme cases of success or failure, measure-
ments need to be done. However it is a problem how to induce the entrepreneur to reveal returns beyond
the conversion point.

(4) Financing with a mix of equity and debt capital: The payoff structure of mixed financing differs
from financing with convertibles as Figure 35 shows.

**Figure 35: Payoff Schemes of the Different Forms of Finance for the Investors**

Mixed financing is characterized by the fact that in the long run, from providing mixed finance inves-
tors earn their opportunity cost:

\[
\int_0^{P_{Mix}} Y \ast f_{H,S}(Y) dY + P_{Mix} \ast \int_{P_{Mix}}^\infty f_{H,S}(Y) dY + \gamma_{Mix} \ast \int_{P_{Mix}}^\infty (Y - P_{Mix}) \ast f_{H,S}(Y) dY = Z \quad (5.6)
\]

It can be shown that, if \( P = P_{Mix} = P_{CD} \), convertible debt yields a higher participation in the upside \( \gamma_{CD} > \gamma_{Mix} \). This can be shown by subtracting Equation (5.6) from Equation (5.3) yielding Equation (5.7).

Given non-negative cash flows, Equation (5.7) which can only be zero if \( \gamma_{CD} > \gamma_{Mix} \):

\[
(1 - \gamma_{Mix}) \ast \int_{P_{CD}}^{P_{Mix}} P \ast f_{H,S}(Y) dY + \gamma_{Mix} \ast \int_{P_{CD}}^{P_{Mix}} (Y - P) \ast f_{H,S}(Y) dY + \\
+ (\gamma_{Mix} - \gamma_{CD}) \ast \int_{P_{CD}}^{P_{Mix}} Y \ast f_{H,S}(Y) dY = 0 \quad (5.7)
\]

For convertible debt, this implies a lower share of the residual claims in extremely successful cases for
the entrepreneur, therefore mitigating the risk incentive problem.

The other way around it can be shown that at identical residual claims \( \gamma_{CD} = \gamma_{Mix} \), the convertible has
c.p. a higher amount to be paid back \( P_{CD} \), due to the fact that in a conversion situation the investor has to
forego the fixed claim, while in a mixed financing situation the investor gets both, the fixed and the resid-
ual claim. This can deter entrepreneurs with low return expectations from market entry.

In addition, given financing with convertible debt in probable medium-return scenarios the entrepre-
neur gets all residual claims which helps to mitigate the effort and perk consumption problems. This
makes convertibles superior to mixed finance. Table 8 summarizes the findings of this analysis, i.e. the
superiority for convertible debt as financing instrument due to convertible debt’s ability to mitigate agency problems.

Table 8: Forms of Finance in the Gompers (1994) Model

<table>
<thead>
<tr>
<th>Type of Finance</th>
<th>Financed Projects</th>
<th>Risk</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>(H)</td>
<td>S</td>
<td>Adverse selection problem</td>
</tr>
<tr>
<td>Debt</td>
<td>H</td>
<td>R</td>
<td>Risk incentive problem</td>
</tr>
<tr>
<td>Convertible</td>
<td>H</td>
<td>S</td>
<td>Welfare-efficient projects realized</td>
</tr>
<tr>
<td>Debt-Equity Mix</td>
<td>H, (L)</td>
<td>S, (R)</td>
<td>Inferior to convertibles</td>
</tr>
</tbody>
</table>

In addition to aligning interests as shown above, convertibles can also help investors to actively include the option to do business with the investee later into their decisions, as argued in chapter 5.5.3.

5.1.5 Majority Share of the Entrepreneur

A measure that serves to align interests and can particularly help against perk consumption and the effort problem is for investors to only participate with minority investments. If the entrepreneur still holds a large part of the company, perk consumption and effort reduction become relatively unattractive.

Again speaking in terms of the model introduced in chapter 4.1.1 a relatively higher absolute value of $-\gamma$, symbolizing the entrepreneur’s share, steepens the entrepreneur’s subjective substitution line. This effect is illustrated in Figure 36. This shift again starts an adjustment process as described before leading to a new equilibrium in $K_{ba}$ as depicted in Figure 37.

Figure 36: Immediate Effect of a Higher Equity Share

Again in this situation the firm value and the entrepreneur’s utility are higher at a lower level of consumption of non-pecuniary benefits $c_{ba}$ as compared to situation $K_2$.

The same is true for the reduction or denial of effort in a holdup situation. The entrepreneur’s incentive to take advantage is lower, since he would also damage the value of his own share of equity. These effects are even enforced by the indirect effect that with a significant share in the venture the entrepreneur can less perfectly diversify his private wealth, therefore being even more interested in the venture’s development (see Schefczyk (2000), p. 131).
However, this measure cannot help against deception concerning project return, risk and feasibility as well as necessary resources and his qualification and motivation. In those situations the entrepreneur intentionally tries to get investors to cheaply provide capital, i.e. to leave him a large share of equity despite investing significant amounts themselves. Investors should get the share of capital appropriate for their investment, but they should not invest too much in order to keep the entrepreneur incentivized.

The advice to leave the entrepreneur with a majority share is hard to follow in reality, since entrepreneurs are often wealth-constraint, i.e. they cannot invest significant amounts themselves. Therefore in many situations it is difficult to leave them with a majority share and still get the appropriate return for the investor. Also one investor holding a minority share but participating in an investment co-operation (syndication), in the sense that several investors hold minority shares that add up to more than 50% of total shares is not the idea of the advise, since that would not improve the entrepreneur’s incentives.

The practical implication of this advise is to insist on significant investment by the entrepreneur (see chapter 5.4.1) whenever possible and to invest a small amount in the beginning and further smaller amounts later on. This is called staging the investment (see chapter 5.5). That way the entrepreneur’s share is kept high as long as possible while it is low enough to provide an adequate return for the investor.

### 5.2 Measures against Moral Hazard

Moral hazard is a problem that arises after the closing of the contract. However even before that the selection of good projects and ventures makes sense (see Schulz (2000), p. 84). This can happen especially with screening procedures, in which before closing the contract the investor tries to find indicators that could possibly predict the entrepreneur’s behavior after the closing of the financing contract (see chapter 5.4.2). Further important measures for the reduction of moral hazard problems after the closing of the contract are monitoring and bonding.

#### 5.2.1 Monitoring

When monitoring, the behavior expected from the agent is put down in a contract, compliance with which is subsequently controlled by the principal. He can do that on the basis of control rights granted to
him in the investment contract. Monitoring can directly lower agency costs, especially the costs caused by perk consumption or the effort problem; however monitoring costs have to be incurred (see chapter 4.1.1).

The investee following unprofitable but personally interesting projects can be prevented by investor getting the right to veto major projects. Perk consumption can be lowered by budgeting certain expenses, especially for administration, travel or rent. Effort problems can be addressed with a close contact between investor and entrepreneur; enabling the investor to judge the effort the entrepreneur puts in.

In this context sanctions are very important. They not only directly align interests as shown in chapter 5.1.2, they also enable the investor to effectively monitor the investee. The investee will only be willing to follow the behavior expected by investors if he has to be afraid of detection and of sanctions. The expected penalty weighted with the probability of detection has to be higher then the average gain through opportunistic behavior (see Ying Yan (1996), pp. 14-15).

If breach of contract can potentially be detected and sanctioned, the only missing piece is the willingness of the investor to put in the effort necessary for detection. However this is not a big problem for young growth companies. (1) Monitoring can be organized as random samples and, if the entrepreneur knows about it, still induces behavior consistent with the contracts made (see Ying Yan (1996), pp. 8-17). This greatly lowers monitoring costs. (2) In addition, since young growth companies need management support from their investors in any way to create value, it is just a small step for the investors to monitor the investees’ actions.

Still there are also arguments against the willingness of investors to monitor. (1) The so-called small ticket argument refers to the costliness of monitoring per invested unit for cases in which the amount invested is very small, which is often the case in early stage investments in young growth companies (see Schulz (2000), p. 86). (2) Because the monitoring costs are usually fully incurred by one investor while all other investors profit from the effect, in situations with dispersed ownership it is hard to ensure appropriate monitoring since every investor hopes that the other investors do the costly monitoring; this is the so-called free rider problem (see Franke/Hax (1999), p. 440; Campbell (1995), pp. 86-91). However young growth companies usually have only a small number of investors who are already closely involved with the venture due to management support. Chapter 6 shows that venture capitalists as intermediaries bundle the investors’ money in order to finance young growth companies and doing this they mitigate both drawbacks described above.

Management support has a second agency-related function: The investor offers management support in anticipation of the problem of deception concerning management motivation and qualification. Active management support can mitigate the effect of deception concerning qualification by “filling the gaps”.

At this point it makes sense to have a closer look how management support typically looks like. As laid out in chapter 2.3.3.a there are three components of management support: (1) being a member of the board with all the information and control rights (see e.g. Meulen (1976), pp. 108-111; Grisebach (1989), pp. 216-232; Bouillet-Cordonnier (1992), pp. 91-101), (2) management support in strategic questions as well as in process support (see e.g. McMillan/Kulow/Khoylarian (1988), pp. 31-34; Gorman/Sahlman (1989), pp. 237; Sapienza/Manigart/Vermeir (1996), pp. 439-469) and (3) operative work as a (shadow) manager on time in a crises (see e.g. Gorman/Sahlman (1989), pp. 237-241; Funke (1992), p. 1110). Strategic and operative support actually actively create value for the investee and they grant the investor insights into the actual business. The membership of the board with the according rights of approval and information rights is to be seen more as a medium to influence the investee in a sense as to minimize the
risk of a total loss and it is important since these rights are crucial for monitoring. Table 9 gives an overview of these rights.

**Table 9: Common Rights of Investors as Members of the Board**

<table>
<thead>
<tr>
<th>Type of Right</th>
<th>Common Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right of Approval</td>
<td>• Contracts for co-operations or company agreement</td>
</tr>
<tr>
<td>(transactions that need to be approved)</td>
<td>• Personnel decision at top management level</td>
</tr>
<tr>
<td></td>
<td>• Changes in strategy or product offering</td>
</tr>
<tr>
<td></td>
<td>• Taking on liabilities</td>
</tr>
<tr>
<td></td>
<td>• Long-term rent or leasing contracts</td>
</tr>
<tr>
<td></td>
<td>• Real estate transactions</td>
</tr>
<tr>
<td></td>
<td>• Choice of accountants and consultants</td>
</tr>
<tr>
<td>Information Rights</td>
<td>• Monthly, quarterly and yearly sales data, profit/loss statements and balance sheets</td>
</tr>
<tr>
<td>(right to audit and to require reports)</td>
<td>• Reports concerning the state of the business including market development, orders and personnel</td>
</tr>
<tr>
<td></td>
<td>• Event-driven information about important issues</td>
</tr>
</tbody>
</table>

**Source:** see Schefczyk (2000), p. 42

The right to influence major personnel decisions plays an especially important role. It is very effective against deception concerning the agent’s qualification and motivation. In the case of moral hazard, the investor can force incompetent members of an entrepreneurial team to leave. The danger of holdup is reduced since the entrepreneur will have to anticipate that he may have to leave the company in this case. In combination with sanctions, such as the sale of shares below value by leaving team members (see chapter 5.1.2), this measure works very well against holdup. However this is inhibited by the central role many entrepreneurs play in their company (see chapter 5.7).

### 5.2.2 Bonding

When bonding, the agent proves at his own cost that his behavior is in compliance with the principal’s interests. A regular reporting of the investee can help to detect moral hazard. Therefore if the investee engages in such actions at his own expense, it is a way of bonding. Another example is voluntary auditing by third parties at the entrepreneur’s expense. In that situation the entrepreneur uses the third party’s reputation for bonding.

This makes sense for the entrepreneur, since the reduction of moral hazard will increase the investors’ willingness to pay for the firm’s shares and this will again help the investor to reach a higher level of utility (see chapter 4.1.1). Therefore it is also in his interest to reduce moral hazard to a certain extent via bonding.

### 5.3 Measure against Holdup: Vertical Integration

As a solution for holdup problems the integration of the investee into a hierarchical structure with authority is possible (see Hartmann-Wendels/Pfingsten/Weber (1998), p. 110). If the investor takes over the investee, he becomes an entrepreneur earning the complete residual claim.

Vertical integration can be advantageous due to the existence of transaction costs, i.e. control and contract enforcement costs (see Williamson (1975), pp. 49-54). Due to additional possible sanctions, e.g. delegation or lay-offs, the incentive for opportunistic behavior is lower in a hierarchical organization. Especially the hold-up problem is solved. Vertical integration makes particularly sense if there is a lot of uncertainty combined with strong incentives for opportunistic behavior (see Schulz (2000), p 91).
However there are strong arguments against vertical integration. Many agency problems stay unsolved, e.g. the effort problem, and within the relationship new problems can emerge. Such problems are overinvestment, co-ordination costs, information deficits and diverging interests within a big corporate. These costs can be extremely high. Also, due to the high degree of uncertainty a central decision maker cannot make good decisions for the venture. The entrepreneur as central figure should be in command (see Richter/Furubotn (1996), p. 27).

5.4 Measures against Adverse Selection

5.4.1 Signaling

Since adverse selection leads to welfare losses (see chapter 4.3) both parties, investor and investee, are interested in the reduction of the information asymmetry. As discussed in chapter 4.3.2 investors may have the possibility to allocate their capital differently, but young growth companies rarely have any alternatives to equity finance (see chapter 2.2).

As discussed above (see chapter 5.1) investors can offer contracts that lead to a self-selection of the potential investees according to their quality, with only the entrepreneurs of above average ventures accepting the contracts offered. However the entrepreneurs do not have to wait for investors trying to get them into a position of self-selection, they can actively signal their quality themselves (see e.g. Spence (1973), pp. 355-374; Campbell/Kracaw (1980), pp. 872-873; Gerke (1993), pp. 636-640). Signaling is the process of credibly informing the investor concerning the venture’s quality, i.e. risk and return expectations. This information would otherwise be very costly to get for the investors.

The entrepreneurs of all companies that are trying to get externally financed try to present themselves as positively as possible, either to hide the fact that they expect to only offer a low return or because they notoriously overassess themselves (see Bernado/Welch (1998), pp. 6-27). Therefore it is very important that the signal is credible. A simple press conference is not enough (see Spremann (1996), p. 720; Franke/Hax (1999), p.413). In order to be credible the potential investee has to take an action that only a high quality venture would take. The development of a prototype may be easy for “good” entrepreneurs; it may be very costly for “bad” entrepreneurs however. Therefore it can be considered a credible signal. In addition to credibility the signal must be connected in a known way to the project quality. Usually this is due to incurred costs (see Swoboda (1994), pp. 197-198), as in the prototype example above.

When investing a significant amount of personal wealth in the venture while at the same time trying to find equity investors, the entrepreneur credibly conveys his trust in the firm. He produces credible information by accepting the costs of a less than optimal diversification of his portfolio and tying his personal fate to the venture’s success. An entrepreneur who knows about the low quality of his project will not be willing to incur these risks. Therefore a significant share of the venture should be self-financed by the entrepreneur.

Another possibility to signal to investors is the investee’s dividend and investment policy. A dividend policy that is investor-friendly or the publishing of investment plans can increase the investors’ trust in the venture (see Ambarish/John/Williams (1987), pp. 324-388). There are several problems attached to this idea: (1) Young growth companies usually need the cash they have to finance their growth and do not want to pay out dividends, especially if they are of high quality. (2) An investor-friendly dividend policy has financial consequences between different types of investors that may not be desirable (see Schmidt
(1988), p. 254). (3) Many companies do not wish to publish their investment strategy because they are afraid to lose a competitive advantage (see chapter 5.7).

A third measure for signaling in the market for equity finance for young growth companies is the delegation of a firm’s information duties. A potential investee could initiate an audit by a third party. Firms to possibly do that are accountants or rating agencies. Investors would find such an audit credible because such third parties (1) are specialized in the discovery of information, (2) have a reputation to defend and (3) possibly are liable for the information they give out.

5.4.2 Information Disclosure

Information disclosure is besides self-selecting contracts by the investor and signaling by the investee a third possibility to mitigate the effects of adverse selection. In that case the market participants try to make the market more transparent before the closing of any contracts in order to avoid adverse selection.

One actual measure could be the investee accepting a thorough screening by the investor. This is typically a staged screening process as shown in Figure 38 considering financial and non-financial criteria (see chapter 2.3.3.a; Tyejbee/Bruno (1984), pp. 1052-1064; Fendel (1987), pp. 178-183; Schroeder (1992), pp. 175-188; Zacharakis/Meyer (1998), pp. 57-76). Only 3% of the received business plans pass the screening process and get finally financed. Considering this number, it is clear that thorough screening is an important measure for the revelation of information; it enables investors to discriminate between good and bad quality ventures.

Figure 38: The Screening Process

<table>
<thead>
<tr>
<th>Step</th>
<th>Typically passing</th>
<th>Content</th>
</tr>
</thead>
</table>
| 1. Arrival of Business Plan | 100% | • Establishment of contact, either directly by the venture or by a mediator  
• Assignment of venture to an investment manager (typically according to industry focus) |
| 2. Screening of the most important characteristics | 25% | • Quick evaluation using the business plan (product, market, sales, profitability, etc.)  
• Request for additional information if necessary |
| 3. Main Selection Process | 8% | • Personal contact with the entrepreneur, typically including a visit at the site  
• Detailed evaluation and due diligence, often in co-operation with third parties (references, consultants, universities, etc.)  
• Sometimes signing of a “Letter of Intent” (LoI) |
| 4. Negotiations | 3% | • Investment proposal by the venture capitalist  
• Negotiations concerning important investment terms  
• Evaluation  
• Invested amount, used instruments  
• Monitoring rights |
| 5. Investment | | • Formal contract  
• Fulfillment of contract terms  
• Start of management support |

This process and these numbers apply to venture capitalists, but in a situation without intermediary a similar screening process would be imaginable concerning the advantages a venture capitalist may have concerning screening see chapter 6.

Schroeder (1992), p. 192

Another possibility for information disclosure is the investee’s acceptance of a third party audit. The investor chooses a third party he trusts, and then can use this specialist’s experience to discriminate between the different qualities of the potential portfolio firms. This again mitigates the adverse selection problem.

A third way to engage into information revelation is the participation of investors and investees in information exchanges. Such information exchanges reduce informational asymmetries by encouraging a dialogue between the investors and investees on the one hand, and by establishing comparability on the
other hand. For such information exchanges three major functions are discussed (see Gerke/Rueth/Schoener (1992), pp. 84-172; Harrison/Mason (1996), pp. 15-20): (1) collecting and passing on information, (2) mediating between investor and investee, and (3) fixing ratings for investees.

It can be argued that the measures that have been introduced as information revelation are in a certain sense part of the signaling category. By accepting screening and audits and by participating in information exchanges, the investee sends out signals to the investor. There are two reasons as of why information revelation should be a different group: (1) The initiative in these measures does not (exclusively) come from the investee as it is the case in signaling situations. Neither is the cost incurred (exclusively) by the investee. (2) The percentage of ventures passing the screening process shows that the willingness to be screened is not sufficient to guarantee for a good quality of the venture. This is due to the missing cost of being screened that would inhibit bad quality firms from participation. The only costs imaginable are the low costs of general administration and the loss of reputation coming with rejection. These costs are negligible however since typically young growth companies talk with many potential investors simultaneously; the loss of reputation would come too late for other investors.

Problematic is the dependency of the costs of signaling and information revelation on firm age. For young growth companies, due to their missing reputation and track record, it is much more expensive to convey credible information than for established players.

5.5 Creating a Dynamic Relationship

A financial transaction does not simply take place at a certain point of time without context. Both parties have a history of actions before the transaction, the transaction lasts for a certain time, and after the transaction a future awaits the economic actors (see Schulz (2000), p. 117-118). These factors should be considered when analyzing the relationship between the actors. Only the reaction over time makes a co-operative relationship, which works to the advantage of both sides possible (see Dixit/Nalebuff (1991), p. 100). Of course these factors should be analyzed for their potential to improve the relationship and to mitigate agency problems.

Before the transaction a company has made certain experiences and has built up a certain reputation in the past that may help to predict its behavior in the financing transaction as discussed in chapter 5.5.1. The financing transaction can be subdivided into a series of smaller transactions; it can be staged as laid out in chapter 5.5.2. Finally in chapter 5.5.3 developments after the transaction such as potential further transactions are discussed.

5.5.1 Reputation

Typically firms rely on external finance several times during their life cycle. Therefore they several times interact in very similar settings with investors in “sequential games” (see Campbell (1995), p. 208). This by itself cannot improve the situation, because if the last period of interaction is known, it is optimal to behave opportunistically in this last period. That can be anticipated and by backward induction and with a finite planning horizon, co-operative behavior and reputation cannot be built (see Dixit/Nalebuff (1991), pp. 100-101; Campbell (1995), pp. 221-233; Neus (1995), pp. 40-42). However, interactions are typically open-ended, which can be reflected e.g. by assuming a life after the anticipated last transaction, the use of reputation on parallel markets or the final sale of the company including reputation (see Schulz (2000), p. 121).
Reputation can be defined as beliefs about unknown characteristics that are determined, starting from an exogenous level of information, by past actions of the informed party (see Milgrom/Roberts (1982), p. 283). It connects these sequential games. Past behavior in financial transactions, i.e. paying back the required amount or performing above expectations, is taken by investors as prediction of certain behavior in future transactions. Also, reputation can serve as an additional collateral that only the entrepreneur suffers from if it is destroyed, since he loses the advantage of having a reputation in future transactions (see Rau-Bredow (1996), p. 215). The threat to destroy the reputation upon certain requirements not being met is a good sanctioning mechanism for the investors.

Reputation can help to mitigate adverse selection. If a company has a reputation for paying back debt in time, the chances that this company is of “high” quality are relatively high. On the other hand it also works against moral hazard and holdup, since the investor could easily sanction the investee if he found out about or suspected opportunistic behavior. A simple statement to the right people may cut off the entrepreneur from sources of capital in the future. However, sometimes additional costs of this sanction for the investor are so high that the opportunistic behavior isn’t made public; if e.g. the public announcement of such behavior damages the reputation of the investor he may cover up the entrepreneur’s behavior (see e.g. Erlei/Leschke/Sauerland (1999), p. 234).

Diamond (1989) shows the effect of reputation on adverse selection and investment decisions for young companies. Since his model is designed for debt financing, it considers the risk incentive problem as example for moral hazard. However the model shows the basic workings of the effects of firm age and reputation on behavioral decisions and therefore its general ideas are presented here.

There are three types of entrepreneurs: Type S can do a project with a safe return S that is enough to pay back the liability, type R can do a project with a possible return \( R > S \) or a return of zero, and type RS can choose between the safe and the risky project. Investors orient the in period t repayable amount \( P_t \) at the probability for return \( R \) in the risky projects and the shares of the three types in the initial population of entrepreneurs. If an entrepreneur can be identified as having invested in a risky project he is excluded from future financing.

For the type RS entrepreneurs the decision whether to invest in the risky project or in the safe project depends on the payback amount \( P_t \) and the present value of future projects \( Y_{t+1} \) that could be achieved if behaving optimally. He decides to choose the safe project if Equation (5.8) is satisfied:

\[
P_t - Y_{t+1} \leq \frac{S - p_{RS}^* R}{(1 - p_{RS})}
\]

with \( p_{RS} \) as probability that the risky version of the RS project returns the amount \( R \).

There are two contrary effects. On the one hand the higher \( P_t \) is, the higher is the probability that RS entrepreneurs choose the risky project. Considering the fact, that at the beginning a lot of R-type entrepreneurs are left, in the first period, \( P_t \) must be relatively high. As slowly but surely these entrepreneurs drop out because some of them cannot pay back, the investors are able to lower \( P_t \) and still get their required return. This implies that age, i.e. survival, is a positive sign that allows investors to lower the amount to be paid back. This again implies that RS entrepreneurs will choose risky projects in the beginning and safe projects as they progress in age. On the other hand the lower \( Y_{t+1} \) is, the higher is the probability that RS entrepreneurs choose the risky project. The value of future returns will decrease as the last period gets closer and will finally be zero. In the first period it is at a maximum. Therefore companies should choose safe projects at first and revert to risky projects as they get older.
From analyzing the dominance of the effects in certain phases, Diamond gets to the four-phase model shown in Figure 39. After first taking chances, RS-entrepreneurs then defend their reputation and then slowly switch to risky projects again. This introduction of reputation, leading to the rational intention to defend the reputation, temporarily completely shuts down the moral hazard problem and mitigates the adverse selection problem as firm age progresses.

**Figure 39: Company Age, Project Choice and Cost of Capital**

![Figure 39: Company Age, Project Choice and Cost of Capital](image)

**Source:** see Schulz (2000), p. 134

In reality reputation is particularly important in situations where there are few other assets that could be used as collateral, which is the case for young growth companies. The entrepreneur can actively use reputation as an instrument to lower his cost of capital. In order to build up a track record it can make sense for young companies to rely on small amounts of external capital very early in their development (see Bester/Scheepens (1996), pp. 565-590). Another measure could be to voluntarily produce financial projections and let investors compare actual and predicted performance in order to build up a reputation for meeting expectations (see Schulz (2000), p. 136). Also the entrepreneur can emphasize, that his social position is at stake; professional failure may have severe social consequences.

### 5.5.2 Staging of Investments

The staging of investments is an approach that includes many aspects of the problems related to agency theory and asymmetric information (see Sahlman (1990), pp. 506-507; Schween (1996), pp. 158-160). Staging means that the investor first invests a small amount of capital and in subsequent rounds of financing adds further capital at new valuations. This stands in severe contrast to the recommendation to synchronize the maturities of external finance and the investment project (see Perridon/Steiner (2002), pp. 550-551; Hart (1995), p. 111). However this golden rule of finance does not take behavioral uncertainty into consideration.

Staging can reduce the agency-related costs of capital significantly since it artificially creates a multi-period financial relationship (see Schulz (2000), p. 139). It mitigates all of the three agency problems, and reveals information about the project development.

Staging has five effects that all reduce moral hazard problems: (1) The renegotiation of the investment conditions, leading to **flexibility in valuations**, will induce the entrepreneur to choose a high level of effort
from the beginning. Success in the early stages leads to lower costs of capital in later rounds of financing and increases the entrepreneur’s total profit (see Hellmann (1994), chapter 2). (2) The investors get an additional tool for sanctioning the entrepreneur for bad performance or in the case of the discovery of opportunistic behavior: The option to withdraw from the financing relationship is a threat to the entrepreneur’s position. However this will only work if the investor has the possibility to withdraw from the project without losing too high a share of the amount invested in the past (see Schulz (2000), p. 145). (3) The company value that has been built up in the past in later rounds of financing can be used as a collateral. (4) Frequent renegotiation of the relationship can lead to a risk distribution between investor and investee that perfectly fits the actual development stage of the project. (5) Due to the regularly necessary company valuations, staging forces the principal to intensely monitor the investee.

The problem of adverse selection is also addressed. While in the initial financing round, investors are relatively unsure about the investee’s quality, the time of co-operation until the next round will reveal valuable information that makes it better possible for the investor to assess the investee and to condition the offered contract on his true characteristics. Therefore the maturity of the chosen financing tools can be seen as a signal to the capital market in the first place (see Diamond (1993), pp. 341-368). The first round could be seen as a fee the investor pays in order to get more information on the venture’s quality. However, in subsequent rounds only this investor can discriminate between the different qualities of ventures, i.e. this perspective implies an almost complete loss of negotiating power for the investee in subsequent rounds.

Even the holdup problem is mitigated. Short-term contracts offer much less freedom of interpretation (see Schulz (2000), p. 141). In addition the process of both sides giving input into the financing relationship step by step reduces the problem that one side could profit by not acting according to the contract (see Admati/Perry (1991), pp. 259-276). Also the sanction function mentioned above pose a threat that reduces the holdup problem. However, if the investors’ capital is invested long-term and in a very specific way into the investee, investors prefer not to engage in staging, i.e. renegotiations, since their position is weak.

Also information about the project is revealed through staging. This reduces the maximum loss. Investors can closely watch the investee’s development and when they see that the company develops negatively they can make use of their option to abandon before the last round of financing and therefore limit their losses. This is very important since entrepreneurs tend to continue projects that turn out to be not viable until they run out of liquidity (see Sahlman (1990), pp. 506-507; Perridon/Steiner (2002), p. 531). In addition to that the step by step reduction of uncertainty leads to a reduction of the risk premiums demanded by the investors (see Schween (1996), pp. 159-160). Finally staging helps the investors to make better decisions. With the perspective on staging as a tool for information discovery in combination with the option to abandon the project, it sometimes makes sense to finance a project stage with a negative expected value if it helps to reveal valuable information about the future project returns (see Roberts/Weitzmann (1981), pp. 1261-1288). In this context the revelation of information can then be used to tailor the next round’s financing amount to the venture’s needs, i.e. to expand or reduce the investment.

All these factors lead to an improved situation for the investors and due to the anticipation of the improvements in the investees’ behavior, they lead to lower costs of capital. However staging also has some negative aspects. From a transaction costs perspective staging causes higher negotiation costs, contract costs and a high frequency of costly company valuations (see Schulz (2000), p. 141-142). Also, staging may slow down the venture’s development thereby making it lose its competitive advantage; these costs can be called “cost of waiting”. These factors increase the costs of capital.
Overall the optimal time gap between rounds of financing is determined by the minimization of the costs of capital, characterized by the tradeoff between the reduction of agency costs and the increase of transaction costs with shortening stage times.

5.5.3 Options on the Venture’s Future

Of course the investee company’s life does not end with the financing project. After that transaction has ended, e.g. after the investee has gone public, successful companies need further financing and financial advice. These possible opportunities for follow-up business are strategic opportunities for the investors in the future that only exist because of the initial investment project (see Willner (1995), p. 222). Since successful co-operations are rarely terminated, this should be an important part of the considerations concerning the initial investment decision: “each round of financing can be seen as a strategic call option” (Gompers (1994), p. 69). Already in chapter 5.5.2 concerning staging, several such real options (see e.g. Trigeorgis (1996)) played a role: the options to abandon, to expand or to wait for further information are examples for that.

The traditional present value method does not include such option thinking. The question whether it is generally flawed because it cannot deal with managerial flexibility (see e.g. Brealey/Myers (1996), pp. 573-574; Trigeorgis (1996), p. 15) or whether the option perspective just integrates additional features of the projects into the valuation (see e.g. Grob (1999), p. 547) shall not be answered here. Either way it makes sense to value these real options to invest later since they yield possible future profits for the investors.

The financial option valuation models can be applied to value such real options only in a very imperfect way due to their restrictive assumptions. However without going too much into detail there are some general findings that can be applied.

Financial options can either be valued using binomial trees (see Cox/Ross/Rubinstein (1979), pp. 229-263) or using the closed-end solution for the special case of a continuous random walk (Brownian motion) of the underlying’s value (see Black/Scholes (1973), pp. 637-654). Even though the assumptions are extremely restrictive, this option pricing formula by Black/Scholes (1973) shows how financial options can be valued and it can give a general idea of the factors influencing the value of real options:

\[
\text{C} = \text{S} \times N(d_1) - \frac{\text{X}}{\text{S}} \times e^{-rT} \times N(d_2)
\]

with

\[
d_1 = \frac{\ln(\frac{\text{S}}{\text{X}}) + (r + 0.5 \times \sigma^2) \times T}{\sigma \times \sqrt{T}}
\]

and

\[
d_2 = d_1 - \sigma \times \sqrt{T}
\]

with C as price of the call option, S as price of the underlying security, X as strike price, \(\sigma\) as volatility of the underlying security, T as time to maturity at the time of valuation, and N(*) as function of the standard normal distribution

Applying these findings to the option to do future business when financing young growth companies yields important insights (see Schulz (2000), pp. 162-165):

1. \(\frac{d \text{C}}{d \text{S}} > 0\): A higher price of the underlying c.p. increases the value of the option. An option on follow-up business with quickly growing successful young companies is more valuable than the same option for disappointingly performing ventures. The measure to be used is the venture’s growth since its absolute value is difficult and costly to get, which makes it very difficult to judge when a real option is in the money and ready to be exercised (see Schulz (2000), p. 163).
(2) \( \frac{dC^\prime}{dX^\prime} < 0 \): A higher strike price c.p. lowers the option value. The strike price can be interpreted as negatively correlated to how advantageous the conditions for the investor in subsequent business will be. Better conditions imply a lower value of \( X^\prime \). These favorable conditions are due to the limited competition due to market entry barriers in these situations (see Laux (1993), p. 955). Such barriers can be caused by formal contractual agreements about future business, either due to the investor’s power on the investee’s board of directors (see chapter 5.2.1) or due to explicit rights such as a conversion right from debt to equity. On the other hand it can also be caused by informal factors such as the effects of learning from monitoring, and the transaction costs related to finding a new partner and negotiating conditions. In addition external investor will not want to invest in a company in which the current investor does not participate any more. This is either due to the signaling effect of an information insider leaving the company, or to the fear of the winner’s curse when bidding higher than the current investor, i.e. the phenomenon that in common value auctions the bidders systematically overbid the real value of the object when bidding according the private noisy signal they have received before, even though the average signal may be correct. The bidder with the most optimistic signal wins and pays more than the actual value (see McMillan (1992), p. 139).

(3) \( \frac{dC^\prime}{d\sigma_S} > 0 \): A higher volatility of the underlying c.p. increases the value of the option. This may be an argument for more freedom to the entrepreneur. That is problematic for moral hazard reasons, but it can help the option value. For real options a traded twin security to the underlying must be found in order to estimate the associated risk (see Willner (1995), p. 222). This is often virtually impossible for young growth companies and industry indicators or values based on experience have to be taken.

(4) \( \frac{dC^\prime}{dT^\prime} > 0 \): A longer time to maturity of the option c.p. increases its value. If there is a lot of time left, chances for price increases are higher, while the downside is limited in any case due to the option character. This implies that the real option for follow-up business is comparatively more valuable for early stage investments. The time to maturity is hard to assess for the real option on follow-up business. For the applicability of the financial models it is assumed that the end of the initial financing project is the optimal time for next steps, i.e. maturity, since there the advantages of being an early mover exactly cancel out with the disadvantages of maybe producing a product not ready for the market yet.

(5) \( \frac{dC^\prime}{dr} > 0 \): A higher riskless rate of return c.p. increases the option value. This influence is not very strong and has virtually no practical relevance for financing young growth companies.

Table 10 summarizes these effects.

<table>
<thead>
<tr>
<th>Influencing factor</th>
<th>Interpretation concerning financing young growth companies</th>
<th>Variable</th>
<th>Influence on option value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of the underlying</td>
<td>Investee firm value</td>
<td>( \bar{S} )</td>
<td>+</td>
</tr>
<tr>
<td>Strike price</td>
<td>Inverse to advantageousness of investment conditions</td>
<td>( \bar{X} )</td>
<td>–</td>
</tr>
<tr>
<td>Volatility of the underlying</td>
<td>Investee firm value volatility</td>
<td>( \sigma_{\bar{S}} )</td>
<td>+</td>
</tr>
<tr>
<td>Time to maturity</td>
<td>Time until end of initial investment</td>
<td>( \bar{T} )</td>
<td>+</td>
</tr>
<tr>
<td>Riskless rate of return</td>
<td>Riskless rate of return</td>
<td>( r )</td>
<td>+</td>
</tr>
</tbody>
</table>

Source: adapted from Schulz (2000), p. 165

One tool to actually allow the investors to make use of this dynamic option perspective is the introduction of convertible debt. That will also help investees, since investors will know to value this possibility and will lower the initial cost of capital for the investee. Convertibles have the advantage of offering a
fixed conversion rate, circumventing renegotiation at the time of option exercise. Also convertibles are immune to risk shifts by the entrepreneur; an increase in project volatility may hurt the value of the debt part of the instrument but it increases the value of the option part. These are just additional advantages of convertibles; chapter 5.1.4 has already shown how convertibles can be used to align interests. In comparison to traditional debt or equity convertibles increase the utility of all participants (see Schulz (2000), p. 170).

5.6 Effects of Competition

Looking at the holdup problem, it shows that the problem becomes worse with a higher degree of specificity of the original investment, because of the shift in negotiating power from the investor to the entrepreneur. This leads to the question of whether for the other agency problems, there may be any equivalent mechanism, that shifts negotiating power and therefore influences results. In price negotiations, typically the intensity of competition for the buyer and for the seller is a factor that has these influences. For the different market structures that are identified in Table 11, different results can be expected.

Table 11: Morphologic Market Scheme

<table>
<thead>
<tr>
<th>Suppliers</th>
<th>Many</th>
</tr>
</thead>
<tbody>
<tr>
<td>Few</td>
<td>Monopoly of Demand</td>
</tr>
<tr>
<td>Bilateral</td>
<td>Monopoly of Supply</td>
</tr>
<tr>
<td>Limited Monopoly</td>
<td>Limited Monopoly</td>
</tr>
<tr>
<td>One</td>
<td>Many</td>
</tr>
<tr>
<td>Monopoly</td>
<td>Many</td>
</tr>
<tr>
<td>Bilateral</td>
<td>Many</td>
</tr>
<tr>
<td>Limited Monopoly</td>
<td>Many</td>
</tr>
<tr>
<td>of Supply</td>
<td>Many</td>
</tr>
<tr>
<td>Monopoly of Supply</td>
<td>Many</td>
</tr>
<tr>
<td>Many</td>
<td></td>
</tr>
<tr>
<td>Monopoly of Supply</td>
<td></td>
</tr>
<tr>
<td>Monopoly of Demand</td>
<td></td>
</tr>
</tbody>
</table>

Source: Simon (1989), p. 11

Competition also influences the three identified agency problems:

Typically when analyzing moral hazard problems, one assumes a remuneration offered to the agent consisting of a fixed part and a part, which varies with performance (see chapter 5.1.4). While the variable part reflects the incentive structure, the fixed part ensures that the agent will participate in the task and not choose to do anything else; it fulfills the participation condition. Usually, it is assumed that one principal interacts with many agents, implying a monopoly condition. This leads to the fixed remuneration just being high enough to ensure the agent’s participation. Introducing the other extreme, a situation in which an agent is in a monopolistic situation with many (potential) principals leads to no change in the incentive structure, i.e. in the variable part of remuneration (see Erlei/Leschke/Sauerland (1999), 125-126). The fixed part changes, however. This time it is so high that if it were any higher the principal would not be interested in delegating the task any more; he just gets his opportunity costs. A bidding process amongst principals would start and the bidder with the best offer, i.e. the offer when he only earns his opportunity costs will win again. These were the two most extreme market forms. When considering other intermediate cases, the incentive structure will stay unchanged and the fixed compensation will be somewhere between the two extremes described above.

Also concerning adverse selection, competition plays a role. When trying to establish a separation equilibrium at asymmetric information, principals raise the cost of capital until “bad” entrepreneurs loose interest in pursuing the venture (see chapter 4.3.1). This is not possible in situations of perfect competition between principals since competitive bidding would prevent them from just raising the cost of capital.
Even for holdup, competition is important in a sense that it influences the asset specificity, that then again influences the extent of the problem. If there are many investment projects wishing to be financed by few principals, the investment may be a lot less specific due to the many outside options.

It has become clear that competition influences the agency problem. Still, there is very little research on the topic, especially in connection to the financing of young growth companies. The idea of considering the effect of the winner’s curse when bidding for financing ventures under imperfect information is tempting, but it is hard to say how it will work, since most authors do not consider different market structures.

5.7 The Competitive Role of Information

Companies in general transform inputs to outputs (see e.g. Kreps (1994), p. 204). The specific character of different companies lies in the knowledge on how to do this transformation (see Schumpeter (1937), p. 116). This knowledge is often called business idea, competitive advantage, innovation advantage or competence of the company (see Schulz (2000), 177).

This perspective on information as a key to competitive success has three major components: (1) On the one hand the fact that information plays a competitive role is the actual reason for the foundation of new companies. (2) On the other hand this role makes young enterprises very reluctant in sharing information with investors inhibiting the mitigation of agency problems. (3) The fact that the information is closely tied to the entrepreneur makes credible sanctions for cases of misbehavior very difficult.

(1) In general companies are founded in order to exploit existing knowledge (see Audretsch (1998), p. 144), even though the knowledge may possibly only exist in the entrepreneur’s mind. This knowledge can be exploited in two ways: either by selling it to an existing company or by founding a new venture. Assuming a perfect market for human capital and technological knowledge, the realization in an existing company is always advantageous due to the possibility take advantage of complementary processes (see Schulz (2000), p. 183). However, in these existing companies bureaucracy and its slowness, its inflexibility to change itself, its inflexible incentive schemes, and difficulties for the potential entrepreneur to adequately communicate his idea lead to a systematic undervaluation of new business ideas.

These disadvantages are answered by the advantages of new smaller organizational structures: Newly founded companies allow the exact appropriability of success and failure, quick decisions, flexibility, close contact to the market and low costs of internal monitoring and control. The decision for or against founding a new enterprise is then made considering the trade-off between taking advantage of complementary factors and the ability to deal with new information (see Schulz (2000), pp. 179-188).

(2) The competitive advantage of newly founded companies is based on their information and the way it is dealt with. Therefore revealing information in any form, in a monitoring, bonding, signaling, self-selection or information disclosure context, does not only imply direct costs. For young growth companies, who own many intangible assets and who spend a lot of their budget on R&D, the revelation of information to the market and the possible unwanted diffusion of knowledge (see Williamson (1975), p. 182) to competitors can have severe negative effects on the firm’s development. Young growth companies are very reluctant to reveal information to investors. There is a conflict between the need for information and the protection of information (see Zemke (1995), p. 227): On the one hand the information is needed to mitigate the strong agency problems, on the other hand entrepreneurs only want to reveal this information if they are sure that an unwanted diffusion of knowledge into the market can be prevented.
Often patents and licenses are proposed as solutions. For that however, the information must be exactly specified in an expensive and long process. In addition patent information is published after 18 months and in fact leads to a wide spread of the information. Even though competitors must not use the exact same technology, they can use smart modifications and adaptations of the patented idea. Therefore patents can offer only little help. However financial intermediaries such as venture capitalists who keep received information to themselves (see chapter 6.4.1) or rating agencies that aggregate the information to a level at which they it is of use only to the investors and not to the competitors can be a solution. This role of intermediaries is shown in Figure 40.

**Figure 40: Prevention of the Diffusion of Knowledge with Intermediaries**

This competitive role of information also makes it important for entrepreneurs to realize their project quickly. Any measures slowing the firm development unnecessarily down will cause costs. Staging can clearly reduce agency issues; however the costs of possibly slowing down projects, of waiting with the main investment until further information is revealed have to be taken into account as well.

Another issue concerning the competitive role of information is the perception of the young growth company in the business world. Especially before the closing of the contract, it is not only in the entrepreneur’s interest to describe his venture positively merely due to financing reasons (see chapter 4.3). The information he projects to the outside also can easily spread and affect other areas of his business as well. Communicating negative information can lead to potential employees or customers having a bad image of the young growth company. This can then lead to a negative development following a negative announcement as a self-fulfilling prophecy (see Spremann (1996), p. 718).

(3) A last information-related issue is the tight connection between the entrepreneur and the business idea. Especially in the early stages of a young growth company’s development a lot of its knowledge is bound as implicit knowledge to the entrepreneur (see chapters 2.1 and 2.3.3.b). In this context knowledge also includes his leadership, his authority, his contacts and his ability to make decisions (see Amit/Glosten/Muller (1990), pp. 1233; Cooper/Gimeno-Gascon/Woo (1994), pp. 376-379).

This importance of the entrepreneur for the venture makes it very difficult for the investor to actually sanction or even remove the entrepreneur since without him the investment project is basically of no value.
This inhibits a mitigation of agency problems with many of the above methods. Many sanctions or restrictions threatened by the investor loose credibility considering how high losses for the investor would be.

The try to simply increase penalties for misbehavior in order to still reduce agency costs is very dangerous, since the sanction design could destroy the productive atmosphere between investor and entrepreneur that helps to create value. However, it is very difficult to actually model the benefits of a fair working atmosphere in order to include it into the agency analysis (see chapter 3.2.2). One possible solution is the staging of investments (see chapter 5.5.2). Both sides fulfilling their commitments step by step and the option to exit at limited losses reduce the dangers of opportunistic behavior.

5.8 Inference from the solutions and mitigations

After having been confronted with the informational problems of financing young growth companies in chapter 4, this chapter has demonstrated that there is a number of tools that can be used to mitigate and to even solve these problems; there should be some empirical evidence for their usage. Since in reality venture capitalists act as intermediaries concerning investments in young growth companies (see chapter 6), only data for their activities is available.

Venture capitalists are very conscious of the agency issues and try to mitigate them. An overview is given by Kaplan/Stroemberg (see Kaplan/Stroemberg (2001), pp. 426-430). Many of the previously discussed issues are addressed in practice.

Concerning financial contracting, in the United States convertible debt is the predominant investment tool. Also venture capitalists try to align interests, since “VC’s change the entrepreneur’s equity compensation function making it more sensitive to performance when incentive and asymmetric information problems are more severe” (Kaplan/Stroemberg (2001), p. 427). The allocation of control rights shows the incompleteness of contracts, acknowledging the existence of holdup risks. Provisions inhibiting exiting entrepreneurs to compete try to mitigate the entrepreneur’s strong position in the firm (see Kaplan/Stroemberg (2001), p. 427). Also adverse selection is addressed: Thorough screening precedes investments. Especially the evaluation of management can be identified as having an influence on venture performance. Also, venture capitalists shift control towards themselves when the venture performs badly, indicating management support activities. Management support and monitoring are also reflected in the fact that venture capitalist-supported ventures bring their products to market more quickly (see Hellmann/Puri (2000), pp. 959-984) and they are more active on the market for managers (see Hellmann/Puri (2002), pp. 169-197). However venture capitalists clearly do not wish to become too involved into monitoring due to the high costs (see Kaplan/Stroemberg (2001), p. 429).

Of course the measures presented in this chapter are not meant to be used in isolation of each other. In order to effectively mitigate the agency problems a cocktail of procedures is necessary. Of course the measures are interrelated (see Kaplan/Stroemberg (2001), p. 429): After having identified the ventures’ weaknesses by screening, these weaknesses are addressed via monitoring and management support. At the same time contracts are designed to facilitate monitoring and to set incentives for the entrepreneur not to behave opportunistically.

After the overview of the agency problems between investor and investee, and of how to deal with them in the past two chapters, the next chapter analyzes venture capital as a financial intermediary that can reduce agency costs. It has to be shown that this reduction in agency costs can compensate for the additional costs of the prolongation of the chain, and if so, which activities actually create the value.
6 Venture Capital as Financial Intermediary

After having understood the agency problems related to the investor-investee relationship in the case of young growth companies, now the effects of financial intermediation by a venture capitalist are examined. First, the derivative relationships that emerge from the prolongation of the transaction chain are analyzed. Then the advantageousness of financial intermediation by venture capitalists is analyzed (see Breuer (1993), pp. 57-150; Hartmann-Wendels/Pfingsten/Weber (1998), pp. 114-148). Finally the value creating activities by the intermediary are introduced. This chapter focuses on agency effects and on transaction cost aspects.

6.1 Venture Capital as two-step agency relationship

Institutions are called financial intermediaries if they enter independent relationships with investors and investees in the context of a financial transaction (see Scholtens (1993), pp. 114-118; Gerke/Pfeufer (1995), p. 728). Intermediaries get cash inflows from the suppliers of capital and pass it on to the demanders of capital, thereby replacing the direct relationship between investor and investee. Some important financial intermediaries are e.g. banks, insurances, pension funds or venture capital firms (see e.g. Bitz (1989), pp. 430-431; Gerke/Pfeufer (1995), p. 728). In this context, venture capitalists are defined to be true intermediaries, having financial relationships with several investors and several investees (see chapter 2.3.1).

Venture capital can in this context be seen as a two-step agency relationship. If a venture capital firm acts as a financial intermediary, the informational asymmetries of the original relationship between investor and investee are not eliminated; they are only shifted to the derivative agency relationships between (1) investor and venture capital firm and (2) venture capital firm and the investee (see Sahlman (1990), pp. 489-493, 506-514; Schween (1996), pp. 160-164). Sometimes even a third relationship is seen between the partners and employees of the venture capital firm (see Zemke (1995), p. 50). This intra-organizational relationship is a standard employer-employee problem; here, the analysis will concentrate on venture capital as intermediary in a two-step agency model. These new relationships are characterized by informational asymmetries themselves.

The four major agency problems in the context of equity finance for young growth companies (see chapter 4.4) exist in the two-step agency relationship at both levels as well (see Chapter 4; Hartmann-Wendels (1987), pp. 18-22; Spremann (1990), pp. 567-572; Zemke (1995), pp. 49-59, 166-168). Table 12 gives an overview of the application of the agency problems and their solutions identified above to the financing situation with an intermediary.

However, when applying these findings, it has to be noted, that especially those objectives of the venture capitalist that are not derived from the investors’ and the investees’ objectives deserve special attention; hence, it is not immediately clear that financial intermediation improves the financing situation. Before examining the advantageousness of financial intermediaries in the market for equity finance for young growth companies in chapter 6.4, the two derivative agency relationships are described in more detail in the following two sections.
Table 12: Important Agency Effects in the Venture Capital Two-Step Agency Relationship

<table>
<thead>
<tr>
<th>Type of Agency Problem</th>
<th>Agent Intention</th>
<th>Investor – Venture Capitalist</th>
<th>Possible Solutions and Mitigations</th>
<th>Venture Capitalist – Investee</th>
<th>Possible Solutions and Mitigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taking advantage of non-pecuniary benefits</td>
<td>Personal wealth, status thinking, satisfaction of curiosity (Moral Hazard)</td>
<td>• VC grants funds to favored investors&lt;br&gt;• VC does &quot;perk consumption&quot;</td>
<td>• Participation of VC management in the fund&lt;br&gt;• Success-dependent remuneration (low management fee)&lt;br&gt;• Influencing major investment decisions&lt;br&gt;• Monitoring by investors&lt;br&gt;• Budgeting expenses</td>
<td>• Investee pursues interesting but unprofitable projects&lt;br&gt;• Investee does &quot;perk consumption&quot;</td>
<td>• Majority share held by entrepreneur&lt;br&gt;• Success-dependent remuneration&lt;br&gt;• Influencing important project decisions&lt;br&gt;• Monitoring by VC&lt;br&gt;• Budgeting expenses</td>
</tr>
<tr>
<td>Deception concerning an agent’s qualification and motivation</td>
<td>Reduction of effort and performance (Moral Hazard)</td>
<td>• External investment reduces effort incentives (effort problem)</td>
<td>• Success-dependent remuneration (high carried interest)&lt;br&gt;• Auditing by investors&lt;br&gt;• Clear definition of the tasks to be performed&lt;br&gt;• Influencing personnel decisions&lt;br&gt;• Monitoring by investors</td>
<td>• External investment reduces effort incentives (effort problem)</td>
<td>• Auditing by VC&lt;br&gt;• Management support by the VC to close gaps&lt;br&gt;• Influencing personnel decisions&lt;br&gt;• Monitoring by VC</td>
</tr>
<tr>
<td>Deception concerning project return, risk and feasibility</td>
<td>Reduction or denial of effort and performance (Holdup)</td>
<td>• VC openly neglects activities in an incomplete contract</td>
<td>• Predetermined sanctions&lt;br&gt;• Influence on personnel decisions&lt;br&gt;• Reputation mechanism&lt;br&gt;• Staged investment with capital calls</td>
<td>• Investee openly neglects activities in an incomplete contract</td>
<td>• Predetermined Sanctions&lt;br&gt;• Collateralized investments&lt;br&gt;• Finance with convertibles&lt;br&gt;• Influence on personnel decisions&lt;br&gt;• Staged investments</td>
</tr>
<tr>
<td>Exaggeration in order to get large quantities of cheap capital (Adverse Selection)</td>
<td>• VC exaggerates the advantage through specialization and his qualification</td>
<td>• Participation of VC management in the fund&lt;br&gt;• Priority of investor returns up to a certain level before VC compensation starts&lt;br&gt;• Staged investment with capital calls&lt;br&gt;• Track record</td>
<td>• Investee exaggerates administrative and market-related qualifications</td>
<td>• Thorough screening by VC&lt;br&gt;• Prototypes and product demonstrations&lt;br&gt;• Partly self-finance&lt;br&gt;• Staged investment</td>
<td>• Success-dependent remuneration&lt;br&gt;• Collateralized investments&lt;br&gt;• Auditing by VC&lt;br&gt;• Monitoring by VC&lt;br&gt;• Information exchanges</td>
</tr>
<tr>
<td>Deception concerning necessary resources</td>
<td>• VC accepts too much capital to manage</td>
<td>• Same as above&lt;br&gt;• Deduction of management fee before carried interest starts&lt;br&gt;• Limit for additional payments</td>
<td>• Investee projects a too low need of resources to motivate the VC to invest</td>
<td>• Cut in remuneration&lt;br&gt;• More than proportional costs for the entrepreneur in later capital rounds (earn-out)&lt;br&gt;• Auditing by VC&lt;br&gt;• Monitoring by VC&lt;br&gt;• Staged investments</td>
<td></td>
</tr>
</tbody>
</table>

Source: adapted from Schefczyk (2000), p. 120
6.2 Relationship between Venture Capitalist and Venture

The derivative relationship between venture capitalist and venture is very similar to the original relationship between investor and investee as was investigated in detail in chapters 4 and 5. The venture capitalist takes on the investor’s role in the relationship with the investee, since his objectives are mainly derived objectives (see chapter 2.3.4), i.e. the provision of return to investors while fulfilling the investees’ requirements.

The additional objectives of the venture capitalist (capital acquisition, efficiency, compensation) do not strongly influence his relationship with his portfolio companies. Some effects such as withholding management support for efficiency reasons or reducing effort for private interests are imaginable, but the carried interest as compensation component (see chapter 2.3.2) should provide for a strong focus on the derivative objectives.

The relationship between venture capitalist and portfolio firm is characterized by the same problems due to agency and asymmetric information as the original relationship. The measures that can be taken by the venture capitalist to solve and mitigate these problems are basically the same as well (see chapter 5). The main difference between these two relationships is the fact that due to specialization, the venture capitalist’s ability to reduce the agency costs is much better than the ability of the investors (see chapters 6.4 and 6.5).

6.3 Relationship between Investor and Venture Capitalist

The investors would like the venture capitalist to act completely in their interest. They would like the venture capitalist to only concentrate on the derived objectives, i.e. to maximize the portfolio firms’ value, and they would like to suppress the venture capitalist’s own interests. Especially the compensation objectives, the market objectives concerning capital acquisition and the venture capitalist’s private goals can lead to behavior, not desired by the investors.

The four agency problems concerning venture financing (see chapter 4.4) exist as well. The consumption of non-pecuniary benefits, through perk consumption or deals with friends at favored conditions, is mainly due to the venture capitalist’s compensation objectives and private objectives. Investors try to counter that by keeping the management fee as low as possible, influencing investment decisions and requiring regular reports. For legal and tax reasons investors cannot engage in close monitoring (see Gompers/Lerner (1999), pp. 19-28).

The deception concerning qualification and motivation exists as well. It could be done for moral hazard reasons (see chapter 4.1.2.a) in order to fulfill private objectives, e.g. spending more time with the family; investors counter this by negotiating the carried interest. The venture capitalist’s remuneration is extremely success-dependent, because he not only receives his capital’s gain, but in addition he receives 20% of the whole fund’s gain. Holdup for wealth-shifting reasons can exist, but the problem is less severe than for the portfolio firms. Venture capitalists have a history that can be analyzed and they want to do further transactions with the investors when starting subsequent funds. The reputation mechanism works in this context. Concerning the possibility of adverse selection, no matter whether the venture capitalist exaggerates his abilities, the expected return or the need for resources, the effect is the same – too much capital to manage. This could happen due to his private objectives, i.e. status thinking, or his compensation objectives. In a larger fund, the venture capitalist may then only invest a certain share of the
capital due to his limited time capacity and to save costs. While the carried interest would be the same as in a smaller but fully invested fund, the management fee typically increases with the fund size at constant cost of operating the fund. Especially well works in this context the mechanism that investors get a certain minimum return, they have to achieve, before management’s participation in the gain starts. Another alternative is to deduce the management fee from the carried interest in the case of a positive business development (see Zemke (1995), pp. 168-173).

As it has been shown above, the success-dependent remuneration structure consisting of management fee and carried interest as presented in chapter 2.3.2 is the main tool for investors to mitigate the agency problems in the derivative relationship with the venture capitalist (see Zemke (1995), pp. 50-51; Gompers/Lerner (1999), pp. 29-94). Of course also the other classes of mitigations can be of use, such as influence in personnel decisions or an exact definition of the tasks and the investment principles, which will then have to be monitored. A summary of the problems and possible countermeasures can be found in Table 12.

### 6.4 Advantageousness of Venture Capital as Intermediary

The advantages of venture capital as a financial intermediary on the market for equity finance for young growth companies consist of two groups: (1) The reduction in transaction costs due to the intermediary’s services in certain fields and (2) the reduction in agency costs by positively influencing agent behavior. The measure of advantageousness is, whether the sum these cost reductions surpasses the additional costs of operating the intermediary (see Diamond (1984), p. 393). This is first investigated qualitatively before engaging into a formal analysis.

#### 6.4.1 Qualitative Analysis

In comparison to investors investing directly in young growth companies, venture capitalists can offer several advantages by directly reducing transaction costs of financing young growth companies (see Benston/Smith (1976), pp. 222-223; Gerke/Pfeufer (1995), pp. 729-730; Schefczyk (2000), pp. 133-134):

- **Institutionalization of the search:** The probability of transactions on financial markets rises with the number of suppliers and their convenient distribution on the market segments. Venture capitalists increase the supply of equity capital for young growth companies and they are institutionalized meeting points for market participants. They reduce search costs and raise the chances of financing.

- **Information provision:** Venture capitalists systematically raise information about potential portfolio firms and use it in the interest of many investors to build up their portfolio (see Figure 40). In addition venture capitalists can lower information costs due to their long-term business relationships, discretion and management of information channels. The venture capitalists’ discretion, i.e. they use the information obtained from the potential portfolio firms to build up their portfolios and don’t pass it on to outsiders, makes investees much more willing to reveal information and to accept such measures as auditing or monitoring (see chapter 5.7).

- **Specialization:** Also, venture capitalists are specialized, i.e. they have the personnel and the knowledge, to efficiently screen, to contract and to provide management support and monitoring to young growth companies. Due to economies of scale and learning curve advantages this lowers the average cost per investment.
➢ Standardization: Venture capitalists use standard contracts, lowering the costs of negotiation and closing of the contract as well as the uncertainties about good contract design.

➢ Optimization of denomination: Venture capitalists can distribute the fixed costs of investment on many investors they invest for. Without the intermediary the investors couldn’t invest in that many ventures due to constraints in budget and diversification.

Therefore there are significant reasons to believe that venture capitalists as intermediaries can lower the transaction costs of financing young growth companies.

Of course there is not only the advantage of lower transaction costs; financial intermediation also reduces agency costs by mitigating opportunistic behavior. Referring back to the model of non-pecuniary benefits (see chapter 4.1.1), e.g. a lower cost of monitoring not only raises the resulting curve (due to lower deviations from the original substitution line) reflecting the transaction cost advantage, it also leads to a reduction of agency problems, i.e. a new tangency point at which more monitoring is done at a higher firm value and an increased agent utility.

A graphical analysis of the issue is shown in Figure 41. Starting point is the equilibrium KM1 that has evolved with monitoring costs that are reflected in line MB1 (see chapter 4.1.1; Figure 25) yielding an agent utility of UM1 and a firm value of YM1. Now, a situation in which the investor has lower monitoring costs, as a venture capitalist would have compared to a direct equity investor, is introduced, resulting in line MB2. One can clearly see that this results in a higher agent utility U_M2 and a higher firm value Y_M2 at lower consumption of non-pecuniary benefits c_M2.

**Figure 41: Improved Equilibrium at Low Monitoring Costs**

As the enlarged version in This effect of course is true in a similar way for the other measures as well (see chapter 5), leading to significant benefits of intermediation due to reduced agency issues.

Figure 42 shows, at the original level of monitoring KM1, the cost reduction caused a reduction of the original monitoring expenses from AKM1 to DKM1 leading to a new firm value YM2. This reflects the reduction in transaction costs. The reduction in agency costs can be seen in the movement of the monitoring equilibrium to the new combination KM2 at an increased firm value YM2, at a decreased level of consumption c_M2 and at an increased level of entrepreneur utility U_M2; the new monitoring expenses are BKM2 only.
This effect of course is true in a similar way for the other measures as well (see chapter 5), leading to significant benefits of intermediation due to reduced agency issues.

**Figure 42: Reduction in Transaction and Agency Costs**

However in general the activity of a venture capital firm causes high and usually fixed costs, which need to be overcompensated by the reduction in transaction and agency costs in the derivative relationships compared to the original relationship. This is not necessarily the case due to the still high degree of asymmetric information in the derivative relationships. Still, the existence of successful venture capital firms hints towards the conjecture that such intermediaries can better deal with the market imperfections described, than single investors could (see Schefczyk (2000), p. 139).

Against this conjecture speaks, that in many financial markets there is a trend towards disintermediation (see Gerke/Pfeufer (1995), pp. 733-734), e.g. the issuance of commercial paper by big corporations. Concerning the financing of young growth companies “corporate venturing” is a trend towards disintermediation, and the informal venture capital market for early-stage investments is disintermediated as well. Still, the high informational asymmetries and the complexity of the product including financing and management support speak in favor of financial intermediation (see Scheczyk (2000), p. 140).

### 6.4.2 Formal Analysis

The formal analysis concerning the advantageousness of venture capital as a financial intermediary is divided into two parts. First the analysis uses a model developed by Chan (1983), which is based on the intermediaries’ superior ability to deal with search problems compared to direct investments by the investors. Then, in a second step, a model by Diamond (1984) modified by Breuer (1993) and Hartmann-Wendels (1987) is considered. That model focuses on the intermediary’s ability to improve situations of moral hazard.

#### 6.4.2.a A Search Cost-centered Approach

This formal analysis clarifies the conditions necessary for the existence of an intermediated equilibrium and therefore for the relevancy of venture capital firms as intermediary. While it was originally developed by Chan (1983, pp. 1543-1560) for the banking sector, it was adapted to venture capital by Amit/Brander/Zott (1998, pp. 441-466) and Schechczyk (2000, pp. 140-144).
The analysis starts with the realistic assumption of positive search costs from screening (see chapter 6.4.1). These costs are incurred when selecting good projects from bad projects and they apply to venture capitalists and informal equity investors who have the choice of direct investments or usage of a venture capitalist as intermediary. During the search the problem of adverse selection exists, for investors have an incentive not to incur search costs but simply to assume average characteristics (see Breuer (1993), p. 133). Investors with lower search costs are less subject to this and can therefore improve the situation.

The total number of investors $N$ is divided in two groups with different search costs. There are $\beta N$ investors with low search costs $\eta$ ($\eta > 0$) and $(1 - \beta)N$ investors with high search costs $\theta$ ($\theta > \eta$). Investors with low search costs are called informed investors. This group consists of specialized informal equity investors and specialized intermediaries, i.e. venture capitalists. Investors with high search costs are informal equity investors that don’t engage in financing young growth companies very often.

If the intermediaries can compensate their costs by advantages in specialization (see chapter 6.4.1) an equilibrium evolves if informed investors are indifferent between (1) using the intermediary and (2) random investment, knowing that the market is analyzed by intermediaries. Investors with high search costs use intermediaries.

In this equilibrium, investing randomly without incurring search costs, investors get the utility $\bar{V}$:

$$d\bar{V} = V^* - d$$

with $V^*$ as utility of superior projects, identifiably with search and $d$ as remuneration of the intermediary per project

In this situation all investments are done at low search costs either by the intermediaries or by informed investors. The share of investors that use intermediaries $\delta$ is given by the share of informed investors using intermediaries out of all investors $\omega$ and the share of uninformed investors, who all use intermediaries:

$$\delta = \omega \beta + (1 - \beta)$$

The total share of superior projects $\lambda$ is related to the share of investors using intermediaries $\delta$:

$$\bar{V} = \lambda(\delta)V^* + (1 - \lambda(\delta))V(\delta)$$

with $V(\delta)$ as utility of inferior projects

This shows that intermediaries can increase the investors’ utility. Therefore $\delta$ needs to be explained. The total remuneration of all intermediaries $T_I$ can also be related to $\delta$; it is the product of the share of investors that use intermediaries $\delta$, the remuneration of an intermediary per project $d$, and the number of investors $N$:

$$T_I(\delta) = \delta dN$$

Assuming an even distribution of activity over all intermediaries, the total revenue per intermediary $T$ can be expressed:

$$T(\delta) = \frac{\delta dN}{B^*}$$

with $B^*$ as number of intermediaries in equilibrium

If the intermediaries have to screen $h_0(\delta)$ projects, then the number of screened projects per intermediary $h^*$ can be expressed given the assumption of an even distribution of activity over all intermediaries:
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\[
h^* = \frac{h_1(\delta)}{B^*} \quad (6.6)
\]

Solving Equation (6.6) for \(B^*\) and plugging it into Equation (6.5) the total revenue per intermediary \(T\) can be expressed independently from \(B^*\):

\[
T(\delta) = \frac{\delta dh^* N}{h_1(\delta)} \quad (6.7)
\]

In market equilibrium, which doesn’t allow any abnormal rent for the intermediary, the willingness to pay per screened project must be equal to the search costs of informed investors and intermediaries. The search costs correspond to the intermediary’s revenue per project. In combination with Equation (6.7) his leads to the equilibrium condition:

\[
F(\delta) = \frac{T(\delta)}{h^*} = \frac{\delta dN}{h_1(\delta)} = \eta \quad (6.8)
\]

with \(F(\delta)\) as willingness to pay per screened project

Solving this for \(\delta\) shows which factors induce investors, who could engage into screening themselves, to use intermediaries. This is only true however under the conditions, that (1) intermediaries can compensate for their cost through specialization, and (2) a market equilibrium evolves:

\[
\delta = \frac{\eta h_1}{dN} \quad (6.9)
\]

The higher the total search costs for all projects (\(\eta h_1\)) in relation to the potential total remuneration of the intermediaries if they were used for all screening (\(dN\)), the higher the intensity of usage of intermediaries, i.e. the more investors will use the intermediaries. One can conclude that high search costs, due to investors having trouble to deal with the effects of agency and asymmetric information lead to a more intense use of intermediaries who are better able to deal with these problems. Because of the high uncertainties involved in the context of financing young growth companies intermediaries, i.e. venture capitalists make sense.

It cannot stay unmentioned that this model has been heavily criticized (see Breuer (1993), pp. 134-135): For the model to consistently explain intermediation, intermediaries need the ability of remembering search results while investors cannot communicate amongst each other. Even then, the model still doesn’t take informational asymmetries between intermediaries and investors into account. It makes sense to consider a second approach to verify the advantageousness of intermediaries.

6.4.2.b A Moral Hazard-centered Approach

After having concluded above that, in the context of search problems, venture capital as intermediary makes sense, this is verified by analyzing the problem from a different angle, i.e. by demonstrating the advantageousness of intermediaries in a moral hazard setup (see Diamond (1984), pp. 393-414; Neus (1995), pp. 107-113; Breuer (1993), pp. 140-148).

M risk neutral and wealth-constraint entrepreneurs offer projects with returns \(Y\) between 0 and \(Y^-\) (evenly distributed with a known and not influencable density function \(f(Y)\)) to \(N\) risk neutral investors who can invest one currency unit each. Risk attitude has impacts on Diamond’s results (see Diamond (1984), pp. 403-407) but that is only due to his specific modeling, and is not a problem for the applicability (see Breuer (1993), p. 146). The projects’ expected rate of return is greater than the riskless rate of return \(r\)
and they require an initial investment of I. Several Investors are needed for one project since \( I > 1 \). There is sufficient capital for financing all projects \( N \geq M \cdot I \).

Since the realized cash flows cannot be observed by the investors, they have to get the agent to pay out their return using control or incentive mechanisms. Using control, control costs \( C \) have to be incurred; an investor gets private information about the return, i.e. he cannot share the information with other investors. The control costs per project are \( I \cdot C \). The type of financing is not relevant in that case. Using incentives the investors introduce non-pecuniary sanctions \( \Sigma \) (e.g. loss of reputation) against the entrepreneur. The entrepreneur will then pay the amount \( TP \) to the investors, which maximizes his utility \( U \) given the incentive scheme under the conditions of ex-post utility maximization and the investors’ expected return:

\[
\max_{TP(Y),\Sigma(y)} E[U] = \int_0^\infty \left[ Y - TP(Y) - \Sigma(TP) \right] f(Y) dY \quad \text{s.t.}
\]

\[
TP(Y) = \arg \max_{\eta(Y)} E\left[ Y - TP(Y) - \Sigma(\eta(y)) \mid Y, \Sigma(\bullet) \right],
\]

\[
\int_0^\infty TP(Y) \cdot f(Y) dY \geq (1 + r) \cdot I
\]

This yields the solution (see Diamond (1984), p. 397):

\[
TP(Y) = \min\{P_{DC}, Y\}
\]

\[
\Sigma(TP) = \max\{0, P_{DC} - TP\}
\]

with \( P_{DC} = \min\{P_{DC} \mid E[\min\{P_{DC}, Y\}] \geq (1 + r) \cdot I\} \) (6.11)

The entrepreneur pays the amount \( R \) to the investors whenever possible; if impossible he pays all he has. This standard debt contract makes the entrepreneur’s utility independent of the repayment amount \( TP \) (see Neus (1995), p. 110):

\[
U(Y) = Y - P_{DC}
\]

The sanctions lead to the fair behavior by the entrepreneurs. Those entrepreneurs who are unlucky with the returns \( Y \) get sanctioned, even though they have reported their gains correctly. This incentive solution is costly as well; the sanctions for the entrepreneurs lead to a utility reduction for the entrepreneurs without increasing the investors’ utility:

\[
E[\Sigma] = \int_0^{R_{ex}} (P_{DC} - Y) \cdot f(Y) dY
\]

(6.13)

For the original relationship between investor and investee, the agency costs per entrepreneur \( AC_{Inv-Ent} \) are given:

\[
AC_{Inv-Ent} = \min[I \cdot C, E[\Sigma]]
\]

(6.14)

In comparison to that an intermediary that finances \( m \) entrepreneurs and gets refinanced by \( m \cdot I \) investors is considered. For all of the relationships to the entrepreneurs he has to choose between control and incentives. He incurs agency costs as shown in Equation (6.14) with the difference that control costs are only \( C \) now, because the intermediary controls for all refinancing investors:

\[
AC_{Int-Ent} = \min[C, E[\Sigma]]
\]

(6.15)

The relationship between investor and intermediary could again be designed with control or incentives. If it were control-driven, the agency costs per entrepreneur would be \( AC_{Inv-Int(c)-Ent} \).
\[ AC_{\text{Inv} - \text{Int(c)-Ent} - \text{Int}} = (I \ast C) + \min \{C, E[\Sigma]\} \quad (6.16) \]

These are in any case more expensive than the agency costs of direct investment given in Equation (6.14), giving the intermediary no reason for existence (see Breuer (1993), pp. 193-194). It can only potentially make sense to manage the intermediary via incentives. In fact in chapter 6.3, it was found that investors mainly manage the relationship with incentives, i.e. the remuneration design.

Independent of the management by control or incentives, it is possible for the intermediary to negotiate a payback amount of \( TP_j = \min (Y_j, T) \) with the entrepreneurs. With this money the intermediary has to satisfy the investors’ minimum rate of return \( r \). In this situation the intermediary maximizes his utility concerning cash inflows and outflows similar to the entrepreneur in Equation (6.10). The result is basically the same as shown in Equation (6.11) (see Neus (1995), pp. 111-112).

With the subindex \( m \) showing that the considered variables apply to the intermediary, not the entrepreneurs, the expected costs of sanctioning are:

\[ E\left[\Sigma_m\right] = \int_0^{P_m} (P_m - Y_m)^* f(Y_m) dY_m \quad (6.17) \]

Since all the stochastic variables \( Y_j \) are distributed identically and independently, the average cash flow per entrepreneur is distributed with:

\[ E\left[\frac{Y_m}{m}\right] = E[Y] \quad \text{and} \quad \text{Var}\left[\frac{Y_m}{m}\right] = \frac{\sigma^2}{m} \quad (6.18) \]

Since the investments are worthwhile, i.e. \( m^* E[Y] > P_m \), that implies:

\[ \lim_{m \to \infty} \text{Prob}(Y_m < P_m) = 0 \quad (6.19) \]

The probability that the intermediary needs to be sanctioned decreases when the number of firms increases and finally vanishes. Therefore sanction costs in the investor-intermediary relationship become negligible with diversification. This implies total agency costs for the intermediated situation of:

\[ AC_{\text{Inv} - \text{Int(c)-Ent} - \text{Int}} = AC_{\text{Ent-Ent}} = \min \{C, E[\Sigma]\} \quad (6.20) \]

Given a large number of companies, a situation with intermediaries weakly dominates a situation of direct investments. Therefore intermediaries are advantageous.

However these findings mainly apply to a banking environment with debt contracts as form of financing. Also the results are quite dependent of the assumed information asymmetry. The model has often been modified to better fit certain situations. One extension is interesting concerning equity investments (see Breuer (1993), pp.151-256). This analysis is too complex to be explained in short. The main line of reasoning and the main results are shown qualitatively below (see Neus (1995), pp. 116-118).

Major changes in the model come from assuming a moral hazard problem, where the entrepreneurs’ behavior can influence project results, instead of the unobservability of cash flows. The entrepreneur consumes one part and invests one part of the obtained financing. Again control or incentives can be used to manage the relationship. If managed by incentives, given a risk neutral entrepreneur, the optimal form of financing again is the standard debt contract as shown above. If he is risk averse however, a conflict between optimal incentives and optimal risk allocation arises resulting in a trade-off situation (see e.g. Demougin/Jost (2001), pp. 54-55). If managed by control, this informational asymmetry implies the need for control in any case at the time of the investment.
Similar to Diamond, the decision for control or for incentives depends on the relative costs between the two alternatives. The reason for the existence of financial intermediaries is similar to Diamond: The intermediary controls the entrepreneurs and is managed by incentives himself. This solution of delegated control saves control costs, while the agency costs of delegation can be neglected due to diversification (see Breuer (1993), p. 186). In this situation the intermediary pays a fixed amount to the entrepreneur and receives residual claims – he invests equity. The solution can be adjusted to the entrepreneurs’ individual degree of risk aversion.

This thinking of superior control efficiency and low costs of delegation can be applied to a venture capital setting (see Hartmann-Wendels (1987), pp. 16-30). The superior control efficiency is very convincing due to the venture capitalists’ involvement in their portfolio firms (see chapter 6.2). However there is plenty of room for criticism. One venture capitalist could monopolize the market and efficiently manage an infinite number of portfolio firms. In addition equity and debt finance are very sensitive to the assumed information asymmetries and can be easily exchanged. Also, the venture capital firms in reality do not get refinanced via debt contracts (see chapter 2.3.2) as implied by the model.

As a conclusion of these formal approaches it can be said, that several different forms of informational asymmetries can explain financial intermediation. However, venture capital cannot really be explained by the models, since most of them cannot explain equity financing in the intermediary-investee relationship, and they cannot explain the form of refinancing chosen by real venture capitalists. Still, they can give an intuition about how intermediaries can improve the situation through delegated search or control.

### 6.5 Functions of Venture Capitalists as Intermediaries

In this chapter it has been shown that on the market for financing for young growth companies, the intermediation by a venture capital firm makes sense given the insights from the economics of institutions and information. Starting from that, this section shows the finance-theoretic functions of venture capital as intermediary. These functions are cost and risk minimizing transformation functions (see e.g. Bitz (1989), pp. 432-436; Gerke/Pfeufer (1995), pp. 732-733; Schefczyk (2000), pp. 144-146). They try to balance the interests of investors for return, stability and liquidity and the interests of investees for long-term finance and flexibility (see chapter 2.3.4).

- **Transformation of risk**
  - Selection of risks: Venture capitalists are specialized on evaluating risks and returns of young growth companies and they can pick the best deals at low transaction costs. Due to specialization the venture capitalist has advantages in selecting and monitoring the ventures.
  - Diversification of risk: Venture capitalists invest in many portfolio firms whose developments are less than perfectly correlated. Thereby the risk of the portfolio is lowered. In combination with the transformation of denomination especially for small investors this common portfolio is better diversified than if they were acting on their own (see Diamond (1984), pp. 400-407; Hartmann-Wendels (1987), pp. 27-28).
  - Allocation of risk: Venture capitalists improve the allocation of capital in the economy since their equity investments enable the young growth companies to get loans (see Schefczyk (2000), p. 145).
o Liability function: Due to the diversification of the venture capitalist, the risk of insolvency is distributed on several investors. However, the investors' liability is usually limited to their commitment in the fund, resulting in a very moderate liability function compared to banks (see Schefczyk (2000), p. 145).

- Transformation of information: Venture capitalists collect information when searching for, screening and monitoring portfolio firms. They aggregate this information and then pass it on to investors, thereby protecting the companies’ wish for secrecy while enabling the investor to judge the venture capitalist by its investments and the therefore expected return.

- Transformation of denomination: Using economies of scale and advantages due to specialization, venture capitalists assimilate the interests of investors and investees concerning denomination; the number and size of investors is no longer of importance due to the fund character of venture capital. This lowers the cost for search and negotiation and possibly enables better diversification as explained above.

- Transformation of maturity: The time portfolio firms are held is independent from the time horizon of investors investing in the venture capital firm. This independence of the two groups enables flexibility concerning the investments, especially concerning the time of exit. This transformation is limited however by (1) the need for liquidity by the portfolio firms and (2) the need for fungibility by the investors.

Of these functions especially the transformation of risks due to the specialization of searching for, screening, contracting with and monitoring of young growth companies is important (see Schefczyk (2000), p. 146). In addition, the experience and specialization concerning management support is one of the main factors creating value for the investee (see chapters 2.3.3, 5.2.1).

7 Conclusion and Outlook

The analysis has shown that it is hard for young growth companies to obtain finance. External equity finance is one solution to that problem. Alternatives for financing quick growth rarely exist, since cash flows are negative and banks behave too conservatively.

However, equity finance in such an uncertain environment has to deal with the problems of asymmetric information. This tempts the entrepreneur to behave opportunistically, which rational investors anticipate, finally leading to a reduction in overall welfare, despite both parties behaving rationally.

The financial relationship can best be analyzed using the agency theory. Three major problems are identified: (1) Moral hazard refers to the agent’s incentive to take advantage of the unobservability of his actions by e.g. consuming at the outside investors’ cost. (2) Holdup describes the agent taking advantage of the incompleteness of contracts by shifting returns away from the investors. (3) Adverse selection refers to the inability of investors to judge the true quality of potential investees and the resulting migration of good quality investees.

The reduction of these asymmetries is in both parties' interest as Jensen/Meckling (1976) demonstrated. There is a big tool kit for solving or at least for mitigating these problems. These methods can be divided into five subsets: (1) Those measures that align interests and therefore attack the problem at its root: the diverging interests are removed. (2-4) Those measures that each mitigate one of the three problems but have a less strong effect on the rest: they imply costs and are only optimal, because the value they create by mitigating agency issues is higher than their cost. (5) The dynamic perspective on the relation-
ship is more a way of thinking than an actual measure, but it can be instrumentalized by actively emphasizing certain dynamic aspects, e.g. a company’s track record. These measures are actively used in the financing of young growth companies.

The involvement of venture capitalists as intermediaries between the investors and investees can be explained with the venture capitalist’s superior ability to deal with these agency problems in a way that even more than compensates for the prolongation of the transaction chain and the associated costs.

As an overview over the results of this analysis, Exhibit 1 to Exhibit 3 show the problems and the measures in the relationships existing in the context of financing young growth companies. The many different approaches to the agency theory, the large number of different classifications of possible solutions and mitigations have been brought into a consistent framework that has then been applied to the special situation of financing young growth companies.

However this classification of the approaches only can be a starting point for further research. Even though there are many models explaining certain agency effects ranging from relatively easy (see e.g. Jensen/Meckling (1976), pp. 305-360) to very complex (see e.g. Scheuermann (2000)), a comprehensive view applied to the financing of young growth companies has not been developed yet.

Also the role of venture capital as an intermediary is yet to be explained in a comprehensive manner. Models highlight certain aspects of the advantageousness but an integrated and consistent view of venture capital as intermediary for external equity finance is still to be developed.

In addition, an integrated perspective on external financing of young growth companies, that includes the possibilities of equity and debt financing (see e.g. Hellmann/Stiglitz (2000)) and actually explains why it is so hard for young growth companies to obtain debt financing, is not yet developed. After all, there is a number of reasons that theoretically speak for debt financing as the better alternative.

A further general question is whether agency models correctly reflect the behavior of entrepreneurs. The question of whether entrepreneurs really wish to behave opportunistically was asked several times throughout the paper. Intrinsic motivation and social recognition may be important factors for the entrepreneur, which need to be modeled when analyzing the relationship. Related to this is the question whether in the context of such a complex financial service as offered by venture capitalists, i.e. the inclusion of finance and consulting into a bundle, the entrepreneur can only be seen as the agent, or whether he should not to a certain extent play the role of a principal as well. Since the investment lifts the financial constraints only, management support in a relational contract is needed to lift the organizational constraints (see chapter 2.3.4).

Finally one cannot but wonder whether agency effects can explain the rise of corporate venture capital or the high volatility in venture capital investments observed in the past years.

A lot of research still lies ahead in many areas concerning the implications of agency effects on venture capital financing. This paper’s overview and systematic introduction into the problems of agency and potential solutions and mitigations can be seen as a basis for further research on the topic. The probably most pressing issue for further inquiry is a comparison of the theoretical predictions concerning the financing relationships with the characteristics of real-world financing relationships. Such studies are crucial for the identification of theory’s most relevant aspects that should be included in a comprehensive theoretical treatment of financing young growth companies.
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31.


Appendix

Exhibit 1: Overview of the Financial Relationships and their Agency Implications (1)

Analysis of the original financial relationship (chapters 4; 5)
- Problem class
- Problem type
- Agent intention
- Actual problem
- Classes of effective solutions
- Examples for good solutions

Analysis of the derivative financial relationship
- Problem class
- Problem type
- Agent intention
- Actual problem
- Classes of effective solutions
- Examples for good solutions

Analysis of the derivative financial relationship
- Problem class
- Problem type
- Agent intention
- Actual problem
- Classes of effective solutions
- Examples for good solutions

Exhibit 2

Exhibit 3
Exhibit 2: Overview of the Financial Relationships and their Agency Implications (2)

<table>
<thead>
<tr>
<th>Examples for good solutions</th>
<th>Classes of effective solutions</th>
<th>Actual problem</th>
<th>Agent intention</th>
<th>Problem type</th>
<th>Problem class</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Majority share held by entrepreneur</td>
<td>-Aligning interests</td>
<td>-Investee pursues interesting but unprofitable projects</td>
<td>-Personal wealth</td>
<td>Non-pecuniary benefits</td>
<td>Moral hazard</td>
</tr>
<tr>
<td>-Success-dependent remuneration</td>
<td>-Monitoring</td>
<td>-Investee does „Perk Consumption“</td>
<td>-Status thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Influencing important project decisions</td>
<td>-Bonding</td>
<td>-External investment reduces effort incentives (effort problem)</td>
<td>-Satisfaction of curiosity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Monitoring by investor</td>
<td>-Dynamic relationship</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Budgeting expenses</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>-Auditing by investor</td>
<td>-Alignment interests</td>
<td>-Investee openly neglects activities in incomplete contracts</td>
<td>-Reduction of effort and performance</td>
<td>Deception</td>
<td>Deception concerning qualification and motivation</td>
</tr>
<tr>
<td>-Management support by investor to close gaps</td>
<td>-Monitoring</td>
<td></td>
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<td>-Influencing personnel decisions</td>
<td>-Bonding</td>
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<tr>
<td>-Monitoring by investor</td>
<td>-Vertical integration</td>
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<td></td>
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<td>-Predetermined sanctions</td>
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<td>-Investee exaggerates administrative and market-related qualifications</td>
<td>-Reduction or denial of effort and performance</td>
<td>Hold-up</td>
<td>Hold-up concerning risk, return and feasibility</td>
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<td>-Collateralized investments</td>
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<td>-Bonding</td>
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<td>-Influence on personnel decisions</td>
<td>-Vertical integration</td>
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<td>-Staged investments</td>
<td>-Dynamic relationship</td>
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<td>-Thorough screening</td>
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<td>-Investee projects a too high profitability to get more/cheaper capital</td>
<td>-Exaggeration to get large quantities of cheap capital</td>
<td>Adverse selection</td>
<td>Adverse selection concerning risk, return and feasibility</td>
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<td>-Prototypes and product demonstrations</td>
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<td>-Partly self-finance</td>
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<td>-Dynamic relationship</td>
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<td>-Success-dependent remuneration</td>
<td>-Aligning interests</td>
<td>-Investee projects a too low need of resources to motivate the investor to invest</td>
<td>-Exaggeration to get large quantities of cheap capital</td>
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<td>-Collateralized investment</td>
<td>-Monitoring</td>
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<td>-Auditing by investor</td>
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<td>-Monitoring by investor</td>
<td>-Vertical integration</td>
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<td>-Information exchanges</td>
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<td>-Cut in remuneration</td>
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<td>-Investee projects a too low need of resources to motivate the investor to invest</td>
<td>-Exaggeration to get large quantities of cheap capital</td>
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<td>-More than proportional costs for the entrepreneur in later capital rounds (earn-out)</td>
<td>-Monitoring</td>
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<td>-Auditing by investor</td>
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<td>-Monitoring by investor</td>
<td>-Vertical integration</td>
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<td>-Dynamic relationship</td>
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</table>

**Agent intention**
- Personal wealth
- Status thinking
- Satisfaction of curiosity

**Problem type**
- Reduction of effort and performance
- Reduction or denial of effort and performance
- Exaggeration to get large quantities of cheap capital

**Problem class**
- Moral hazard
- Hold-up
- Adverse selection

**Agent intention**
- Personal wealth
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**Problem type**
- Reduction of effort and performance
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**Problem class**
- Moral hazard
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- Adverse selection
Exhibit 3: Overview of the Financial Relationships and their Agency Implications (3)

<table>
<thead>
<tr>
<th>Problem class</th>
<th>Problem type</th>
<th>Agent type</th>
<th>Actual problem</th>
<th>Classes of effective solutions</th>
<th>Examples for good solutions</th>
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<tbody>
<tr>
<td>Investor</td>
<td>- Low returns</td>
<td>Non-pecuniary benefits</td>
<td>- Personal wealth</td>
<td>- Aligning interests</td>
<td>Participation of VC management in the fund, success-dependent remuneration, low management fee</td>
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<td>- Stability</td>
<td>Status thinking</td>
<td>- Satisfaction of curiosity</td>
<td>- Monitoring</td>
<td>Influencing important investment decisions</td>
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<td>- Liquidity</td>
<td>- Satisfaction of curiosity</td>
<td>- Satisfaction of curiosity</td>
<td>- Budgeting expenses</td>
<td>Monitoring by investor</td>
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<tr>
<td>Venture Capitalist</td>
<td>Transformation of risk</td>
<td>Deception concerning qualification and motivation</td>
<td>- Reduction or denial of effort and performance</td>
<td>- Bonding</td>
<td>Success-dependent remuneration, low carried interest</td>
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<td></td>
<td>- Selection</td>
<td>- External investment reduces effort incentives</td>
<td>- Vertical integration</td>
<td>- Dynamic relationship</td>
<td>Clear definition of the tasks to be performed</td>
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<td>- Diversification</td>
<td>- Effort problem</td>
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<td>- Dynamic relationship</td>
<td>Influencing personnel decisions</td>
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<td>- Allocation</td>
<td>- Participate in VC fund</td>
<td>- Monitoring by investor</td>
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<td>Monitoring by investor</td>
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<td>- Liability</td>
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<td>Success-dependent remuneration, high carried interest</td>
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<td>- Satisfaction of curiosity</td>
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<td>- Monitoring</td>
<td>Clear definition of the tasks to be performed</td>
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<td>- Monitoring</td>
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<td>Influencing personnel decisions</td>
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<td>- of maturity</td>
<td>- Satisfaction of curiosity</td>
<td>- Monitoring by investor</td>
<td>- Monitoring</td>
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<td>Young growth company</td>
<td>- Organizational development</td>
<td>Deception concerning necessary resources</td>
<td>- Exaggerate the advantage through specialization</td>
<td>- Aligning interests</td>
<td>Participation of VC management in the fund</td>
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<td>- Majority to entrepreneur</td>
<td>- VC projects a too high profitability to get more/cheaper capital</td>
<td>- Monitoring</td>
<td>- Monitoring</td>
<td>Priority of investor returns before VC compensation</td>
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<tr>
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<td>- Long-term finance</td>
<td>- VC projects a too high profitability to get more/cheaper capital</td>
<td>- Monitoring</td>
<td>- Monitoring</td>
<td>Staged investments with capital calls</td>
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<td>- Avoid fixed claims</td>
<td>- VC accepts too much capital to manage</td>
<td>- Monitoring</td>
<td>- Monitoring</td>
<td>Track record</td>
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<td>- VC accepts too much capital to manage</td>
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<td>Staged investments with capital calls</td>
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<td>- Track record</td>
<td>- Same as above</td>
<td>- Deduction of management fee before carried interest starts</td>
<td>- Limit for additional payments</td>
<td>- Deduction of management fee before carried interest starts</td>
</tr>
</tbody>
</table>

Legend:
- Participation of VC management in the fund
- Success-dependent remuneration, low management fee
- Influencing important investment decisions
- Monitoring by investor
- Budgeting expenses
- Clear definition of the tasks to be performed
- Influencing personnel decisions
- Monitoring by investor
- Success-dependent remuneration, high carried interest
- Monitoring by investor
- Track record
- Staged investments with capital calls
- Priority of investor returns before VC compensation
- Monitoring by investor
- Contractually fixed investment principles
- Industry rankings
- Same as above
- Deduction of management fee before carried interest starts
- Limit for additional payments