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## Smart capital in German start-ups: an empirical analysis

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# JENA ECONOMIC RESEARCH PAPERS



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## **Smart capital in German start-ups – an empirical analysis**

by

**Dorothea Schäfer  
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## **Smart capital in German start-ups – an empirical analysis.**

Dorothea Schäfer<sup>+</sup> and Dirk Schilder<sup>‡</sup>

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### **Abstract**

It is still an open question what kind of smart capital relational investors actually supply. We divide smart capital into several components and conduct a survey among 85 German suppliers of start-up finance. The results show that the degree of “smartness” is determined by the financial product used and also by the financiers’ institutional background, the duration of the investment and the stage of development of the firm being financed.

JEL-classification: G21, G24, D21, M13, O16

Keywords: Smart capital, start-up financing, venture capital, banks.

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## 1. Introduction

The provision of smart capital by so-called relational investors is commonly considered to be pivotal for the growth prospects of risky and developing start-ups. Relational investors, such as venture capital (VC) companies, are expected to combine the provision of corporate finance with consulting services and to promote the professionalism of the firms in their portfolio (Hellmann and Puri, 2002). The term smart capital for this kind of financial service derives from the fact that in order to be successful, it is necessary to have considerable expertise with regard to the portfolio firm, the technology employed and the market environment. Ideally, the financiers participate actively in the information flows both within the firm and between the firm and its business environment. Indeed, several studies find evidence that VC companies do in fact invest in obtaining proprietary information about their clients' businesses and spend substantial time and effort in assistance, advising, and monitoring their portfolio firms (Kaplan and Strömberg, 2004; Macmillan et al., 1988; Sapienza, 1992; Sapienza et al., 1996). Nevertheless, the term smart capital still remains somewhat of a black box. What is still unclear is the kind of smart capital actually provided, and whether "smartness" means the same when different relational investors other than just VC companies are considered.

The research focus on VC companies as relational investors might be justified in the market-based US financial system. However, the situation may be different in a bank-based system like that in Germany. The German financial system is characterized by two major features: the well-known *Hausbank* principle and the importance of public intermediaries in corporate financing. The *Hausbank* principle reflects a close relationship between the bank and its client firm. *Hausbanks* are involved in the businesses they finance and they monitor them closely (Elsas and Krahn, 1998, 2004). Thus many German commercial banks can also be seen as relational investors. Moreover, despite the fact that public financing is often said to be passive (Hellmann and Puri, 2002), several references in the literature indicate that German public equity suppliers, in particular public VC companies, are different because they try to establish a close relationship with

their target firms (Hood, 2000, Schilder, 2006). Therefore, the public equity suppliers in Germany could be also an important part of the market for smart capital.

In this paper we investigate the provision of smart capital not only by VC companies but also by other possible relational investors in Germany. We define smart capital as a two way flow of information where information flows from the company to the financier and consultation and support flow in the opposite direction. The financier has some right to control and information for ensuring the flow of data, mainly reports, about the development in management, technology, and product marketing of the firm it finances. In return the investor has to carry out certain responsibilities, predominantly those of an advisory or consulting nature.

The main focus of this paper is twofold. First, we open the “Smart Capital” black box and expose the characteristics that turn financiers into relational investors. Second, we compare types of financiers who differ with respect to their provision of smart capital. In particular, we analyze how both the intensity of the reciprocal information flows and the intensity of the control and consulting services differ among distinct types of relational investors.

We use a unique dataset to explore the provision of smart capital for start-up companies within the bank based system in Germany. This data is based on 85 face-to-face interviews made with different types of financiers. It enables us to analyze the heterogeneity of the market for smart capital and to compare the different types of financiers. The rest paper is organized as follows. In Section 2, we introduce a concept for measuring smart capital and derive hypotheses about the determinants of the supply of smart capital from a literature review. In Section 3 we describe the dataset and Section 4 presents the empirical analyses and the results. Finally, in Section 5 we draw conclusions for policy and further research.

## **2. Measurement and determinants of smart capital**

### **2.1 Measuring**

We define smart capital as a reciprocal information process. To capture this notion we employ the concept of knowledge building. Nonaka (1994) defines this process as, “... knowledge is created and organized on the very flow of information.” Therefore, the bases of knowledge creation are information flows. Know-

ledge can analytically be divided into two types (Polanyi, 1966). The first type is the so-called explicit knowledge. Explicit knowledge and the underlying information flows can be codified and documented in the form of reports. These features make information sharing among individuals fairly easy. In corporate financing, the exchange of explicit knowledge can be done by business assessments or balance-sheet statements. Thus, we measure the flow of explicit knowledge or information by the frequency of the codified information exchange, e.g., in the form of reports.

The second form, tacit knowledge, is more complex. Tacit knowledge cannot be easily translated into numbers or even into words and is strongly linked with the individual itself. Typical examples are practical expertise or knowledge that a person gains by personally experiencing a specific situation. Tacit knowledge usually cannot be codified because of its implicit character (Nonaka, 1994). It is often impossible to communicate and share tacit knowledge via documentation, in particular, since it is frequently associated with what von Hippel (1994) calls sticky information. The exchange of sticky information is difficult and costly. Personal interaction is necessary for acquiring tacit knowledge (Nonaka, 1994). Thus, we employ the frequency of personal contacts and the amount and different forms of consulting services delivered by the investor as proxies for the extent to which tacit knowledge is exchanged between the two parties.

Based on the distinction between explicit and tacit knowledge, we can identify the different components of smart capital. First, we find the exchange of explicit knowledge in different forms of business reports such as business assessments, reports on collateral or the technological development of a product. The second component contains flows of implicit knowledge. These comprise the frequency of contacts between the financier and the financed company – face-to-face and via telecommunication – and the different forms of consulting and influence offered or mandated by the investor. We assume that the more distinct topics this consulting entails, the broader the flows of implicit knowledge are. The combination of both flows of implicit and explicit knowledge results in smart capital. If the financier offers investments linked to the two ways of knowledge exchange we consider him a relational investor.

## 2.2 The institutional background of possible relational investors

Different financial institutions with different business and investment strategies might deliver smart capital up to various levels. The literature allows no doubt that VC firms offer smart capital. Several surveys that summarize the research findings on VC clearly state that VC companies are highly involved in the business of the financed companies (Macmillan et al., 1988; Hellmann and Puri, 2002; Lerner, 1995), have intensive contacts with their portfolio firms (Sapienza, 1992), and are well informed with regard to the financed companies' businesses through constant monitoring (Gompers, 1995). The VC subsidiaries of industrial companies, so-called corporate VC firms, are believed to initiate an even more intensive flow of information than their independent counterparts (Bottazzi et al., 2004) due to a higher ratio of strategic investments (Block and MacMillan, 1993) and due to better technical skills (Chesbrough, 2000). In line with these findings, we expect that VC companies deliver a wide range of services in connection with their equity investments, which can be equated with a provision of smart capital.

The formal VC investors are supplemented by an informal market segment: the Business Angels. These are private individuals who are, similar to the formal VC companies, considered to be deeply involved in the businesses they finance (Mason and Harrison, 1996; Osnabrugge, 1998; Brettel, 2003). Furthermore, they often have hedonistic and altruistic motives when investing in a start-up company (Mason and Harrison, 1994; Paul et al., 2003). Private benefits such as "happiness" caused by the development of a new company should improve the cooperation and result in heavy flows of information between "Angel" and firm (Sullivan and Miller, 1996). Because of this we do not expect to find a great difference in the provision of smart capital between informal VC suppliers, i.e., Angel investors or Business Angels, and formal VC firms.

Several aspects of the German financial system suggest that there is another group of relational investors in addition to formal and informal VC investors: the commercial banks and the savings banks. German banks have a long history in relationship banking and in playing an active role in corporate control (Gerschenkron, 1962; Cable, 1985). Relationship-based financing is often considered to be one of the core businesses of most German banking institutions (Schäfer, 2002). German universal banks have never been legally restricted in



either their contracting behavior or their ability to exert corporate control. As so-called *Hausbanks*, banks as credit suppliers are prepared to be deeply involved with their firms' businesses (Elsas and Krahen, 1998, 2004). A *Hausbank* relationship is characterized by constant interaction, a reciprocal flow of information (Elsas and Krahen, 2004, 208f.), and even direct influence by the creditor on the financed companies (Elsas, 2004). This behavior is not just based on transactional information, but it is also based on a strong relationship between the participating parties. Therefore, it is compatible with what Boot (2000) called relationship financing. Thus, we expect the banks to provide smart capital for start-ups, especially as the *Hausbank* relationship is common for financing small-sized and medium-sized companies (Edwards and Fischer, 1994, 143; Lehman and Neuberger, 2001).

During the 1990s, German banks have started to set subsidiary VC organizations in order to expand their equity financing. The bank-related VC companies have similar investment criteria and employ monitoring and consulting strategies analogous to those of their individual counterparts (Bottazzi et al., 2004). However, their integration into the institutional background of banks and their dependency on their mother company might influence their aims and therefore their investment strategy (Tykvova, 2004; Osnabrugge and Robinson, 2001). Banks often use VC subsidiaries for establishing a financial relationship with the customers and possibly for providing loans to the customers later on (Hellman et al., 2004). The independent VC companies' predominant aim which is helping the portfolio firm grow quickly and selling their shares with a profit might not be an important feature of the banks' VC subsidiaries. This difference might reduce the incentives of the banks' subsidiaries to offer a wide range of consulting services and to exert direct influence on their portfolio companies. Therefore, the information flows within bank dependent VC investments might be lower than those of other relational investors such as independent VC companies or Angel investors.

Apart from the important role of banks, the German financial system has a second special feature: the public VC providers. Public VC firms have a considerable market presence in the entrepreneurial finance sector (see for example Sunley et al., 2005; Fritsch and Schilder, 2007; Schilder, 2006). Their lower return requirements (Bascha and Walz, 2002) combined with their strong ambitions to

contribute to local economic development (see e.g., Sunley et al., 2005; Tykvova, 2004) may allow, and even force, these entities to establish a more intensive relationship and closer contact to the portfolio firms than their private counterparts can afford. Therefore, their provision of smart capital might be characterized by intensive flows of information by means of large numbers of consulting services.

### **2.3 Further determinants of smart capital**

The literature reflects the assumption that financiers with different institutional background and different business strategies offer different levels of smart capital. In addition to the type of financiers, some further factors might influence the level of smart capital: the financial product that is predominantly used, the developmental stage that the financed companies are in, and the expected time horizon or duration of the investment.

Equity financing turns the external investor into one of the owners of the enterprise. This owner position is associated with a large numbers of monitoring rights - often even enhanced by additional rights (Sahlman, 1990) - that spur the deep information flows between firm and investor. Furthermore, the financier participates directly in the earnings of the company and, if the investor sells his shares, he can also benefit from the growth of the venture. Therefore, it is in his interest to ensure that the financed firm develops rapidly. This often requires consulting services and, sometimes, directly exerted influence on the business practice of the portfolio company, for example by a CEO turnover when the start-up is in trouble (Lerner, 1995). Thus, equity financing is an incentive for strong flows of information in both directions.

Mezzanine products and, in particular, silent investments, might be combined with less monitoring, advising and, especially, direct influence. In balance-sheet terms both financial products are located between the two poles of equity and debt. They usually do not include voting rights. Furthermore, the financiers participate less in the profits than they would with direct ownership (Bascha and Walz, 2002). With regard to credit financing, some caveats should be mentioned which may constrain the information flows. First, due to the collateral, some of the investor's risk exposure comes from the fluctuations of the value of the pledged assets. Thus, relational credit financiers may focus less on both the con-

sulting activities and a regular exchange of information regarding the project's development. Their main focus is on the pledged assets rather than on uncollateralized equity as in the case of the equity financiers (Manove et al., 2001). Second, compared to investment managers in VC companies, the loan officers may have built up their expertise predominantly on financial issues but lack technological knowledge (Ueda, 2002). This might hinder their ability to explore the non-transactional information about the start-up, such as entrepreneurial or technological abilities within the company. Given these caveats, the credit financiers may place more weight on information about the collateral's value and financial reports than equity financiers do. Therefore, the supply of monitoring and consulting combined with credit financing might be lower than that of equity financing.

The age of the firm might also influence the provision of smart capital. Young companies often need to be monitored and advised more intensively than companies in later stages of their technical and organizational development (Gupta and Sapienza, 1992; Sapienza et al., 1996; Sorensen Stuart, 2001). A young company in the early phase of its growth is likely to require more involvement by the relational investor than a company at a later stage of development (Gupta and Sapienza, 1992). Possible reasons are a lack of business and management skills in young innovative companies which are often run by engineers or natural scientists (Gupta and Sapienza, 1992) and a high degree of uncertainty about the technical and economic success of the project (Sapienza et al., 1996). Financiers that focus on early stage investments might, therefore, have to offer deeper flows of information in order to increase the chances of success of the portfolio firm and, therefore, of their investment. Accordingly, early stage investors are expected to provide more smart capital services than later stage financiers.

The effect of the investment horizon on the provision of smart capital has not been evaluated as much as the development stage of the portfolio firm. Gompers (1995) suggests that the duration of the investment is negatively related to the financier's degree of involvement in the firm's affairs. The longer the expected investment horizon is, the less likely it is that the financier will be actively involved in the business. There are basically two reasons for this negative relationship. Firstly, long-term investors often target stable and relatively safe firms and stay away from high-risk-high-return companies. These firms seem to be able to

organize most of their growth themselves. Secondly, short-term financing may create additional transaction costs from renewing of the financing contract and the additional information collection required (Fama, 1985; Gompers, 1995). By contrast, gathering information about the portfolio company will be of little importance for long-term investments. This leads to the assumption that the longer the time horizon of the investment, the less intense are the information flows.

### **3. Dataset**

The in depth empirical analysis is based on a survey that provides us with micro data on the nature and dimension of the flow of information between the investors and the portfolio firms. The survey was carried out between September 2004 and September 2005. It consists of 85 face-to-face interviews with different kinds of financiers that offer corporate financing. The financiers interviewed are located in distinct regional areas of Germany. The interviews are based on a largely standardized quantitative questionnaire which provided some space for qualitative answers. The relevance of the questions was proved through several pre-tests. Questions pertained mainly to the investment behavior of the financiers and the attached information flows. The interviews were conducted by one of the authors. We interviewed one investment manager per firm. All interviewees are actively involved in the financing, monitoring, and supervising process.

Our survey includes 22 VC companies, both independent and corporate ones; eleven private Business Angels; 23 banks of two types, public savings and private commercial banks; seventeen of their VC subsidiaries; and twelve public providers of equity. The participants in the study are taken from member lists of the German Private Equity and Venture Capital Association, the Business Angels Network Germany, and the Association of German Banks. From these databases, we selected 300 possible interview partners of all five types of financiers. In doing this, account was taken of the unequal regional distribution of the different types of financiers and their attitudes towards entrepreneurial finance. We tried to build a sample that is representative of the different types of financial institutions and we are not aware of any bias in this sample.

For our analyses, we group our survey data into two sets of variables that open the black box “Smart Capital” and capture the different directions of the

information flow. The deeper and more diverse these flows of information, the higher is the level of smart capital. We use the frequency of reports (weekly, monthly, quarterly, or yearly) and their contents as an indicator of the flow of information from the firm to the financier. The flow of information in the opposite direction is measured by the importance, frequency, and diversity of the financier's consulting activity and its direct influence on the businesses financed.

In addition to quantifiable information such as the share of early stage investments within a portfolio, the data contain two types of ordinal variables. The first type (Type A) varies within the ranges: never (1), seldom (2), frequently (3), very frequently (4). For example, if asked, "How often do you actively consult your portfolio firm?" the respondent had the choice between the four alternatives. The second type (Type B) results from questions that aim at receiving a personal assessment of the financier's investment activity such as, "How important do you consider your advice for the success of your portfolio firm?" In this case, the respondent had to decide between the following five alternatives: not important (1), of minor importance (2), among other things important (3), very important (4), dominant (5).

Furthermore, we include two variables concerning the frequency of interaction between the two parties that can be used as a proxy for the flow of information in both directions. We asked for the frequency of contacts per month, either personal or via telecommunication means. These two variables are interval variables not ordinal ones. A short description of the main variables we use in the analysis is provided:

CONSULTING (CS) is the frequency of the financier's consulting (Type A).

INFLUENCE (INF) shows the importance of influence by the financier (Type A).

EARLY-STAGE (EARL) is a variable that gives the percentage of early stage investment in the portfolio considered.

EXPECTED INVESTMENT-PERIOD (INVPER) is the average estimated investment period per investment in months.

Finally, we use Type A variables to indicate how important a specific financial product is for the financier:

CRED is credit financing.

MIHO25 is the minority holding up to 25 percent of the stakes.

MIHO50 is the minority holding between 25 percent and 50 percent of the stakes.

SILENT is the silent investment.

MEZZ is the mezzanine product.

## **4. Empirical issues**

### **4.1 Descriptive statistics**

The financiers in the sample cover a wide range of potential suppliers of smart capital and differ strongly in their structure.<sup>1</sup> However, there is partial homogeneity with respect to the financial products offered, and this might be important for the provision of smart capital. Apart from commercial and savings banks which almost exclusively use loan financing, all other intermediaries in our survey offer equity or at least equity linked products (Table 1). The average importance of the financial products used is a Type A variable and ranges from one, which means that the investor does not use this product at all, to four, which means that this product is most frequently used. For example, the value 3.83 in line one indicates that banks concentrate almost completely on loans, whereas the figures around one show that the other types of financiers hardly ever use them. VC companies and Angel investors prefer to acquire minority stakes in the portfolio firms. Silent equity investments occur more frequently with the banks' VC subsidiaries and public equity suppliers.

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<sup>1</sup> We have to note that the information about the financiers solely counts for the interviewed departments or branches and not for the whole companies.

Table 1: Importance of financial products (mean values)

Importance of product:	VCs	Business Angels	Banks	Bank-VCs	Public-VCs
CRED	1.04	1.27	3.83	1.00	1.00
MIHO25	3.14	3.64	1.04	3.41	3.24
MIHO50	3.00	2.27	1.09	2.23	2.33
SILENT	1.04	1.00	1.43	2.43	3.47
MEZZ	1.00	1.00	1.52	1.43	1.47

A strong heterogenic structure from the sample can be seen with regard to the composition of the managed portfolios, i.e. the share of early stage investments and the average investment period (Table 2). On average, the banks, the private Angel investors, and the public VC companies tend to have the longest investment horizon with more than 70 months; however, the average share of early stage investments in the portfolios of these financiers differs explicitly and ranges from around 22 percent in the portfolios of public equity suppliers to more than 90 percent of early stage investments for Business Angels. By contrast, the VC firms follow a rather short-term strategy with respect to the investment horizon (55 months) and invest, on average, more than two thirds of their money in early stages.

Table 2: Average share of early stage investments and average investment period per portfolio (in percentage)

	Share of early stage investments (in percentage of the portfolio)		Average investment period (in months)	
	Mean	Standard deviation	Mean	Standard deviation
VCs	70.91	29.93	55.75	16.12
Business Angels	92.73	24.12	70.00	14.03
Banks	41.75	42.39	78.72	33.97
Bank-VCs	44.06	30.49	64.20	20.73
Public-VCs	21.92	29.02	80.30	31.16

Table 3 shows the average values of these variables that show the information flows for the five types of financial intermediaries and, therefore, help to open the black box “Smart Capital”. In parallel with earlier research, we find that VC companies offer a high-level of smart capital. The first row reveals that VC firms use both forms of knowledge transfer – the explicit and implicit forms – very intensely. In addition, they are more deeply involved in the businesses of the companies than the other types of financiers. VC firms do not only consult frequently (lines 1 to 10) and exert direct influence (line 18) but they are also well informed about what is going on in the portfolio companies (lines 12 to 15). Furthermore, they report, on average, a high frequency of contacts with their portfolio firms (lines 16 and 17). These results indicate that the VC companies offer a high level of smart capital with deep and diverse flows of explicit and implicit information.

Private Angel investors largely behave in line with formal VC suppliers but fall behind in some aspects for some kinds of consulting (lines 8 to 10) and reporting (lines 14 and 15). This deviation can be grounded in their relatively strong specialization and their restricted resources. Furthermore, they might have a very close informal relationship with their portfolio companies which is indicated by the highest frequency of personal contacts per month. This relationship might make intensive reporting by the portfolio company unnecessary and lead to an underestimation of the different consulting activities within the survey. Nevertheless, the statistics seems to support the hypothesis that informal VC investors offer smart capital to an extent rather similar to that of formal VC companies.

By contrast, the results show that banks, as loan suppliers, are less interested in the details concerning the businesses of their portfolio companies. As indicated in the lines 1 to 11, this attitude leads to a less intensive and rather specific consulting activity mainly focused on business related topics, such as financing (line 8). Moreover, the portfolio firms report overall less frequently (line 12) but inform quite often about collateral (line 14). The interaction between banks and firms is rather scarce (lines 16 and 17). Such behavior corresponds with the assumption that the flow of explicit and implicit information between banks



and their portfolio firms is less developed than that of the VC investors and the Angel investors.

Table 3: Importance of variables (mean values)

Line		VCs	Business Angels	Banks	Bank-VCs	Public-VCs
1	Frequency of consulting	3.91	3.91	3.22	3.59	3.42
	Frequency of consulting in...					
2	• accounting	2.36	2.00	2.48	2.47	2.50
3	• controlling	2.50	1.82	2.39	2.65	2.58
4	• marketing	2.59	2.18	2.00	2.24	1.75
5	• technical problems	2.36	1.55	1.09	1.41	1.33
6	• strategical problems	2.59	3.18	2.61	3.35	3.08
7	• network advantages	3.00	3.27	2.44	2.71	2.50
8	• financing	3.50	2.00	3.74	3.23	3.50
9	• patent protection	2.59	1.36	1.26	1.71	1.33
10	• juridical problems	2.27	1.18	1.30	1.41	1.50
11	Importance of consulting for success of portfolio firm	4.23	4.46	3.74	3.88	3.83
12	Frequency of reports	3.00	2.73	2.17	2.88	2.58
	Thereof reports about...					
13	• business assessments	3.96	4.00	3.91	3.88	4.00
14	• collateral	1.23	1.00	2.74	1.41	1.75
15	• technological development	3.27	2.18	2.17	2.53	2.58
16	Number of face-to-face contacts (per month)	1.35	1.64	0.43	0.92	0.87
17	Number of contacts via telecommunication (per month)	8.05	3.73	1.71	3.75	2.12
18	Degree of influence exerted by the financier	3.32	2.55	2.13	2.65	2.36

The results for the VC-subsidaries of banks are, in some respect, similar to those of their mother companies. On average, they have less frequent interactions with their portfolio firms (lines 16 and 17) than Angel investors and the group of independent and corporate VC companies. Overall, consulting activities (lines 1 to 10) are of minor importance for bank-dependent VC firms; although they offer financial products similar to those of independent VC companies (see

Table 1). Their consulting activity is mainly focused on financing issues, strategic problems, and business related topics such as strategic problems (lines 2, 3, 6, and 8). These findings indicate that the information flows are smaller in the case of bank-dependent VC firms than in the case of other formal and informal VC investors, i.e., a provision of smart capital with limitations.

The public equity suppliers have a fairly similar pattern to that of the bank subsidiaries. On the one hand, they indicate with a quite high frequency of consulting in some areas (see e.g., lines 1 through 3, 6 and 8) rather strong involvement in the businesses of the portfolio firms. Again, the consulting activity is focused on the same business related topics. On the other hand, they barely reach the overall average of contacts per month (lines 16 and 17). These findings do not correspond with the hypothesis that public VC investors spend more effort and time on the flow of information to their portfolio firms than any kind of private VC company. They suggest rather that the public equity suppliers offer only a reduced choice of smart capital services.

Line 11 shows an interesting finding about how German start-up financiers judge the importance of their consulting for the success and growth of the portfolio firm. Despite considerable differences in the amount of consulting services offered to the companies, all types of financiers regard consulting as an important driver for the portfolio firm's success. Although financiers are more or less convinced of the necessity of their consulting activity, there seems to be a certain imbalance between the assumed need of start-ups and the services offered.

Overall, the descriptive statistics of the different components of smart capital show that all financiers provide some sort of smart capital, but that there are considerable differences in the intensity of information flows. Furthermore, we can see that the world of smart capital is not black and white, or even good and evil. There is no clear dichotomy between relational investors and non-relational investors, as, for example, is sometimes expected for banks and non-banks or credit and equity financiers. We evaluated this segmentation hypothesis by using a dichotomous discriminant analysis. Neither the comparison of banks versus non-banks nor credit versus equity financiers show a well defined dichotomy. Therefore, the first result from this study is that the issue of being a relational investor is

not a question of offering smart capital or not, it is more a question of the level of information flows that determine the provision of smart capital.

#### 4.2 Driving forces of smart capital provision

To estimate in how far the financial product predominantly used, the share of early stage investment (EARL) and the investment horizon (INVPER) influence the level of smart capital, we employ an ordered logistic estimation. As the dependent variable we use the frequency and importance of consulting (CS) and the directly exerted influence by the financier (IFL), because those indicate the intensity of information flows from the financier to the company. The average investment period and the financial product preferred are missing in some observations. Even though the missing values are almost equally distributed over the different groups, we have to be cautious when interpreting the results. We abstain from calculating the marginal effect due to the missing value problem in some specifications and to the ordinal character of the used variables. We comment only on the direction of the coefficients but not on their magnitude.

Table 5: The influence of financial products on the provision of consulting services (ordered logistic regression)

	CS (I)	CS (II)	CS (III)	CS (IV)	CS (V)
EARL	0.027** (2.83)	0.024** (2.62)	0.028** (2.86)	0.030** (3.23)	0.027** (2.83)
INVPER	-0.027* (2.13)	-0.026* (1.98)	-0.035** (2.63)	-0.040** (2.85)	-0.033** (2.62)
CRED	-0.676** (2.60)	-	-	-	-
MIHO25	-	0.590* (2.20)	-	-	-
MIHO50	-	-	-0.117 (0.37)	-	-
SLEEP	-	-	-	0.415 (1.49)	-
MEZZ	-	-	-	-	0.108 (0.25)
Pseudo R-squared	0.285	0.265	0.219	0.240	0.218

Number of observations: 64; \* significant at a 5% level; \*\* significant at a 1% level, z-value in parentheses

The results of estimations clearly show that the share of early stage investments within a portfolio affects the consulting activity and, therefore, the investors' level of smart capital (Tables 5 and 6). The more early-stage investments the financiers have in their portfolio, the more intensive is their consulting (Table 5). The influence exerted by the financier on the activity of the portfolio firm, which is the strongest form of information flow, is also much more developed for those financiers that focus on early stage investments (Table 6). This finding is in line with the expectations from the literature (see Section 2). The opposite correlation can be seen for the average investment period. The longer the investment horizon, the less are consulting services and influence provided by the financier. This result is consistent with Gompers (1995).

Table 6: The influence of financial products on the influence by financiers (ordered logistic regression)

	IFL (I)	IFL (II)	IFL (III)	IFL (IV)	IFL (V)
EARL	0.020** (2.72)	0.017* (2.35)	0.014 (1.78)	0.016* (2.16)	0.016* (2.14)
INVPER	-0.022* (2.10)	-0.019 (1.90)	-0.020 (1.89)	-0.021* (2.08)	-0.027** (2.60)
CRED	-0.651** (2.74)	-	-	-	-
MIHO25	-	0.425* (2.01)	-	-	-
MIHO50	-	-	0.908** (3.38)	-	-
SLEEP	-	-	-	-0.354 (1.46)	-
MEZZ	-	-	-	-	-0.673 (1.47)
Pseudo R-squared	0.177	0.148	0.209	0.135	0.135

Number of observations: 63; \* significant at a 5% level; \*\* significant at a 1% level, z-value in parentheses

To capture the isolated effect of different financial products, we run the regressions using the ordinal variables for the importance of each product as independent variable. Credits (Models CS (I) and IFL (I)) have a statistically significant influence on the level of smart capital. The focus on loan financing leads to less consulting and influence being exerted by the investor. Whereas the other financial products do not show strong statistically significant impact on the con-

sulting service, except of a weak influence by minority holdings up to 25 percent (Model CS(II)). Minority holdings positively affect the occurrence of the influence (Models IFL (II) and IFL(III)). They enable the financier to exert influence at different levels from simple business decisions up to the composition of the management. Credits, mezzanine products, and silent investment do not allow such a high level of influence, or do so only if these are constituted in additional agreements. Although, the financial products are connected with different rights and different incentives for consulting a portfolio company, they only partly affect the flows of information between financier and firm.

Table 7: The influence of institutional backgrounds on the provision of consulting services (ordered logistic regression)

	CS (VI)	CS (VII)	CS (VIII)	CS (IX)	CS (X)
EARL	0.025** (2.70)	0.024** (2.68)	0.024** (2.57)	0.026** (2.98)	0.029** (3.08)
INVPER	-0.027* (2.15)	-0.029* (2.28)	-0.034** (2.74)	-0.034** (2.66)	-0.036** (2.77)
Banks	-2.016** (2.65)	-	-	-	-
VC companies	-	1.199 (1.38)	-	-	-
Business Angels	-	-	1.009 (0.52)	-	-
Bank dependent VC companies	-	-	-	0.078 (0.11)	-
Public VC companies	-	-	-	-	0.780 (0.93)
Pseudo R-squared	0.287	0.2381	0.222	0.217	0.226

Number of observations: 64; \* significant at a 5% level; \*\* significant at a 1% level, z-value in parentheses

A further reason for the varying levels of smart capital might be the institutional background of the financiers as it influences their business practice and their will and ability to provide services that support the firm. Therefore, we re-run the regressions substituting the variables for the distinct financial products by dummy variables for the different types of financiers (Tables 7 and 8). The variables take the value one, if the investor belongs to a certain type of financiers and zero, if not. The results indicate that the institutional background and the corresponding business strategy have an effect on the provision of smart capital similar

to that of the financial products used predominantly. Banks show a statistically negative impact on the intensity of consulting service (Model CS (VI)) and on the influence exerted on the financed companies (Model IFL (VI)). This correlation is in line with the results for credit, which is mostly used by banks (Table 1). The VC companies exert influence on the portfolio companies more often than other investors do. This might be due to their equity investments and, especially, their business strategy. However, being one of the other financiers who offer equity or equity linked products does not affect the level of consulting services provided by the investors (Models CS (VII) to CS (X)).

Table 8: The influence of institutional backgrounds on the influence by financiers (ordered logistic regression)

	IFL (VI)	IFL (VII)	IFL (VIII)	IFL (IX)	IFL (X)
EARL	0.019* (2.55)	0.016* (2.15)	0.024** (2.94)	0.020** (2.74)	0.019* (2.54)
INVPER	-0.022* (2.11)	-0.017 (1.66)	-0.023* (2.30)	-0.024* (2.41)	-0.024* (2.35)
Banks	-2.022** (2.83)	-	-	-	-
VC companies	-	2.647** (3.57)	-	-	-
Business Angels	-	-	-0.927 (1.09)	-	-
Bank dependent VC companies	-	-	-	0.083 (0.14)	-
Public VC companies	-	-	-		-0.598 (0.81)
Pseudo R-squared	0.182	0.234	0.128	0.120	0.124

Number of observations: 63; \* significant at a 5% level; \*\* significant at a 1% level, z-value in parentheses

In line with the results about the influence of diverse financial products on the provision of smart capital (Tables 5 and 6), the share of early stage investments within a portfolio has a statistically positive impact on the consulting activities of the financiers and on the influence exerted. The average investment period negatively affects the level of both independent variables reflecting the flows of information (Models CS(VI)-CS(X) and IFL(VI)-IFL(X)).

The information flow in the opposite direction, i.e. from the company to the financier, can be measured by the frequency of reports given to the investors.

This frequency does not vary significantly between the groups of different financiers and, especially, within the groups. Therefore, a statistically significant analysis is somewhat meaningless. However, the frequency of reports does show a significant correlation with the frequency of consulting and the influence indicator. The Spearman-Kendall's rank correlation coefficient between the frequency of reports and of consulting is 0.34 and between reporting and exerting influence it is 0.56, both statistically significant on the one-percent level. This finding implies that an intense flow of information from the financier to the firm in form of consulting and influence is highly linked to a deep flow in the opposite direction. The same applies to the number of contacts – personal and via telecommunication – between investor and target firm. The exchange of implicit knowledge is connected strongly with consulting and influence exerted by the financier. Thus those two components are the best indicators for the level of smart capital the different types of financiers provide.

To check for the robustness of the estimations we experimented with other possible determinants, such as the ratio of portfolio firms per investment manager or the size of the intermediary measured by the number of investment managers. Since we are unable to find any significant impact for these, we abstain from reporting these specifications. Furthermore, we also conducted our estimations excluding ten financiers who do not offer any start-up financing at all. The results from the ordered logit models do not vary from the results presented above.

## **5. Conclusion and prospects**

In this paper, we explore a special part of the German market for start-up finance: the market for smart capital. The analysis is based on a theoretical concept for measuring the “smartness” of capital that enables us to open the black box “Smart Capital”. The results reveal a certain heterogeneity regarding the provision of smart capital by different types of financiers. We find that all financiers deliver smart capital. However, the extent and the manner of doing this differ. The banks, as credit financiers, seem to offer rather low levels of smart capital whereas Business Angels and the independent and corporate VC companies prefer a deep and diverse exchange of information with their portfolio companies. The banks' VC subsidiaries and the public VC companies lie between these extremes.

With regard to the determinants of smart capital, we find that the share of early stage investments in a portfolio and the investment horizon both affect the

level of smart capital. The influence of the financial product is statistically significant for loan financing and minority holdings. However, the financial instrument predominantly used does not seem to affect the provision of smart capital. This result indicates that the separation of the market observed is also driven by the institutional background of the investors, not only by the financial instrument used. This assumption is confirmed when we control for the different types of financiers. The fact of being a bank influences the “smartness” of the capital negatively, whereas being an independent or corporate VC company has a slightly positive influence. This might reflect different business strategies, although the varying institutional backgrounds of public VCs, bank-dependent VC companies or Business Angels does not affect the provision of smart capital.

Although we lack detailed data on the actual amount invested in start-ups by the different types of financiers, from our survey results we can conclude that the commitment to the provision of smart capital is still strong among Germany’s financiers, especially in start-up financing. Moreover, the surviving companies of the still immature VC industry in Germany are struggling to overcome the slump in investment activity and fund raising, and they are trying to build a strong reputation as unique providers of a specific form of smart capital.

Our analysis enables us to identify different groups of financiers in the market for informed start-up capital. However, we are aware of the considerable heterogeneity among Germany’s relational investors. Each segment has its own business strategy and specific goals. Even the members within each segment are far from being homogeneous. This could lead to incompatibilities between the financiers in case of syndication, i.e. where more than one investor is engaged in a specific start-up company. Moreover, the observed heterogeneity suggests that entrepreneurs have to specify exactly what form of capital, and which level of consulting, they need before they approach possible financiers.

The heterogeneity of the providers of smart capital we observed opens up areas for further research. Firstly, syndication may show different results, depending on whether the syndication is arranged within a group of relational investors or between groups. And secondly, the question of how different forms of relational capital affect the success of the portfolio firms is still unexplored.<sup>2</sup>

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<sup>2</sup> First steps in this direction have been made by De Clercq and Sapienza (2006) who analyze the perception of performance of venture capital firms in combination with the relational capital.



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