

2 Data

2.1 Abstract

This part of the thesis examines the quality of the survey data and presents descriptive statistics for the sample of private equity firms. The study employed a cross-sectional survey design to collect data on key determinants and rules of decision-making in private equity firms. Following a preparatory phase, which included expert interviews as well as an online pilot test, a self-administered, standardised questionnaire was made available to more than 2,300 private equity firms located in the United States of America, Canada, and eleven countries in Europe. The field phase of the survey lasted a little over two months, during the course of which each addressee received up to two reminder notifications. After screening returned questionnaires for completeness and verifying the eligibility of responding private equity firms, the final sample consisted of 134 complete, and 2 partially complete survey questionnaires. The corresponding survey response rate of 5.8% is lower than response rates specified in other private equity mail surveys. A regression analysis of response rates and the numbers of units addressed in 16 private equity mail surveys suggests that this outcome is largely a result of the unusually large sample frame size of the survey in this thesis. I use multiple methods to examine whether the survey non-response has any detrimental effect on the quality of data; the results of these analyses yield no evidence that the group of non-respondent firms differ materially from the group of respondent firms in any way, other than perhaps employing a more stringent policy of confidentiality and being more likely to be located in the United States of America or Canada. Country weights are introduced to compensate any bias that might flow from a skewed geographic distribution of private equity firms in the sample. As a final quality check, the validity of the survey data was assessed by comparing response data to information from an external database; the results are reassuring in that most matching variables are highly correlated with each other. The sample of respondent firms is almost equally balanced between venture capital and buyout firms. In the year of the survey, responding private equity firms had been in existence for, on average, 9 to 11 years and had raised an average of 2 to 3 private equity funds. The mean (median) capital under management of the sample amounted to €426.0 million (€150.0 million). Respondent specifications regarding the “rough average return” of their private equity firm “across all funds” imply a mean IRR of 33.5% and a mean multiple of 2.6, whereas the respective average amounts of the subsample of buyout firms are higher than those of venture capital firms.

2.2 Data Quality

2.2.1 Calculation of survey outcome rates

The survey outcome rates shown in this thesis are calculated in accordance with the guidelines and standard definitions for final dispositions of case codes and outcome rates for surveys as set out by the American Association for Public Opinion Research (AAPOR, 2009).¹⁹ As illustrated in the introduction to this thesis, the original (pre-survey) sample frame contained 2,373 private equity firms. During the course of the mail survey 73 of these firms were eliminated from the sample frame — irrespective of whether or not they had completed a survey form — because they had ceased to exist, were inactive, had been identified as duplicate listings, or because of serious doubts concerning their profit-seeking nature. Thus, the final (post-survey) sample frame consisted of 2,300 private equity firms located in the United States of America, Canada, and eleven countries in Europe. Following a review of the altogether 149 questionnaires that were received in the field phase of the survey, thirteen questionnaires were removed from the analysis because they contained insufficient data or because the corresponding private equity firms had been eliminated from the sample frame. The remaining sample of 136 returned questionnaires comprises 134 *completed* questionnaires, and 2 *partially completed* questionnaires.²⁰

¹⁹ This excludes specific statistics relating to online participation, for which no guidelines were available

²⁰ A table with more detail on the final disposition codes of the sample frame is available in Appendix D

Table 2
Survey outcome rates by location

Location	Frame Count	Sample ^a Count	Response	Co-	Refusal	Contact
			Rate	operation Rate	Rate	Rate
			%			
US	1,573	57	3.6	72.2	1.3	5.0
UK	218	18	8.3	66.7	4.1	12.4
France	92	6	6.5	75.0	2.2	8.7
Germany	88	14	15.9	70.0	6.8	22.7
Canada	82	5	6.1	71.4	2.4	8.5
Italy	43	5	11.6	71.4	2.3	16.3
Sweden	43	4	9.3	66.7	4.7	14.0
Switzerland	38	6	15.8	85.7	2.6	18.4
Spain	36	3	8.3	100.0	0.0	8.3
Finland	24	2	8.3	100.0	0.0	8.3
Netherlands	24	4	16.7	80.0	4.2	20.8
Norway	22	8	36.4	100.0	0.0	36.4
Denmark	17	2	11.8	66.7	5.9	17.6
Total	2,300	134	5.8	73.6	2.0	7.9

Note. All outcome rates are calculated in accordance with the 2009 Standard Definitions for final dispositions of case codes and outcome rates for surveys as set out by the American Association for Public Opinion Research (AAPOR).

^aQuestionnaires categorised as *complete* only.

Table 2 shows a breakdown of the survey outcome rates by location. Response rates in European countries varied widely between 6.5% (France) and 36.4% (Norway). The lowest response rate by country was generated in the United States of America (3.6%) — the country, which accounts for more than two thirds of private equity firms in the sample frame. Roughly two thirds of all completed questionnaires were submitted via the online survey tool. 94 of the 110 persons who logged on to the internet survey tool returned a complete form, representing a conversion rate of 85.5%. The mean average time that online participants were logged on to the internet survey tool was 13.7 minutes.²¹

2.2.2 Comparison with previous private equity mail surveys

The overall response rate of 5.8% is lower than response rates specified in other private equity mail surveys. One possible explanation for this outcome is the large size of the survey in this

²¹ The calculation of mean duration is based on the data of 85 online survey participants who completed the questionnaire in one session

thesis. All else being equal, more survey addressees imply less time and resource available for processing each individual unit (e.g. eligibility checks, verification of address, and communications with units). But perhaps more importantly, the addressees of large scale surveys might be less inclined to respond to the survey request than addressees of small scale surveys because their relative contribution to the survey is smaller.²² Figure 3 shows a scatter plot of response rates and numbers of units addressed for previous private equity mail surveys and the survey in this thesis. Evidently, the graph supports the assumption of a link between the two variables; the coefficient of Spearman rank correlation is large and statistically significant ($r_s = -.90, p < .0005$, two-tailed, $n = 16$).²³ A linear regression of logarithmic transformations of the two variables yields the approximating curve depicted in the graph.²⁴ The regression model is statistically significant, $F(1, 14) = 44.9, p < .0005$, and explains 76.2% of the variation in response rates.²⁵

²² This, of course, only applies to surveys in which the recipients are conscious of the sample frame size (as in the survey in this thesis)

²³ The outcome of the test remains unchanged when using critical values of the Spearman rank order correlation coefficients for small sample sizes specified by Zar (1972): $r_{s \text{ crit}} (n = 16, \alpha = .01, \text{two-tailed}) = .635$

²⁴ A scatter-plot of regression residuals showed increased variance for sample frame sizes below 250 (heteroscedasticity). This suggests that the sample frame size is a less reliable predictor of response rates in small-scale surveys

²⁵ A regression of the data excluding the present survey led to results of similar strength; the response rate of the present survey lies within the 95% confidence band of such a model

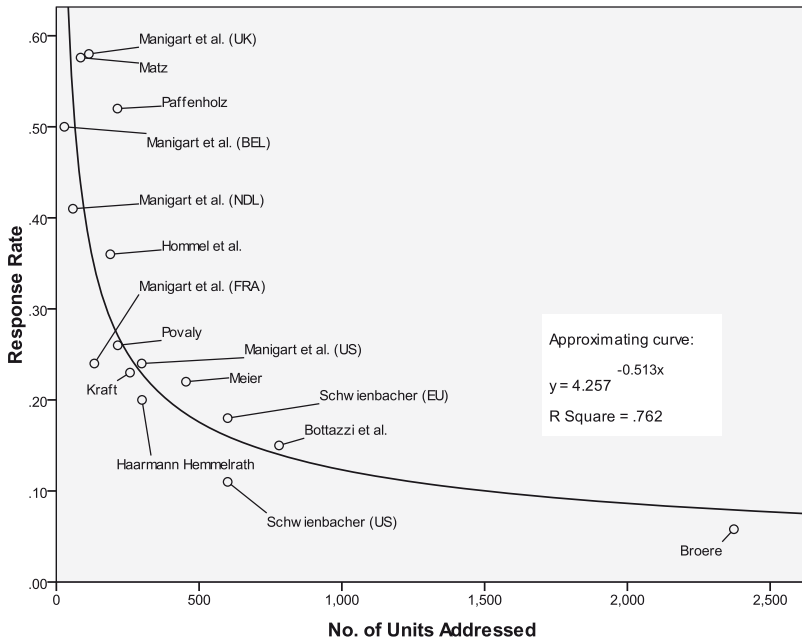


Figure 3. Scatter plot of response rates and sample frame sizes (No. of Units Addressed) for private equity mail surveys. All figures are reported values, except the response rate for Matz, which is derived from other figures reported in the study. The response rate for Haarmann Hemmelrath is a minimum value. The response rates are sourced from the following publications: Bottazzi, L., & Da Rin, M. (2002). Venture capital in Europe and the financing of innovative companies. *Economic Policy*, 17(34), 231–269; Haarmann Hemmelrath (Ed.) (2002). *Exit-Management in Beteiligungsgesellschaften: Ergebnisse einer Studie der Haarmann Hemmelrath Management Consultants GmbH in Zusammenarbeit mit der der Technischen Universität zu Braunschweig*. Düsseldorf, Germany: Author; Hommel, U., Ritter, M., & Wright, M. (2003). Verhalten der Beteiligungsfinanzierer nach dem "Downturn": Ergebnisse einer empirischen Untersuchung. *Finanz Betrieb*, 5(5), 323–333; Kraft, V. (2001). *Private Equity-Investitionen in Turnarounds und Restrukturierungen* (Doctoral dissertation, University of St.Gallen, Switzerland). Frankfurt am Main, Germany: Campus; Manigart, S., de Waele, K., Wright, M., Robbie, K., Desbrières, P., Sapienza, H. J., & Beekman, A. (2002). Determinants of required return in venture capital investments: a five-country study. *Journal of Business Venturing*, 17(4), 291–312; Matz, C. (2002). *Wettbewerbsentwicklung im deutschen Private-Equity-Markt: Strategieoptionen für Beteiligungskapital-Gesellschaften* (Doctoral dissertation, WHU – Otto Beisheim School of Management, Koblenz, Germany, 2001). Wiesbaden, Germany: Deutscher Universitäts-Verlag; Meier, D. (2006). *Post-investment value addition to buyouts: Analysis of European private equity firms* (Doctoral dissertation, RWTH Aachen, Germany, 2005). Wiesbaden, Germany: Deutscher Universitäts-Verlag; Paffenholz, G. (2004). *Exitmanagement: Desinvestitionen von Beteiligungsgesellschaften* (Doctoral dissertation, University of Cologne, Germany, 2004). Lohmar, Germany: Eul; Povaly, S. (2007). *Private equity exits: Divestment process management for leveraged buyouts*. Berlin, Germany: Springer; Schwiebacher, A. (2005). *An empirical analysis of venture capital exits in Europe and in the United States*. EFA 2002 Berlin Meetings Discussion Paper. Retrieved from <http://ssrn.com/abstract=302001>.

Although the large sample frame size goes a long way towards explaining the lower response rate of the survey in this thesis, a number of other factors may also have played a role. These

include the possibly lower propensity of private equity firms located in the United States of America to respond to mail surveys compared to that of private of private equity firms located in Europe, the personalised (i.e. non-anonymous) design of the survey, the lack of sponsorship and support by a national or international industry association,^{26 27} and a possible temporary lack of readiness to respond to mail surveys in the aftermath of the sharp downturn in private equity markets during the field phase of the survey. Part of the difference might also stem from a tendency in professional literature to overstate response rates.²⁸ Of course, the comparatively low response rate could also signify quality issues in the design or execution of the survey. To some extent, this concern is allayed by other indicators of survey quality, such as the high online conversion rate, the low number of incomplete questionnaires returned, and the positive feedback from survey participants and industry associations during the field phase of the study.

2.2.3 Analysis of non-response

2.2.3.1 Background

Research has not yet established whether, or to what extent survey non-response generally affects the quality of survey statistics (see AAPOR, n.d., for a summary discussion of the influence of non-response on survey quality). However, it is evident that non-response can cause error “to the extent that the respondents differ from the nonrespondents on the statistics of interest” (Groves et al., 2004, p. 182). The first part of this analysis investigates the types and causes of non-response, with a view to establishing whether causes for refusals to participate could be connected to the data measured in the survey. The second part of the analysis compares the characteristics of respondents and non-respondents, using data from the sample frame database. The last part of the analysis compares the characteristics of “early respondents” and “late respondents”, using data from the sample frame database, whereas the extent of a participant’s resistance to respond to the survey request is proxied by the number of reminders that a participant had received before responding.

²⁶ A small number of recipients declined to partake in the survey, stating that they participate only in surveys of particular industry associations

²⁷ Conversely, local university patronage could explain the comparatively high survey response rate in Germany

²⁸ Johnson and Owens (2003) identified large inconsistencies in reporting standards in professional literature. After studying 95 journal articles in social sciences and health sciences, they observe that response rates without definition “can mean anything, particularly in the absence of any additional information regarding sample disposition” (p. 130) and that they “have yet to encounter any case in which a response rate has been *underestimated* (vis-à-vis AAPOR standard formulas)” (p. 132). A cursory review of the private equity mail surveys referred to in Figure 3 shows that only Matz (2002) provides information on disposition status (though without reporting a response rate); none of the studies specify, for example, whether the reported rates include partial responses

2.2.3.2 Analysis of types and causes of non-response

According to Groves (2004, p. 178), “bias flows from nonresponse when the causes of the nonresponse are linked to the survey statistics measured”. The breakdown of survey non-response in Appendix D shows that the vast majority of non-response (around 96%) is made up of addressees from whom “nothing ever returned”; other types of non-response mostly comprise documented failures to contact the addressee (returned error messages) and explicit refusals. The causes of non-response for the large group of silent private equity firms are unknown. Some non-respondents may not have received the survey request due to erroneous contact details and postal failures; others may have ceased to exist or may have considered their firms ineligible for the survey. However, it appears likely that a large number of addressees were simply not inclined to respond to the survey request. Their reasons might be similar to those provided in the 22 explicit refusals. 19 of these non-respondents stated one or more of the following reasons: (a) the firm policy does not permit their responding to survey requests (41%); (b) insufficient time or personnel to respond (36%); and (c) no disclosure of such information to outsiders (18%). In addition, two non-respondents declared that they were not interested in the survey, and one non-respondent from France claimed to not speak English.

The high percentages of responses under (a) and (c) suggest a bias in the survey sample towards private equity firms with less stringent confidentiality policies. However, it appears rather unlikely that such a bias should affect the statistics measured in the survey (i.e. private equity firm objectives and minimum return requirements, success measures and decision metrics, rules for exit decisions and general firm characteristics). This is largely consistent with the results of a comparison between respondents and non-respondents presented in the following (aside from a location bias). Other than that, the language issue specified in one refusal could indicate that private equity firms from non-English-speaking countries are underrepresented in the sample of respondents. This concern was rejected after observing that non-English-speaking countries in the survey generated a higher average response rate than English-speaking countries in the survey (see Table 2 in Chapter 2.2.1).

2.2.3.3 Comparison of respondents and non-respondents

2.2.3.3.1 Bivariate analyses

The characteristics of respondents and non-respondents were compared, using data from the sample frame database. Table 3 exhibits the results of the bivariate analysis. The Pearson Chi-Square tests reject the independence of the survey participation status from Type and Location; the strength of association is small in both instances, with each variable accounting for less than 3% of variance in participation status. The descriptive statistics for continuous variables show that responding private equity firms were on average younger, had raised less funds, and were

smaller (by Staff Count, Funds, and Funds Raised) than non-responding private equity firms. Independent samples *t*-tests yielded statistically significant results for the parameters Age and Funds Raised, whereas the size of effect is small in both cases.

Table 3
Connections between survey participation status and firm characteristics

Variables	Pearson Chi-Square test				
	<i>n</i>	<i>df</i>	χ^2	<i>p</i> ^a	Φ
Participation status and Type	2,300	2	9.6	.008 ***	.06
Participation status and Location	2,300	5	61.8	<.0005 ***	.16

Variable	Status		Status		Status		Independent <i>t</i> -test		
	R	NR	R	NR	R	NR	<i>M</i> _{diff}	<i>p</i> ^a	<i>d</i>
	Subsample size		Mean		Standard deviation				
Age (yrs)	83	1,348	12.3	15.4	8.9	12.2	-3.1	.021 **	-0.26
Staff Count	78	1,110	13.3	16.5	11.1	43.0	-3.1	.521	-0.08
Funds	109	1,642	2.4	2.8	1.7	3.0	-0.4	.168 ^b	-0.14
Funds Raised (\$m)	104	1,491	466.5	1,075.4	845.9	3,751.6	-608.8	<.0005 ***	-0.17

Note. The sample frame of 2,300 private equity firms is divided by participation status into 136 respondent firms (R) and 2,164 non-respondent firms (NR). The firm characteristics of the sample frame were obtained from the Preqin database *Fund Manager Profiles* in February 2009. Type specifies the type of private equity firm, whereas database entries denoted as Early Stage, Early Stage: Seed, Early Stage: Start-up, Expansion/Growth Capital, Late Stage, and Venture (General) are categorised as *venture capital*; database entries Buyout, Management Buy-out, Privatisation, Turnaround, Succession, Management Buy-in, Spin-offs, Divestiture, and Public to Private are categorised as *buyout*; all remaining entries are included in the category *other*. Location specifies private equity firm headquarter location, divided into six categories: United States of America and Canada, United Kingdom, France, Germany, Nordic (Denmark, Finland, Norway, and Sweden), and Other European (Italy, the Netherlands, Spain, and Switzerland). Funds denotes the number of funds a private equity firm has raised. Funds Raised denotes the value of funds raised over the last ten years in US\$ millions.

^a*ps* are two-tailed. **p* < .10. ***p* < .05. ****p* < .01.

^bEqual variances not assumed.

2.2.3.3.2 Logistic regression

A binary logistic regression analysis was performed with the participation status as dependent variable. To increase the statistical power of the analysis, the predictor variables comprise only variables that were found to be significant in the bivariate analyses, that is, Age, Funds Raised, Location (coded in five dummy variables for the logistic regression), and Type (coded in two dummy variables).²⁹ The database contained sufficient information (listwise) for a regression

²⁹ The table of correlations between predictor variables (see Appendix F) shows no sign of excessive correlation (*multicollinearity*)

analysis with a sample of 1,111 private equity firms, comprising 64 respondent firms. The results of the regression analysis show that inclusion of predictor variables into the model with intercept only, significantly increases the model's ability to predict the participation status of private equity firms (see Table 4). A Hosmer and Lemeshow Goodness-of-Fit test suggests that the model estimates fit the observed data at an acceptable level. The strength of association is limited: Pseudo R Square ranges between 5.0% (Cox and Snell) and 14.0% (Nagelkerke). Only the dummy variable US & Canada has a significant partial effect ($p < .0005$). Inverting the odds ratio for this variable implies that (all else being equal) a private equity firm located in any of the countries Italy, the Netherlands, Spain, or Switzerland (together the reference dummy variable for Location) was 6.7 times (95% CI [3.0, 14.9]) more likely to respond to the survey than a private equity firm based in the United States of America or Canada.

Table 4

Binary logistic regression of variables predicting the survey participation status of private equity firms in the sample frame

Predictor	B	Wald χ^2	df	p	Odds ratio (e^B)	95% CI for e^B	
						Lower	Upper
Constant ***	-1.40	11.3	1	.001 ***	.25		
Age (yrs)	-0.02	0.9	1	.333	.98	0.95	1.02
Funds Raised (\$m)	0.00	1.4	1	.245	1.00	1.00	1.00
Location ***		42.8	5	< .0005 ***			
US & Canada ***	-1.90	21.6	1	< .0005 ***	.15	0.07	0.33
UK	-0.70	2.2	1	.139	.50	0.20	1.26
France	-0.71	1.5	1	.219	.49	0.16	1.53
Germany	0.28	0.3	1	.590	1.32	0.48	3.66
Nordic	0.18	0.1	1	.699	1.20	0.47	3.04
Type		3.5	2	.175			
Venture capital	-0.23	0.5	1	.466	.79	0.42	1.48
Buyout	0.41	1.4	1	.235	1.51	0.76	2.98
Test		χ^2	df	p			
Omnibus test		56.9	9	< .0005 ***			
Hosmer and Lemeshow test		4.9	8	.772			

Note. The sample of 1,111 private equity firms with valid data (listwise) is divided by Participation Status (the dependent variable) into 64 respondent firms and 1,047 non-respondent firms. The firm characteristics of the sample were obtained from the Preqin database *Fund Manager Profiles* in February 2009. CI = confidence interval. Funds Raised denotes the value of funds raised over the last ten years in US\$ millions. Location specifies private equity firm headquarter location, coded in five dummy variables. *Nordic* includes Denmark, Finland, Norway, and Sweden. The reference dummy comprises Italy, the Netherlands, Spain, and Switzerland. Type specifies the type of private equity firm, whereas database entries denoted as Early Stage, Early Stage: Seed, Early Stage: Start-up, Expansion/Growth Capital, Late Stage, and Venture (General) are categorised as *venture capital*; database entries Buyout, Management Buy-out, Privatisation, Turnaround, Succession, Management Buy-in, Spin-offs, Divestiture, and Public to Private are categorised as *buyout*; all remaining entries are included in the reference category *other*. Cox and Snell $R^2 = .050$. Nagelkerke $R^2 = .140$.

* $p < .10$. ** $p < .05$. *** $p < .01$.

2.2.3.4 Comparison of early respondents and late respondents

According to the continuum of resistance model (Lin & Schaeffer, 1995), participants who were difficult to contact can be used to estimate the impact of non-response on survey results. This study employs the number of reminder notifications that private equity firms received before responding to the survey request (*Reminders*) as the condition reflecting the level of effort that was required to elicit a response. Accordingly, the analysis compared average sample frame characteristics of respondents across different conditions. Table 5 shows that the Pearson Chi-Square test rejects independence between variables Location and Reminders ($p = .001$, two-

tailed). The magnitude of association is medium and implies that the location of a respondent accounts for around 13.7% of variance in the number of reminders. The associations between continuous firm characteristic variables and the number of reminders were examined using one-way between-subjects analyses of variance. The descriptive statistics show that respondent firms are, on average, younger, less experienced (by Funds), and also smaller (by Staff Count and Funds Raised) with each additional reminder.³⁰ Table 5 shows that none of the corresponding test results are statistically significant. No multivariate analyses were performed, as the valid sample (listwise) for the four variables consisted of only 38 private equity firms.

Table 5

Connections between the numbers of reminder notifications received and firm characteristics of respondent firms

Variable	Pearson Chi-Square test				
	<i>n</i>	<i>df</i>	χ^2	<i>p</i> ^a	Φ
Reminders and Type	136	4	1.6	.810	.11
Reminders and Location	136	4	18.6	.001 ***	.37

Variable	Reminders			Reminders			Reminders			One-way ANOVA			
	0	1	2	0	1	2	0	1	2	<i>df</i>	<i>F</i>	<i>p</i>	η
	Subsample size			Mean			Standard deviation			Between subjects			
Age (yrs)	32	23	28	13.5	13.2	10.1	10.0	9.9	6.0	2	1.26	.289	.03
Staff Count	35	19	24	14.8	14.4	10.4	11.5	13.3	8.1	2	1.24	.295	.03
Funds	43	29	37	2.6	2.4	2.2	1.6	2.0	1.6	2	0.39	.676	.01
Funds Raised (\$m)	41	26	37	537.9	568.7	315.7	823.2	1246.3	423.0	2	0.92	.401	.02

Note. The firm characteristics for the sample of respondent firms ($n = 136$) were obtained from the Prequin database *Fund Manager Profiles* in February 2009. Reminders specifies the number of reminder notifications a respondent firm received before submitting the questionnaire. Type specifies the type of private equity firm, whereas database entries denoted as Early Stage, Early Stage: Seed, Early Stage: Start-up, Expansion/Growth Capital, Late Stage, and Venture (General) are categorised as *venture capital*; database entries Buyout, Management Buy-out, Privatisation, Turnaround, Succession, Management Buy-in, Spin-offs, Divestiture, and Public to Private are categorised as *buyout*; all remaining entries are included in the category *other*. Location specifies private equity firm headquarter location, divided into three categories: United States of America and Canada, United Kingdom, and Other European (Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, and Switzerland). Funds denotes the number of funds a private equity firm has raised. Funds Raised denotes the value of funds raised over the last ten years in US\$ millions.

^atwo-tailed. * $p < .10$. ** $p < .05$. *** $p < .01$.

An analysis of response patterns by location reveals considerable differences across geographic regions (see Figure 4). In the United States of America and Canada the number of responses

³⁰ One exception is a minimal increase in the average value of funds raised from respondents without reminder to respondents with one reminder (this goes along with high standard deviation)

increased with each reminder notification, in the United Kingdom a constant number of responses was generated with each reminder, whereas in other European countries more than half of all responses (60%) were submitted before any reminder was issued. These observations support the speculation in Chapter 2.2.2 that private equity firms in the United States of America and Europe respond differently to survey requests.

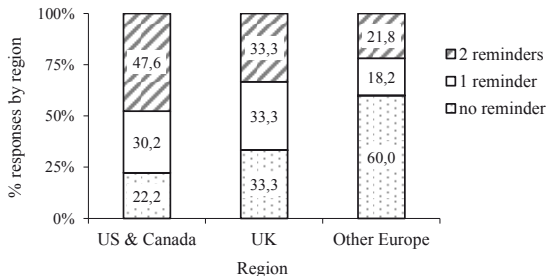


Figure 4. Numbers of reminders required to elicit a response from survey participants by geographic region ($n = 136$). Region denotes private equity firm headquarter location. Other Europe comprises Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, and Switzerland.

2.2.3.5 Implications for the study

Overall, the analyses yield no evidence that the large group of non-respondents differs materially from the group of respondents in any way, other than possibly employing a more stringent policy of confidentiality and being more likely to be located in the United States of America or Canada. As regards the policy of confidentiality, it does not appear very likely that the key statistics measured in the survey (i.e. the objectives, minimum return requirements, success measures, decision metrics of firms and their rules for exit decisions) should be materially affected by this characteristic. As regards the location, it is quite conceivable that the recorded survey statistics should vary between geographic regions, for example, due to a differing maturity of private equity markets (see, e.g. Black & Gilson, 1998). The non-response analysis shows in particular that private equity firms located in the United States of America and Canada were generally less responsive and required more reminders to elicit a response than their counterparts located in Europe. Consequentially, this underrepresentation of U.S. and Canadian private equity firms in the survey sample could give rise to error when using sample data for inferences to the underlying population of private equity firms.

In order to reduce the potential error from country bias, private equity firms in the survey sample are assigned country weights. These are calculated so as to make the percentage distribution by country of weighted respondents match the percentage distribution by country

of private equity firms in the sample frame population (see Groves et al., 2004, p. 326, for information on methods of sample weighting). All ensuing data analyses in this thesis, excepting those relating to countries and regions use the weights presented in Table 6.

Table 6
Assignment of weights by country

Location	Frame		Sample		Weight
	Count	Percent	Count	Percent	
US	1,573	58	68.4	42.6	1.60
UK	218	18	9.5	13.2	0.72
France	92	6	4.0	4.4	0.91
Germany	88	14	3.8	10.3	0.37
Canada	82	5	3.6	3.7	0.97
Italy	43	6	1.9	4.4	0.42
Sweden	43	4	1.9	2.9	0.64
Switzerland	38	6	1.7	4.4	0.37
Spain	36	3	1.6	2.2	0.71
Finland	24	2	1.0	1.5	0.71
Netherlands	24	4	1.0	2.9	0.35
Norway	22	8	1.0	5.9	0.16
Denmark	17	2	0.7	1.5	0.50
Total	2,300	136	100.0	100.0	

Note. Location specifies private equity firm headquarter location. Weights reflect the ratio of a country's share of private equity firms in the frame population to its share of firms in the survey sample.

2.2.4 Correlations between survey responses and comparable external data

One way of estimating the validity of survey data is to measure the correlation between survey responses and external data that evaluate the same construct (Groves et al., 2004, pp. 254–258). Incidentally, a small number of private equity firm characteristics that were collated in the survey are also supplied in the external database that was used for selecting the sample frame (the Preqin database *Fund Manager Profiles*). But using the Preqin database as the “gold standard” for assessing the quality of the survey data in this thesis has its own implications: The validity of its data is unknown; therefore, deviations between the two sets of data could stem from errors in either database. Moreover, such deviations could also arise from time differences between the two data sources, or from differences in the targeted construct. However, these complications do not render the test meaningless: Whereas an absence of collinearity does not yield conclusive evidence on the quality of data because the source of deviation is ambiguous, high degrees of positive correlation should serve as an acceptable sign of the validity of both datasets.

Table 7
Correlations of survey variables with external data

Survey variable	Matching data from external database	Pearson		Spearman	
		<i>r</i>	<i>n</i>	<i>r_s</i>	<i>n</i>
Age (yrs)	Age derived from year of establishment	.85 ***	71	.92 ***	80
Funds	Total number of funds raised	.22 **	96	.69 ***	108
Capital (€m)	Estimated available capital in US\$ millions	.89 ***	91	.73 ***	103
Firm Type	Firm types derived from data on "Strategies" ^a	.	.	.63 ***	156
BO - VC	Firm types derived from data on "Strategies" ^b	.80 ***	92	.81 ***	108

Note. Correlations were tested pairwise, using country-weighted data. The weights reflect the ratio of a country's share of private equity firms in the frame population to its share of firms in the survey sample. The matching external data were sourced from the Preqin database *Fund Manager Profiles* in February 2009. Survey variables: Age is the number of years a respondent's firm has been in existence. Funds is the number of private equity funds a respondent's firm has raised. Capital is the rough total capital under management of a respondent's firm in € millions. Range specifications were replaced by their means, and amounts in other currencies were converted to € amounts using the averages of market exchange rates over the time of the survey. Firm Type contains all sample firms, categorised as either buyout (BO), venture capital (VC), or *other*. VC includes eight firms of related firm types, such as "growth equity" and "business angel"; BO includes two firms of related firm types ("industry specific buyout" and "restructuring buyout"). BO - VC contains only sample firms with firm types BO and VC.

^aEarly Stage, Early Stage: Seed, Early Stage: Start-up, Expansion/Growth Capital, Late Stage, and Venture (General) are categorised as VC; Buyout, Management Buy-out, Privatisation, Turnaround, Succession, Management Buy-in, Spin-offs, Divestiture, and Public to Private are categorised as BO, all remaining entries are allocated to the category *other*.

^bAllocations as before, but excluding firms allocated to the category *other*.

* $p < .10$. ** $p < .05$. *** $p < .01$. All p s are two-tailed.

Table 7 shows overall fairly high degrees of correlation between the survey responses and the corresponding data in the external database. The comparatively low coefficient of Spearman rank correlation for Firm Type is caused by a larger number of *other* type private equity firms in the Preqin database than in the study sample — this is most likely the result of an incomplete allocation of database entries to the firm types venture capital and buyout. If the analysis is limited to venture capital and buyout firms only, the coefficient of Spearman rank correlation increases to .81 ($p < .0005$, two-tailed, $n = 108$). Overall, the results are reassuring in that most matching variables are highly correlated with each other.

2.3 Descriptive Statistics

The sample contains 136 private equity firms located in the United States of America, Canada, and Europe. Table 8, Table 9, and Table 10 show key descriptive statistics for the sample firms in total and broken down by firm type (see Appendix G for variable definitions). In the year of the survey, responding private equity firms (not funds) had been in existence for, on average, 9 to 11 years and had raised an average of 2 to 3 private equity funds. The mean (median) capital under management of the sample amounts to €426.0 million (€150.0 million). The respective values for the subgroups of venture capital and buyout firms amount to €232.3 million (€130.0

million) and to €671.0 million (€200.0 million). The dispersion of capital under management is high, particularly for buyout firms. Median values are lower than mean values because the distributions are right-skewed. A comparison of statistics for venture capital and buyout firms in the sample shows that the average venture capital firm is smaller (by capital under management), undertakes smaller investments, and manages a larger number of investments than the average buyout firm. Independent samples *t*-tests and Mann-Whitney *U*-tests show that these differences are statistically significant ($\alpha = .05$, two-tailed).³¹

The mean (median) IRR of private equity firms that had provided valid responses for this item ($n = 88$) amounts to 33.5% (26%). The mean (median) multiple of the subsample of private equity firms that had submitted valid details for this item ($n = 66$) amounts to 2.6 (2.7). As the survey questionnaire referred only to the “(rough) average return” that a firm had “achieved across all funds”, the amounts specified by respondents may not always be fully comparable with each other. Notwithstanding this, the data show a noteworthy pattern: The average IRR and multiple for the sample of venture capital firms is lower than the average IRR and multiple for the sample of buyout firms. An independent samples *t*-test is statistically significant for the difference in multiples; the size of effect is large. A corresponding test with IRR data was conducted using a logarithmic transformation because the distribution of “simple” IRRs was found to be right-skewed (skewness of 4.1 and 2.3 for venture capital and buyout firms, respectively). The mean difference in \ln IRR is statistically significant,³² suggesting that the ratio of the geometric mean IRR of buyout firms to the geometric mean IRR of venture capital firms is 1.9 (95% CI [1.3, 2.7]);³³ the size of effect large. Additional exploratory analyses yielded connections between IRR performance and other firm attributes: The IRR of venture capital firms in the sample is positively related to firm experience (as measured by the number of funds raised); the IRR of buyout firms in the sample is negatively associated with geographical specialisation and, to a lesser extent, with the number of investments (see Appendix E for further detail).

³¹ In Table 8, the results of Mann-Whitney *U*-tests are only shown where they differ materially from the results of the independent samples *t*-tests

³² Table 8 shows that a non-parametric Mann-Whitney *U*-test using simple IRRs leads to the same outcome

³³ The antilog of the arithmetic mean difference between the logarithm-transformed values yields the geometric mean. In this particular case, the ratio of geometric mean IRRs also roughly reflects the relation between the respective median IRRs, because the distributions of \ln IRR are largely symmetric

Table 8

Key characteristics (ordinal scale and continuous variables) of private equity firms in the survey sample by type

Characteristic	Type			Type			VC - BO		
	VC	BO	All	VC	BO	All	M_{diff}	p^a	d
	Mean			Median					
Age (yrs)	10.0	12.2	10.7	9.0	10.0	9.0	-2.3	.146	-0.27
Funds	3.3	2.5	2.8	2.0	2.0	2.0	0.8	.182	0.25
Capital (€m)	232.3	671.0	426.0	130.0	200.0	150.0	-438.7	.026 ^{**b}	-0.43
Investments	18.0	8.4	12.7	14.0	7.0	9.0	9.6	.004 ^{***}	0.55
Investment Size (€m)	5.9	32.5	18.1	4.0	15.0	7.5	-26.6	< .0005 ^{***}	-0.94
IRR (%)	32.9	35.2	33.5	15.0	30.0	26.0	-2.4	.828 ^{c,d}	-0.06
Multiple	2.1	2.8	2.6	1.9	3.0	2.7	-0.7	.007 ^{***}	-1.05
	Standard deviation			Subsample size					
Age (yrs)	7.0	9.8	8.4	62	60	133			
Funds	4.1	1.8	3.0	57	58	126			
Capital (€m)	357.2	1,386.3	984.5	56	55	123			
Investments	22.9	9.0	17.3	58	61	130			
Investment Size (€m)	5.6	40.4	30.0	64	59	134			
IRR (%)	61.8	17.7	41.2	34	45	88			
Multiple	0.9	0.5	0.7	18	42	66			

Note. All figures are based on country-weighted survey data. The weights reflect the ratio of a country's share of private equity firms in the frame population to its share of firms in the survey sample. The type of private equity firm comprises venture capital (VC), buyout (BO), and other. VC includes eight firms of related firm types, such as "growth equity" and "business angel"; BO includes two firms of related firm types ("industry specific buyout" and "restructuring buyout"). M_{diff} denotes mean difference. Age is the number of years a respondent's firm has been in existence. Funds is the number of private equity funds a respondent's firm has raised. Capital is the rough total capital under management of a respondent's firm in € millions. Investments is the rough number of company investments managed by a respondent's firm. Investment Size is a respondent firm's rough typical investment size (equity stake) in € millions. Range specifications were replaced by their means, and amounts in other currencies were converted to € amounts using the averages of market exchange rates over the time of the survey. IRR is the rough average IRR (in %) that a respondent's firm has achieved across all funds. Some amounts were expressly specified as gross. One amount was specified as net; this value was divided by 0.8 to arrive at a rough approximation of gross return. Response data also include one forecast value and three minimum return specifications (implied by ">" as prefix or "+" as suffix). Multiple is the rough average multiple that a respondent's firm has achieved across all funds. Some figures were expressly specified as gross. Response data also include one forecast value and two minimum return specifications. Two extreme values (50 and 1300) were excluded from the analysis.

^aUsing independent samples t -tests for equality of means. All p s are two-tailed. Equal variances are only assumed for the variable Funds. ^{*} $p < .10$. ^{**} $p < .05$. ^{***} $p < .01$.

^bMann-Whitney $U = 1,573$; p (two-tailed) = .008; mean rank VC = 57.3; mean rank BO = 74.8.

^cMann-Whitney $U = 494$; p (two-tailed) < .0005; mean rank VC = 33.1; mean rank BO = 58.7.

^dAn independent samples t -test for equality of means using ln IRR instead of simple IRR was also significant: p (two-tailed) = .001, equal variances not assumed, $M_{diff} = 0.64$, 95% CI [0.27, 1.00], $d = 0.88$.

The distribution of private equity firms in the sample is almost equally balanced between buyout firms and venture capital firms across all major geographical regions (see Table 6 in Chapter 2.2.3.5 for non-weighted country counts). Most private equity firms in the sample prefer a hands-on style of management and mostly manage their investments in closed-end funds. Buyout firms show a slightly stronger tendency than venture capital firms to obtain their fund capital from outside investors, whereas venture capital firms show a stronger tendency than buyout firms to obtain their fund capital from private families and from the government, state or a public institution.

Table 9
 Key characteristics (nominal scale variables) of private equity firms in the survey sample by type

Characteristic	Type			Type			VC vs. BO		
	VC	BO	All	VC	BO	All	χ^2	p^a	Φ
	Count			% within type					
Region									
US & Canada	48	45	98	76.0	73.4	71.9			
Europe	15	16	38	24.0	26.6	28.1			
Total	64	61	136	100.0	100.0	100.0			
Management Style									
Hands-on	39	40	88	62.8	65.5	65.8	0.1	.755	.03
Supportive	21	19	41	33.4	30.8	30.8	0.1	.758	-.03
Hands-off	0	1	1	0.0	1.8	0.8	1.1	.491 ^b	.10
Other	2	1	3	3.8	1.9	2.6	0.4	1.000 ^b	-.06
Total	62	61	134	100.0	100.0	100.0			
Closed-End Fund									
Yes	50	46	104	79.8	77.1	77.9	0.1	.716	-.03
No	13	14	30	20.2	22.9	22.1	0.1	.716	.03
Total	63	59	134	100.0	100.0	100.0			
Sources Of Fund Capital									
Outside investors	53	56	116	59.8	84.8	69.5	2.9	.087 [*]	.15
Private family	14	5	21	16.1	7.2	12.7	5.0	.026 ^{**}	-.20
Government, state etc.	12	1	14	13.4	1.6	8.2	9.5	.002 ^{***}	-.28
Parent company	4	2	7	4.8	2.9	3.9	0.8	.680 ^b	-.08
Capital markets	1	1	3	1.6	1.1	1.5	0.2	1.000 ^b	-.04
Other	4	2	7	4.3	2.4	4.2	0.8	.680 ^b	-.08
Responses	88	67	167	100.0	100.0	100.0			
Total	64	61	136	72.1	91.1	81.1			

Note. All figures are based on country-weighted survey data. The weights reflect the ratio of a country's share of private equity firms in the frame population to its share of firms in the survey sample. The type of private equity firm comprises venture capital (VC), buyout (BO), and *other*. VC includes eight firms of related firm types, such as "growth equity" and "business angel"; BO includes two firms of related firm types ("industry specific buyout" and "restructuring buyout"). Region refers to the firms' headquarter locations. Because the data are country-weighted, the weight of a region in the sample reflects the weight of a region in the frame population. Closed-End Fund denotes whether a respondent's firm mostly manages its investments in (closed-end) funds with a fixed lifetime. Sources Of Fund Capital specifies the provider(s) of the majority of fund capital for a respondent's firm. In one case the information was manually researched.

^aUsing Chi-Square tests of homogeneity of proportions ($df=1$). All ps are two-tailed. ^{*} $p < .10$. ^{**} $p < .05$. ^{***} $p < .01$.

^bExact test applied because some cells had an expected count of less than 5.

The investment preferences of venture capital and buyout firms exhibit some general differences. Venture capital firms mostly target minority ownership stakes, whereas buyout

firms mostly target majority stakes. Buyout firms also show a stronger tendency towards better-performing target companies than do venture capital firms. Many venture capital firms declared that they had no preference regarding target firms' performance; possibly because the performance of very early-stage companies is not considered to be a critical indicator for the future performance of such companies. Last, venture capital firms show a stronger tendency to specialise in industry sectors than buyout firms. One explanation for this difference might be the typical emphasis in venture capital on young, high-growth companies. Such companies are naturally more frequent in new and fast-growing industries.

Table 10

Key investment preferences (nominal scale variables) of private equity firms in the survey sample by type

Characteristic	Type			Type			VC vs. BO		
	VC	BO	All	VC	BO	All	χ^2	p^a	Φ
	Count			% within type					
Preferred Ownership									
Majority	10	50	64	15.9	91.9	50.7	66.1	<.0005***	.76
Minority	41	1	47	68.5	1.3	37.2	55.4	<.0005***	-.70
Other	9	4	15	15.6	6.8	12.1	1.0	.317	-.09
Total	60	54	126	100.0	100.0	100.0			
Preferred Target Performance									
Well- or underperforming	35	54	100	59.7	94.4	79.1	19.6	<.0005***	.41
Loss-making	5	2	7	9.2	2.8	5.4	2.1	.272 ^b	-.13
Other	18	2	20	31.1	2.8	15.4	16.4	<.0005***	-.38
Total	58	57	127	100.0	100.0	100.0			
Industry Specialisation									
Yes	50	30	84	78.9	50.3	62.5	11.0	.001***	-.30
No	13	30	51	21.1	49.7	37.5	11.0	.001***	.30
Total	63	60	135	100.0	100.0	100.0			
Geographic Specialisation									
Yes	45	45	98	71.4	73.9	72.2	0.1	.755	.03
No	18	16	38	28.6	26.1	27.8	0.1	.755	-.03
Total	64	61	136	100.0	100.0	100.0			

Note. All figures are based on country-weighted survey data. The weights reflect the ratio of a country's share of private equity firms in the frame population to its share of firms in the survey sample. The type of private equity firm comprises venture capital (VC), buyout (BO), and *other*. VC includes eight firms of related firm types, such as "growth equity" and "business angel"; BO includes two firms of related firm types ("industry specific buyout" and "restructuring buyout").

^aUsing Chi-Square tests of homogeneity of proportions ($df = 1$). All p s are two-tailed. * $p < .10$. ** $p < .05$. *** $p < .01$.

^bExact test applied because some cells had an expected count of less than 5.

All firm characteristics were screened for large and significant levels of association with each other (see Appendix H). The closest levels of association exist between firm type (buyout or venture capital) and preferred ownership (majority or minority), between Age and Funds, and between Capital and Investment Size. In the following, the variable Preferred Ownership is omitted from tables and presentations, unless additional insights are offered by its inclusion.



<http://www.springer.com/978-3-658-03779-6>

Decision-Making in Private Equity Firms
An Empirical Study of Determinants and Rules

Broere, M.

2014, XXII, 212 p. 14 illus., Softcover

ISBN: 978-3-658-03779-6