THE COMPETITIVE IMPLICATIONS OF INTRA-INDUSTRY DIVERSIFICATION, THE FIRM-INVESTOR NETWORK, AND RESOURCE ACQUISITION ACROSS THE FIRM BOUNDARY: EVIDENCE FROM THE HEDGE FUND INDUSTRY

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Abstract of the Thesis

The competitive implications of intra-industry diversification (chapter 2), the firm-investor network (chapter 3) and resource acquisition across the firm boundary (chapter 4) are of central concern to this thesis. The analysis draws on qualitative evidence, a quantitative, large-scale, longitudinal panel dataset (chapters 2 and 3), as well as conceptual reasoning (chapter 4). The empirical setting of the analysis is the hedge fund industry, which is characterised by small, entrepreneurial and knowledge-intensive firms.

Whereas the three main chapters of this thesis are constructed and presented as stand-alone papers, three overarching insights emerge. First, intra-industry diversification impacts firm performance and firm survival in non-trivial ways. Whereas the positive effect of intra-industry diversification on survival seems to be driven by the risk reducing effect of beyond sub-sector diversification within an industry, the negative effect on performance seems to be driven by within sub-sector diversification, which may create limited value for investors. Second, the relationship of investment firms and their customers (i.e. investors) is much more multifaceted than the view of 'investors as passive providers of capital' would suggest. The analysis provides evidence for a performance and survival enhancing impact of the firm-investor network on the hedge fund firm. Third, moderation of complexity via a differential flow of resources is an important, yet underappreciated attribute of the firm boundary, which may contribute to the creation of resource asymmetries as a basis for competitive advantage.

Although the evidence presented in this thesis is based on the empirical setting of the hedge fund industry, the findings on intra-industry diversification, the firm-investor network and resource acquisition across the firm boundary may generalise to other firms in the (financial) services industry.

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Chapter 1

Introduction to the Thesis

This thesis is structured into three stand-alone, yet topically connected research papers concerned with the competitive implications of (1) intra-industry diversification, (2) the firm-investor network and (3) resource acquisition across the firm boundary.

This structure allowed the author to focus on different methods of analysis and different types of evidence. Chapters 2 and 3 provide *qualitative and quantitative evidence* from interviews and a longitudinal, large-scale hedge fund panel dataset. By comparison, chapter 4 presents *conceptual reasoning*, which develops an interdisciplinary metaphor in order to derive novel insights on how the firm boundary helps to moderate resource complexity via different modes of resource acquisition.

The empirical setting of the thesis is the hedge fund industry. Hedge fund firms (or, used synonymously, 'hedge fund management companies', abbreviated as 'HFMCs') are, depending on the jurisdiction, lightly-regulated investment vehicles for 'accredited' investors, which fulfil certain wealth or income requirements[1]. As 'agents of market efficiency[2]', hedge fund firms attempt to identify and to exploit inefficiencies[3] in financial markets (Economist, 2012). However, as financial markets are dynamic social systems, inefficiencies disappear once enough money is engaged in exploiting them (Beunza, Hardie and MacKenzie, 2006). The restriction to 'accredited' investors allows for the use of advanced and fairly risky

[1] To be considered as 'accredited investors', institutional investors are required to have assets in excess of USD 5m whereas natural persons are required to either have assets in excess of USD 1m or an income exceeding USD 200,000 p.a. (SEC, 2014).

[2] A market is understood to be 'efficient' if "it is impossible to make economic profits by trading on the basis of information" (Jensen, 1978, p. 96). The 'efficient market hypothesis' has three main forms. In the weak form, this 'information' refers to the past price history of the market, whereas in the semi-strong and the strong forms, 'information' refers to all publicly available information and all *public and private* information, respectively.

[3] Market inefficiencies (e.g. 'wrongly' priced securities, such as stocks or bonds) may disappear through the buying or selling activity of market participants, which 'pushes' the price of a security close to its underlying 'true' value (e.g. the present value of the future cash flows from a security).

investment tools, such as leverage[4] and short-selling[5] (e.g. Hardie and MacKenzie, 2007). These enhanced investment tools allow hedge funds to hedge market risk[6] or to profit from declining markets with a net short exposure. Since hedge fund firms "characteristically use substantial leverage, they play a far more important role in the global securities markets than the size of their net assets indicates. Market makers on the floor of the NYSE have estimated that during 2004, trades by hedge funds often accounted for more than half of the total daily number of shares changing hands" (Malkiel and Saha, 2005, p. 80). Short selling and leverage are core characteristics of hedge fund firms because if "hedge funds didn't sell short, all they would be is just leveraged long funds that charge high fees" (Biggs, 2006, p. 21).

Hedge fund firms engage in various investment strategies ranging from classical long[7]-short equity investing to high-frequency computer-commanded trading. The value creation aspect of hedge funds has two components. First, the generation of returns by investing the investors' (i.e. customers') capital[8]. Second, and often underappreciated, the creation of returns, which are not or only loosely correlated to other major asset classes (e.g. stocks or bonds) in a hedge fund investor's portfolio (e.g. Fung and Hsieh, 2006). In terms of value appropriation, hedge fund firms have a special fee structure, which intends to align the incentives of managers and investors. In addition to a management fee (a share of assets under management), hedge fund firms also charge an incentive fee, which is a share of the

[4] Using 'leverage' in investments refers to buying securities with borrowed money.
[5] A 'short sale' is understood to be the sale of a security, which the seller does not own. In order to still sell the security, the short seller first has to borrow it, usually from an institutional investor. The security lender receives a fee for lending out the security (D'Avolio, 2002). Short sellers bet that the price of a security will fall so that they can buy it in the open market (and return it to the security lender) for a lower price than they realised in the short sale.
[6] 'Hedging' of market risk refers to the reduction or neutralisation of the risk of price changes that affect all securities in a specific market (e.g. all car manufacturers). This can be achieved by simultaneously taking matching long and short positions in the stocks of two companies, which are active in the same industry (e.g. two car manufacturers). As some hedge funds specialise on taking stock specific risk (i.e. they invest in an undervalued stock) they sometimes want to hedge the overall risk of the market the undervalued company is operating in.
[7] Taking a 'long' position in a security refers to buying a security. It is the opposite position to a 'short sale' or taking a 'short' position (for more details on short sales, please see footnote 5).
[8] Please note that the focus of this chapter is on the role of investors as 'customers' of the hedge fund firm, not as 'shareholders' (i.e. equity owners) in the hedge fund firm.

investment profits (calculated and paid annually). The standard compensation model used by most hedge fund firms is 'two and twenty', with 2% fees on assets under management and 20% fees on investment profits (e.g. Crockett, 2007). Most hedge fund managers' incentive fee payments are subject to 'high-water marks', which mandate that incentive fees are only payable once the hedge fund has recouped prior losses, which the investor may have incurred with the hedge fund investment (e.g. Goetzmann et al., 2003). To further align the incentives of investors and managers, hedge fund managers usually have substantial amounts of their own private wealth invested in their funds, which indicates that they have 'skin in the game' (cf. Biggs, 2006) and will not "'put it all on black' in order to 'win' back earlier losses" (Clare and Motson, 2009, p. 25).

The following paragraphs briefly summarise the main chapters of the thesis and point out why the hedge fund industry seems to be an interesting research setting for the study of intra-industry diversification (chapter 2), the firm investor network (chapter 3) and resource acquisition across the firm boundary (chapter 4).

Chapter 2 investigates in a differentiated way how intra-industry diversification is related to hedge fund firm survival and performance. The analysis suggests diversification (a) within and (b) beyond the sub-sector of the industry as components of intra-industry diversification. The results indicate a positive effect of intra-industry diversification on survival, which may be driven by the risk reducing effect of beyond sub-sector diversification. By comparison, the results provide evidence for a negative effect of intra-industry diversification on performance, which seems to be driven by diversification within the sub-sector. Overall, the chapter contributes to the emerging literature on intra-industry diversification (e.g. Zahavi and Lavie, 2013; Tanriverdi and Lee, 2008; Li and Greenwood, 2004; Stern and Henderson, 2004). The hedge fund industry seems to be a more fine-grained and homogenous setting for the analysis of intra-industry diversification compared to the extant literature, which classified all

activities within the same, fairly broad, 4 digit SIC code as 'intra-industry diversification' (e.g. Zahavi and Lavie, 2013; Stern and Henderson, 2004; Tanriverdi and Lee, 2008). The SIC 'bucket' of hedge fund firms (SIC 6211; First Research, 2014) would consider a wide array of other finance firms, such as stock brokers, mutual funds, investment banks and other securities investors as the same 'industry'. By contrast, this study (along the lines of extant research using hedge funds as empirical setting, e.g. de Figueiredo, Meyer-Doyle and Rawley, 2013; Miller, 2012; Aragon, 2007) considers the universe of hedge fund firms to form the 'hedge fund industry'. Compared to the broad 4 digit SIC code definition, hedge fund firms offer one homogenous type of service, which is investment of customer capital into fairly liquid securities for the compensation of a management fee (i.e. a share of assets under management) and an incentive fee (i.e. a share of investment profits).

Chapter 3 is concerned with the relationship between hedge fund firms and their investors, particularly with investors' role beyond the provision of capital. The chapter assembles evidence of both qualitative (exploratory expert interviews) and quantitative (large-scale panel dataset) kinds to suggest that investors into hedge funds are not only mere providers of capital but that they can be active partners in the identification, assessment and execution of current and prospective investment opportunities. While the qualitative evidence is used to motivate the hypotheses to be tested, the quantitative analyses indicate that hedge fund firms with an active firm-investor network tend to show enhanced performance and survival. Concerning theory development, this chapter informs and contributes to theories on the active involvement and tangible added value of a firm's customers as for example discussed in the literatures on 'customer innovation' (e.g. Thomke and von Hippel, 2002; Harhoff et al., 2003; von Hippel, 2007; Hienerth et al., 2014) or 'product co-creation' (e.g. Prahalad and Ramaswamy 2004; Nambisan, 2002; Hoyer et al., 2010). Regarding the study of the active firm investor network, the analysis of a large-scale hedge fund panel dataset seems to be a

helpful approach to answer calls for more large-scale, quantitative research (e.g. Bogers, Afuah and Bastian, 2010) to test and complement the interesting qualitative and conceptual insights developed from the extant body of (mostly qualitative) research on customer innovation. Furthermore, the hedge fund industry seems to be an interesting context and 'conservative setting' for the study of customer involvement since one may not naturally expect customer involvement in such a secretive industry[9] with numerous highly specialised firms. This setting contrasts with settings in the extant literature where one may expect more customer involvement, such as 'collaborative' settings like software development (e.g. by users via innovation toolkits; Franke and von Hippel, 2003) or settings with lower barriers (e.g. in terms of technology or required capital) to produce an innovation (e.g. sports related consumer goods; Baldwin et al., 2006; Hienerth, 2006; Luethje et al., 2005).

Chapter 4 presents a paper based on conceptual reasoning, which is illustrated using examples from the hedge fund industry. The chapter develops an interdisciplinary metaphor in order to derive novel insights on how the firm boundary helps to moderate resource complexity via different modes of resource acquisition. The characteristic of semi-permeability (to resource flows) of the firm boundary is portrayed as important for the creation of resource asymmetries, which in turn seem to be key antecedents to value creation and appropriation. The paper suggests that an important, yet underappreciated function of the firm boundary is the moderation of two types of resource complexity: the complexity of the acquired resource and the complexity of the internal resource set. The analysis draws on generalised insights from cell biology and suggests four modes of resource acquisition, which depend on the configuration of both types of resource complexity. Regarding the

[9] It is difficult for hedge fund firms to protect their intellectual property (De Figueiredo, Meyer-Doyle and Rawley, 2013), which may be part of the reason why "hedge fund managers […] fiercely resist offering transparency" (Aggarwal and Jorion, 2012, p. 108). Information revealed though transparency may encourage competitors to replicate or reverse engineer the trading strategy of a fund. Alternatively, understanding the idea behind a trading strategy may give competitors the chance to forecast future trades and enter positions before the fund, hence artificially increasing prices (Hedges, 2005).

investigation of resource acquisition across a semi-permeable firm boundary, hedge fund firms seem to serve as interesting setting to illustrate the theoretical reasoning. Hedge fund firms are small, asset-light, entrepreneurial organisations, which need to acquire resources from the environment in order to build a resource asymmetry, which helps them to deliver hard-to-imitate value to their customers (i.e. investors). Since hedge fund firms aim to profit from temporary inefficiencies in financial markets, they need to keep their resource setup aligned with the continuously changing environment. As Thompson (1967) noted, this agility in response to changed conditions in the environment is key for firm survival in complex and unpredictable environments.

The final part of this introduction to the doctoral thesis provides some brief notes on the authors' personal PhD journey.

When the author embarked on the journey of the PhD in 2010, he did not quite realise what a profound catalyst a PhD is for the professional and personal development of a young researcher. In the first year of the journey, the author and his colleagues were trained in quantitative and qualitative methods and were introduced to the different theoretical streams in the literature on organisations and strategy.

The first year also provided the author with his first chance to apply the newly acquired knowledge in a challenging but very interesting empirical setting: the global hedge fund industry. On the one hand, the setting is challenging because the industry is very secretive and data access (both qualitative and quantitative) is difficult. On the other hand, the industry is very interesting because it is characterised by small, knowledge-intensive, asset-light firms that are lead by a type of 'elite entrepreneur'. The author enjoyed meeting and discussing his research with some of these entrepreneurs, who were narrowly focused experts in their field of investing and often had an interestingly erratic personality that evoked both admiration and

a degree of 'professional fear' in their employees. While building up connections with hedge fund practitioners at various international conferences, the author acquainted himself with analysing the TASS database, one of the largest quantitative panel datasets on the hedge fund industry.

The author completed the first year as the best student of the Management PhD student cohort and was awarded a Master of Research with distinction. At the beginning of the second year, the author was invited to his first international academic conference and had the honour to present his research at the '4th Annual Hedge Fund Research Conference' in Paris organised by the NYSE Euronext exchange and researchers from CREST, Edhec Business School and the University of Toronto. Further conferences followed in the second year, with, among others, EURAM 2012 and the AOM 2012. Besides the helpful comments and advice from the author's supervisors and his PhD colleagues, the comments received at these conferences helped to substantially improve the theoretical and empirical positioning of the research.

In the third year, the author was fortunate to become a Fulbright Visiting Scholar at the Wharton School of the University of Pennsylvania from August 2012 to August 2013. In addition to regular discussions with his supervisors, the author was able to obtain valuable suggestions regarding his research from various scholars at Wharton. Moreover, he was given the opportunity to present in the Wharton Management PhD student seminar and the Snider Center Research Workshops. Due to the nature of his empirical setting, the author regularly 'reached across the aisle' and met with management as well as finance researchers. In addition to refining chapter 2, chapter 4 of the thesis was developed at Wharton, building on the coursework and discussions in Dan Levinthal's PhD course on the economic foundations of management. A course on quantitative empirical methods offered by Todd Gormley from the finance department substantially improved the author's knowledge and execution of

large-scale data analysis. In addition to the visit at Wharton in the third year of the PhD, the author was invited to present his research at various international conferences, among others the European Theory Development Workshop at HEC Paris and the EGOS Colloquium at HEC Montréal.

After the return from Wharton, the author continued his ongoing qualitative enquiry with hedge fund managers and developed chapter 3 of this thesis. Furthermore, chapters 2 and 4 of this thesis were substantially refined and the author presented his research among others, at the SMS conference in Atlanta (where he was selected into the SMS PhD consortium), a workshop on firm boundaries at Copenhagen Business School and the Journal of Management Studies Conference at Cambridge University. Chapters 2 and 4 of this thesis were invited for presentation at the 2014 AOM Annual Meeting in Philadelphia by the BPS and OMT division, respectively.

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Chapter 2

Intra-Industry Diversification: Implications for Firm Survival and Firm Performance

Evidence from Hedge Fund Firms

2.1 Abstract

This chapter contributes to the emerging literature on intra-industry diversification by investigating in a differentiated way how intra-industry diversification is related to firm survival and firm performance. The analysis, which is empirically based in the hedge fund industry, shows that the effects of intra-industry diversification on survival and performance are complex. It provides some insight into this complexity by proposing two components of intra-industry diversification: diversification within and beyond the sub-sector of the industry. Whereas the positive effect of intra-industry diversification on survival seems to be driven by the risk reducing effect of beyond sub-sector diversification, the negative effect on performance seems to be driven by diversification within the sub-sector, which may create limited value for investors. Regarding non-linear effects, high levels of intra-industry diversification are shown to be negatively related to survival, indicating that even in a context of intra industry diversification of small and entrepreneurial firms, adjustment of 'overdiversification' is not frictionless.

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2.2 Introduction

Diversification within industry boundaries is an empirically highly relevant phenomenon. Firms tend to start their operations undiversified, i.e. focused on a single product and usually extend their scope first within their industry before moving beyond it. Whereas *inter*-industry diversification usually applies to larger firms[10], intra-industry diversification is feasible also for small and medium sized firms and is hence "more prevalent than inter-industry diversification" (Zahavi and Lavie, 2013, p. 978).

Along the lines of prior literature, intra-industry diversification is understood as a firm's efforts to expand its product portfolio and thereby moving beyond a specific niche within an industry (e.g. Zahavi and Lavie, 2013; Tanriverdi and Lee, 2008; Li and Greenwood, 2004). As with related diversification *beyond* industry boundaries (e.g. Rumelt, 1974; Teece, 1980; Peteraf, 1993; Farjoun, 1994; Makides and Williamson, 1996), the main driver of intra-industry diversification seems to be economies of scope in the use of a firm's resources (e.g. Tanriverdi and Lee, 2008 and Li and Greenwood, 2004) via "resource redeployment across related product markets" (Zahavi and Lavie, 2013, p. 980).

Although the extant intra-industry diversification literature is silent on this point, there seems to be a fine line between 'intra-industry diversification' and 'product differentiation'. Product differentiation seems to refer to limited, minor adjustments in the characteristics of an existing product according to specific customer needs (Clemons, Hann and Hitt, 2002) or when a minor customised component or process is applied to an existing product (Lee and Tang, 1997). In terms of the underlying resources, it seems that product differentiation can be achieved without adjusting the existing set of resources. By comparison, intra-industry diversification refers to the expansion of a firm's product portfolio to a new market niche,

[10] Compared to *inter*-industry diversification, which may happen via mergers and acquisitions of large firms (e.g. Bergh and Lawless (1998) focus on Fortune 500 companies), intra-industry diversification is mostly 'homegrown' and occurs through the expansion of a firm's product portfolio within an industry.

which likely caters to different customer needs and requires a stand-alone product and not merely minor adjustments/customisations to an existing product. Although intra-industry diversification seems to occur due to synergies in the use of resources, a firm's resource set needs to be adjusted and modified for its new application (Zahavi and Lavie, 2013).

This chapter investigates intra-industry diversification in the context of the hedge fund industry, which allows for a more focused analysis of intra-industry diversification compared to the extant literature. Considering the broad operationalisation of intra-industry diversification in the extant literature, which classified all activities within the same, fairly broad, 4 digit SIC code as 'intra-industry diversification' (e.g. Zahavi and Lavie, 2013; Stern and Henderson, 2004; Tanriverdi and Lee, 2008), the hedge fund industry seems to be a more fine-grained and homogenous setting. To illustrate the very broad 'industry definition' of the 4 digit SIC code level, the 'SIC bucket' of hedge fund firms (SIC 6211; First Research, 2014) would include stock brokers, mutual funds, investment banks and other finance firms as the same 'industry'. By contrast, the firms in the hedge fund industry (i.e. hedge fund management companies) offer one homogenous type of service, which is the investment of customer capital into fairly liquid securities for the compensation of a management fee (i.e. a share of assets under management) and an incentive fee (i.e. a share of investment profits). While some hedge fund firms may offer 'product differentiation' via minor customisations of their existing products according to the needs of specific investors (e.g. adjustment of lock-up or redemption notice periods or other contractual clauses), the different products of a hedge fund firm may be considered as distinct units, with their own profit and loss calculation and catering to different customer needs.

Despite its empirical prevalence, scholarly attention to the phenomenon of intra-industry diversification has been limited. However, first contributors to the subject denote the emerging stream of research on intra-industry diversification as "literature" (Tanriverdi and

Lee, 2008, p. 382). This chapter focuses on the relationship between intra-industry diversification and firm survival, as well as firm performance and contributes in three aspects to the nascent literature on intra-industry diversification.

First, compared to the extant literature on the phenomenon, which either focuses on firm survival or firm performance as outcome variable, this chapter investigates both variables. Although related, survival and performance are distinct outcome measures with distinct antecedents (e.g. Schaffer, 1989; Hill and Birkinshaw, 2007; Kalleberg and Leicht, 1991) and hence an investigation of both variables may yield a "better and more complete understanding" (Delios and Beamish, 2001, p. 1035) of the studied phenomenon.

Second, the analysis suggests a more nuanced view of intra-industry diversification by proposing the components of within and beyond sub-sector diversification in an industry. Regarding survival, and in line with risk reduction arguments (e.g. Bercovitz and Mitchell, 2007; Lubatkin and Chatterjee, 1994), the analysis shows that intra-industry diversification beyond the sub-sector is the key driver behind the survival enhancing effect of intra-industry diversification. This contrasts with findings by the only other study on intra-industry diversification and survival (Stern and Henderson, 2004) who find no significant effect of beyond sub-sector diversification and survival. Regarding performance, the analysis shows that intra-industry diversification beyond the sub-sector enhances firm performance while within sub-sector diversification decreases performance, contributing to an overall negative performance effect of intra industry diversification. This corresponds to and expands upon findings in the extant, yet still fairly limited literature on intra-industry diversification (e.g. Zahavi and Lavie, 2013 and Tanriverdi and Lee, 2008).

Third, the analysis investigates non-linear effects of intra-industry diversification on both firm survival and performance. While intra-industry diversification is generally survival

enhancing, there seems to be a survival decreasing aspect of overdiversification, which counters a conjecture by Bercovitz and Mitchell (2007) that problems of overdiversification are most relevant to distant *inter*-industry diversification. Higher levels of intra-industry diversification are positively related to firm performance, which is in line with the findings of Zahavi and Lavie (2013).

The remainder of the chapter is organised as follows. Section 3 reviews the related literature, whereas section 4 develops the hypotheses to be tested in the empirical analysis. Section 5 introduces the empirical setting, while sections 6 and 7 provide information about the data and the regression models, respectively. Section 8 presents the results of the regression analyses whereas section 9 discusses the boundary conditions, contributions and practitioner implications of the results. Section 10 concludes.

2.3 Review of the Related Literature

The following section provides an overview of related work and positions the chapter in the scholarly conversation on intra-industry diversification as an emerging literature complementing research on *inter*-industry diversification. First, however, a brief summary of the insights, which research on *inter*-industry diversification has provided on the link to performance and survival, is presented.

Concerning the debate on the relationship between diversification and performance, most scholarly work has investigated *inter*-industry diversification. In the strategy field, the scholarly enquiry started with early seminal contributions from, among others, Rumelt (1974), Teece (1980), Bettis (1981) and Rumelt (1982). The early work on diversification yielded the important insight that the relationship among the activities in various industries matters, specifically that diversification seems to be positively related to performance if the businesses of the firm are related.

This positive performance effect was largely attributed to resource sharing, i.e. economies of scope in the "recurrent use of proprietary knowhow or the common and recurrent use of a specialised and indivisible physical asset" (Teece, 1980, p. 223). The shared resource, upon which a firm draws when expanding beyond its industry, may be physical or intangible, e.g. knowledge related (for example synergies in R&D, Bettis, 1981). In a similar spirit of 'resource sharing', Farjoun (1994, p. 186) notes that "diversification is directed into target industries that require resources (e.g., technical and marketing skills) similar to the resources of the diversifying firms". Peteraf (1993, p. 188), who argues that "the prevailing theory of diversification can be characterised as resource-based" more generally notes, that a firm's resources seem to determine its business scope: "For an individual firm, whether it is a single-line business or widely diversified, the critical task is to use its available resources to the greatest end they can support" (Peteraf, 1993, p. 189).

Markides and Williamson (1996, p. 240) illustrate with an example how resource sharing is connected to inter-industry diversification: *"the Citizen Watch Company Ltd. claims that its diversified products, which include watches, printers for personal computers, floppy disk drives, small portable PCs, liquid crystal color TVs, quartz oscillators, and precision machine tools and robots, share a common set of advanced, precision technologies that the company developed in the course of manufacturing watches."*

Related to these resource sharing explanations but looking outward towards competitors, another possibility for the performance implications are market power explanations, in which the firm may cross-subsidise products to 'price competition out of a market' (e.g. Berger and Ofek, 1995 and Bolton and Scharfstein, 1990). Diversification into unrelated businesses however was seen to be less beneficial to performance (Rumelt, 1974; Montgomery and Wernerfelt, 1988) and potentially associated with, for example, managerial diseconomies, inefficiencies as well as governance and control limits (Markides, 1992). In their summary of

the insights of *inter*-industry diversification research from the 1970s to the late 1990s, Palich, Cardinal and Miller (2000) conjecture that the relationship between performance and *inter*-industry diversification roughly follows an inverted u-shape, with moderate levels of diversification being associated with the highest levels of performance. Benefits of diversification however seem to decrease once firms move to diversification into unrelated industries. Concerning intra-industry diversification, which Palich, Cardinal and Miller (2000, p. 159) call "limited diversification", the authors conjecture that it may not be positively related to firm performance due to "limited opportunities to leverage resources and capabilities" (Palich, Cardinal and Miller, 2000, p. 159).

Compared to the *inter*-industry diversification link to firm performance, a line of enquiry, which has received less attention, seems to be the link between *inter*-industry diversification and survival. This may partly be due to the fact that the majority of prior research has investigated the diversification of very large firms (e.g. Fortune 500 firms, Bettis, 1981; Rumelt, 1982; Markides and Williamson, 1994; Bergh and Lawless, 1998 or large firms in the petroleum industry, Teece, 1980), which are unlikely to fail within a limited observation period, hence limiting the variance in the survival variable. Two studies, which have drawn the *inter*-industry diversification-survival link are Cottrell and Nault (2004) and Bercovitz and Mitchell (2007). Both studies indicate that in general, diversification seems to be positively related to survival. However, there seem to be boundary conditions, such as the distance of diversification or the potential survival decreasing effect of overdiversification, should a firm not be able to refocus swiftly. The survival enhancing effect may be due to the risk reducing characteristic of diversification, which seems to apply especially to related diversification (Lubatkin and Chatterjee, 1994). Related diversification best combines the portfolio effect of imperfectly correlated cash flows among the lines of operation, while still being able to capture potential resource synergies from combining related businesses.

Cottrell and Nault, 2004 investigate *inter*-industry diversification in the wider computer software industry corresponding roughly to SIC codes 7371 (computer programming services) and 7372 (prepackaged software). The authors find that diversification within a software category or hardware platform, in which the firm is already active, is positively associated with firm survival, whereas diversification into new software categories or servicing new hardware platforms is negatively associated with firm survival. The authors attribute the negative survival implications to the higher costs and potential risks a firm is exposed to when expanding into new software categories or hardware platforms.

Bercovitz and Mitchell (2007) point out that when investigating the scope-survival relationship, it is important to control for scale as well as profitability. The authors approach the 'scope' aspect of their investigation from an angle of *inter*-industry diversification looking at the medical and healthcare industries. They find that scope positively impacts survival, which may be due to, among others, resource sharing/resource allocation efficiency and risk reduction due to imperfectly correlated cash flows from the diversified activities. The authors also point to the potential negative effects of overdiversification, which they conjecture to be caused by too much unrelated diversification. Contrary to this note, the present study shows that also settings of intra-industry diversification are not immune to this liability of overdiversification.

2.3.1 Brief overview of the extant literature on intra-industry diversification. Intra-industry diversification has been long ignored and is only a nascent field in the strategy literature (Zahavi and Lavie, 2013; Tanriverdi and Lee, 2008; Li and Greenwood, 2004). Of the few studies that have addressed this emerging domain, most studies conceptualised intra-industry diversification rather widely (e.g. as diversification within the industries summarised under a four digit SIC code) and have focused on firm performance as outcome variable. This rather broad definition of intra-industry diversification seems to have been driven by

constraints in the empirical datasets the researchers used. Considering this broad empirical operationalisation of intra-industry diversification in combination with a fairly wide array of different measures of performance, extant studies have – maybe not surprisingly – produced mixed results:

Zahavi and Lavie (2013) study sales growth of firms in the pre-packaged software industry as performance measure and find a u-shaped relationship between intra-industry diversification and performance. They explain this finding, which is counterintuitive given findings of related, *inter*-industry diversification, with limitations to economies of scope at low levels of intra-industry diversification. Overlapping functionality with limited complementary value, cannibalisation and redundancy, as well as potential cognitive biases of managers are mentioned as possible explanations for this finding.

In their study of firms in the general insurance industry, Li and Greenwood (2004) have focused on return on assets (ROA) as a performance variable and conclude that they "found no benefits of intra industry diversification per se" (Li and Greenwood, 2004, p. 1146). Intra-industry diversification did not show a significant effect on ROA in their analysis. By comparison, Tanriverdi and Lee (2008) take market share and sales growth as dependent variables and find that intra-industry diversification, depending on the model, is either insignificant or it reduces sales growth when it is implemented without a broader strategy beyond intra-industry diversification (e.g. platform diversification).

Stern and Henderson (2004) is the only study, which has investigated the impact of intra-industry diversification on firm survival. This study made a first attempt at describing intra-industry diversification as differentiated phenomenon. The authors took into account 'product lines', which may be considered similar to brands. Cadillac, Pontiac and Saab are mentioned for example as 'product lines' of General Motors. These 'product lines' may be comparable

to within sub-sector diversification in the hedge fund industry (e.g. a long short equity fund with focus on the US healthcare sector versus a long short equity fund with focus on European oil and gas companies). Whereas this shows that there is variance within the investment strategy 'bucket' of hedge funds, the differences across strategies seem to be wider than 'brand differences' – e.g. a long short equity fund (investing in stocks) vs. a global macro fund (investing in currencies and sovereign debt). In terms of results, Stern and Henderson (2004) do not find a significant effect of across line diversification on survival and some evidence that within (primary) line diversification enhances survival. In their analyses, the authors do not control for performance as variable affecting organisational survival (e.g. Bercovitz and Mitchell, 2007) and they do not take into account possible non-linear effects of diversification on survival.

Table 1 summarises the studies and findings in the nascent literature stream of intra-industry diversification.

Table 1: Summary of studies and findings in the emerging literature stream of intra-industry diversification

Study	Unit of Analysis	Empirical Data	Measurement/Analysis	Main Finding Regarding Intra-Industry Diversification
Zahavi and Lavie, 2013	Firm	156 firms in the pre-packaged software industry	Regression analysis; performance measure: sales growth	U-shaped relationship between intra-industry diversification and performance (sales growth) due to limited economies of scope and cognitive biases (negative transfer effects)
Tanriverdi and Lee, 2008	Firm	884 firms in the pre-packaged software industry	Regression analysis; performance measures: sales growth and market share	Intra-industry diversification either insignificant or performance (sales growth and market share) decreasing depending on combination of intra-industry diversification with broader strategy (e.g. software platform diversification)
Li and Greenwood, 2004	Firm	276 firms in the general insurance industry selling "any insurance other than health and life insurance" (p. 1140)	Regression analysis; performance measures: return on assets (ROA)	Intra-industry diversification has no significant effect on performance (ROA); authors "found no benefits of intra-industry diversification per se" (p. 1146)
Stern and Henderson, 2004	Firm	736 firms in the industry of personal computer manufacturing	Regression analysis using organizational failure rates	Diversification within a brand-like industry line either insignificant or enhances firm survival, whereas diversification across a line insignificant in all models

2.3.2 Other related work. Although not directly concerned with 'intra-industry diversification', de Figueiredo and Rawley (2011) investigate the performance implications of a subset of hedge fund firms taking the step from a one product to a two product firm. The authors find a negative within-firm effect of the '1 to 2 fund' diversification on hedge fund firm performance. As their focus is specifically on the first step of diversification (i.e. the expansion from 1 to 2 funds), the authors do not investigate intra-industry diversification as a wider and potentially more differentiated phenomenon.

Not related conceptually to the diversification literature but related with regard to the empirical setting, Miller (2012) has investigated failure of US hedge fund firms from a lens of organisational/entrepreneurial learning. Consistent with the baseline results of the present study, the author shows that diversification is negatively related to HFMC failure. However, the analysis does not consider performance and scale (i.e. assets under management) as potentially important control variables in an investigation of diversification and survival (Bercovitz and Mitchell, 2007). Furthermore, as the conceptual focus of the study is not on diversification, the fine-grained difference between intra-industry diversification within and beyond sub sectors of the hedge fund industry is not investigated.

2.3.3 Survival vs. performance as outcome variables. Firm performance and survival are important outcome variables. The following paragraphs briefly discuss performance and survival as outcome variables and propose that investigating both of them in the same study, while potentially increasing the complexity of the analysis and the results, may be fruitful as it may lead to a "better and more complete understanding" (Delios and Beamish, 2001, p. 1035) of the studied phenomenon.

The Oxford English Dictionary defines 'survival' as "the continuing to live after some event" (OED Online, 2014a). Survival is the most basic measure of 'performance' in a sense that it

is “a necessary condition for positive profits” (Cottrell and Nault, 2004, p. 1015). Whereas firm survival is a somewhat more narrowly focused concept compared to performance, it can be understood in various forms, mostly via its opposite outcomes, such as firm failure (e.g. divestiture, dissolution, bankruptcy; e.g. Bercovitz and Mitchell, 2007; Delios and Beamish, 2001, Kalleberg and Leicht, 1991), industry exit (e.g. Stern and Henderson, 2004, Sleuwaegen and Onkelinx, 2014), or ‘inactivity’ (e.g. Hill and Birkinshaw, 2008). In addition, survival may be considered as a more holistic gauge of ‘performance’ since it includes a wider range of stakeholders (compared to performance, which seems to be a variable tailored to shareholders and managers): “survival is a meaningful performance measure for multiple stakeholders in a business […] survival and failure affect other stakeholders, including employees, suppliers, distributors, and communities, who make dedicated investments in a particular business” (Bercovitz and Mitchell, 2007, p. 62).

By comparison, ‘performance’ seems to be a broader concept, which is mirrored in its definition in the Oxford English Dictionary: “The quality of execution of […] an action, operation, or process; the competence or effectiveness of a person or thing in performing an action” (OED Online, 2014b). Compared to the relatively limited operationalisation of survival, many different variables may be understood to indicate performance. The following list provides illustrative examples rather than being exhaustive: Market-based measures, such as sales growth (Zahavi and Lavie, 2013; Tanriverdi and Lee, 2008), sales (Laursen and Salter, 2006) or market share (Tanriverdi and Lee, 2008). Accounting-based measures also find application, such as growth of gross earnings (Kalleberg and Leicht, 1991) or accounting-based measures of returns, such as return on assets or return on equity (e.g. Li and Greenwood, 2004; Ray et al., 2013; Hitt, Hoskisson and Kim, 1997; Roberts, 1999). Other measures are based on Likert-scale assessments in surveys (Foss et al., 2011; Hill and

Birkinshaw, 2008; Delios and Beamish, 2001), or are more unconventional/tailored to a specific setting, such as time from initiation to completion (Macher and Boerner, 2006).

Although survival and performance are popular as outcome variables in the literature, they are usually investigated in isolation. Studies typically focus on either survival or performance. Rarely are both variables investigated in the same study. The reasons for this may lie in data constraints, narrow focus of a study, difficulty of the involved analysis, or potential complexity of results (i.e. when the two outcome variables yield seemingly conflicting results).

Survival seems to be the most basic measure of firm 'performance', which acts as prerequisite for any other measure of performance. Despite this relation of the measures, the few researchers who have investigated both performance and survival, have pointed out that the measures are distinct. In a conceptual essay, Schaffer (1989, p. 30) points out that profit maximisation "does not 'summarise appropriately the conditions for survival". Along those lines, empirical researchers have noted the "divergent antecedents of these two outcome variables – performance and survival" (Hill and Birkinshaw, 2007, p. 441) as a result of identifying different drivers of performance and survival. Hill and Birkinshaw (2007, p. 441) for example find that corporate venture units with "longer-term and more uncertain objectives are more easily closed down when other priorities take precedence within the parent company", regardless of the performance track record. In a study on the performance and survival of multinational firms, Delios and Beamish (2001, p. 1028) also note that "survival and profitability have different antecedents". In particular, the authors noted different effects of a multinational firm's host country experience on firm survival and profitability. Continuing with the theme that performance and survival are distinct outcome variables driven by different factors, Kalleberg and Leicht (1991, p. 137) note in a study on gender and

organisational performance that "survival and success are distinct aspects of performance that are determined by different processes".

In summary, these examples from the literature suggest that performance and survival seem to be distinct outcome measures and although they are conceptually related (without survival no performance), they seem to be determined by different factors and a positive impact of an independent variable on one of these outcome measure does not automatically imply a similar effect on the other.

The emerging literature on intra-industry diversification (as well as most of the work on *inter*-industry diversification) has predominantly focused on performance as outcome variable. Whereas performance may be an adequate outcome variable for large corporations and their endeavours of *inter*-industry diversification (e.g. Bergh and Lawless, 1998), most firms in developed as well as developing countries tend to be small and entrepreneurial, yet very important for the economy[11]. The focus on small, entrepreneurial firms may imply that survival is a useful outcome variable in addition to performance, since failure is a very real threat for small, entrepreneurial firms (Freeman et al, 1983).

2.4 Development of Hypotheses

This thesis chapter investigates the effect of intra-industry diversification on survival and performance. Six hypotheses are developed and tested. The first three hypotheses (H1-H3) relate to the relationship between intra-industry diversification and firm survival whereas the second three hypotheses (H4-H6) relate to the relationship between intra-industry diversification and firm performance.

2.4.1 The effect of intra-industry diversification on firm survival. In order to create a connection point to prior research on intra-industry diversification (e.g. Zahavi and Lavie,

[11] For example research by the World Bank using a sample of 99 countries showed that SMEs with less than 50 people were responsible for 32% of the jobs created (Ayyagari, Demirguc-Kunt and Maksimovic, 2011).

2013), diversification and survival (e.g. Bercovitz and Mitchell, 2007), as well as studies investigating diversification in the hedge fund context (e.g. de Figueiredo and Rawley, 2011), hypothesis 1 predicts that intra-industry diversification enhances firm survival. This may be the case because of risk reduction. Firms as a whole become less exposed to volatility in one product market in a sense that environmental shocks or changes in customer preferences in one product can be 'levelled out' by another product. Due to these dissimilarities in product markets, "the cash flows of different product lines correlate imperfectly, so that product line breadth reduces the variance, and thus the overall risk, of the business" (Bercovitz and Mitchell, 2007, p. 65). This reasoning seems to be in line with the 'practical' statement of the general manager of a hedge fund (AUM category: 250m-500m), who noted: "If you have multiple products, you are not as hard hit if something adversary happens".

H1: Intra-industry diversification is positively related to firm survival.

However, "business expansion does not come without costs and beyond some point, the costs may outweigh the benefits of greater breadth" (Bercovitz and Mitchell, 2007, p. 66). This may be relevant for survival if firms cannot easily or cheaply re-narrow their level of intra-industry diversification. Bercovitz and Mitchell (2007) claim that this may only happen if a firm overstretches its scope in an exercise of *inter*-industry diversification. The present paper however puts this to an empirical test and argues that the negative consequences of overdiversification may also exist as far as intra-industry diversification is concerned. This may be due to increasing costs per unit of additional diversification, e.g. due to managerial diseconomies of scale or higher complexity of management (Markides, 1992). Moreover, small, entrepreneurial firms may not have enough spare resources to re-narrow their business scope.

H2: High levels of intra-industry diversification are negatively related to firm survival.

This paper views intra-industry diversification not as a homogenous phenomenon but identifies finer sub-categories: diversification within and beyond a subsector of an industry.

This goes beyond the different 'brands' as used by Stern and Henderson (2004). They argue that more closely related diversification enhances firm survival since resources can be shared across products. While this seems intuitive, Zahavi and Lavie (2013) show evidence that close intra-industry diversification may lead to limited economies of scope in the use of resources and may introduce new costs due to cognitive biases (i.e. 'negative transfer effects' occurring in the application of resources to seemingly similar, yet distinct products). Furthermore, overlapping functionality, redundancy or cannibalisation with respect to other products of the firm may be additional forces, which put the firm at a higher risk of failure.

In addition to arguments involving the efficient or inefficient sharing or distribution of resources across diversified operations, the risk reducing perspective of diversification also seems to merit consideration. According to the argument above regarding the imperfect correlation of cash flows across different products (e.g. Bercovitz and Mitchell, 2007; Lubatkin and Chatterjee, 1994), one may expect that diversification beyond a sub-sector (within the same industry) to have higher survival benefits for the firm than the diversification within one sub-sector. Since activities within the same industry (regardless if within or beyond the sub-sector) seem to have a degree of relation, resource sharing may apply to both components. The portfolio effect of imperfectly correlated cash flows among the lines of operation seems to especially apply to beyond sub-sector diversification within the same industry. Combined this leads to the following hypothesis:

H3: Intra-industry diversification beyond sub-sectors has a stronger survival enhancing effect than diversification within sub-sectors of an industry.

2.4.2 The effect of intra-industry diversification on firm performance. Although the general *inter*-industry diversification literature has found a positive performance effect of related diversification (e.g. Rumelt, 1974; Rumelt, 1982; Teece, 1980; Bettis, 1981; Palich, Cardinal and Miller, 2000), scholars investigating intra-industry diversification have shown evidence that close intra-industry diversification may be negatively associated with performance (e.g. Zahavi and Lavie, 2013; Tanriverdi and Lee, 2008), for example due to "negative transfer" (Zahavi and Lavie, 2013, p. 979): Negative transfer indicates that "learned behavior can generate negative consequences when a practice is applied with no adjustments in a context that is slightly different from the context in which learning originally occurred".

Along the lines of these results in the extant literature on intra-industry diversification, it is hypothesised that intra-industry diversification is negatively related to performance. Compared to the extant studies on intra-industry diversification and performance, which have largely investigated sales growth or market share as performance measures (Zahavi and Lavie, 2013 and Tanriverdi and Lee, 2011), or accounting based performance measures (e.g. return on assets, Li and Greenwood, 2004), this chapter investigates return on invested capital as performance measure.

H4: Intra-industry diversification is negatively related to firm performance.

Similar to hypothesis 2, a non-linear relationship between intra-industry diversification and performance is investigated. As pointed out by Zahavi and Lavie (2013), economies of scope, such as effective resource sharing or resource redeployment, may materialise at higher levels of intra-industry diversification. At the same time, potential negative effects of very close intra-industry diversification such as provision of limited complementary value, redundancies

with existing products or 'negative transfer' may be mitigated by a greater distance of intra-industry diversification. In summary, the following hypothesis is stated:

H5: High levels of intra-industry diversification are positively related to firm performance.

With respect to the components of intra-industry diversification, i.e. diversification within and beyond a sub-sector of the industry, an interesting duality arises, which prior literature has not postulated and tested empirically.

If the proposed logic of Zahavi and Lavie (2013) applies, one would hypothesise to see opposite performance effects for the suggested two components of intra-industry diversification. Diversification within the sub-sector is fairly close intra-industry diversification, which may have negative performance effects since the adjustment of resources to seemingly similar, yet distinct uses can lead to 'negative transfer effects' "since managers may fail to recognize subtle yet critical differences across the firm's closely related products" (Zahavi and Lavie, 2013, p. 982). "Believing that a product should be managed according to practices that have been developed for related products, managers may inappropriately apply existing resources" (Zahavi and Lavie, 2013, p. 982), which may result in the negative impact of within sub-sector diversification on performance. This negative impact may be intensified by the provision of limited complementary value to customers, which may entail cannibalisation in the sales of closely related products *in addition* to the increased costs from 'negative transfer'.

By comparison, diversification beyond the sub-sector may alleviate the effects of negative transfer since the more pronounced differences between the products may make the required adjustments in the firm's resource set more evident. Hence, at this greater 'distance' of intra-industry diversification, the synergies and efficiency gains in the use of a firm's resources

(e.g. Tanriverdi and Lee, 2008 and Li and Greenwood, 2004) via "resource redeployment across related product markets" (Zahavi and Lavie, 2013, p. 980) may materialise.

H6: Intra-industry diversification beyond sub-sectors is positively related to firm performance while intra-industry diversification within sub-sectors is negatively related to firm performance.

Figure 1 explicates the causal imagery to be tested in the empirical analysis of this chapter and summarises the presented hypotheses.

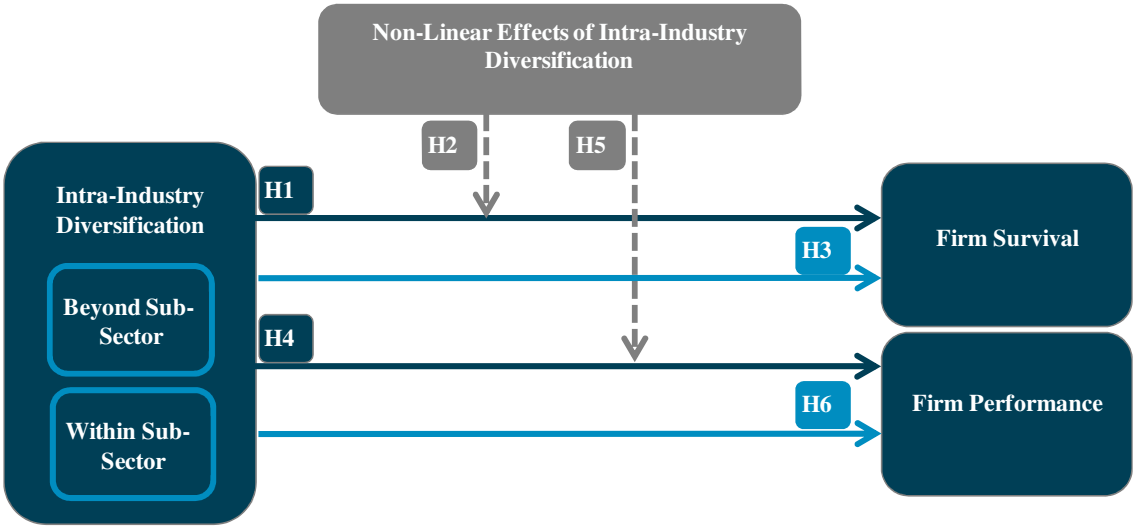

Figure 1: Summary of hypotheses.

2.5 The Empirical Setting

The setting for the empirical analysis is the global hedge fund industry. As noted in the introduction, hedge funds firms are lightly-regulated, pooled investment vehicles for 'sophisticated' investors. Their restriction to 'sophisticated' investors allows for the use of advanced but also fairly risky investment techniques such as leverage or short-selling (Hardie and MacKenzie, 2007). Managers are usually compensated not only with a management fee (e.g. 2% of assets under management, AUM) but also a performance fee (e.g. 20% of positive

investment returns). There are several reasons why the hedge fund industry seems to be an adequate setting to investigate the relationship between intra-industry diversification and firm survival, as well as firm performance.

First, hedge fund firms are small, focused and knowledge-driven entrepreneurial firms, which usually start up with one product (i.e. one investment fund). In this industry, which is shaped by numerous small firms, failure is an integral part of the industry (the average firm only survives for a bit more than five and a half years[12]). Various authors have commented on the short-lived nature of hedge funds, for example Brown, Goetzmann and Ibbotson (1999, p. 92): "The downside to managing hedge funds is that they frequently disappear. The rate of attrition of hedge funds is relatively high" or investment veteran Barton Biggs (2012, p. xviii): "it is a battle – the battle for investment survival". The meaning of survival in the hedge fund industry was aptly summarised by Nobel laureate Myron Scholes (2004, p. 10): "Most hedge funds are organized as 'hunter' groups that will not survive for many generations. That is, few have figured out how to build a business or a 'farm' to create an enterprise that has franchise value […] *Survivorship, however, is proof of a value added activity*" [emphasis added].

Second, the hedge fund industry provides a narrower focus on a setting of intra-industry diversification compared to the broad operationalisation on the 4 digit SIC code level prevalent in the extant literature on intra-industry diversification (e.g. Zahavi and Lavie, 2013; Stern and Henderson, 2004; Tanriverdi and Lee, 2008). Although not stated specifically in extant research, the operationalisation of intra-industry diversification at the 4 digit SIC code level implies that the boundaries of an industry are understood to be fairly wide. While "a precise and meaningful definition of an industry is a vain objective" (Robinson, 1956, p. 361), and resulting classifications may lead to arbitrary groupings

[12] Analysis based on empirical dataset used in this thesis. Please see Table 2 for further descriptive statistics.

(Nightingale 1978; Porac and Thomas, 1990), it seems somewhat daring to consider firms with the same 4 digit SIC codes as part of the same industry as it covers very different products and activities. In the case of Zahavi and Lavie (2013), the 'prepackaged software industry' (SIC 7372) includes different products (e.g. data processing software, computer games, operating systems, programming software) as well as different functions (such as publishing, design, production). To make the point even clearer, if one looks at the SIC 'bucket' of the hedge fund industry (SIC 6211; First Research, 2014) one would consider stock brokers, mutual funds, investment banks and other securities investors all as the same 'industry'. This present research focuses on the hedge fund industry as a focused intra-industry setting of fairly homogenous firms (compared with 4 digit SIC code categories). Conceptually, this focus is important since the broad approach to intra-industry diversification via 4 digit SIC codes may have contributed to the mixed results on intra-industry diversification in the extant literature.

Third, the compensation of hedge fund managers does not 'naturally' require or incentivise them to engage in intra-industry diversification since their compensation is based on assets and not the number of products under management. Hence, having multiple products is not necessarily a 'natural state' a firm converges to once it matures. Nevertheless, the proportion of multi vs. single-product firms has increased from 50% in 1994 to 78% in 2012[13].

2.6 Data and Variables

2.6.1 Dataset. The dataset comes from the Lipper TASS hedge fund database with monthly observations between January 1994 and November 2012. The TASS hedge fund database is widely used for hedge fund research (e.g. Baden-Fuller, Ferriani, Mengoli, and Torlo, 2013; Bollen and Pool 2012; Agarwal, Daniel and Naik 2009; Fung, Hsieh, Naik and Ramadorai,

[13] For more details and an illustration of the year-by-year development, please see Figure 4.

2008, etc.) and is considered to be one of the most comprehensive commercial datasets (e.g. de Figueiredo and Rawley, 2011).

For the analysis, funds of funds were excluded from the dataset since they are not just an 'investment style' but represent, as additional intermediary, a different firm from 'regular' hedge fund management companies. In order to deal with outliers, all variables (except those ranging between 0 and 1) were winsorised at the 1% and 99% tails (cf. Klein and Zur, 2009). Since assets under management (in log) are an important control variable and the returns of the management company are calculated by weighing the returns of the underlying funds by AUM (please see variable definition below), observations with missing AUM were excluded. The overall sample size is 219,479 firm-month observations of 3,295 HFMCs.

Since managers self-report their information to hedge fund databases, potential biases in hedge fund databases were discussed in the literature (e.g. Liang 2000; Fung and Hsieh, 2006). Survivorship bias and selection bias may be considered as categories of potential bias. In order to account for survivorship bias, the dataset includes both operating and defunct funds. In a database of only 'live' funds, the estimates (for example of returns) may be biased upwards since the database only covers survivors. Lower performing HFMCs may have closed down and dropped out of the database. To avoid this bias, the database used for this research is composed of life and dead funds (i.e. funds are retained (and not dropped out of) the database, even if they are dead). Selection bias may exist because reporting to hedge fund databases is voluntary. In fact, some hedge fund managers may opt to not report to any database due to poor performance, while others may decide to not report to a database because their fund has reached an optimal size and does not need to attract additional capital. Hence, no hedge fund dataset represents the full universe of firms active in the hedge fund industry. Since it is impossible to measure the unobservable number of funds, which did not

register with any database, Fung and Hsieh (2006, p. 11) conclude that "neither the magnitude nor the direction of the net effect of selection bias is clear".

2.6.2 Variable definitions. The analysis focuses on two dependent variables: hedge fund firm performance and survival. Hedge fund firm performance is measured by the returns of the hedge fund firm. The returns of the hedge fund firm *i* in month *t* are the returns of the underlying funds *j* weighted by assets under management in *t-1*[14]:

$$HFMC\ Return_{i,t} = \frac{\sum_j AUM_{j,t-1}(1+ReturnFund_{j,t})}{\sum_j AUM_{j,t-1}}$$

The dependent variable of the analysis is hedge fund firm failure. A hedge fund firm is defined as dead if all its underlying funds stopped reporting (e.g. Grecu, Malkiel and Saha, 2007) to the database *and* at least one underlying fund was classified as 'liquidated'. Of the 3,295 hedge fund management companies in the sample, this definition classifies 941 firms (28.6%) as 'dead'. This variable is operationalised for the fixed effects panel OLS regressions by a dynamic indicator variable that takes the value of one in the 12 months prior to the date that the hedge fund management company 'died'. For the Cox regressions, the indicator variable was recoded to turn one only in the month that the hedge fund firm died.

The main explanatory variable is intra-industry diversification, which is the number of fund products offered by the HFMC – i.e. the number of funds a hedge fund firm manages in any given month[15] between 1994 and 2012. The focus on the hedge fund industry may allow for a more focused perspective on intra-industry diversification compared to the broad four digit SIC code conceptualisation of an 'industry' used in other studies (e.g. Zahavi and Lavie, 2013; Stern and Henderson, 2004; Tanriverdi and Lee, 2008).

[14] Since the calculation of the AUM-weighted returns for the management company requires assets under management, observations with missing AUM were excluded from the analysis.
[15] This variable as well as the other variables are dynamically calculated for every firm-month observation in the dataset.

In further analyses, this variable of intra-industry diversification is broken down into its components of within and beyond sub-sector diversification:

(1) Diversification beyond the sub-sector: This variable denotes the number of unique investment strategies offered by a HFMC's funds under management (every fund belongs to one investment strategy 'bucket'). Investment strategies are fairly broad 'buckets' for the classification of what a HF does. The 11 investment strategies in the TASS database are the following: convertible arbitrage, dedicated short bias, emerging markets, equity market neural, event driven, fixed income arbitrage, global macro, long short equity hedge, managed futures, multi-strategy and options strategy. As every hedge fund firm offers at least one fund, the minimum of this variable is 1.

(2) Diversification within the sub-sector: This variable denotes the difference between the number of funds and the number of unique investment strategies offered by the hedge fund firm. This measure of intra-investment strategy diversification reflects the number of additional funds the firm manages within its unique investment strategies. For focused hedge fund firms with only one fund, the minimum of this variable is 0 (i.e. the firm does not offer additional funds within its unique strategy).

The basic idea behind the components of intra-industry diversification is that a HFMC, which has funds in two (or more) of these investment strategy buckets is more diversified than a HFMC, which has two (or more) funds within the same investment strategy bucket[16]. The following example may further clarify the meaning and operationalisation of the intra-industry diversification variable and its components: A HFMC offers a total of 5 funds in two unique investment strategy buckets (e.g. long short equity hedge and event driven). The firm's score on the 'intra-industry diversification' variable is 5. Its score on intra-industry

[16] An example for two funds in the bucket of 'long short equity hedge' would be the following: one long short equity hedge fund with focus on US pharmaceuticals and one long short equity hedge fund with focus on European retailers.

diversification beyond the sub-sector is 2 (because its funds offer 2 unique investment strategies) whereas the firm's score on intra-industry diversification within sub-sectors is 3 (because it offers 3 additional funds within these two investment strategies)[17].

The analysis includes several control variables, such as the standard deviation, skewness and kurtosis of returns, as well as the hedge fund firm's size (natural logarithm of assets under management), age and the 'active firm-investor network', which chapter 3 of this thesis focuses on (for the detailed definition of this variable, please refer to chapter 3.4.2.1). Capital flows, a further control variable, are defined as follows (e.g. Agarwal, Daniel and Naik, 2009; Fung, Hsieh, Naik and Ramadorai 2008):

$$HRMC\ Flows_{i,t} = \frac{HFMC\ AUM_{i,t} - HFMC\ AUM_{i,t-1}\ (1 + HFMC\ Return_{i,t})}{HFMC\ AUM_{i,t-1}}$$

In addition, Fung and Hsieh eight factor alphas were estimated. All alpha measures were calculated in a rolling window regression with a 'learning period' of 12 months. Following the standard method of Fung and Hsieh (2001 and 2004), the fund returns above the risk free rate are regressed against the following eight factors, the constant in the regression is 'alpha': 1. Equity factor (S&P 500), 2. equity size factor (Russell 2000 less S&P 500), 3. emerging market factor (MSCI Emerging Market Index), 4. bond market factor (constant maturity adjusted ten-year Treasury bond yield), 5. bond credit spread factor (change in Moody's BAA credit spread over a constant-maturity adjusted 10 year Treasury bond yield) and three trend-following option factors formed from excess returns on portfolios of lookback straddles for 6. bonds, 7. currencies and 8. commodities[18]. Table 2 presents the summary statistics.

[17] Please note that this firm would have the same intra strategy diversification score if it had 3 funds in the 'long short equity hedge' bucket and 2 funds in the 'event driven' bucket or vice versa. The firm's number of additional funds across unique investment strategy buckets is 3 in both cases.

[18] Further information on the eight risk factors and the composition of the model can be found on David Hsieh's homepage: http://faculty.fuqua.duke.edu/~dah7/HFRFData.htm

Table 2: Descriptive statistics and correlations. (HFMC = Hedge Fund Management Company)[19]

	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Firm Death	0.05	0.21	0.00	1.00	1.00												
2. HFMC Return	0.01	0.05	-0.15	0.17	-0.05	1.00											
3. Intra-Industry Diversification	2.03	1.81	1.00	11.00	-0.03	-0.02	1.00										
4. Beyond Sub Sector (Intra-Industry) Diversification	1.17	0.46	1.00	3.00	-0.03	-0.01	0.60	1.00									
5. Within Sub Sector (Intra-Industry) Diversification	0.86	1.58	0.00	10.00	-0.03	-0.02	0.97	0.40	1.00								
6. Active Firm-Investor Network	0.10	0.37	0.00	8.00	-0.03	0.01	0.05	0.00	0.05	1.00							
7. Std Deviation of HFMC Return	0.04	0.03	0.00	0.17	-0.01	0.04	-0.11	-0.11	-0.10	-0.01	1.00						
8. Skewness of HFMC Return	-0.04	0.76	-2.13	1.98	-0.03	0.08	-0.05	-0.03	-0.04	-0.01	0.07	1.00					
9. Kurtosis of HFMC Return	2.95	1.19	1.50	7.80	0.02	-0.01	-0.02	-0.01	-0.01	-0.03	0.06	-0.07	1.00				
10. HFMC 8 Factor Alpha	0.00	0.29	-1.08	1.07	-0.01	0.04	0.00	0.00	0.00	0.00	-0.04	0.00	-0.02	1.00			
11. Flows HFMC	0.01	0.18	-0.96	0.85	-0.06	0.00	0.00	0.00	-0.01	0.00	-0.02	0.04	0.00	0.01	1.00		
12. HFMC Ln Assets Under Mgmt	17.61	2.06	12.64	22.70	-0.10	0.00	0.42	0.26	0.41	0.03	-0.26	-0.06	-0.03	0.00	0.05	1.00	
13. Age of HFMC (in years)	5.79	4.67	0.19	21.13	0.00	-0.03	0.19	0.14	0.17	0.08	-0.02	-0.04	-0.05	0.01	-0.08	0.28	1.00

[19] Please note that the high correlation between intra-industry diversification and its components is due to the construction of the component variables, i.e. Intra-industry Diversification = Beyond Sub-sector Diversification + Within Sub-sector Diversification. In terms of multicollinearity, this is not a concern since the components of intra-industry diversification and its combined measure do not appear in the same regression.

2.7 Regression Models

In the first step of the empirical analysis, the effect of intra-industry diversification on the survival of hedge fund firm *i* in month *t* is investigated using the following model (OLS fixed effects panel regression):

$$\begin{aligned} HFMC\ Failure_{i,t} = {} & \beta_0 + \beta_1\ Intra\text{-}Industry\ Diversification_{i,t} \\ & + \beta_2\ Intra\text{-}Industry\ Diversification\ Squared_{i,t} \\ & + \beta_3\ Active\ Firm\text{-}Investor\ Network_{i,t} + \beta_4\ HFMC\ Return_{i,t} \\ & + \beta_5\ Standard\ Deviation\ of\ Returns_{i,t} + \beta_6\ Skewness\ of\ Returns_{i,t} \\ & + \beta_7\ Kurtosis\ of\ Returns_{i,t} + \beta_8\ HFMC\ 8\ Factor\ Alpha_{i,t} \\ & + \beta_9\ HFMC\ Flows_{i,t} + \beta_{10}\ HFMC\ ln\ AUM_{i,t} \\ & + \beta_{11}\ HFMC\ Age_{i,t} + \alpha_i + \delta_t + u_{i,t} \end{aligned}$$

α_i reflects the hedge fund firm fixed effects in order to account for unobserved firm-level heterogeneity and δ_t reflects year fixed effects. Standard errors are robust to heteroscedasticity and are clustered on the level of the hedge fund firm in order to account for within-firm correlation over time.

In a second regression model, the same regressions are run with *Intra-industry Diversification* broken down into its components, *Within and Beyond Sub-sector Diversification.*

In addition to the OLS fixed effects panel regressions, the survival analyses (using the same covariates as specified above) were rerun using a Cox regression (e.g. Miller, 2012). The Cox model takes the following functional form

$$h_i(t) = h(t)\ exp\ (x_i\beta),$$

h_i is the mortality hazard rate at time t for firm i. $h(t)$ is the unspecified baseline mortality hazard rate whereas x_i is a vector of covariates (the same as in the OLS fixed effects panel model) and β is a vector of coefficients belonging to the covariates.

The effect of intra-industry diversification on the performance of the hedge fund firm i in month t is investigated using the following model (OLS fixed effects panel regression):

$$HFMC\ Return_{i,t} = \beta_0 + \beta_1\ Intra\text{-}Industry\ Diversification_{i,t}$$
$$+ \beta_2\ Active\ Firm\text{-}Investor\ Network_{i,t} + \beta_3\ HFMC\ LnAUM_{i,t}$$
$$+ \beta_4\ HFMC\ Age_{i,t} + \alpha_i + \delta_t + u_{i,t}$$

α_i reflects the hedge fund firm fixed effects in order to account for unobserved firm-level heterogeneity and δ_t reflects year fixed effects. Standard errors are robust to heteroscedasticity and are clustered on the level of the hedge fund firm in order to account for within-firm correlation over time.

2.8 Results

The first section shows some descriptive evidence on multi fund hedge fund firms for the observation period between 1994 and 2012. The second section shows the results of the regression analysis.

Figure 2 illustrates the data distribution of the intra-industry diversification variable by number of firm month observations (as pointed out in the description of the dataset, the overall sample size is 219,479 firm-month observations). As illustrated by the figure, the hedge fund industry is characterised by fairly focused firms since the majority of the firm-month observations come from firms with low levels of intra-industry diversification.

However, it seems important to note, that *even firms, which later diversify, tend to start their operations undiversified*[20], which contributes to the skew of the distribution towards low levels of diversification.

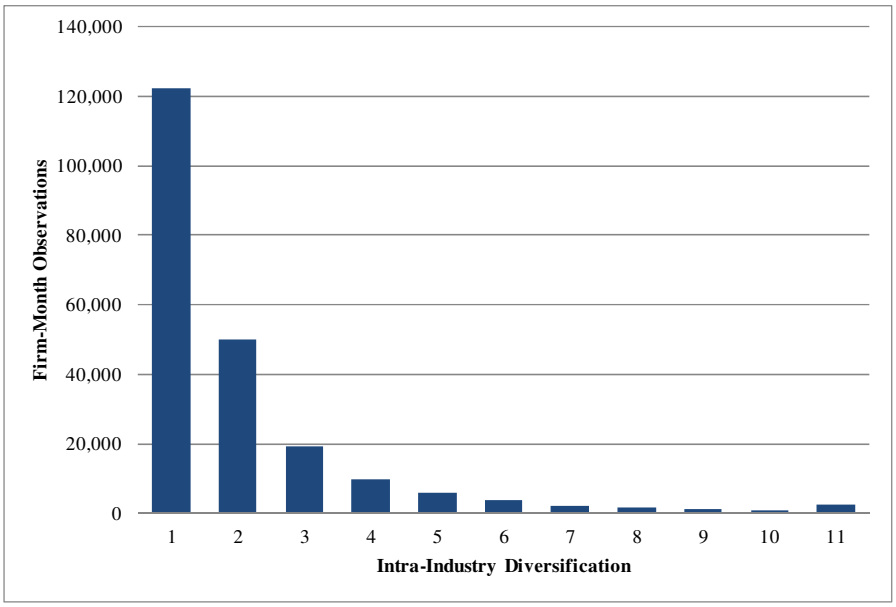

Figure 2: Histogram of data distribution of the intra-industry diversification variable. This graph shows the distribution of the intra-industry diversification variable by firm-month observation (as pointed out in the description of the dataset, the overall sample size is 219,479 firm-month observations).

Intra-industry diversification in the hedge fund industry (i.e. a hedge fund firm offering multiple hedge fund products) has become more prevalent in the past decade as a graphical analysis over the observation period indicates. Figure 3 illustrates the average number of funds per hedge fund firm, whereas Figure 4 splits funds active in a certain year by their affiliation with a non-diversified or an intra-industry diversified firm.

[20] This was also noted in the literature, for example by Zahavi and Lavie (2013).

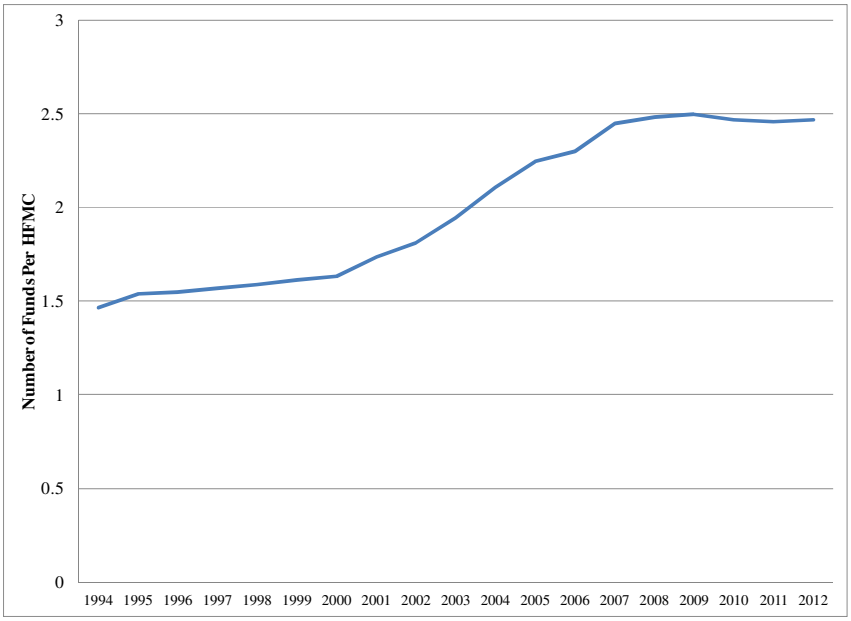

Figure 3: Average number of funds per hedge fund firm (HFMC).

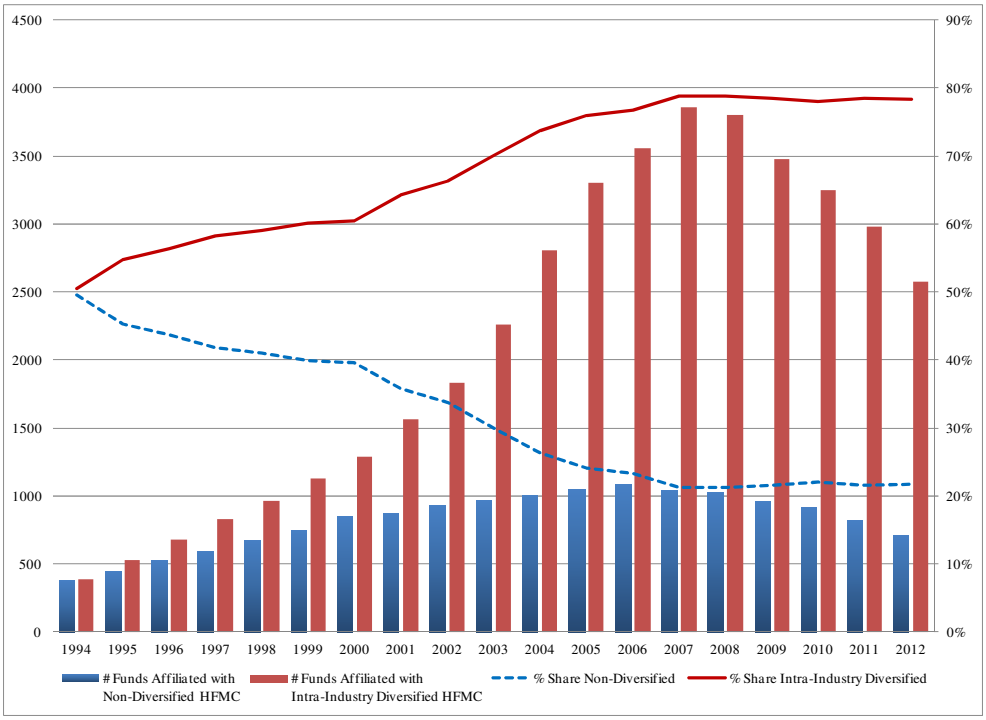

Figure 4: Shares of non-diversified versus intra-industry diversified hedge fund firms. This graph illustrates the split of the hedge funds active in a given year by affiliation with an intra-industry diversified vs. a non-diversified hedge fund management company (HFMC). This split is illustrated by columns depicting the number of funds active each year in the two categories. The line chart (units on the secondary axis) illustrates this development as share of funds in the TASS database.

Regarding the results of the regression analysis, the first step in the investigation is an analysis of how intra-industry diversification affects HFMC survival. Table 3 shows the results from the fixed effects OLS panel regressions whereas Table 4 shows the results from the Cox regressions.

Hypothesis 1 stated that intra-industry diversification is positively related to firm survival. Overall, the results of the regression analyses (column 1 of Tables 3 and 4) seem to support this hypothesis since intra-industry diversification is negatively related to hedge fund firm failure. Concerning the OLS panel fixed effects regression, a one unit increase in the active firm-investor network variable is associated with a 0.0114 unit decrease in HFMC failure, ceteris paribus. Consistent with the results on the panel OLS fixed effects regression, also the Cox regressions show a negative relation between firm mortality rates and intra-industry diversification (Table 4). A one unit increase in intra-industry diversification decreases mortality hazard by 15% (=exp (−0.1650) − 1).

Table 3: Analysis of the impact of intra-industry diversification on HFMC failure (OLS Panel Fixed Effects Regression). The death variable is operationalised with a dynamic indicator variable that takes the value of one in the 12 months prior to the date that the hedge fund management company 'died' (as it enters the 'failure zone'). All standard errors are adjusted for heteroskedasticity and clustered at the HFMC level. Coefficients marked with ***, ** and * are significant at the 1%, 5%, 10% level, respectively.

	Hedge Fund Management Company (HFMC) Failure		
Intra-Industry Diversification	-0.0114***	-0.0303***	
	(.0018)	(.0051)	
Intra-Industry Diversification Squared		0.0019***	
		(.0004)	
Beyond Sub Sector (Intra-Industry) Diversification			-0.0340***
			(.0063)
Within Sub Sector (Intra-Industry) Diversification			-0.0072***
			(.0021)
Active Firm-Investor Network	-0.0087	-0.0069	-0.0085
	(.0057)	(.0057)	(.0057)
HFMC Return	-0.0716***	-0.0720***	-0.0709***
	(.0109)	(.0108)	(.0108)
Std Deviation of HFMC Return	-0.0995	-0.1028	-0.1043
	(.0757)	(.0757)	(.0753)
Skewness of HFMC Return	-0.0022	-0.0021	-0.0021
	(.0016)	(.0016)	(.0016)
Kurtosis of HFMC Return	0.0018*	0.0018*	0.0017*
	(.0009)	(.0009)	(.0009)
HFMC 8 Factor Alpha	-0.0011	-0.0012	-0.0012
	(.0029)	(.0029)	(.0029)
Flows HFMC	-0.0333***	-0.0337***	-0.0330***
	(.0047)	(.0047)	(.0047)
HFMC Ln Assets Under Mgmt	-0.0225***	-0.0213***	-0.0225***
	(.0023)	(.0023)	(.0023)
Age of HFMC (in years)	0.0132***	0.0131***	0.0131***
	(.0020)	(.0021)	(.0019)
_cons	0.3403***	0.3419***	0.3615***
	(.0398)	(.0398)	(.0405)
Firm Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES
Within R-Squared	0.0640	0.0654	0.0650
Number of Firm-Month Observations	180,664	180,664	180,664

****** p<0.01; ** p<0.05, * p<0.10***

Robust Standard Errors in Parentheses

Standard Errors Clustered by HFMC

With respect to the control variables, the active firm investor network is negatively related to HFMC failure across the different models, however only significantly so (at conventional levels) in the Cox models (for more details on the active firm-investor network, please see chapter 3 of this thesis).

The results regarding the other control variables seem intuitively plausible (and in line with prior research at the level of analysis of the hedge fund, not the firm, e.g. Liang, 2000, Gregoriou, 2002, Amin and Kat, 2003): returns, flows and assets under management are negatively related to HFMC failure whereas firm age and kurtosis of returns (fatter tails) are positively related to HFMC failure. In the Cox models, also standard deviation and skewness are negatively associated with HFMC failure.

Table 4: Analysis of the impact of intra-industry diversification on HFMC hazard (Cox Regression). The death variable is operationalised with a dynamic indicator variable that takes the value of one in the month the HFMC 'died'. The table reports the mortality hazard rates for each variable in exponential form (standard errors in parentheses). Coefficients marked with ***, ** and * are significant at the 1%, 5%, 10% level, respectively.

	HFMC Mortality Hazard Rate (Exponential Form)		
Intra-Industry Diversification	-0.1650***	-0.2775***	
	(.0369)	(.0870)	
Intra-Industry Diversification Squared		0.0149	
		(.0100)	
Beyond Sub Sector (Intra-Industry) Diversification			-0.5123***
			(.1374)
Within Sub Sector (Intra-Industry) Diversification			-0.1033**
			(.0411)
Active Firm-Investor Network	-0.4013***	-0.3983***	-0.4149***
	(.1529)	(.1533)	(.1527)
HFMC Return	-5.7607***	-5.7712***	-5.7494***
	(.8564)	(.8563)	(.8560)
Std Deviation of HFMC Return	-3.9465***	-3.9928***	-4.1034***
	(1.2327)	(1.2327)	(1.2354)
Skewness of HFMC Return	-0.1923***	-0.1918***	-0.1917***
	(.0492)	(.0492)	(.0492)
Kurtosis of HFMC Return	0.0875***	0.0872***	0.0871***
	(.0294)	(.0294)	(.0294)
HFMC 8 Factor Alpha	-0.0476	-0.0475	-0.0489
	(.1296)	(.1296)	(.1296)
Flows HFMC	-1.7743***	-1.7812***	-1.7846***
	(.1795)	(.1797)	(.1801)
HFMC Ln Assets Under Mgmt	-0.3385***	-0.3341***	-0.3401***
	(.0220)	(.0222)	(.0220)
Age of HFMC (in years)	0.0269***	0.0271***	0.0278***
	(.0086)	(.0086)	(.0086)
Chi-Squared	597.9***	599.9***	605.9***
Number of Firm-Month Observations	180,664	180,664	180,664

****** p<0.01; ** p<0.05, * p<0.10***

Regarding hypothesis 2, which stated that high levels of intra-industry diversification are negatively related to hedge fund firm survival, the results in both Tables 3 and 4 (column 2)

indicate that the squared term of intra-industry diversification is positively associated with HFMC failure (however not significantly so in the Cox model). This seems to provide initial support for the conjecture that it is not easily possible for a HFMC to smoothly re-narrow its intra-industry diversification, without being at an increased risk of failure. This finding seems to counter the note of Bercovitz and Mitchell (2007, p. 66) that at "the product line level and the product sub-sector level […] firms […] are able to subtract obsolete or conflicting product lines without damaging their survival chances". The results indicate that overdiversification *even in a setting of intra-industry diversification,* cannot be rectified in a frictionless manner.

Hypothesis 3 conjectures regarding the components of intra-industry diversification that diversification beyond sub-sectors has a stronger survival enhancing effect than diversification within sub-sectors. As indicated by column three of Tables 3 and 4, also this hypothesis seems to be supported. Both components of intra-industry diversification seem to be negatively related to hedge fund firm failure. However, the failure decreasing effect (judged by absolute coefficient size) of beyond sub-sector diversification is 4.72 times and 4.96 times larger than within sub-sector diversification in the OLS panel fixed effects regression and the Cox regressions, respectively. This insight contrasts with the findings of Stern and Henderson (2004) since they do not find a significant effect of 'across line diversification'. In addition to the different operationalisation of beyond sub-sector diversification, another reason for the different results may be that these researchers focus on the four digit SIC code as fairly broad understanding of intra-industry diversification.

Overall, this result seems to be in line with the 'insurance effect' of diversification (e.g. Bercovitz and Mitchell, 2007; Lubatkin and Chatterjee, 1994). The strong survival enhancing effect of beyond sub-sector diversification may be due to imperfectly correlated cash flows

from different products, which are within the same industry but in different sub-sectors and hence likely less correlated than products within the same sub-sector.

Moving to hedge fund firm performance as a dependent variable, hypothesis 4 stated that intra-industry diversification is negatively related to hedge fund firm performance. The results of the analysis presented in Table 5, column 1 show evidence in support of this conjecture. Ceteris paribus, a one unit increase in intra-industry diversification is associated with a 3 basis point decrease in *monthly* hedge fund returns. On an annualised basis[21], this return increase corresponds to 36 basis points. Given average annual returns of hedge fund firms of circa 12 percent this seems to be an economically small, yet noteworthy effect (i.e. 3 percent of annual average performance). This finding is in line with the negative performance effect of intra-industry diversification that Zahavi and Lavie (2013) and Tanriverdi and Lee (2008) find. However, compared to these studies on intra-industry diversification and performance, which have largely investigated sales growth or market share as performance measures (Zahavi and Lavie, 2013 and Tanriverdi and Lee, 2011), this chapter investigates return on invested capital as performance measure.

Hypothesis 5 stated that high levels of intra-industry diversification are positively related to firm performance. This conjecture, which was derived from insights presented by Zahavi and Lavie (2013), is supported by the results of the analysis. The squared term of the intra industry diversification measure is significantly and positively related to monthly hedge fund firm returns. However, judging from the coefficient size, the economic impact of the effect seems to be rather small.

[21] Since returns are usually reported on a per annum basis, the effects on monthly returns were annualised, which corresponds to usual practice in hedge fund (e.g. Asness, Krail and Liew, 2001 or Liang, 2001) and other finance research (e.g. Petengrill, Sundaram and Mathur, 1995 or Statman, 2000).

Taking together the findings on hypotheses 4 and 5, this result provides another point of evidence that the performance dynamics of intra-industry diversification are indeed different to what scholars have found when investigating related *inter*-industry diversification. In contrast to the insights of an inverted u-shape relationship between diversification and performance as identified by studies on *inter*-industry diversification (e.g. Palich, Cardinal and Miller, 2000), the intra-industry diversification context seems to show a regular u-shape relationship between diversification and performance (Zahavi and Lavie, 2013).

Hypothesis 6 stated that intra-industry diversification beyond sub-sectors is positively related to firm performance while intra-industry diversification within sub-sectors of one industry is negatively related to firm performance. This investigation of the performance implications of the suggested components of intra-industry diversification is to the best of the author's knowledge novel in the literature. The results presented in Table 5, column 3, show evidence in support of this hypothesis.

Ceteris paribus, a one unit increase in beyond sub-sector diversification is related to a 7 basis point *increase* in monthly hedge fund firm returns, whereas a one unit increase in within sector diversification is related to a 5 basis point *decrease* in returns. On an annualised basis, the return increase from beyond sub-sector diversification corresponds to 84 basis points whereas the decrease from within sub-sector diversification corresponds to 60 basis points. Given average annual returns of hedge fund firms of circa 12 percent this seems like an economically noteworthy effect (i.e. 7 and -5 percent of annual average performance, respectively).

This result expands the findings on the performance implications of intra-industry diversification by Zahavi and Lavie (2013). It provides additional insights on the driver behind the negative performance effect of intra-industry diversification. Close intra-industry

diversification indeed seems to create performance decreasing difficulties for the firm, such as limited economies of scope in the sharing of resources across products or limited complementary value created for customers. By contrast, diversification beyond the sub-sector is positively related to hedge fund firm performance.

The investigation of the components of intra-industry diversification brought some clarification to the seemingly paradoxical results that intra-industry diversification is positively related to firm survival but negatively related to firm performance. The performance and survival enhancing effect of beyond sub-sector diversification is consistent across models. The negative effect on performance is driven by within sub-sector diversification, which seems to still have a minor survival enhancing effect, but reduces firm performance.

Table 5: Analysis of the impact of intra-industry diversification on HFMC returns (OLS Panel Fixed Effects Regression). Coefficients marked with ***, ** and * are significant at the 1%, 5%, 10% level, respectively.

	Hedge Fund Management Company (HFMC) Returns		
Intra-Industry Diversification	-0.0003***	-0.0009***	
	(.0001)	(.0003)	
Intra-Industry Diversification Squared		0.0001*	
		(.0000)	
Beyond Sub Sector (Intra-Industry) Diversification			0.0007*
			(.0004)
Within Sub Sector (Intra-Industry) Diversification			-0.0005***
			(.0001)
Active Firm-Investor Network	0.0007*	0.0008*	0.0007*
	(.0004)	(.0004)	(.0004)
HFMC Ln Assets Under Mgmt	-0.0009***	-0.0008***	-0.0009***
	(.0001)	(.0001)	(.0001)
Age of HFMC (in years)	-0.0002	-0.0002	-0.0002
	(.0003)	(.0003)	(.0003)
_cons	0.0222***	0.0222***	0.0213***
	(.0025)	(.0025)	(.0025)
Firm Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES
Within R-Squared	0.0267	0.0267	0.0267
Number of Firm-Month Observations	215,626	215,626	215,626

****** p<0.01; ** p<0.05, * p<0.10***

Robust Standard Errors in Parentheses

Standard Errors Clustered by HFMC

2.9 Discussion

This paper engaged theoretically and empirically with the phenomenon of intra-industry diversification and its nascent literature. It investigated two aspects of intra-industry diversification: (1) the potential components of intra industry diversification and their effect on firm performance and survival and (2) nonlinearities in the relationship between intra-industry diversification and performance, as well as survival.

The results in the chapter show a non-trivial relationship between intra-industry diversification, performance and survival. Regarding survival, the results indicated that intra-industry diversification and its components (beyond and within sub-sector diversification) enhance survival. Overdiversification may hurt survival, indicating that the readjustment of diversification is not easy and frictionless as Bercovitz and Mitchell (2007) conjecture for settings of diversification within an industry. Comparing to the few studies on *inter*-industry diversification (Bercovitz and Mitchell, 2007 and Cottrell and Nault, 2004), the survival enhancing effect, as well as the indicated inverted u-shape relationship (high levels of diversification decrease survival), seems to prevail in both settings of intra- and *inter*-industry diversification.

Regarding performance, the analysis revealed that while beyond sub-sector diversification is positively related to firm performance, within sub-sector diversification is negatively related to performance and driving the overall effect of intra-industry diversification on performance. This provides some more details on the negative relationship, which also Zahavi and Lavie (2013) and Tanriverdi and Lee (2008) find. Furthermore, the analysis of nonlinear components confirms the finding of Zahavi and Lavie (2013) that high levels of diversification are positively related to performance. The more fine-grained empirical analysis of the components of intra-industry diversification seems to provide support for and extend the resource-based explanations of the intra-industry diversification – performance

relationship. The analysis in this chapter helps to establish the boundaries of when intra-industry diversification has positive versus negative performance consequences based on the 'distance' of a firm's diversification within an industry. While diversification within the sub-sector as fairly 'close' intra-industry diversification may have negative performance consequences due to 'negative transfer effects' (Zahavi and Lavie, 2013) in the redeployment of resources, the benefits of the modification and adjustment of firm resources to other products may materialise as far as 'more distant' intra-industry diversification beyond the sub-sector is concerned.

Overall, this result provides another point of evidence that the performance dynamics of intra-industry diversification seem to be different to what scholars have found when investigating *inter*-industry diversification (Zahavi and Lavie, 2013). Putting in context the results of intra-industry diversification (a u-shaped relationship between diversification and performance) with the results of *inter*-industry diversification (an inverted u-shaped relationship between diversification and performance, e.g. Palich, Cardinal and Miller, 2000) the following schematically depicted overall relationship emerges (please see Figure 5). For intra-industry diversification, performance may begin to increase once the firm moves into different sub-sectors of the industry, whereas for *inter*-industry diversification, performance may begin to decrease once the firm diversifies into unrelated industries.

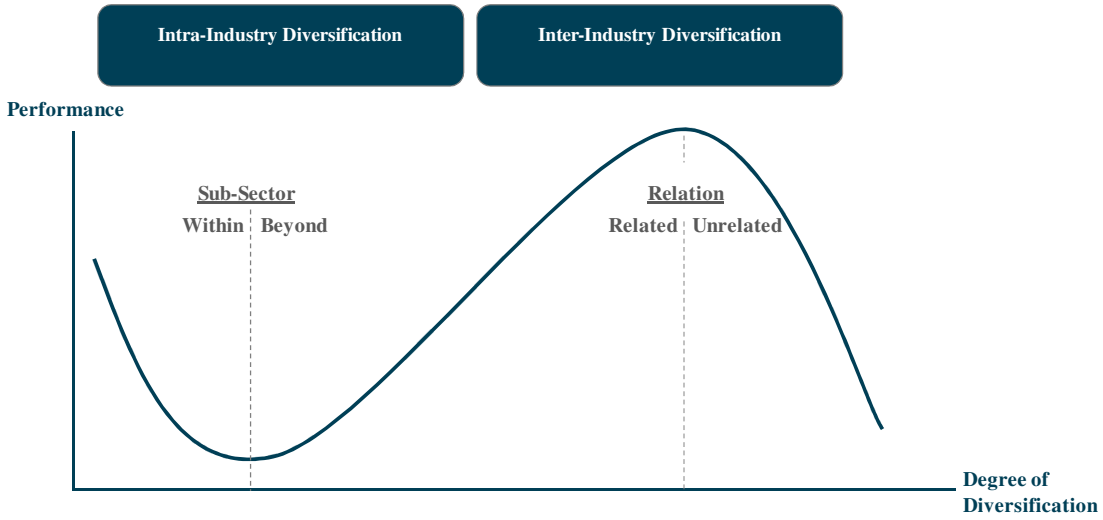

Figure 5: Schematic depiction of the potential performance-diversification relationship drawing on insights from studies of intra- and *inter*-industry diversification.

2.9.1 Boundary conditions. As with any research findings, it may enhance the understanding of the findings if their boundary conditions are considered.

Whereas the context of the hedge fund industry provides a narrow setting for the investigation of intra-industry diversification and adds colour to the extant empirical research, which has mainly focused on the context of software and information technology (e.g. Tanriverdi and Lee, 2008 and Zahavi and Lavie, 2013), it may also slightly underestimate the benefits of resource sharing as component of intra-industry diversification. This is the case since investor (i.e. customer) capital is normally not easily transferrable between hedge fund products since investors usually commit capital directly to a fund of their choice, not the overarching firm. Overall, this may slightly underestimate the resource sharing component of intra-industry diversification.

This research is rooted in a setting of 'homegrown' intra-industry diversification. Compared to the *inter*-industry diversification of large firms, which may happen via acquisitions (e.g. Bergh and Lawless (1998) focus on Fortune 500 companies), this 'homegrown' intra-industry

diversification seems to have received little scholarly attention. Since 'homegrown' diversification seems to require fewer resources than 'diversification by acquisition', it may apply to a larger share of firms. Nevertheless, it seems important to point out this boundary condition since 'homegrown diversification' and 'diversification by acquisition' may be governed by slightly different dynamics.

2.9.2 Contributions. The paper advances the nascent literature on intra-industry diversification in four areas.

First, instead of focusing exclusively on performance or survival as outcome variables, this paper investigates both variables, which is novel with respect to intra-industry diversification. In fact also for the literature on *inter*-industry diversification, the joint investigation of these two variables seems to have been widely ignored (Bercovitz and Mitchell (2007) is a rare exception). However, it may be rewarding to investigate both variables as it may lead to a "better and more complete understanding" (Delios and Beamish, 2001, p. 1035) of the studied phenomenon.

The joint analysis of both measures in this chapter showed the seemingly paradoxical result that intra-industry diversification is positively related to firm survival while being negatively related to firm performance. Given that prior literature emphasised that these outcome measures are distinct in their nature and have different drivers (e.g. Schaffer, 1989; Hill and Birkinshaw, 2007, Delios and Beamish, 2001) this finding may be regarded as noteworthy but not paradoxical. The analysis of the components of intra-industry diversification provided a novel insight into these dynamics by showing that diversification beyond the sub-sector of the industry is positively related to both survival and performance, while diversification within the sub-sector is still positively related to survival yet negatively related to performance. This finding indicates that the potentially performance decreasing effects of

intra-industry diversification (i.e. limited economies of scope, overlapping functionalities with other products, etc.) seem to be especially prevalent for diversification within a sub-sector. The survival enhancing effect (especially of beyond sub-sector diversification) seems to be driven by risk reduction via multiple products with imperfectly correlated cash flows (e.g. Bercovitz and Mitchell, 2007; Lubatkin and Chatterjee, 1994).

Second, the analysis investigates non-linear effects of intra-industry diversification on both survival and performance. Whereas the analysis finds evidence in support of the recently discovered u-shaped relationship between intra-industry diversification and performance (Zahavi and Lavie, 2013), which may be valuable in its own right, the non-linear effect of intra-industry diversification on firm survival has not been investigated yet. The findings in this paper contrast with a conjecture by Bercovitz and Mitchell (2007, p. 66) that overdiversification is not an issue for focused or relatedly diversified firms since at "the product line level and the product sub-sector level […] firms […] are able to subtract obsolete or conflicting product lines without damaging their survival chances". The analysis in this chapter shows that even as far as intra-industry diversification is concerned, firms may not be able to frictionlessly adjust their level of diversification since high levels of intra-industry diversification are positively related to firm failure. This qualification of the note of Bercovitz and Mitchell (2007) may be attributed to the fact that this chapter looks at hedge fund firms, which are small and entrepreneurial entities, whereas Bercovitz and Mitchell (2007) looked at larger firms in an *inter*-industry diversification context (i.e. medical devices, healthcare services).

Third, the paper proposes a more nuanced view of intra-industry diversification, which helps to explain its effects on survival and performance. It proposes that intra-industry diversification is not a homogenous phenomenon but that there may be finer subcategories of intra-industry diversification: within and beyond sub-sectors of an industry. The analysis

describes these components of intra-industry diversification and shows their relative importance. Regarding survival, beyond sub-sector diversification contributes most strongly to the survival enhancing effect of intra-industry diversification. This finding contrasts with the result of the only other study on intra-industry diversification and survival (Stern and Henderson, 2004), who find that beyond sub-sector diversification (beyond the primary line of business) did not matter for survival. The discrepancy may be due to two factors. First, Stern and Henderson (2004) focus on the four digit SIC code as fairly broad operationalisation of intra-industry diversification. Second, they conceptualise business lines in a sense of 'brands' compared to the categories of within and beyond sub-sector diversification proposed in this chapter.

Fourth, as briefly pointed out above, this chapter has a narrow empirical focus on intra-industry diversification within the hedge fund industry. The operationalisation of intra-industry diversification in the extant literature is rather broad (i.e. the 4 digit SIC Code, e.g. Zahavi and Lavie, 2013; Stern and Henderson, 2004; Tanriverdi and Lee, 2008), which seems to be partially due to granularity constraints in the researchers' data. It is somewhat daring to consider firms with the same 4 digit SIC codes as part of the same industry as it covers very different products and activities. If one looks at the SIC classification of the hedge fund industry (SIC 6211, First Research, 2014) one would consider stock brokers, mutual funds, investment banks and other securities investors all as the same 'industry'. This chapter focuses on the hedge fund industry as a focused intra-industry setting of fairly homogenous firms (compared with 4 digit SIC code categories). Although the 4 digit SIC code category is an operationalisation of intra-industry diversification, it seems to matter conceptually since this broad approach to intra-industry diversification may have contributed to the mixed results regarding intra-industry diversification in the literature (e.g. Zahavi and Lavie, 2013; Tanriverdi and Lee, 2008; Stern and Henderson, 2004; Li and Greenwood, 2004).

2.9.3 Potential implications for practice. Considering a wider audience of practitioners involved in similar settings characterised by small, asset-light firms, as well as "knowledge intensity and lack of intellectual property protection, the hedge fund sector appears representative of many other service sectors in the economy" (de Figueiredo, Meyer-Doyle and Rawley, 2013, p. 849).

This study may contribute to a more fine-grained understanding of intra-industry diversification and its effects among practitioners. The analysis points out that the highest survival *and* performance benefits of intra-industry diversification seem to be achieved by beyond sub-sector diversification within the same industry. Hence it may be worthwhile for managers to consider leveraging their resources beyond their sub-sector for potentially enhanced performance and less correlated cash flows as an 'insurance' related to higher chances of survival. However, beyond sub-sector diversification may be more challenging to realise than within sub-sector diversification since customers may sometimes prefer highly specialised firms, which 'stick to their knitting' and focus on one sub-sector only.

2.10 Conclusion

In conclusion, this chapter presented empirical evidence on the effect of intra-industry diversification on two outcome measures: firm survival and firm performance. The chapter took a differentiated view on the phenomenon and attempted to advance the nascent academic literature on intra-industry diversification by investigating the components of intra-industry diversification, as well as the nonlinearities in the relationship between intra-industry diversification, survival and performance.

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Chapter 3

Beyond Providers of Capital: The Importance of the Firm – Investor Network for Hedge Fund Firm Performance and Survival

3.1 Abstract

This chapter assembles evidence of both qualitative (exploratory expert interviews) and quantitative (large-scale panel dataset) kinds to suggest that investors into hedge funds are not only mere providers of capital but that they can be active partners in the identification, assessment and execution of current and prospective investment opportunities. The analysis indicates that hedge fund firms with an active firm-investor network beyond the provision of capital show enhanced performance and survival. From a theoretical perspective, the insights in this chapter inform and contribute to theories on the active involvement and tangible added value of a firm's customers.

I would like to thank Charles Baden-Fuller and Hans Frankort for the insightful discussions as well as the helpful input on this chapter. Furthermore, I would like to thank all the conversation partners from the industry (at hedge funds, investments banks, university endowments, family offices, as well as one central bank and one financial regulator) for their time and interesting hands-on industry insights.

3.2 Introduction

Hedge fund firms are service providers. They provide the service of investment management to their customers, who are sophisticated investors (Fung and Hsieh, 1999), such as high net worth individuals, family offices, pension funds or endowment funds. The service they provide to these customers is the investment of customer capital in the identification and exploitation of market inefficiencies (e.g. Economist, 2012) according to their expertise and the investment policy of the firm. The investors as customers pay fees for this service and after a certain period, they exit the investment. In the literature on hedge funds (e.g. Bollen and Pool, 2012; Jagannathan, Malakhov and Novikov, 2010; Agarwal, Daniel and Naik, 2009; Titman and Tiu, 2011) investors are assumed to be passive and the (hedge fund) firm-investor relationship does not go beyond the mere provision of capital with occasional monitoring of investment results.

This chapter takes the provision of capital to a hedge fund firm as the starting point for the investigation of the hedge fund firm-customer (i.e. investor) relationship. Please note that the focus of this chapter is on the role of *investors* as 'customers' of the hedge fund firm, not as 'shareholders' (i.e. equity owners) in the hedge fund firm.

The analysis in the chapter assembles evidence of both quantitative and qualitative kinds to suggest that the provision of capital enables a rich and ongoing exchange of information between the firm and potentially knowledgeable investors on the identification, assessment and execution of current and future investment opportunities. The analysis includes a qualitative part of limited scope (25 exploratory expert interviews), which informed the hypothesis development for the quantitative analysis. The triangulation (Flick, 2009) across data sources (qualitative and quantitative data) and methods of analysis, as well as the consistency of the qualitative and quantitative results, may yield some confidence about the validity of the presented concept of the active firm-investor network.

This active firm-investor network seems important for firms in the hedge fund industry since financial markets are dynamic social systems, in which inefficiencies (i.e. profit opportunities for hedge funds) disappear once enough money is engaged in exploiting them (Beunza, Hardie and MacKenzie, 2006). The firm-investor network may translate into tangible outcomes along the dimensions of firm profitability and survival. In particular, the empirical analysis suggests that an active firm-investor network is positively related to hedge fund firm performance and survival.

Regarding the conversation in the literature, this chapter attempts to contribute to the literature on customer innovation, but also holds insights for the finance literature on hedge funds, as well as the literature in the sociology of finance on hedge funds.

Although the extant customer innovation literature has provided convincing evidence that customers are an important force for innovation, four areas seem to have received little attention in the scholarly conversation in this literature:

First, the vast majority of studies in the customer innovation literature have taken a customer/user-centric approach (e.g. von Hippel, 2007; Hienerth, 2006; Harhoff et al., 2003; Luethje et al., 2005), which ignored the competitive consequences for firms (i.e. producers). The present study focuses on the firm-level and investigates how an active firm-customer network impacts hedge fund firm profitability and survival. Second, this chapter attempts to answer calls for more large-scale, quantitative research (e.g. Bogers, Afuah and Bastian, 2010) to test and complement the interesting qualitative and conceptual insights developed from the extant body of (mostly qualitative) research on customer innovation. Third, the study links to findings in the literature that organisational practices and characteristics may be important 'enablers' of customer innovation and knowledge transfer from customers (e.g. Foss et al, 2011 and Foss, Lyngsie and Zahra, 2013). The analysis shows that that 'outward

looking' (observable by an outsider, e.g. a customer) organisational characteristics (e.g. as used in the composition of the empirical proxy measure for the active firm-investor network) may provide an important 'docking point' to invite customers to engage with the firm and to share their expertise. Fourth, the hedge fund industry seems to be an interesting context and 'conservative setting' for the study of customer involvement since one may not naturally expect customer involvement in such a secretive industry with numerous highly specialised firms. This setting contrasts with settings in the extant literature where one may expect more customer involvement, such as 'collaborative' settings like software development (e.g. by users via innovation toolkits; Franke and von Hippel, 2003) or settings with lower barriers (in terms of technology, required capital) to produce an innovation (e.g. sports related consumer goods, Baldwin et al., 2006; Hienerth, 2006; Luethje et al., 2005).

With regard to the literatures on hedge funds in finance and the sociology of finance, this chapter points out that hedge fund investors, who are usually portrayed to take a passive or monitoring role, may also be active partners in the creation, assessment and execution of investment ideas. Additionally, the active hedge fund firm-investor relationship may be considered as a potentially interesting type of 'market'. Researchers in the sociology of finance have usually investigated the technology enabled interaction of market participants in highly liquid, standardised and transparent markets (e.g. stocks, bonds or standardised derivatives; e.g. MacKenzie, 2012). This study provides a first insight on the idiosyncratic hedge fund firm-investor 'market', where the exchange of a homogenous good (i.e. capital) forms the basis of a relationship, in which a heterogeneous and tailored good (information) is exchanged.

The remainder of the chapter is organised as follows. Section 3 reviews the related literature, whereas section 4 introduces the qualitative and quantitative data, as well as the methods of analysis. Section 5 shows the findings of the exploratory qualitative enquiry with hedge fund

experts and develops the hypotheses to be tested in the quantitative analysis. Section 6 provides the results of the quantitative analysis whereas section 7 discusses the boundary conditions, contributions and practitioner implications of the qualitative and quantitative results. Section 8 concludes.

3.3 Review of the Related Literature

The following review of the literature portrays how this chapter relates to extant scholarly work in the fields of (1) strategy and innovation (i.e. customer innovation), (2) finance (i.e. studies on hedge funds) and (3) the sociology of finance.

3.3.1 Literature in strategy and innovation (i.e. studies on customer/user innovation).

The literature on customer/user innovation is of relevance to this research since the phenomenon of the active (hedge fund) firm-investor network, which helps with the identification, assessment and execution of investment ideas, may be considered as engaging with customers in innovation and co-creation of products.

In terms of definitions, 'customers' or 'users' are defined as firms or individuals "that expect to benefit from using a design, a product, or a service". Conversely, 'firms' or the 'producers' "expect to benefit from selling a design, a product, or a service" (both quotes: Baldwin and von Hippel, 2011, p. 1400).

This section reviews the related literature and points out four areas in the customer innovation literature, which this chapter aims to contribute to by investigating the consequences of customer innovation *for the firm* (i.e. the producer of a good or service). Hence, this chapter takes a firm-centric view of customer innovation.

In the first section, this review of the literature provides insights on users/customers as innovators, whereas in the second section, it elaborates on the positive and negative consequences of customer/user innovation for firms.

Regarding customers as innovators, the main body of the literature on customer innovation has shown that customers can be independent innovators (Bogers, Afuah and Bastian, 2010) who create or upgrade their own products. Customers, independently of manufacturers, engage in product innovation for the benefit of enhanced in-house use (e.g. Thomke and von Hippel, 2002). Customer innovation experienced a boost with the advent of new technologies (e.g. personal computer, internet, etc.), which substantially decreased communication and design costs. Going forward, "technological trends suggest that both design costs and communication costs will be further reduced over time" (Baldwin and von Hippel, 2011, p. 1410).

Due to improved connectivity between users (e.g. via the internet and other means of communication), some users share their innovation with the rest of the user community. They are incentivised to do so (1) since they see the activity as fun (negative cost), (2) because of the reputation and acknowledgement they receive within their communities, or (3) due to their potentially increased value on the employment market (Harhoff et al., 2003). User innovation can function independently of manufacturers if users are motivated to innovate, share their findings freely and are able to produce the innovations cost effectively (von Hippel, 2007).

Although a majority of the customer innovation literature has focused on the customer, with firms playing a secondary or no role at all (von Hippel et al., 2011; von Hippel, 2007; Luethje et al., 2005; Harhoff et al., 2003), some authors have provided initial insights on the firm-

level consequences of customer innovation. These consequences can be positive and negative.

Concerning the positive consequences, firms can use the innovative power of their customers by providing them with firm-specific tool kits for independent innovation and product customisation (Thomke and von Hippel, 2002; von Hippel and Katz, 2002) or they can focus on ‘lead users’ at the technological frontier, which may serve as a "need forecasting laboratory" (von Hippel, 1986, p. 791) for the general market since their present needs will be reflected in the general needs of ordinary users in the future. Baldwin and von Hippel (2011, p. 1411) note that through “monitoring and incorporating lead-user innovations into their own offerings, producer innovators may enhance their product and service offerings while at the same time reducing their design costs and increasing their likelihood of success in the marketplace”. Lilien et al. (2002) showed in a case study at 3M that compared to traditional innovation projects, projects involving lead users generate substantially increased innovation performance as measured by sales projections (approx. 8 times of a traditional project).

The conversation in the literature around co-creation of products with customers also points to potential advantages for firms, who actively engage with their customers. Nambisan (2002) notes that with respect to new product development, customers, in addition to being users, can be a passive information source and active co-creators. Prahalad and Ramaswamy (2004, p. 11) argue that the customer is not separate from the value creation process and that the roles of customers and producers converge into a situation where customers and producers are "collaborators in co-creating value and competitors for the extraction of economic value". Along these lines, Laursen and Salter (2006) find that openness of a firm to external sources of information increases innovation performance. Hoyer et al. (2010) identify several advantages of co-creation, such as a better understanding of customer needs, improved quality, decreased risk and increased market acceptance of new products.

Concerning the potentially negative consequences for firms, new competitors can emerge from user innovators. In some cases, user-innovators have a cost advantage over firms and capitalise on the opportunity of low-cost production (Hienerth et al., 2014) by commercialising their innovation and entering the market as user-manufacturers. This market can either be an existing market or a new market or niche, which user-manufacturers may enter before established companies (Baldwin et al., 2006; Bogers, Afuah and Bastian, 2010). Along those lines, Baldwin and von Hippel (2011, p. 1399) conjecture that "innovation by individual users and user firms […] are modes of innovating that increasingly compete with and may displace producer innovation in many parts of the economy". Additional downsides for firms who involve customers in the creation of new products include intellectual property and secrecy concerns (Bogers, Afuah and Bastian, 2010), dependence on customers and the introduction of additional complexity (Franke and Piller, 2003) in the process of developing new products.

Table 6 summarises examples on active customer involvement from the literature on customer innovation. Please note that the purpose of this table is to illustrate rather than to be representative.

Table 6: Related literature on active customers in the field of customer innovation

Study	Unit of Analysis	Empirical Data	Measurement/Analysis	Main Finding
		Customer/User Innovation		
Hienerth, von Hippel and Jensen, 2014	Customer/user and producer	Case study of the innovation history in whitewater kayaking over 50 years	Descriptive comparison statistics	In the case of whitewater kayaking, "producers as a group spent about 3× more than users as a group on innovation per 'important' innovation developed" (p. 197)
Oliveira and von Hippel, 2011	Customer/user	Archival data and expert interviews; financial services first commercially introduced by major US banks 1975-2010	Reasoning based on qualitative data	Studies "the role of user-innovations in service development" (p. 806); 55% of computerized commercial banking and 44% of computerized retail banking services were first developed and implemented by individual service users
von Hippel, Ogawa and de Jong, 2011	Customer/user	Survey of consumers in the UK (1,173 respondents), Japan (2,000) and the US (1,992)	Descriptive comparison statistics	Consumers are a major source of product innovation; innovators are more likely to be highly educated, to have a technical education and to be male; firms are in competition for customer-innovators
von Hippel, 2007	Customer/user	Review of the extant innovation literature from the lens of user innovation	Reasoning based on extant academic literature	Identifies three conditions under which user innovation networks can function entirely independently from manufacturers: sufficient incentive to innovate, voluntary reveal information, ability to manufacture cheaply
Baldwin, Hienerth and von Hippel, 2006	Connection customer-producer	Case study form the rodeo kayak industry	Economic modeling	Evolution from user innovation to commercial product: user-manufacturers first commercialize user-innovations followed by high-capital, low variable cost commercial producers once the market stabilizes
Luethje, Herstatt and von Hippel, 2005	Customer/user	Case study in the mountain biking industry; 2 surveys with 106 and 185 respondents	Descriptive statistics and regression analysis (logit models on factors determining user product improvement)	Users predominantly draw on local information (i.e. information they already have) to determine the need and the solution for a user innovation
Harhoff, Henkel and von Hippel, 2003	Customer/user	Qualitative examples from semi-conductors, clinical chemistry, library information systems and software	Economic modeling	Freely revealing innovations can be rational for customers/users due to the following incentives: reputation/acknowledgement for good work, value on the job market, cost seen as negative (fun)
Lilien et al., 2002	Customer/user and producer	Case study investigating 3M and the effects of its lead-user idea generation process	Descriptive comparison statistics; Innovation performance is gauged using an estimate of sales	Compared to traditional innovation projects, projects involving lead users are estimated to generate substantially increased innovation performance as measured by sales projections (approx. 8 times of a traditional project)
Thomke and von Hippel, 2002	Customer/user	Qualitative examples from various industries, e.g. food chemistry, computer chips, synthetic materials, software	Reasoning based on qualitative data	Design, testing and building of products can be shifted from the firm to customers via user friendly tool kits for customers
von Hippel, 1986	Lead user as subset of customers/users	Review of the extant innovation literature from the lens of lead user innovation	Conceptual reasoning	Lead users serve as "need forecasting laboratory" (p. 791) for the general market since their present needs will become general for ordinary users months or years in the future

Although the extant customer innovation literature has provided convincing evidence that customers are an important force for innovation, four areas seem to have received little attention in the scholarly conversation in this literature:

First, as the vast majority of studies in the customer innovation literature have taken a customer/user-centric approach (e.g. von Hippel, 2007; Hienerth, 2006; Harhoff et al., 2003; Luethje et al., 2005), the competitive consequences for firms (producers) in terms of firm performance and firm survival have largely been ignored[22]. The present study takes a firm perspective and investigates how an active firm-customer relationship impacts hedge fund firm profitability and survival using qualitative as well as quantitative data.

Second, in their review of the literature on customer innovation, Bogers, Afuah and Bastian (2010, p. 871) note: *"To date, most research exploring users as innovators is based on case studies or other small-sample studies. […] In general, the research stream on users as innovators will greatly benefit from empirically testing (on a larger scale) the ideas and propositions that it puts forward"*. This chapter attempts to answer this call for more large-scale, quantitative research to test and complement the interesting qualitative and theoretical insights developed from the extant body of (mostly qualitative) research on customer innovation. This chapter combines qualitative and quantitative evidence: It motivates, describes and illustrates the active firm-investor network using qualitative data, while it subsequently investigates in a large-scale, longitudinal panel dataset how an active firm-investor network impacts firm performance[23] and firm survival.

[22] Of course, it has been studied in general terms, how innovation affects firm performance and survival. The extant literature, which investigated the general innovation-performance or innovation-survival relationships, however largely focused on innovation by the firm, attributing no particular role to customers (e.g. Fontana and Nesta, 2009; Cefis and Marsili, 2006; Roberts, 1999; Banbury and Mitchell, 1995).

[23] In the few quantitative studies that deal with customer involvement in product development, revenue is often used as performance variable (Lilien et al., 2002 or Laursen and Salter, 2006). This operationalisation however neglects the cost side of the profitability equation (profit = revenue – cost).

Third, as firm-level consequences in general have not been in the focus of the discussion around customer innovation, an area that seems to have been underattended in the literature is the specification of organisational characteristics, which enable (or constrain) an engagement with customers. A notable study in this field is Foss et al. (2011), which emphasises that inward looking organisational practices (e.g. intensive vertical and lateral communication, rewarding employees for acquiring and sharing knowledge, delegation of decision rights) are important for the link between customer knowledge and innovation. Organisational practices and elements of organisational design, which link the firm to external knowledge sources (e.g. customers) were identified to not only be useful for the initial recognition but also for the ongoing exploitation of opportunities (Foss, Lyngsie and Zahra, 2013). This chapter links to these findings in the literature by showing that 'outward looking' (i.e. observable by an outsider, e.g. a customer) organisational characteristics (e.g. as used in the composition of the empirical proxy measure for the active firm-investor network; for more details, please see chapter 3.4.2.1) may provide an important 'docking point' to invite customers to engage with the firm and to share their expertise in the recognition, assessment and execution of investment opportunities.

Fourth, most prior studies on customer innovation were situated in the manufacturing sector (e.g. machinery manufacturers, petroleum & chemical industry, the high tech & IT/computer industry (e.g. semiconductors, software) or "sports-related consumer goods and other leisure-time activities" (Bogers, Afuah and Bastian, 2010, p. 859), such as whitewater kayaking (e.g. Hienerth et al., 2014). A study of the implications of customer involvement in the hedge fund industry seems to be a unique setting considering the empirical context of the extant literature (a loosely related study in terms of industry context is Oliveira and von Hippel (2011), which studies user innovation in the banking industry). The hedge fund industry seems to be an interesting context and 'conservative setting' for the study of customer involvement since one

may not naturally expect customer involvement in such a secretive industry with numerous highly specialised firms. This setting contrasts with settings where one may expect more customer involvement, such as 'collaborative' settings like software development (e.g. by users via innovation toolkits; Franke and von Hippel, 2003) or settings with lower barriers (in terms of technology, required capital) to produce an innovation (e.g. sports related consumer goods; Baldwin et al., 2006; Hienerth, 2006; Luethje et al., 2005).

3.3.2 Literature on hedge funds in the field of finance. As far as hedge fund investors (the customers of hedge fund firms) are concerned, the extant finance literature seems to have ignored the active, co-creating role, hedge fund investors can play in the identification, assessment and execution of investment ideas.

Instead, the literature in finance (largely implicitly) assumed investors to be passive providers of investment capital (e.g. Bollen and Pool, 2012; Jagannathan, Malakhov and Novikov, 2010; Agarwal, Daniel and Naik, 2009; Titman and Tiu, 2011), which engage in a careful due diligence before making an investment and passively monitor the hedge fund during the time of investment (Brown et al., 2012 and 2008; Agarwal et al., 2013). The debate around hedge funds and their investors in the finance literature has mainly focused on three areas:

First, scholars engaged in identifying drivers of hedge fund performance (e.g. risk exposure; Fung and Hsieh 2001 and 2004, Amin and Kat, 2003b, Titman and Tiu, 2011; Bollen and Whaley, 2009), which is a key concern from the perspective of investors because they want to identify funds, which will outperform going forward. Among the factors associated with hedge fund performance are manager characteristics (Li et al., 2011), disclosure and transparency (Agarwal et al., 2013; Aragon, Hertzel and Shi, 2013), fee structures (Agarwal, Daniel and Naik, 2009) and contractual clauses (Goetzmann, Ingersoll and Ross, 2003; Amin and Kat, 2003b), such as lockup restrictions (Aragon, 2007), which decide when and how

much of the hedge fund returns actually end up with investors (Dichev and Yu, 2011). Triggered by spectacular hedge fund failures or hedge fund fraud, another concern for investors connected to performance is the correctness and accuracy of returns reported by hedge funds (Bollen and Pool, 2012; Liang, 2003) and the danger for the survival of a hedge fund firm coming from operational risk (i.e. failed internal procedures or inadequate disclosure of legal or regulatory problems; Brown, Goetzmann, Liang, and Schwarz, 2008, 2009 and 2012).

Second, as far as investor behaviour is concerned, investors seem to exhibit 'return-chasing' behaviour, where capital allocations are based on past hedge fund returns (Ramadorai, 2013; Fung et al., 2008). Related to this debate of return chasing is the research on performance persistence. If performance of hedge funds was persistent, chasing of past returns may be a sensible strategy for investors. Although studies could empirically identify some level of performance persistence (mostly in the short to medium term), returns in hedge funds overall are not performance persistent (Jagannathan et al., 2010; Agarwal and Naik, 2000).

Third, the finance perspective on hedge funds is concerned with financial portfolio management (e.g. Markowitz, 1959) and the risk and return consequences for the overall portfolio if an investor allocates a part of her capital to hedge funds. Among the factors noted is a diversification benefit, which originates from hedge fund returns exhibiting a low correlation with returns of stocks or bonds (Edwards, 1999). However, the higher moments of the return distribution, such as skewness or kurtosis and non-linear payoffs associated with specific trading strategies (Agarwal and Naik, 2004) also play a role in assessing the potential benefits of adding hedge funds to a portfolio (Amin and Kat, 2003a).

Overall, the finance literature has assumed a passive or at best monitoring role of hedge fund investors without mentioning a potential symbiotic, co-creating function of investors in the identification, assessment and execution of investment opportunities.

The hypothesis development in this chapter is grounded in rich qualitative 'micro' data from expert interviews with hedge fund managers and other actors in the industry, an approach rarely taken by finance studies, which tend to focus on the investigation of aggregated 'macro' behaviour of economic actors.

Considering the qualitative and quantitative evidence provided in this chapter, the silence in the literature about the active, co-creating role of investors seems striking, since hedge fund managers and investors perceived the role of investors to encompass more than the mere provision of capital and regular monitoring. This chapter provides first evidence and documentation of the phenomenon of the active firm-investor network and makes an initial attempt to describe and make explicit this hitherto largely tacit practitioner knowledge.

3.3.3 Literature in the field of sociology of finance. Although not primarily concerned with the implications of the firm-customer relationship, the literature in the area of the sociology of finance (a branch of the wider field of economic sociology; e.g. Granovetter, 1985; Fligstein, 1990; Zuckerman, 1999) has provided new insights on actors in financial markets.

Using largely qualitative data, such as interviews or ethnographic observation research, sociologists of finance conceptualise financial markets as large social systems, in which human actors as well as technological artefacts (e.g. trading systems) interact. This interest in the combination of the human and the technological component of financial markets has lead this field to focus on technology-intensive empirical settings, such as high frequency trading (MacKenzie et al., 2012), the pricing and trading of complex financial instruments

(MacKenzie, 2011 and MacKenzie, 2012) or arbitrage trading in the age of quantitative finance (Beunza and Stark, 2004 and Beunza et al., 2006).

In qualitative enquiries about the interaction of human actors and technology, hedge funds sometimes served as settings. For example in a case study (MacKenzie, 2003), which describes sociological aspects of arbitrage, such as the possibility that arbitrageurs know and imitate each other, as factors contributing to the collapse of the hedge fund Long Term Capital Management. Another example is a study by Hardie and MacKenzie (2007), which describes the 'agencement' (i.e. assemblage of human beings and technological artefacts) of a hedge fund as an 'economic actor'. An additional interesting application of the hedge fund context using a sociology of finance/strategy perspective relates to networks of hedge funds with their service providers (Baden-Fuller et al., 2013).

The discourse in the sociology of finance has mainly relied on observation research and interview data and rarely linked the observations involving one or a limited set of firms to larger, quantitative macro data providing insights on the aggregate behaviour of firms in an industry. This chapter attempts to address this gap by linking qualitative insights on the firm-investor network to the analysis of a large-scale dataset on the hedge fund industry. Furthermore, the sociology of finance literature has mainly focused on the interaction (aided by technology) of economic actors in liquid markets, buying and selling homogenous and standardised products through continuous market making (e.g. MacKenzie, 2012). The present study sheds first light on the firm-investor relationship as a potentially interesting second type of 'market', which seems more idiosyncratic, less liquid and less transparent. Here, the exchange of a homogenous good (i.e. capital) forms the basis of an investment relationship, in which a heterogeneous good (i.e. information/knowledge) is exchanged.

3.4 Qualitative and Quantitative Data and Methods of Analysis

This thesis chapter utilises both qualitative and quantitative data. The following paragraphs introduce the data and describe the methods of analysis.

3.4.1 Qualitative Data and Methods of Analysis

The qualitative section draws on expert interviews with hedge fund managers, investors and other stakeholders in the hedge fund industry (e.g. regulators, bankers). In general, the exploratory qualitative enquiry is limited in its extent and only serves as input to the hypotheses development for the quantitative data analysis on a large-scale hedge fund dataset. The following paragraphs provide information about how interview partners were accessed and selected and how the researcher prepared, executed and analysed the interviews.

3.4.1.1 Accessing interview partners. *"Research access to hedge funds is hard. The sector is a discreet one, partly through necessity (the non-solicitation requirement), partly through choice, with many hedge-fund managers traditionally shunning personal publicity"* (Hardie and MacKenzie, 2007, p. 61).

The study of hedge fund firms and their leaders (i.e. hedge fund managers) and other stakeholders (e.g. investors, regulators) is the study of an elite in the financial industry. Hence, access to interview partners is a major challenge, as pointed out by Hardie and MacKenzie (2007) and Kvale and Brinkmann (2009, p. 147): "Obtaining access to the interviewees is a key problem when studying elites". This may be part of the reason why there are only few studies, which collected qualitative data in the hedge fund industry (notable exceptions include: MacKenzie, 2003, Hardie and MacKenzie, 2007 and Simon, Millo, Kellard, and Engel, 2010). The partners and employees of investment management firms usually shy the limelight and maintain a very low public profile in order (a) to avoid drawing unnecessary public scrutiny to their investment activities and (b) to avoid providing

outsiders with information or clues about their closely held, proprietary investment approach. The investment profession, and hedge funds in particular, have received a lot of bad press recently where they were portrayed as "akin to financial pirates, preying on the innocents" (Kroijer, 2010, p. ix). Resentments against investment managers, particularly hedge fund firms, may vary by cultural setting as one interviewee pointed out: "In Germany it is almost a cultural taboo to deal with hedge funds". This conversation partner described the origin of the professional as well as the emotional criticism hedge funds receive with a vivid metaphor: "when a pub fight breaks out you often don't hit the guy who started the fight but the one whom you hate the most".

Despite these barriers, the researcher obtained access to hedge fund practitioners via a two-tiered strategy: (1) attending talks by hedge fund practitioners in university settings, particularly at Cass Business School, the Wharton School and London Business School and (2) attending/presenting at various international flagship conferences directed to a practitioner audience in the following years: 2011 (London), 2012 (Paris, London), 2013 (New York, London) and 2014 (Paris). Informal contacts made at the conference were invited to a conversation. Conversation partners had to be leaders of their firms with substantial industry experience (Flick, 2009). Leadership in their firms (i.e. partners, investment managers) seems important because this increases the likelihood that conversation partners' views have an impact on reality, i.e. that views and opinions are translated into action in the firm. People with different angles on the hedge fund industry were selected, most importantly hedge fund managers and hedge fund investors (i.e. 'producers' and 'customers'), in order to obtain a variety of viewpoints, which may mitigate potential biases or 'common views' prevalent within one stakeholder group.

25 experts shared their thoughts in conversations of c. 45 minutes in length. With 19 of these experts the researcher was able to arrange a meeting in person (preferred option) whereas 6 experts were interviewed via telephone.

The 25 hedge fund practitioners belonged to 14 different firms. The interviewees were split up in 14 practitioners from hedge funds, 5 practitioners from institutional investors (university endowments, family offices, insurance companies), 3 practitioners from one of the world's leading financial regulators, one practitioner from an investment consultancy, one practitioner from one of the world's four largest central banks and one practitioner who was a former investment manager and managing director at one of the nine bulge bracket investment banks.

In terms of job rank, 13 of these practitioners were partners or investment directors at their firms with an industry experience between 10 and 25 years, 4 practitioners were senior portfolio managers with industry experience between 5 and 10 years, 8 were investment analysts or specialists such as legal, regulatory or operations professionals with an industry experience between 3 and 20 years.

In terms of geography, 15 of the interviewees were based in the UK, 6 of the interviewees were based in the US, 3 of the interviewees were based in Germany and 1 interviewee was based in Hong Kong. The interviews were conducted in 2013 (with the exception of two interviews, which were conducted in 2012 and early 2014, respectively). All interviews were open-ended in structure and were conducted by the author. The participants were assured full anonymity in terms of their person as well as their firms, which is why this chapter only provides job ranks for people and AUM categories for firms.

In terms of organisational characteristics of the hedge fund firms in the study, their size was small to medium, with average assets under management of USD 534m and an average

number of 16 employees. Their investment focus was mostly in equity and corporate debt (and some commodities and real assets) of small to medium-sized companies in developed countries with the large majority of investments being in Europe and the United States.

3.4.1.2 Preparation of the interviews. An important part of the preparation for the interviewer is to demonstrate familiarity with the industry. The author did this by pointing out his research focus and professional experience in the finance industry. Knowledge about the current issues and topics of debate in the industry was obtained through attendance of specialist practitioner conferences and reading of the financial and trade press (i.e. specialist publications for the hedge fund industry). In expert interviews in particular, it is important that the interviewee perceives the interviewer as knowledgeable, which makes spending time on the interview worth their while. Expert interviews "demand a high level of expertise from the interviewer" and the confidentiality concerns of experts and elites often lead to "reservations about tape recording" (both quotes: Flick, 2009, p. 168). Due to the high secrecy level of the industry and the seniority of most interviewees, practitioners were not comfortable with being voice recorded. During the conversation, handwritten notes were taken as a 'condensed account' (Spradley, 1979) which were typed up and extended right after the conversation (Kvale and Brinkmann, 2009; Flick, 2009).

In order to be perceived as knowledgeable partner, it is important that the interviewer is familiar with the CV of the interviewed person. The researcher did this before every interview with the help of the company webpage, the LinkedIn profile of the interview partner or materials the company provided (e.g. organisational chart). Kvale and Brinkmann, (2009, p. 147) summarise the challenge of the interviewer being a co-expert in the following way: "The interviewer should be knowledgeable about the topic of concern and master of the technical language, as well as be familiar with the social situation and biography of the

interviewee […] knowledge of the interview topic will gain respect and be able to achieve an extent of symmetry in the interview relationship".

3.4.1.3 Execution of the Interviews. In the beginning of each interview, the researcher briefly recapped why he is interested in the hedge fund industry and how his academic and professional experience relates to the industry. Along the lines of Spradley (1979), Kvale and Brinkmann, (2009) and Flick (2009), the interviewer acted as an attentive listener who posed open questions at the beginning and follow-up questions that emerged out of what the conversation partner said (mostly to have him or her elaborate on a certain point mentioned).

The interviews usually had two parts: After the introduction, the conversation first started out with some general comments from practitioners on the researcher's topics of interest (e.g. hedge fund survival, performance and diversification). The extensiveness of the discussion around this part depended on the interview partner's specific expertise and willingness to share thoughts about the research findings. The second part was open in structure and dealt with the interview partners' thoughts on which factors make the hedge fund firm successful over the long term. The topic of the firm-investor network evolved and took shape as interesting issue in the course of these exploratory practitioner conversations.

3.4.1.4 Processing and structuring of the answers. After the interviews, the researcher tried to identify themes in what the conversation partner noted (i.e. what he/she described as important in influencing the success of the HFMC). The researcher then compared these themes with factors influencing the success of a hedge fund as identified in the literature. It may be expected (and to some extent reassuring) that many of the mentioned themes have been noted the literature. Chapter 3.5 presents the qualitative evidence on the active firm-investor network, as well as the 'side themes' influencing hedge fund success identified in the exploratory qualitative enquiry.

3.4.1.5 Potential biases associated with the qualitative enquiry. The exploratory expert interviews may be subject to several biases that have been identified to affect qualitative research. Along the lines of Collier and Mahoney (1996, p. 59), bias is understood as "systematic error that is expected to occur in a given context of research, whereas "error" is generally taken to mean any difference between an estimated value and the "true" value of a variable or parameter, whether the difference follows a systematic pattern or not".

This section will discuss the following three categories of bias: (1) selection bias, as well as biases introduced to the study by (2) interview partners and (3) the researcher (i.e. investigator bias).

First, selection bias may occur when selection processes occur in the design of the study or the studied phenomenon (Collier and Mahoney, 1996). In the exploratory qualitative enquiry, the main selection process, which occurred, is the selection of interview partners. This selection of interview partners seemed to have been a two sided selection, where the researcher made contact with (e.g. at conferences, please see chapter 1) and invited industry experts for a conversation, however the selected interview partners also chose to agree to engage in a conversation with the researcher. Selection bias could mean that the observed phenomenon of the firm-investor network is overstated in the sample compared to the overall population. This concern seems to be alleviated by the main empirical analysis in this chapter, i.e. the investigation of the survival and performance consequences of the firm-investor network in a large-scale quantitative dataset.

A related concern to the classical selection bias is that the qualitative enquiry may shed light on the phenomenon only from the perspective of one group of actors. This bias of a 'common lens' on the phenomenon was alleviated by construction of a diverse sample of interview partners (Daly and Lumley, 2002). The researcher talked about the firm-investor network not

only with experts from hedge fund firms, but also from investors, a regulator, a central bank, an investment consultancy and an investment bank.[24]

Second, among the biases introduced by the respondents may be recall bias (Huber and Power, 1985), in which they have difficulties recalling events or their experience relating to the studied phenomenon. This bias was alleviated since a large majority of the interview partners (23 out of 25) were involved with the firm-investor network in their current occupation. Furthermore, the interview partners may not have the information of interest (Huber and Power, 1985) or may not be in a position to shape the firm according to their opinions (Flick, 2009). In order to ensure that interview partners' opinions had a tangible impact on their firms, interview partners had to be leaders with considerable experience and authority to impact the direction of their firms. Impression management and retrospective sensemaking may be further potential biases in qualitative research introduced by the interview partners. The diverse sample with a variety of perspectives (hedge fund managers, investors, regulators, etc.) seems to alleviate this concern, since it seems not likely that "varied informants will engage in convergent retrospective sensemaking and/or impression management" (Eisenhardt and Graebner, 2007, p. 28).

Third, regarding biases introduced by the researcher ('researcher bias' (Eisenhardt, 1989) or 'investigator bias' (Sutton, 1997)), it is important to acknowledge that interviewing often includes a subjective element as "knowledge is constructed in the interaction between interviewer and interviewee" (Kvale and Brinkmann, 2009, p. 2), which seems to give each interview a 'unique' character. This especially seems to be the case since the interviewer is part of the knowledge creation during the interview. The acknowledged, active role of the researcher may however also be considered as an advantage as it may "come to highlight

[24] A trade-off in this approach of constructing a sample with diverse perspectives however was that in most firms, only one respondent was interviewed.

specific aspects of the phenomena investigated and bring new dimensions forward, contributing to a multiperspectival construction of knowledge" (Kvale and Brinkmann, 2009, p. 170). As interviews could not be tape recorded, this subjective element may extend to the researcher's notes and written records of the exploratory interviews.

In general, discussions of potential bias revolve around the underlying concern that the research findings may not be generalisable to a wider set of firms (e.g. Collier and Mahoney, 1996; Eisenhardt and Graebner, 2007; Shah and Corley, 2006; Eisenhardt, 1989; Sutton, 1997). Compared to studies, which use only qualitative research, this chapter identified a phenomenon (the firm-investor network) through qualitative research, *which is subsequently tested in a large-scale quantitative dataset*. This triangulation across data sources and analysis techniques may provide enhanced confidence about the generalisability of the phenomenon. In fact, analysing the organisational characteristics of the firms in the qualitative study gave the researcher a sense of the way in which the studied firms, which showed an active firm-investor network, may be distinctive (Collier and Mahoney, 1996) compared to the 'average firm' in the industry. This in turn informed the construction of the proxy measure (please see chapter 3.4.2.1 for further details).

3.4.2 Quantitative Data and Methods of Analysis

In a second step, the impact of the firm-investor network on HFMC survival and performance is investigated using a large-scale quantitative dataset. This triangulation (Flick, 2009) across data sources and methods (qualitative and quantitative data analysis), as well as the consistency of the qualitative and quantitative results may yield some confidence about the validity of the presented concept of the firm-investor network.

This quantitative application of the idea of the hedge fund firm-investor network draws on a large-scale hedge fund panel dataset, which was also used in the previous chapter of this thesis. Although a quantitative dataset does not provide evidence as deep and rich as the interviews, it provides a perspective on whether the idea, which emerged from the practitioner conversations, may hold up across a large-scale sample of the hedge fund industry.

3.4.2.1 Creation of a firm-investor network proxy for use in the large-scale dataset. Analysing the statements made by the interview partners, as well as the organisational characteristics of the firms, which participated in the exploratory expert interviews, gave the researcher an idea how firms that showed an active firm-investor network, may be distinctive (Collier and Mahoney, 1996) compared to the 'average firm' in the hedge fund industry. These insights from the qualitative research informed the construction of the proxy measure.

Since the TASS database is a commercial database targeted at institutional investors interested in investing in hedge fund firms, the database does not offer explicit information on investors. Based on the qualitative enquiry and supplemented by evidence in the practitioner and academic literature, a proxy measure was created using important *organisational characteristics*, which turned out to be common to firms with an active firm-investor network. For more details on how the components of the proxy measure relate to the qualitative enquiry, please see Table 7.

In addition to evidence from the qualitative enquiry, insights on the location and expertise of hedge fund investors, as well as profit opportunities under market inefficiencies were taken from the practitioner (Prequin, 2013; Ernst and Young 2013; Prequin 2012) and academic literature (Chordia et al., 2005; La Porta et al., 1997; Dahlquist and Robertsson, 2001; Dvorak, 2005; Leuz et al., 2009).

The proxy measure is composed of the following three elements:

(1) *Co-Location*: The first criterion of the proxy is that the hedge funds are located where the majority of hedge fund investors are located. The three main geographical areas where hedge fund investors are located are North America (US and Canada), Europe and Japan. Evidence in the *Ernst and Young 2013 Hedge Fund Survey* showed that 51% of hedge fund investors come from North America, 44% from Europe and 5% from Asia, mainly Japan (Ernst and Young, 2013 and Prequin, 2013).

Co-location of funds and investors may be an important aspect of the development of an active firm-investor network since it may facilitate in-person meetings for discussion and exchange of in-depth investment information. A managing partner of a firm in the USD 250-500m AUM category indicated that private investors (high net worth individuals), as well as family offices are especially interested in such (regular) meetings.

The investment director of natural resource/commodity investments at a larger fund (AUM category: USD 1-5bn) viewed the potential virtues of co-location from a different angle: His firm has its core investor base in the country where its headquarters are located. With more 'exotic' investments, such as natural resources or commodities, regular face-to-face meetings with investors seem to be necessary to educate the investors regarding the asset class, as well as its legal and tax implications. Furthermore, face-to-face meetings help to overcome career risk concerns of the institutional investor's investment officers, who often do not want to take the risk (and responsibility) for potential investment losses in a newly entered asset class.

This co-location may not only be a matter of coincidence but some firms seem to purposefully invest into being close to their investors. This is illustrated by the firm of one conversation partner (investment manager; AUM category: USD 1-5bn), which opened new offices in large cities in Eastern Europe and Central Europe in order to be close to current and future investors as well as potential new investments. The closeness to potential new investments may arise naturally since investment ideas generated from the firm-investor network seem to be likely in the 'home market' of the investor, which ties to the second component of the proxy: 'investment focus'.

Please note that the proxy measure understands co-location in a fairly broad sense, not as location in a specific country but as location of a hedge fund in a geographic region where research indicated that a majority of the hedge fund investors are located (i.e. Europe, North America or Japan; Ernst and Young, 2013 and Prequin, 2013). This takes into account the increasing integration of economic regions such as North America and Europe, where country borders seem to decrease in importance for the demarcation of 'co-location'.

(2) *Investment Focus*: The second component of the proxy is that the location of the hedge fund (in one of the three regions where investors are predominantly located: North America, Europe or Japan, as described in the previous point above) has to match with the geographic investment focus of the fund.

In connection to the previous point, the firm of the interviewed investment manager (AUM category: USD 1-5bn) has local offices in 4 different countries and initiates and monitors investments in these markets from the local offices in these countries (investment focus: renewable energy, healthcare). A partner at a different hedge fund firm (AUM category: USD 1-5bn) noted that sparring of ideas for future investments

(and solving of potential issues with problematic current investments) happens among others during annual visits of cornerstone investors to the premises of the fund and to selected underlying portfolio companies. The location of the firm, its main investor base (among others a large Northern European pension fund and a Western European railway pension scheme) and its investment focus are in Europe.

This match of location and investment focus in regions where HF investors are located seems important because investors may be especially knowledgeable partners as far as their home investment market is concerned (e.g. Dahlquist and Robertsson, 2001; Dvorak, 2005 and Leuz et al., 2009). Along those lines, the *Prequin 2012 Hedge Fund Study* (Prequin, 2012) found that investors' leading regional preferences for hedge fund investment are North America (51%), Europe (27%) and Asia (14%).

As with the previous point, please note that the match of location and investment focus is done on the level of the region, not the individual country (an example of a 'match' of the first two proxy criteria would be 'location of fund = Europe' and 'investment focus of fund = Europe').

(3) *Focus on less information efficient assets:* In addition to being located in hedge fund investors' regions and having a match between location and investment focus, the emphasis on less information efficient assets seems important for the value add of an active firm-investor network. If hedge fund firms focus on very information efficient assets (e.g. large capitalization[25] stocks) there may not be a lot of information benefit the firm-investor network can provide. This limited benefit seems to be due to the widespread attention and coverage these large cap stocks (e.g. Apple, Inc.) receive in

[25] Market capitalisation is the market value of a company (market capitalisation = current share price * shares outstanding). 'Small capitalisation' or 'small cap' is understood to be the lowest quartile of firms on an equity market ranked by market capitalisation. 'Large cap' is the top quartile of companies ranked by market capitalisation and 'mid cap' are the two quartiles in between small and large cap (e.g. Bauman, Conover and Miller, 1998).

the media as well as investment bank research (i.e. it is harder to note a piece of information or generate an investment thesis which has not been articulated or acted upon by another market participant).

However if the firm focuses on small and medium cap firms, the pricing inefficiencies in these stocks may be a lot higher (i.e. there are more profit opportunities; e.g. Chordia et al., 2005; La Porta et al., 1997).

Firms in the qualitative part of the study with an active firm-investor network seem to exhibit this focus on small and medium market capitalisation stocks. For example, a partner of a firm located in Europe (AUM category: USD 1-5bn) focused on European companies in the small and medium market capitalisation range. The hedge fund firm invested for example in stocks of a Northern European news and publishing company (market capitalisation: ca. EUR 150m), a Spanish firm in the food production industry (market capitalisation: ca. EUR 2bn), and a German machine tool producer (market capitalisation: ca. EUR 2bn). Along the same lines, the firm of an interviewed Managing Partner (AUM category: USD 250-500m) invested in small cap firms such as a natural resources exploitation company (market cap: ca. € 40m) and a biotech company (market cap: ca. € 350m)

In summary, the proxy measure for the active firm-investor network measures the number of funds offered by the hedge fund firm, which fulfil all of the three components of the proxy described above. This means they are (1) located in the region of investors, (2) the funds' investment focus matches with its geographic region of location and (3) the funds focus on less information efficient assets (i.e. small and mid cap stocks).

As illustration of the measurement of the active-firm investor network proxy variable, a hedge fund firm, which offers two funds, which are (1) located in Europe, (2) have their

investment focus in Europe and (3) invest in small or medium capitalisation stocks in Europe (for example one of the funds specialises in industrials and the other fund specialises in consumer goods) would receive a score on the proxy measure of 2. An assumption of the proxy measure is that all three conditions have to be fulfilled in order for an active firm-investor network to be present. Hence, the score on the proxy measure would not change if the hedge fund firm offered other funds, which do not fulfil the three conditions of the proxy outlined above (e.g. an additional fund, which specialises on large cap stocks).

Table 7: Connection between the components of the proxy measure and insights from the qualitative data[26]

Component	Statement/Observation
Co-Location	*Investment Manager [$1-5bn]:* Local closeness to current and potential investors, as well as potential investment targets, is viewed as very important by the investment manager's firm. For this reason the firm opened two new offices in large cities in Eastern Europe and Central Europe *Investment Director Natural Resource/Commodity Investments [$1-5bn]:* Firm has its core investor base in the country where its headquarters are located; With more exotic investments, regular face-to-face meetings with investors (conversation partner gave the example of a conservatively investing European insurance company which would commit USD500m-USD1bn once the "dam breaks") are necessary. These meetings serve two purposes: First, an educational purpose regarding the asset class and its legal and tax implications, as well as helping to overcome career risk concerns of the institutional investor's investment officers since they often do not want to take the risk (and responsibility) for potential investment losses in a newly entered asset class *Partner [$1-5bn],* pointed out that the firm is co-located in the same city (London) with its most important, cornerstone investor (entrepreneur in the financial services industry) *Managing Partner [$250-500m]* pointed out that family offices and private investors encourage an ongoing conversation and may want to arrange meetings. Co-location seems to facilitate the organization and execution of these (regular) meetings (which may include visits to the offices of the fund, as the General Manager in the same firm pointed out)
Investment Focus	*Investment Manager [$1-5bn]:* Firm of investment manager has offices in 4 different countries and initiates and monitors investments in these markets from the local offices in these countries (investment focus: renewable energy, healthcare) *Partner of Fund [$1-5bn]:* Sparring of investment ideas for future investments (and solving of potential issues with problematic current investments) happens among others during annual visits of cornerstone investors to the premises of the fund and to selected underlying portfolio companies. The location of the firm, its main investor base (among others a large Northern European pension fund and a Western European railway pension scheme) and its investment focus are in Europe. *Senior Investment Associate at Endowment Fund ($>5bn):* Since 2000, c. 70% of alternative investments were allocated in the US (same country as the location of the endowment)
Less Information Efficient Assets	*Partner of Fund [$1-5bn]:* Fund has a focus on European companies in the small and medium market capitalization range, examples of investments: Northern European news and publishing company (market cap: ca. € 2bn), Spanish firm in the food production industry (market cap: ca. € 2bn), German machine tool producer (market cap: ca. € 2bn) *Partner and CIO at Investment Office of Family Endowment [$500m-1bn]:* Investment office is located in Central Europe; Investment focus is on European small market capitalization companies (market cap range: €50-500m), investment focus: healthcare, consumer goods, industrials *Managing Director of University Endowment ($1-5bn):* Investment niches with low engagement/ownership of institutional investors have more (profitable) investment opportunities. The investment firm of the *Managing Partner [$250-500m]* invests in small cap firms, examples: natural resources exploitation company (market cap: ca. € 40m) and biotech company (market cap: ca. €350m)

[26] If available, the interview evidence was augmented by additional information from the hedge fund firms' or the investee companies' home pages.

3.4.2.2 Dataset and variable definitions. The same quantitative dataset as in chapter 2 is used for the empirical analysis. The data for the empirical analysis comes from the Lipper TASS hedge fund database with monthly observations between January 1994 and November 2012. The overall sample size is 219,479 firm-month observations of 3,295 HFMCs.

For the analysis, funds of funds were excluded from the dataset since they are not just an 'investment style' but represent, as additional intermediary, a very different firm from 'regular' hedge fund management companies. In order to deal with outliers, all variables (except those ranging between 0 and 1) were winsorised at the 1% and 99% tails (cf. Klein and Zur, 2009).

The analysis focuses on two dependent variables: hedge fund firm performance and survival. Hedge fund firm performance is measured by the returns of the hedge fund firm. The returns of the hedge fund firm *i* in month *t* are the returns of the underlying funds *j* weighted by assets under management[27] (AUM) in *t-1*:

$$HFMC\ Return_{i,t} = \frac{\sum_j AUM_{j,t-1}(1+ReturnFund_{j,t})}{\sum_j AUM_{j,t-1}}$$

The second dependent variable is hedge fund firm failure. A hedge fund firm is defined as dead if all its underlying funds stopped reporting (e.g. Grecu, Malkiel and Saha, 2007) to the database *and* at least one underlying fund was classified as 'liquidated' in the database. Of the 3,295 hedge fund management companies in the sample, this definition classifies 941 firms (28.6%) as 'dead'. This variable is operationalised for the fixed effects panel OLS regressions with a dynamic indicator variable that takes the value of one in the 12 months prior to the date that the hedge fund management company 'died' (marking the 'failure zone'

[27] Since the calculation of the AUM-weighted returns for the management company requires assets under management, observations with missing AUM were excluded from the analysis.

of a firm). For the Cox regressions, the indicator variable was recoded to turn one only in the month that the hedge fund firm died.

Firm failure is a basic, yet unambiguous and important variable to gauge the impact of the firm-investor network. This variable seems especially useful in a setting such as the hedge fund industry, where the risk of failure is real to the firms since they tend to be small and entrepreneurial, without 'corporate fat pads' to buffer shocks from the environment. Considering survivorship as the flipside of failure, Nobel laureate and hedge fund manager Myron Scholes, understands hedge fund firm survivorship as "the proof of a value added activity" (Scholes, 2004, p. 10).

The main explanatory variable is the 'active firm-investor network', which denotes the number of funds under the management of the hedge fund firm, which fulfil the three criteria detailed above (1. location in Europe, North America or Japan; 2. match of location and investment focus; 3. focus on informationally less efficient assets).

The analysis includes several control variables such as the standard deviation, skewness and kurtosis of returns, as well as the hedge fund firm's size (natural logarithm of assets under management), the firm's age and its degree of intra-industry diversification (i.e. how many fund products the HFMC has under management; the focus of chapter 2 in this thesis). Capital flows to the hedge fund firm are a further control variable. The relative flows of capital for hedge fund firm *i* in month *t* are defined as follows (e.g. Agarwal, Daniel and Naik, 2009; Fung, Hsieh, Naik and Ramadorai 2008):

$$HRMC\ Flows_{i,t} = \frac{HFMC\ AUM_{i,t} - HFMC\ AUM_{i,t-1}\ (1+HFMC\ Return_{i,t})}{HFMC\ AUM_{i,t-1}}$$

In addition, Fung and Hsieh eight factor alphas were calculated. All alpha measures were calculated in a rolling window regression with a 'learning period' of 12 months. Following

the standard method of Fung and Hsieh (2001 and 2004), the fund returns above the risk free rate are regressed against the following eight factors, the constant in the regression is 'alpha': 1. Equity factor (S&P 500), 2. equity size factor (Russell 2000 less S&P 500), 3. emerging market factor (MSCI Emerging Market Index), 4. bond market factor (constant maturity adjusted ten-year Treasury bond yield), 5. bond credit spread factor (change in Moody's BAA credit spread over a constant-maturity adjusted 10 year Treasury bond yield) and three trend-following option factors formed from excess returns on portfolios of lookback straddles for 6. bonds, 7. currencies and 8. commodities[28].

3.4.2.3 Regression Models. The effect of the 'active firm-investor network' on the returns of the hedge fund firm is investigated using the following OLS fixed effects panel regression:

$$HFMC\ Return_{i,t} = \beta_0 + \beta_1\ Active\ Firm\text{-}Investor\ Network_{i,t} + \beta_2\ Intra\text{-}Industry\ Diversification_{i,t} + \beta_3\ HFMC\ LnAUM_{i,t} + \beta_4\ HFMC\ Age_{i,t} + \alpha_i + \delta_t + u_{i,t}$$

α_i reflects the hedge fund firm fixed effects in order to account for unobserved firm-level heterogeneity and δ_t reflects year fixed effects. Standard errors are robust to heteroscedasticity and are clustered on the level of the hedge fund firm in order to account for within-firm correlation over time.

The effect of the 'active firm-investor network' on the survival of the hedge fund firm *i* in month *t* is investigated using the following model (OLS fixed effects panel regression):

$$HFMC\ Failure_{i,t} = \beta_0 + \beta_1\ Active\ Firm\text{-}Investor\ Network_{i,t} + \beta_2\ HFMC\ Return_{i,t} + \beta_3\ Standard\ Deviation\ of\ Returns_{i,t} + \beta_4\ Skewness\ of\ Returns_{i,t}$$

[28] Further information on the eight risk factors and the composition of the model can be found on David Hsieh's homepage: http://faculty.fuqua.duke.edu/~dah7/HFRFData.htm

$$+ \beta_5 \, Kurtosis\ of\ Returns_{i,t} + \beta_6 \, HFMC\ 8\ Factor\ Alpha_{i,t}$$

$$+ \beta_7 \, HFMC\ Flows_{i,t} + \beta_8 \, Intra\text{-}Industry\ Diversification_{i,t}$$

$$+ \beta_9 \, HFMC\ ln\ AUM_{,t} + \beta_{10} \, HFMC\ Age_{i,t} + \alpha_i + \delta_t + u_{i,t}$$

α_i reflects the hedge fund firm fixed effects in order to account for unobserved firm-level heterogeneity and δ_t reflects year fixed effects. Standard errors are robust to heteroscedasticity and are clustered on the level of the hedge fund firm in order to account for within-firm correlation over time.

In addition to the OLS fixed effects panel regression, a Cox regression (e.g. Miller, 2012) was run with the same covariates. The Cox model takes the following functional form:

$$h_i(t) = h(t) \exp(x_i \beta)$$

h_i is the mortality hazard rate at time t for firm i. On the right hand side of the equation, h(t) is the unspecified baseline mortality hazard rate whereas x_i is a vector of covariates (the same as in the OLS fixed effects panel model) and β is a vector of covariate coefficients.

3.5 Findings of the Qualitative Enquiry and Development of Hypotheses for the Quantitative Analysis

As indicated in the description of the qualitative methods, themes influencing the success and competitiveness of a hedge fund firm were identified from the qualitative evidence and compared to the insights the literature provides. Before the discussion of the qualitative evidence focuses on the 'main theme' of this chapter (i.e. the active firm-investor network), this section introduces other 'side themes' that were identified in the qualitative enquiry. Table 8 provides an overview of the identified themes other than the active firm-investor network and links them to works in the literature on hedge funds, which correspond to and reflect these themes.

Table 8: 'Side-themes' other than the active firm investor network influencing hedge fund firm competitiveness

Theme	Evidence in Qualitative Data	Reflected in the Literature
Past Performance (Track Record)	*Investment Director [$1-5bn]:* Investors have a return chasing behavior, which can lead to herding, since some investors need the reassurance that other investors are also actively investing in the same field. *Partner [$1-5bn]:* Performance can also bring a fund into a challenging situation since investors want to 'cash out' after a period of excellent performance. *Managing Director of Endowment [$>5bn]:* When looking at performance, not only asset appreciation but also yield should be taken into account. Asset appreciation needs to be watched with care since it means that somebody would pay more money for the exact same asset sometime in the future. If people focus too much on asset appreciation, a bubble may be around the corner. *Managing Director of Endowment [$1-5bn]:* In general, more money will move into a nascent asset class or investment strategy as more managers can show a track record: "It's a little bit like a chicken and egg problem. Managers can't build experience if they don't have money to manage". *Senior Investment Associate at Endowment [>5bn AUM]:* "Due to their [hedge funds'] lack of transparency regarding portfolio positions and investment strategy, investors rely more on seeing a successful track record. Probably more than they should."; "Institutional investors are probably just as bad as retail investors and chase returns allocating money to firms with the highest prior returns". *Former Investment Manager at Family Office [$500-1bn]:* Institutional investors are not immune against herding and are likely overemphasizing the importance of the past return track record in their decision making.	Jagannathan et al., 2010; Agarwal and Naik, 2000; Dichev and Yu, 2011; Fung, Hsieh, Naik and Ramadorai, 2008; Fung and Hsieh, 2006; Baquero., ter Horst and Verbeek, 2005; Gregoriou, 2002; Liang, 2000
Leverage	*Conversation with three Regulation Officers at a Leading Financial Regulator:* "If there is no leverage there is hardly any systemic risk". Regulator is interested in identifying gross leverage instead of netted data. Counterparties and clearing houses are linkages in the financial system regarding transmission of risk. *Founding Partner of Fund [$100-250m]:* An investment manager has to be careful with leverage.	Ang, Gorovyy and van Inwegen, 2011; Liang, 2000; Fung and Hsieh, 1999
External Risk Factors Originating from Underlying Investments	*Research Analyst [at Investment Consultancy]:* For investors, political risk (e.g. expropriation) and reputation risk (e.g. through non-sustainable, environmentally harmful activities) are key components in the due diligence phase and the ongoing conversation with the fund managers. *Managing Director of Endowment [$1-5bn]:* Important to consider the impact of an investment on the environment and on the (local) community. If there are only slight doubts regarding how socially responsible an investment is, it will not be executed.	Hong and Kacperczyk, 2009; Chong, Her and Phillips, 2006
Alignment of Interest	*Partner [$1-5bn]:* Alignment of interest is key: All the partners invest in the funds, and "all our employees have to invest a minimum amount of 2,000 GBP into the fund". *Partner and CIO [$500m-1bn]:* To align incentives of the conversation partner with the main investors, the partner has to co-invest about 90% of his own wealth in the investment decisions he makes.	Agarwal, Daniel and Naik, 2009; Clare and Motson, 2009

Table 8 (continued)

Theme	Evidence in Qualitative Data	Reflected in the Literature
Internal Organization and Procedures	*Partner [$1-5bn]:* Written down procedures provide an important frame for daily operations (identifying investment, activities while invested, procedure for exiting investments). However, "these written down procedures are only useful to a certain extent because sometimes a specific situation develops so differently". In addition, having a lessons learned document from past investments is key for learning on the job. *Partner and CIO [$500m-1bn]:* Notes with lessons learned are key parts of employee promotion and bonus. *Investment Manager [$250-500m]:* "Operational risk is underestimated": Most investors have no procedure to assess operational risk of a hedge fund; People coming out of larger institutions and founding a fund really underestimate the importance of operations (e.g. properly dealing with administrator and prime broker: for example double checking the securities positions the administrator provides or checking the profit and loss statement). *Founding Partner [$100-250m]:* Knowledge management is important, especially notes where investment mistakes are analyzed in order to learn from them in the future: "Everybody always talks about 'best practice', nobody talks about 'worst practice', which is unfortunate since learning from your or others' mistakes is important". However the conversation partner acknowledged that it is very challenging to get employees or business partners to openly talk about their mistakes.	Feffer and Kundro, 2003; Brown, Goetzmann, Liang and Schwarz 2008, 2009 and 2012
Investment Approach & Investment Horizon	*Partner and CIO [$500m-1bn]:* Investment decisions in firms are long-term: executed on the basis of an opinion where the investee company will be in 5-20 years. *Managing Director of Endowment [$>5bn]:* The value add of the manager has to be clear for the conversation partner to see the point in paying fees (buying an asset and 'sitting on it' doesn't show a clear value add of the manager). *Managing Director [$>5bn]:* Ongoing value add of manager is assessed carefully beyond selecting, buying and holding an asset. One cannot just count on the fact that an asset will appreciate in value with the manager sitting around and doing nothing. *Founding Partner [$100-250m]:* Manager first and foremost has to be an expert in the investment strategy and needs to select carefully with whom he cooperates (employees and external service providers).	Klein and Zur, 2009; Getmansky, Lo and Mei, 2004; Liang, 1999
Networks (e.g. to service providers and other firms in the industry)	*Investment Manager [$250-500m]:* "Normally, people PB where they come from". Meaning that partners at investment firms normally appoint as prime brokers their former colleagues at the investment bank where they used to work at. Prime Brokers provide important services to a hedge fund firm: leverage, securities borrowing and securities lending. *Managing Partner [$250-500m]:* "Your success depends on the quality of the work you do and the kind of network you have, what kind of people you know". *Former Investment Manager and Managing Director at one of the Nine 'Bulge Bracket' Investment Banks:* Many institutional investors rely on the same set of external investment consultants, who have a list of recommended hedge fund firms.	Baden-Fuller et al., 2013; de Figueiredo, Meyer-Doyle and Rawley, 2013; Simon et al., 2010
Transparency	*Partner [$250-500m]:* Consistency in the transparency question is key; Non-disclosure agreements (NDAs) are an indirect constraint to transparency. Sometimes investors require the asset manager to sign a NDA. *Managing Partner [$250-500m]:* Investors want to know what they own – it is much harder now to raise a 100% discretional fund than it was 5 years ago: "Raising a 100% discretionary fund is not as easy anymore – it is impossible to raise". *General Manager [$250-500m]:* Investors make sure that the business is well run – does not win you additional investors but is a 'given'; Being open is good: "If somebody asks a straight question you gotta give them a straight answer". *Senior HF Expert and Group Leader at one of the World's Top 4 Central Banks:* Split trend in HF firms: the young ones have to be transparent as a prerequisite of getting investors' money whereas the old established ones try to avoid transparency.	Aggarwal and Jorion, 2012; Hedges, 2005; Anson, 2002

Among the 'side themes' influencing a hedge fund firm's competitiveness is the hedge fund firm's past performance (i.e. the hedge fund firm's performance track record). The practitioners mentioned the phenomenon that investors chase returns and allocate capital to firms, which outperformed in the (recent) past. However, a good past performance record may not only imply capital inflows from (new) investors as a partner of a fund (AUM category: USD 1-5bn) pointed out: Existing investors may also decide to realise their profits and redeem their investment. An interest around hedge fund performance can also be identified in the finance literature on hedge funds, which studied for example hedge fund 'return chasing' and performance persistence (Jagannathan et al., 2010; Agarwal and Naik, 2000; Fung, Hsieh, Naik and Ramadorai, 2008), returns for investors (Dichev and Yu, 2011), or the survival enhancing impact of positive hedge fund performance (Baquero., ter Horst and Verbeek, 2005, Liang, 2000 or Gregoriou, 2002).

Other themes influencing the competitiveness of a hedge fund firm identified in the exploratory qualitative enquiry were internal factors such as leverage, organisational procedures as well as the investment approach of the hedge fund firm. While regulators expressed hedge fund leverage as their single biggest concern regarding systemic risk from hedge funds, hedge fund managers noted that the risk coming from inadequate internal procedures or deficient management of internal knowledge tends to be underestimated – an assessment that is mirrored in the extant literature on operational risk (e.g. Brown, Goetzmann, Liang and Schwarz 2008, 2009 and 2012). The investment approach and investment time horizon are important factors identified by practitioners since the value add of the hedge fund firm (i.e. its expertise in an investment strategy) and the time period capital needs to be committed, has to be clear to investors (among others to justify the fairly high fees that hedge fund firms charge).

As far as external stakeholders are concerned, themes such as alignment of interest, networks, transparency and external risk factors seemed to be important to practitioners. Alignment of interest is ensured via co-investment of the hedge fund manager or the hedge fund firm's employees with the regular investors. Networks to external stakeholders other than investors (e.g. service providers such as prime brokers or external consultants) are also seen as an important factor influencing the competitive position of a hedge fund. A theme, which is also reflected in the sociology of finance and strategy literature on hedge funds (e.g. Baden-Fuller et al., 2013; de Figueiredo, Meyer-Doyle and Rawley, 2013; Simon et al., 2010). In the light of recent hedge fund scandals, transparency was identified as a factor influencing the success of a hedge fund firm. Practitioners pointed out that consistency (across all investors) in the transparency question is key and that transparency requirements seem to have increased recently because it has become more difficult to raise fully discretionary, intransparent funds, especially for young, not well established hedge fund firms. Related to transparency are external risk factors, which can adversely affect the hedge fund firm's competitive position. Among these risk factors are political risks (e.g. expropriation) and reputation risks (e.g. through non-sustainable, environmentally harmful activities). These kinds of external risks seem to be especially prevalent in commodity investments, which depend on the exploitation of a natural resource (e.g. crude oil, coal or metals).

3.5.1 The Active Firm-Investor Network

With regard to the 'main theme', i.e. the active firm-investor network, the results of the exploratory qualitative enquiry may hint at possible implications of an active firm-investor network for hedge fund performance and survival. The insights from the expert interviews are taken to develop hypotheses for the quantitative data analysis.

The qualitative evidence suggests that information exchange between the hedge fund firm and its investors is not a one-off event for a particular investment but an ongoing conversation. This ongoing conversation may have a positive effect on a firm's performance and survival. However, it seems important to note that an active firm-investor network also comes at a price since a continued conversation demands an enhanced time investment on the side of the firm, as well as the investor. In conversations, investment managers described the intensive contact with investors to be sometimes "tedious" and "operationally more intensive" (senior analyst of fund in the USD 250-500m AUM category). The founding partner in the same firm seemed to be in 'continuous contact' with investors, which sometimes gave him an aura of 'unhealthy busyness' (he compulsively checked his e-mails and responded to apparently urgent ones three times in a circa 30 minute conversation).

3.5.2 The Active Firm-Investor Network –Effects on Hedge Fund Firm Performance

The interview evidence indicated that in addition to providing capital, investors seem to provide hedge fund firms with non-monetary, information-related benefits: (1) as general sparring partners for an investment idea and (2) as sector experts with deep industry-specific knowledge and networks. In summary, these information related benefits seem to be positively related to hedge fund firm performance.

3.5.2.1 The investor as general sparring partner. Institutional investors (e.g. pension funds, university endowments and family offices) and high net worth individuals seem to have a wealth of exposure to investment ideas in various industries. Hence, they can provide general advice on an investment idea in a sense of a 'sanity check'. Investors obtain an extensive overview of new investment ideas and trends in the asset management industry because hedge fund firms pitch their investment ideas to these investors in the hope to obtain a capital allocation. Hence, investors are in a good position to assess the competitive strength

and profitability of a new trading or investment idea since they have a feel for (1) competitors offering a related product and (2) how much capital is already 'chasing' a specific investment or trading idea.

In addition to hands-on advice on a particular investment, investors can also provide high-level guidance for an investment fund's strategy as the managing partner and CIO of a proprietary investment unit of a large European single family office noted. The sole aim of the investment unit is to invest and increase the (liquid) wealth of the family (its single customer). Although the family did not interfere in daily investment decision making, it provided overall guidance on the temporal (i.e. long-term), sector (focus on manufacturing, medical devices, chemicals) and style (i.e. active ownership, concentrated portfolio, in-depth & in person due diligence) orientation of the investments.

3.5.2.2 The investor as provider of specific sector knowledge and networks. Since many investors, especially family offices and high net worth individuals, have earned their fortunes in specific industries, these types of investors can equip the hedge fund with deep sector expertise and networks to important players in the industry. However, also here, the alignment of interest is important, as a senior analyst (AUM category: USD 250-500m) pointed out: "[You have to] leverage the knowledge of your investors and get the experts of the field to invest with you and to align their incentives with yours […]. It's all about alignment of interest and trust. Especially because you can't be the expert of all industries you are investing in".

A partner, as well as an analyst (both at the same firm, AUM category: USD 250-500m) illustrated the benefit of investors' expertise with an example where one of their fund's cornerstone investors is a successful serial entrepreneur in the biotech industry and the investor played a key role in identifying and assessing the hedge fund firm's biotech

investments. These 'industry-rooted' investors often not only draw on their own expertise but leverage their personal network of contacts in the industry to come up with (a) potential investment targets and (b) a differentiated opinion on a shortlist of potential investment targets.

After the execution of an investment, investors may stay involved, for example via board appointments (evidence provided by partner at fund in the AUM category USD 250-500m) at investee companies. Investors can also be important 'bridge builders' as an example provided by a partner at a hedge fund firm (AUM category: USD 1-5bn) illustrates: This fund is specialised on activist investments into mid-sized, publicly listed companies. Once the fund has taken a stake in a company, the fund managers found it very difficult to get into a conversation with the firm's management because the managers feared that the fund would use its investor muscle to replace them. This fund however has the strategy to cooperate with the existing management of a firm. This 'friendly intent' could only be credibly communicated via the industry contacts of an investor in the fund. This investor reached out to his personal network in the industry and got across the message to the firm that "they are nice people" and that the hedge fund firm has the intent to improve the company in close cooperation with the existing management. Only after this 'third party reference' did the management start an open dialogue with the activist hedge fund firm.

Overall, the evidence from the explorative qualitative enquiry seems to indicate that an active firm investor network may improve the investment decision making for a hedge fund firm and may link the hedge fund firm to valuable sources of information. Hence it seems appropriate to hypothesise that an active firm-investor network enhances hedge fund firm performance.

H1: An active hedge fund firm – investor network enhances hedge fund firm performance.

3.5.3 Active Firm-Investor Network –Effects on Hedge Fund Firm Survival

In addition to performance implications, the qualitative evidence hints at a potentially positive relationship between an active firm-investor relationship and firm survival. Although performance and survival seem to be distinct outcome measures (e.g. Schaffer, 1989; Hill and Birkinshaw, 2007; Kalleberg and Leicht, 1991), investigating both measures may be fruitful as it may lead to a "better and more complete understanding" (Delios and Beamish, 2001, p. 1035) of the studied phenomenon[29].

3.5.3.1 The Investor as Advisor Regarding the Operations and Organisational Setup of the Firm. An active firm-investor network may not only entail an ongoing conversation about current and future investment opportunities, but may also include advice and feedback on the operations and the organisational setup of a hedge fund firm, conversation partners from hedge funds as well as investors pointed out. This may include advice on the efficiency of a hedge fund firm's internal ability to execute investments, internal operational procedures, tax implications of certain investments, key man risk[30], the quality/adequacy of a fund's service providers (e.g. recommendation of an international law firm, which is well established in a particular jurisdiction the fund wants to invest in) or other aspects related to a hedge fund firm's 'operational risk', which is understood as "the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events" (Brown, Goetzmann, Liang, and Schwarz, 2012).

Related to hedge fund operational risk is the investors' requirement of transparency in the ongoing conversation with the hedge fund firm. A Senior Investment Associate at an Endowment Fund (AUM category: > 5bn USD) noted that transparency is a key factor and

[29] For further details, please see chapter 2.3.3 for a detailed discussion of studying the two outcome measures of performance and survival.
[30] Since many hedge fund firms are small, entrepreneurial entities, 'key man risk' refers to the danger that a hedge fund firms ceases to survive once the entrepreneurial founder dies or decides to step down.

that he only invests in transparent firms that are willing to show him the underlying investments on a regular basis.

3.5.3.2 Generation of a Series of Transient Investment Advantages. *"Hedge funds operate in highly competitive markets, where information and trading advantages are unlikely to be maintained for long"* (Dichev and Yu, 2011, p. 248).

Hedge funds exploit inefficiencies in information and structure of financial markets. Such inefficiencies could be securities whose prices do not reflect their 'true' (e.g. fundamental or temporarily adequate) value. As financial markets are dynamic social systems of actors interconnected by technology (e.g. Beunza and Stark, 2004 and Beunza et al., 2006, MacKenzie, 2012, Hardie and MacKenzie, 2007) these inefficiencies become very small or disappear once enough capital is engaged in their exploitation. A practitioner illustrated this by noting that the investment "space becomes crowded and the [hedge fund's] strategy stops working".

The investor network seems to be an especially useful asset when the firm is looking for a new profit opportunity to exploit as substitution for (or in addition to) existing investments. Hedge fund firms, which only try to exploit one inefficiency in a particular market and which have not cultivated an active investor network, may have limited room to pivot once their initial investment thesis stops to produce satisfactory returns. As their current 'wave' of competitive advantage rolls out, they do not have a procedure to identify and catch the next 'wave' of profitable investment opportunities (e.g. McGrath, 2013a and 2013b).

In the network of investors, no single investor will likely have expertise in all the fund's current and prospective investment opportunities. In some investments, the investor will be able to contribute expertise. In others, the investor will be a mere provider of capital. For the investors, it seems beneficial to be part of such a network (with diverse industry expertise)

since it "provides access to otherwise closed investments" as a senior hedge fund analyst (AUM category: USD 250-500m) pointed out. Investors get the chance to participate in investment opportunities they would not normally have invested in due to lacking awareness of or expertise in a specific sector. An important prerequisite for the firm-investor network to materialise its benefits seems to be the ability of the fund manager to pick the right investor-advisors for each investment.

This 'investor network' approach, which involves the investors as knowledgeable partners, may create a strong engagement and commitment of investors. This seems especially true for high net worth individuals as a comment of the senior analyst indicates: "You engage with your investors in a specific topic […] it gives the rich people something to talk about at the cocktail parties because they know exactly what they invested in".

Overall, the evidence from the exploratory qualitative enquiry seems to indicate that an active firm investor network may help to improve the operations at a hedge fund firm. Furthermore, the firm-investor network may be a valuable resource for a hedge fund firm to stay competitive beyond an initial investment idea. It may help to build a series of profitable, yet transient investment opportunities, which in their aggregate may contribute to enhanced survival.

H2: An active hedge fund firm – investor network enhances hedge fund firm survival.

Table 9 presents a summary of statements practitioners made in the expert interviews and the resulting predicted effects, which informed the hypothesis development in preparation of the quantitative analysis.

Table 9: Summary of hypothesis development based on the qualitative data

Category	Hedge Fund Firm	Investor	Predicted Effect
Investor Provides Valuable Information for the Investment Decision Making Process	*Investment Manager [$1-5bn]:* Investors give advice regarding an industry or a specific investment target *Senior Investment Analyst [$250-500m]:* High net worth individuals and family offices suited for active firm-investor relationship: "You engage with your investors in a specific topic […] it gives the rich people something to talk about at the cocktail parties because they know exactly what they invested in"; "You have to] leverage the knowledge of your investors and get the experts of the field to invest with you […] you can't be the expert of all industries you are investing in"; "Ideas come from investors." *Managing Partner [$250-500m]:* Private investors and family offices encourage an ongoing conversation with the firm; Actively building a network with investors is important for (1) the acquisition of industry and geographic knowledge, (2) the alignment of interest with investors, (3) size of investments (investors co-invest in addition to their stake in the fund), (4) governance of investments (board appointments)	*CIO at Family Office [$500m-1bn]:* Family provides guidance on the temporal, sector and style orientation of the investments *Investment Manager [$250-500m]:* Time horizon of investors is important for the development of an active firm-investor network: funds of funds sometimes only have an investment time horizon of 3-6 months whereas individual investors, family offices or endowments often have 2-3 years *Managing Director Endowment [$1-5bn]:* Interaction with investment manager may depend on investor's need to encourage a certain behavior (socially responsible investing)	**Enhanced Performance (H1)**
Investor Links the Hedge Fund Firm to Valuable Sources of Information	*Partner [$1-5bn]:* 'Friendly intent' of investment fund towards management of investee firm could only be communicated via the industry contacts of an investor in the fund *Founding Partner [$250-500m]:* A network with investors is an important component on "the softer side of things" when managing a fund or launching a new product *Partner [$250-500m]:* Ongoing "interaction with our knowledgeable partners in the underlying industries" forces analysts to specialize and manage the conversation with investors *General Manager [$250-500m]:* Specialist, deep sector knowledge is acquired from investors with expertise in a sector (e.g. pharma and life science)	*Former Investment Manager at Family Office [$500m-1bn]:* Investors obtain an impression of trends and investment ideas in the hedge fund industry via hedge fund managers' pitch presentations.	**Enhanced Performance (H1)**
Firm-Investor Network: Guidance on Operations and Efficiency	*Investment Director [$1-5bn] and General Manager [$250-500m]:* Cross marketing of other products offered by the investment manager, which show a comparable risk and return profile (e.g. offering funds that invest in infrastructure and logistics to investors who have invested in or show an interest in investing in agricultural / natural resource investments). *In-House Legal Counsel [$250-500m]* and *Senior Operations Officer [$250-500m]:* Tax, legal and operations considerations regarding current and prospective investments of the hedge fund firm are an important factor for investors and part of the ongoing conversation. The legal function for example determines the optimal tax structure for an investment considering the requirements of all investors. The legal function largely works in the background and makes sure that even in an adverse event (e.g. legal proceedings against the hedge fund firm or its executives) "all bases are covered". Another example for the tangible value add of smooth operations are cost savings, e.g. the optimization of tax and transaction costs related to trades in foreign currencies or on foreign markets.	*Former Investment Manager at Family Office [$500m-1bn]:* Conversation with hedge fund firm includes discussing operations and the organizational setup of the firm. One aspect of the organizational set-up of the firm is 'key man risk' since many hedge fund firms are small, entrepreneurial entities, which may cease to exist once the founder dies or decides to step down. (However, the *Founding Partner of a Fund [$100-250m]* pointed out that 'key man risk' may also have positive aspects: the character and leadership style of the key man shapes the enterprise as he or she does not need to compromise, e.g. compared to decision making via an investment committee) *Senior Investment Associate at Endowment Fund [$> 5bn]:* Transparency is a key factor in the ongoing conversation between firm and investor. Conversation partner only invests in transparent firms that are willing to show him the underlying investments on a regular basis.	**Enhanced Survival (H2)**

3.6 Quantitative Application of the Concept of the 'Active Firm-Investor Network'

The following paragraphs present the results of the quantitative application of the concept of the active firm-investor network and test the hypotheses developed on the basis of the exploratory qualitative enquiry with practitioners. Table 10 presents the summary statistics and correlations of the variables used in the quantitative analysis.

Table 10: Descriptive statistics and correlations. (HFMC = Hedge Fund Management Company)[31]

	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11
1. Firm Death	0.05	0.21	0.00	1.00	1.00										
2. HFMC Return	0.01	0.05	-0.15	0.17	-0.05	1.00									
3. Active Firm-Investor Network	0.10	0.37	0.00	8.00	-0.03	0.01	1.00								
4. Std Deviation of HFMC Return	0.04	0.03	0.00	0.17	-0.01	0.04	-0.01	1.00							
5. Skewness of HFMC Return	-0.04	0.76	-2.13	1.98	-0.03	0.08	-0.01	0.07	1.00						
6. Kurtosis of HFMC Return	2.95	1.19	1.50	7.80	0.02	-0.01	-0.03	0.06	-0.07	1.00					
7. HFMC 8 Factor Alpha	0.00	0.29	-1.08	1.07	-0.01	0.04	0.00	-0.04	0.00	-0.02	1.00				
8. Flows HFMC	0.01	0.18	-0.96	0.85	-0.06	0.00	0.00	-0.02	0.04	0.00	0.01	1.00			
9. Intra-Industry Diversification	2.03	1.81	1.00	11.00	-0.03	-0.02	0.05	-0.11	-0.05	-0.02	0.00	0.00	1.00		
10. HFMC Ln Assets Under Mgmt	17.61	2.06	12.64	22.70	-0.10	0.00	0.03	-0.26	-0.06	-0.03	0.00	0.05	0.42	1.00	
11. Age of HFMC (in years)	5.79	4.67	0.19	21.13	0.00	-0.03	0.08	-0.02	-0.04	-0.05	0.01	-0.08	0.19	0.28	1.00

Regarding the effect of an active firm-investor network, hypothesis 1 stated that an active hedge fund firm-investor network enhances hedge fund firm performance. The analysis finds support for this hypothesis. Table 11 shows the results of the OLS panel fixed effects regressions and indicates that, ceteris paribus, a one unit increase in the active firm investor network variable is associated with an increase in hedge fund firm monthly returns by 7 basis points. On an annualised basis, this return increase corresponds to 84 basis points. Given average annual returns of hedge fund firms of circa 12 percent this seems like an economically notable effect (i.e. 7 percent of average annual performance).

[31] Please note that the failure variable displays the specification as under the OLS panel fixed effects models: A dynamic indicator variable that takes the value of one in the 12 months prior to the date that the hedge fund management company 'died'.

With respect to the control variables, hedge fund assets under management are negatively related to hedge fund firm performance. This finding corresponds to and confirms findings in the finance literature on the hedge fund product level: smaller hedge funds tend to perform a bit better (e.g. Agarwal, Daniel and Naik, 2009, Ammann and Moerth, 2005). Intra-Industry diversification is negatively related to hedge fund performance (for a detailed discussion of intra-industry diversification, please see chapter 2 of this thesis).

Table 11: Analysis of the impact of an active firm-investor network on hedge fund management company (HFMC) performance (OLS Panel Fixed Effects Regression). All standard errors are adjusted for heteroskedasticity and clustered at the HFMC level. Coefficients marked with ***, ** and * are significant at the 1%, 5%, 10% level, respectively.

	Hedge Fund Management Company (HFMC) Returns	
Active Firm-Investor Network		0.0007*
		(.0004)
Intra-Industry Diversification	-0.0003***	-0.0003***
	(.0001)	(.0001)
HFMC Ln Assets Under Mgmt	-0.0009***	-0.0009***
	(.0001)	(.0001)
Age of HFMC (in years)	-0.0002	-0.0002
	(.0003)	(.0003)
_cons	0.0223***	0.0222***
	(.0025)	(.0025)
Firm Fixed Effects	YES	YES
Year Fixed Effects	YES	YES
Within R-Squared	0.0267	0.0267
Number of Firm-Month Observations	215,626	215,626

****** p<0.01; ** p<0.05, * p<0.10***

Robust Standard Errors in Parentheses

Standard Errors Clustered by HFMC

Hypothesis 2 states that an active hedge fund firm-investor network enhances hedge fund firm survival. The empirical investigation draws on two models for the empirical analysis: OLS panel fixed effects regressions and Cox regressions. Table 12 shows the results of the OLS panel fixed effects regressions. The analysis shows that the 'active firm-investor network' is negatively associated with hedge fund firm failure, although the coefficient is not significant at conventional levels (it is significant at the 13% level). The impact of the control

variables seems institutively plausible (and in line with prior research on hedge funds at the level of analysis of the hedge fund product, e.g. Liang, 2000; Gregoriou, 2002; Amin and Kat, 2003). Returns, capital flows from investors, assets under management and intra-industry diversification of the HFMC are negatively related to firm failure, whereas a higher kurtosis of returns (i.e. fatter tails) as well as firm age are positively related to firm failure.

Table 12: Analysis of the impact of an active firm-investor network on HFMC failure (OLS Panel Fixed Effects Regression). The death variable is operationalised with a dynamic indicator variable that takes the value of one in the 12 months prior to the date that the hedge fund management company 'died' (as it enters its 'failure zone'). All standard errors are adjusted for heteroskedasticity and clustered at the HFMC level. Coefficients marked with ***, ** and * are significant at the 1%, 5%, 10% level, respectively.

	Hedge Fund Management Company (HFMC) Failure	
Active Firm-Investor Network		-0.0087
		(.0057)
HFMC Return	-0.0717***	-0.0716***
	(.0109)	(.0109)
Std Deviation of HFMC Return	-0.1004	-0.0995
	(.0757)	(.0757)
Skewness of HFMC Return	-0.0022	-0.0022
	(.0016)	(.0016)
Kurtosis of HFMC Return	0.0018*	0.0018*
	(.0009)	(.0009)
HFMC 8 Factor Alpha	-0.0011	-0.0011
	(.0029)	(.0029)
Flows HFMC	-0.0334***	-0.0333***
	(.0048)	(.0047)
Intra-Industry Diversification	-0.0116***	-0.0114***
	(.0018)	(.0018)
HFMC Ln Assets Under Mgmt	-0.0225***	-0.0225***
	(.0023)	(.0023)
Age of HFMC (in years)	0.0131***	0.0132***
	(.0020)	(.0020)
_cons	0.3392***	0.3403***
	(.0398)	(.0398)
Firm Fixed Effects	YES	YES
Year Fixed Effects	YES	YES
Within R-Squared	0.0639	0.0640
Number of Firm-Month Observations	180,664	180,664

****** p<0.01; ** p<0.05, * p<0.10***

Robust Standard Errors in Parentheses

Standard Errors Clustered by HFMC

Whereas the failure decreasing effect of the active firm-investor network is not significant at conventional levels in the OLS panel fixed effects regressions, the Cox regressions show a significant negative relation between firm mortality rates and an active firm investor network. Table 13 shows the hazard rates (and standard errors) for each covariate in exponential form. A one unit increase in the 'active firm investor network' variable decreases mortality hazard by 33% (=exp (-0.4013)-1). Regarding control variables, returns[32], flows, assets under management, intra-industry diversification and skewness of returns are negatively related to firm mortality. Kurtosis of returns (fatter tails) and age are positively related to firm mortality.

Table 13: Analysis of the impact of an active firm-investor network on HFMC hazard (Cox Regression). The death variable is operationalised with a dynamic indicator variable that takes the value of one in the month the HFMC 'died'. The table reports the mortality hazard rates in exponential form (standard errors in parentheses). Coefficients marked with ***, ** and * are significant at the 1%, 5%, 10% level, respectively.

	HFMC Mortality Hazard Rate (Exponential Form)	
Active Firm-Investor Network		-0.4013***
		(.1529)
HFMC Return	-5.7735***	-5.7607***
	(.8577)	(.8564)
Std Deviation of HFMC Return	-3.9511***	-3.9465***
	(1.2362)	(1.2327)
Skewness of HFMC Return	-0.1911***	-0.1923***
	(.0492)	(.0492)
Kurtosis of HFMC Return	0.0910***	0.0875***
	(.0294)	(.0294)
HFMC 8 Factor Alpha	-0.0472	-0.0476
	(.1299)	(.1296)
Flows HFMC	-1.7952***	-1.7743***
	(.1795)	(.1795)
Intra-Industry Diversification	-0.1670***	-0.1650***
	(.0371)	(.0369)
HFMC Ln Assets Under Mgmt	-0.3403***	-0.3385***
	(.0220)	(.0220)
Age of HFMC (in years)	0.0251***	0.0269***
	(.0086)	(.0086)
Chi-Squared	589.76***	597.9***
Number of Firm-Month Observations	180,664	180,664

****** p<0.01; ** p<0.05, * p<0.10***

[32] The large size of the coefficient of HFMC Return is due to the way returns are coded. A 1% return is coded as "0.01" and not as "1". Hence a one unit increase in the present notation indicates an increase by 100 percentage points. The same applies to HFMC Flows.

This analysis finds partial support for hypothesis 2. The active firm-investor network seems to be negatively related to hedge fund firm failure. Whereas this failure decreasing effect is consistent across both panel OLS and Cox regressions, it is however only statistically significant at conventional levels in the Cox regressions.

Overall, the results of the quantitative analysis seem to broadly support the conjectures from the qualitative data. The triangulation of data, methods and analysis techniques, as well as the consistency of the qualitative and quantitative results may yield some confidence about the validity of the presented concept of the active firm-investor network.

3.7 Discussion

Overall, this chapter provided qualitative and quantitative evidence that hedge fund investors may add value beyond the mere provision of capital. Specifically, the analysis indicates that an active firm-investor network is positively related to hedge fund firm performance and survival. Active investors engage in an ongoing conversation with the firm and serve as sparring partners for the identification, assessment and execution of investment ideas.

An active firm-investor network may help a hedge fund firm to become a going concern business that performs and survives beyond the shelf life of a specific investment opportunity. Along those lines, Nobel laureate Myron Scholes (2004, both quotes p. 10) considers hedge fund survivorship as "proof of a value added activity", which many firms in the industry don't manage to deliver: "Most hedge funds are organized as 'hunter' groups that will not survive for many generations. That is, few have figured out how to build a business or a 'farm' to create an enterprise that has franchise value, where the whole is greater than the sum of the parts".

3.7.1 Boundary conditions. As with any research findings, it may enhance the understanding of the findings if their limitations and boundary conditions are considered.

First, with respect to the data sources and the question of generalisability, it seems important to note that the exploratory qualitative enquiry was limited in its scope (25 industry experts), which limits the 'generalisability' of the findings. However, the qualitative enquiry seems useful since it provides first evidence regarding the richness of the firm-investor relationship beyond the mere provision of capital, which informed the hypothesis development for the subsequent quantitative analysis. The results of the quantitative analysis indicate that an active firm-investor network is positively associated with hedge fund firm performance and survival. This triangulation (Flick, 2009) across data sources and methods (qualitative and quantitative data analysis) with reasonably consistent results may yield some confidence about the validity of the presented concept of the 'active firm-investor network'.

Nevertheless, a limitation of the quantitative analysis is that the large scale hedge fund dataset did not contain explicit information on investors in hedge fund firms. Availability of information on investors (e.g. number of investors, types of investors, intensity of interaction with the hedge fund firm, etc.) may have made possible a more direct and more fine-grained analysis of the impact of the active firm-investor network on hedge fund firm survival and performance. Investor data, however, is very sensitive and highly competition relevant, which is why hedge fund firms would not reveal it voluntarily.

As indicated by the quantitative operationalisation of the active firm-investor network, the concept seems to apply particularly well to hedge fund firms, which recruit their investors from the geographical region where they are located and which have their investment focus in the same region where their investors are located. In addition, the investment firms, which have an active firm-investor network seem to invest in informationally less efficient assets (such as mid and small capitalisation stocks). Consequently, if a potential replication study would focus on hedge fund firms with these characteristics, it seems likely that an active firm-investor network could be observed.

The investors in these types of funds tend to be high net worth individuals or family offices, potentially with expertise and contacts in a specific sector. In most cases, this deep sector expertise comes from the fact that the individuals or families may have generated their wealth in a certain sector (e.g. healthcare, real estate, etc.). High net worth individuals, family offices and endowments seem to have a long-term investment horizon and seem likely to build long-term relationships with their asset managers (Lerner et al., 2007). An ongoing conversation about current and future investment opportunities may be a vital part of the establishment of these long-term relationships.

Second, the hedge fund-investor network is not exclusively a source of valuable information, as it may sometimes lead to 'bad' trades or investments. An interview partner leading the hedge fund unit at one of the world's top 4 central banks indicated that investors sometimes 'push' the hedge fund firm to initiate a new investment. These trades or investments may follow a herd of other investors doing the same, which can lead to 'tourists' in the same trade. Tourists indicate that the managers stray from their specialty area and may not be fully informed about the risks and potential downsides of a trade. In case the hedge fund engages in an investment, which was proposed by an investor, it seems important that the fund management runs a deep internal due diligence on the suggestion instead of 'blindly' following the investor's advice. In this due diligence both the potential profitability, as well as the fit with the hedge fund firm's current investment profile seem important. The phenomenon has received scholarly attention, e.g. by Simon et al. (2010), a study which provides the Porsche (long) / Volkswagen (short) trade as a case example for a potentially dangerous 'consensus trade'.

Third, whereas the hedge fund firm-investor network may add value, it may, under certain conditions, be copied by competitors. For an outsider or even an investor, the active network of a hedge fund firm to its investors seems to be hard to observe in its totality and is hence

hard to copy. However, an interview with a former managing director and investment portfolio manager at one of the nine 'bulge bracket' investment banks indicated that personnel turnover may be a key threat to the seeming inimitability of the firm-investor network. When senior investment managers leave to set up their own firm or join competitor firms, it is likely that they know the composition of the overall investor network and that they will contact the same investors for their own fund raising, thereby partially or fully replicating the firm-investor network. An investment manager in a fund (AUM category: USD 1-5bn) indicated that a firm can address this problem by only having the partners involved in fund raising. The partners then 'own' the relationships with the firm's investors (i.e. they are the key contact point for the investors). Since the partners in a hedge fund firm are 'locked-in' by ownership of an equity stake in the hedge fund management company, they seem to be the people least likely to leave the firm.

3.7.2 Contributions. This chapter aims to contribute to the literature on customer innovation, but also holds insights for research on hedge funds in the fields of finance and the sociology of finance.

With respect to the customer innovation literature, this chapter contributes to the scholarly conversation in the following four areas:

First, the vast majority of studies in the customer innovation literature have taken a customer/user-centric approach in which the firm (i.e. the 'producer') played at best a secondary role or no role at all (e.g. von Hippel et al., 2011; von Hippel, 2007; Luethje et al., 2005; Harhoff et al., 2003). This chapter focuses on the firm-level instead of the customer level by analysing a large-scale, longitudinal dataset on hedge fund firms.

Second, in their review of the literature on customer innovation, Bogers, Afuah and Bastian (2010, p. 871) note: *"To date, most research exploring users as innovators is based on case*

studies or other small-sample studies. […] In general, the research stream on users as innovators will greatly benefit from empirically testing (on a larger scale) the ideas and propositions that it puts forward". This chapter attempts to answer this call for more large-scale, quantitative research to test and complement the interesting qualitative and conceptual insights developed by the extant body of (mostly qualitative) research on customer innovation. Using a large scale, longitudinal panel dataset, the quantitative analysis shows that an active firm-investor network is positively related to hedge fund firm performance and survival.

Third, the study links to findings in the literature that organisational characteristics may be important 'enablers' of customer innovation and knowledge transfer from customers (e.g. Foss et al, 2011 and Foss, Lyngsie and Zahra, 2013). The analysis shows that that 'outward looking' (observable by an outsider, e.g. a customer) organisational characteristics (e.g. as used in the composition of the empirical proxy measure for the active firm-investor network) may provide an important 'docking point' to invite customers to engage with the firm in an active firm-investor network.

Fourth, the hedge fund industry seems to be an interesting context and a 'conservative setting' for the study of customer involvement since one may not naturally expect customer involvement in such a secretive industry with numerous highly specialised firms. These firms exist in order to provide investors (i.e. their customers) with the service of investment management. High levels of customer involvement are not expected in the hedge fund industry since at very high levels of involvement, investors may come close to 'defeating the purpose' of paying (via management and incentive fees) a hedge fund firm for providing the service of investment management. This setting contrasts with settings in the extant literature where one may expect more customer involvement, such as 'collaborative' settings like software development (e.g. by users via innovation toolkits; Franke and von Hippel, 2003) or

settings with lower barriers (e.g. in terms of technology and required capital) to produce an innovation (e.g. sports related consumer goods; Baldwin et al., 2006; Hienerth, 2006; Luethje et al., 2005).

With regard to the literatures on hedge funds in finance and the sociology of finance, this chapter emphasises that hedge fund investors may be active partners in the creation, assessment and execution of investment ideas. This complements and extends the passive or monitoring role that the finance literature has assumed hedge fund investors to take. Since researchers in the sociology of finance have usually investigated the technology enabled interaction of market participants in highly liquid, standardised and transparent markets (e.g. stocks, bonds or standardised derivatives; e.g. MacKenzie, 2012), the active hedge fund firm-investor relationship may be considered as a potentially interesting different type of 'market' where the exchange of a homogenous good (i.e. capital) forms the basis of a relationship, in which a heterogeneous and tailored good (information) is exchanged.

3.7.3 Potential implications for practice. For hedge fund practitioners, it may be insightful to see that an active firm investor network may be a potentially underappreciated source of competitive advantage. Depending on their area of expertise and investment orientation, investors may be valuable sources of knowledge for the identification, assessment and execution of investment ideas and potentially also regarding the operations of the hedge fund firm. This chapter showed evidence that investing into an active network with knowledgeable investors may 'pay off' in terms of enhanced hedge fund firm performance and survival. However, a note of caution seems appropriate since cultivating and maintaining an active conversation may be a strenuous effort. An interview partner noted that the intensive contact with investors can be "tedious" and "operationally more intensive".

On a more general note, the findings on the active role of investors may apply to a wider range of alternative investment firms, such as private equity or real asset (e.g. real estate) investment firms. As hedge fund firms are for the most part small, entrepreneurial entities, which are characterised by "knowledge intensity and lack of intellectual property protection", insights from the hedge fund sector have been noted to potentially be "representative of many other service sectors in the economy" (both quotes: de Figueiredo, Meyer-Doyle and Rawley, 2013, p. 849).

3.8 Conclusion

In conclusion, this chapter presented qualitative evidence that the hedge fund firm-investor relationship may be richer and more nuanced than the mere provision of capital. An active firm-investor network provides the stage for an ongoing information exchange regarding the identification, assessment and execution of investment ideas. A quantitative analysis showed that an active firm-investor network is positively associated with hedge fund performance and survival. The consistence of results across this triangulation of data sources and methods may yield reasonable confidence about the validity of the presented concept of the firm-investor network. From a theoretical perspective, the insights in this chapter inform and contribute to theories on the active involvement and tangible added value of a firm's customers.

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Chapter 4

The Firm Boundary as Semi-Permeable Membrane

4.1 Abstract

The firm boundary unites two opposing functions: separation and permeability. It simultaneously isolates the firm from and connects it with the environment. Focusing on a resource-based view of the firm, more specifically resource flows across the firm boundary, this chapter suggests that semi-permeability of the firm boundary is important for the creation of a resource asymmetry, which in turn is a key antecedent to value creation and appropriation. The analysis develops an interdisciplinary metaphor in order to derive novel insights on how the firm boundary moderates two types of resource complexity: the complexity of the acquired resource and the complexity of the internal resource set. The analysis draws on generalised insights from cell biology and proposes four modes of resource acquisition, which depend on the configuration of both types of resource complexity. The conceptual reasoning is illustrated using examples from the hedge fund industry.

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4.2 Introduction

Value creation and appropriation may be considered as the basis of business activity because economic actors are, among others, "motivated by the possibility of capturing economic gains" (Coff, 2010, p. 711). Resources seem to be an important prerequisite for value creation. Some resources may be of strategic importance in a sense that they are (1) "limited in supply or costly to imitate" (Leiblein and Miller, 2003) and (2) able to alter the 'architecture' of the value creation process. The accumulation of these resources inside the firm seems to create an asymmetry compared to the environment, which may be essential to the firm as potential source for value creation and appropriation (Schoemaker, 1990).

Resource acquisition via transport across the firm boundary seems to be an important antecedent in the creation of these vital resource asymmetries because most firms do not possess all the required resources ex ante in order to 'autarkically' create value for the customer (Schilling and Steensma, 2002). Resource acquisition involves the firm boundary as part of the firm, which enables a differential flow of resources. This differential resource flow seems to be important for the creation of valuable, rare, inimitable and non-substitutable (VRIN; Kraaijenbrink, Spender and Groen, 2010) resource sets since "resource asymmetries occur because of differential flow of resources" (Gnyawali and Madhavan, 2001, p. 431).

The conceptual analysis in this paper sheds light on how the firm boundary may enable this differential flow of resources. The firm boundary is understood to encompass all the resources the firm controls. Since resource transport across the firm boundary has the goal of obtaining full control over the 'imported' resource so that it can be integrated into the existing firm internal resource set, this process may be understood as 'resource acquisition'. Control over the resources within the firm boundary seems important for two reasons: First, control over a resource gives the firm the opportunity to create an interacting bundle of resources, which may be a key aspect of creating hard to imitate value for the customer.

Second, control over resources may enable the firm to appropriate a large share of the created value (Barney, 1986).

One ontological communality of the firm boundary and a biological cell membrane is the characteristic of 'semi-permeability', which enables a differential flow of resources and allows the firm boundary to act as a barrier from and as a bridge to the environment. In order to ensure a functioning differential flow of resources as basis of a resource asymmetry, a key function of the firm boundary is the moderation of complexity in two areas: (1) the complexity of the acquired resource and (2) the complexity of the internal resource setup.

Complexity is understood in a sense of Simon (1962) as interconnectedness of parts. More specifically, Simon (1962, p. 468) defines a complex system as "one made up of a large number of parts that interact in a nonsimple way". This 'interaction of parts' may sometimes be observable, but in other cases it may not be clear (1) which parts participate in the interaction and (2) how the parts interact, leading to uncertainty about cause and effect relationships (Barney, 1999). Simon's (1962) definition seems to be along the lines of Thompson[33] (1967, p. 10) who describes this interplay between uncertainty and certainty (i.e. clarity about cause and effect relationships) in organisations: "we will conceive of complex organizations as open systems, hence indeterminate and faced with uncertainty, but at the same time subject to criteria of rationality and hence needing determinateness and certainty".

In order to analyse how this differential flow of resources may work and how the firm boundary may moderate the two areas of complexity, this paper conceptualises the firm boundary as semi-permeable membrane. The analysis draws on generalised insights from cell biology, specifically molecule transport across the cell membrane, and suggests four modes

[33] Thompson's (1967, p. 6) note on interdependence: "Approached as natural system, the complex organization is a set of interdependent parts which together make up a whole because each contributes something and receives something from the whole, which in turn is interdependent with some larger environment."

of resource acquisition, which depend on the complexity of the acquired resource and the complexity of the internal resource set.

There are three unique components to this paper, which attempt to contribute to the literature on firm boundaries. First, semi-permeability of the firm boundary is examined as a key attribute to create a resource asymmetry via the contemporaneous isolation and inflow of resources. Second, the paper sheds light on an important, yet hitherto underappreciated function of the firm boundary regarding the acquisition of resources: the firm boundary as moderator between the complexity of the target resource (i.e. its degree of interdependence with other resources in the environment) and the complexity of the overall internal resource setup of the firm (i.e. the degree of interdependence of resources inside the firm). The analysis considers four combinations of these two types of complexity and suggests specific modes of resource acquisition. These modes of resource acquisition are drawn from a stylised dichotomy of bundled versus focused resource acquisition, which the paper develops. Third, while a focus of the literature has been on resource access via other forms[34] than full control / ownership (e.g. knowledge resources created or transferred in technology alliances; Frankort, 2013), this paper focuses on resource acquisition and integration under the umbrella of hierarchical governance, a field of enquiry that so far seems to have seen little differentiated analysis.

The following sections provide insights on the status of the literature and develop the core proposition of the paper, namely that semi-permeability of the firm boundary and its ability to moderate complexity are antecedents to the creation of a resource asymmetry, which in turn may be a key determinant of how much value the firm can create and appropriate. Examples from the hedge fund industry help to illustrate the conceptual reasoning.

[34] Grant and Baden-Fuller (2004, p. 62) provide an insightful list of a variety of organisational arrangements and governance mechanisms that lie between market and hierarchy.

4.3 Review of the Related Literature

4.3.1 Value creation and appropriation. Value creation and appropriation may be considered as the basis of business activity as economic actors seem to be, among others, "motivated by the possibility of capturing economic gains" (Coff, 2010, p. 711). However, value for the customer has to be created before (a part of) it can be appropriated by the firm (Alvarez and Barney, 2004). The total value created will "ultimately be distributed across stakeholders" (Coff, 2010, p. 713), hence firms have to master a dual challenge of creating value and keeping a more or less large share of it (Shoemaker, 1990). Important stakeholders for value creation and appropriation seem to be the providers of resources necessary to create the value for the customer. If the resources are owned by the firm, a big chunk of the value will be appropriated by the firm, else, the providers of the resources will capture a part of the created value (Barney, 1986).

For hedge fund firms, the value creation aspect has two components. First, the creation of financial returns using the investors' capital. Second, and often underappreciated, the creation of returns, which are not or only loosely correlated to other major asset classes (e.g. equity) in a hedge fund investor's portfolio (e.g. Fung and Hsieh, 2006). The value appropriation aspect is also split into two components: a 'management fee' on assets under management (usually between 1% and 2 %) and an 'incentive fee' on the profits a fund makes (usually between 15% and 20%; e.g. Clare and Motson, 2009). Providers of resources for the value creation of the hedge fund firm are the hedge fund's employees (e.g. Hardie and MacKenzie, 2007), as well as data providers (e.g. Bloomberg terminals, e.g. Albinus, 2011), other service providers (e.g. prime brokers, auditors, law firms; e.g. Simon et al., 2010 and Baden-Fuller et al., 2013) or even investors (please see chapter 3 of this thesis for an investigation of the active role of investors).

4.3.2 'Asymmetry' as basis for interdependence and value creation. In order to distinguish itself from competitors, the firm has to build a resource 'asymmetry' vis-à-vis its environment. This asymmetry seems to be built by specialisation of resources and bundling of these specialised resources (Thompson, 1967) within the boundaries of the firm. As "complex organizations cannot be self sufficient" (Thompson, 1967, p. 49), specialisation entails acquiring resources from the environment. Hence, with specialisation, firms or other market actors "wish to be interdependent" (Thompson, 1967, p. 16). However, the downside of this interdependence due to specialisation is the increased dependence on the environment and the intensified impact of uncertainty originating in the firm's environment. Uncertainty may exist in the environment since it "does not fully disclose the alternatives available or the consequences of those alternatives" (Thompson, 1967, p. 9). Consequently, specialisation makes the organisation an "open system" (Thompson, 1967, p. 10), which may be able to build a distinctive resource set as basis for delivering value to customers. However, the resource set of the firm also has to maintain flexibility in order to react to shocks in the environment. As illustrated in the following sections, the firm boundary fulfils a crucial role for building this resource asymmetry and maintaining flexibility. Not only does it help to acquire the resources to build a resource asymmetry (e.g. Dierickx and Cool, 1989), it also protects the specialised resources from 'diffusing' into the environment. A firm's technical core[35] may be a specialised set of resources, which, as Thompson (1967) suggested, firms attempt to 'buffer' from the environment (Hargadon, Davis and Weick, 2003).

The literature on the resource based view of the firm (e.g. Barney, 1986 and 1991; Wernerfelt, 1984; Dierickx and Cool, 1989; Peteraf, 1993) has noted resource asymmetries vis-à-vis the environment as an important component of value creation since resources useful

[35] As Hargadon, Davis and Weick (2003, p. 499) note, "Thompson himself is vague in defining the technical core", however Thompson seems to use the term rather broadly, as his understanding of 'technology' suggests: "We are thus using the term technology in its broad sense as a system of techniques" (Thompson and Bates, 1957, p. 325).

for the distinction from competitors (1) do not seem to be available freely and (2) do not seem to have a uniform quality (Dierickx and Cool, 1989; Thompson, 1967). These resource asymmetries normally play out as difference between the resource endowment of the firm and its environment (which includes other firms). Along these lines, Wernerfelt (2011, p. 1369) notes that "a few resources are such that only one firm can have them, with patents being the clear example". In the same vein, Afuah (2003, p. 34) points out that "competitive advantage in the face of technological change rests on firm-specific, difficult-to-imitate, and costly-to-trade resources". Amit and Zott (2001, p. 497) link resources directly to value creation: "specialized resources […] (which are heterogeneous within an industry, scarce, durable, not easily traded, and difficult to imitate), may lead to value creation", which Adner and Kapoor (2010, p. 306) tie back to competitive advantage: "A firm's competitive advantage depends on its ability to create more value than its rivals".

It seems important to bear in mind that resource asymmetry mainly comes from 'architectural resources', i.e. resources, which are able to alter the 'architecture' of the firm's value creation process. Conversely, 'flow resources', i.e. basic resources (e.g. commodities, raw materials, etc.), which are an input that 'flows through' the firm's value creation process, are homogenous and largely abundant in their nature. They are an input to but do not alter the value creation process of the firm and hence do not tend to contribute to the creation of a resource asymmetry vis-à-vis the environment.

4.3.3 Resource asymmetry and the firm boundary. Since resource asymmetries are usually expressed in terms of 'the firm' versus 'the environment', the firm boundary becomes the frontline in the creation and mediation of such resource asymmetries. Systems theory (e.g. Luhmann, 2006 and 2013) provides the insight that 'creating asymmetry' may be the original function of 'the boundary'. Luhmann (2006, p. 38) notes that asymmetry is essential to the existence of a system (e.g. a firm) since "no system can exist without an environment […] it

would revert immediately to a state of equilibrium without difference". Abbott (1995, p. 870) provides the insight that boundaries seem to emerge by linking up points of difference: "The making of an entity is simply the connecting up of these local oppositions and differences into a single whole that has a quality which I shall call "thingness"".

The following sketch of the literature on firm boundaries focuses on ways in which firm boundaries create 'asymmetry'. It follows the broad classification of the extant literature into four 'cognitive boxes' as suggested by Santos and Eisenhardt (2005). Although the concept of the semi-permeable firm boundary and its complexity moderating function may be applied also to other views of the firm boundary, this paper focuses on the *'competence view'*.

The main theoretical engine of the (1) *competence view* on firm boundaries is the resource-based view of the firm (e.g. Barney, 1991; Wernerfelt, 1984). The boundary conceptualisation of the competence view states that "boundaries should be set at the point that maximizes the value of the firm's resource portfolio" (Santos and Eisenhardt, 2005, p. 497). With the resource or a bundle of resources as unit of analysis, the asymmetry using this theoretical lens lies in the idiosyncratic resource set of the firm versus the resource set in the environment (largely consisting of factors of production or basic resources available on strategic factor markets; Barney, 1986; Teece et al., 1997). To create competitive advantage, a resource has to create an asymmetry to the environment via value, rarity, inimitability and non-substitutability (Kraaijenbrink, Spender and Groen, 2010). Dierickx and Cool (1989) suggested that this asymmetry may be built by upgrading and refining resources inside the firm whereas Dyer and Singh (1998) point out that resources may span firm boundaries via inter-firm collaboration. This chapter draws the attention to the role of the firm boundary as key component in creating and maintaining resource asymmetries vis-à-vis its environment.

The theoretical engine of the (2) *efficiency view* is transaction cost economics (TCE, e.g. Coase, 1937, Williamson, 1985), with the central argument that firm "boundaries should be set at the point that minimizes the cost of governing activities" (Santos and Eisenhardt, 2005, p. 492). TCE takes the single transaction as level of analysis and draws the firm boundary assessing "one transaction at a time" (Jacobides and Billinger, 2006, p. 249) as a *discrete* 'make or buy' decision[36]. The greater the asymmetry (i.e. degree of difference to the average market transaction) of the single transaction with respect to (a) asset specificity, (b) environmental uncertainty and (c) behavioural uncertainty, the more likely it is that the transaction is carried out within the firm boundary (Williamson, 1985, Santos and Eisenhardt, 2005). Related literature has kept the transaction as unit of analysis (e.g. as a legal contract, Masten, 1988) but begun to link up transactions in a concept of the firm as bundle of interdependent transactions unified by property rights (e.g. Hart and Moore, 1990).

Another view on firm boundaries is offered by the (3) *power view*. It draws on resource dependence theory (e.g. Pfeffer and Salancik, 1978) and industrial organisation (Porter, 2008), and states that firm "boundaries should be set at the point that maximizes strategic control over crucial external forces" (Santos and Eisenhardt, 2005, p. 495). The power view takes a more holistic approach than TCE with the unit of analysis being the firm (and its relation to the competitive environment) instead of the single transaction. From the perspective of the firm, there seem to be two types of asymmetry, a 'bad' one where the firm is at a disadvantage to the industry and a 'good' one where the firm has a stronger standing than the average competitor. The power conceptualisation is a largely 'defensive approach' with its main focus being on the mitigation of the adverse influence of 'bad' asymmetry. This can be achieved by obtaining ownership or control over crucial assets, competitors, further steps in the value chain (e.g. Santos and Eisenhardt, 2009, Porter, 2008) or by curbing the

[36] The conceptualisation of a discrete make or buy decision may not necessarily correspond to reality as some firms make *and* buy the same component (concurrent sourcing, e.g. Parmigiani and Mitchell, 2009).

influence of important external stakeholders on the firm (e.g. an authoritarian government; Meyer and Lu, 2004). The underlying reason of fighting this 'bad' asymmetry is to create a 'controlled' environment for the firm with as few sources of uncertainty as possible.

The (4) *identity view* of firm boundaries draws on managerial cognition (e.g. Weick, 1995) and postulates that "boundaries should be set to achieve coherence between the identity of the organization and its activities" (Santos and Eisenhardt, 2005, p. 500). The unit of analysis using this theoretical lens seems to be the individual or a group of individuals, which constitute 'the firm' as entity for collective sensemaking of an uncertain and complex environment. The firm boundary is drawn around a group of individuals developing, sharing and adhering to the same set of cognitive frames (Santos and Eisenhardt, 2005) for decision-making under uncertainty. Hence, asymmetry in the identity view seems to manifest itself in an asymmetry of cognitive frames of identity and decision making between members of the community called 'firm' ('us') and members of the 'environment' ('them').

Table 14 illustrates the presented lenses on firm boundaries and how they may create 'asymmetry' using the empirical setting of the hedge fund industry. Although different in their focus and conceptual nature, the four views on firm boundaries are not mutually exclusive when illustrated in an empirical setting (i.e. the four lenses may complement each other or may be at work at the same time; Santos and Eisenhardt, 2005).

Table 14: Illustration of the four theoretical lenses on firm boundaries and how 'asymmetry' to the environment is created using the empirical setting of the hedge fund industry

View	Application to the Hedge Fund Industry	Type of Asymmetry Created by the Firm Boundary	What is Acquired/Transported Across the Firm Boundary?
Competence	Hedge fund firms strive to obtain valuable resources (and set up resource configurations) to inform the investment decision making process with the goal of identifying, assessing and profitably exploiting market inefficiencies (environmental opportunities).	Hedge fund firms strive to import resources, which relate to and enhance their investment strategy (e.g. experts in the analysis of a certain security or a computer programmer to optimize a high frequency trading algorithm) and (often in their interaction) contribute to forming an autonomous, largely market independent investment opinion.	Valuable, rare and hard to imitate resources (mostly human capital, specialized trading or information systems, proprietary databases) or information from networks with important actors (e.g. investors) are imported across the firm boundary and then integrated into a set of resources inside the firm.
Efficiency	As small, entrepreneurial firms, hedge fund firms want to ensure an efficient, cost-effective organization and need to decide, which kind of organizational tasks are carried out inside and outside of the firm.	Hedge funds tend to carry out tasks, which inform the investment decision (e.g. research and analysis) in house. Many supporting service functions such as operations, legal and administration are outsourced to specialist firms.	Services as defined in legal and economic contracts, such as prime brokerage (margin lending, securities borrowing) by investment banks, legal advice by specialized law firms, audit and tax advice by accountancy firms.
Power	Hedge fund firms strive for autonomy (to realize their investment strategy) and aim to reduce the dependence on and uncertainty originating from external influences.	With respect to outside influences on the hedge fund firm's success, hedge funds firms attempt to obtain access, influence or control over these outside influences (e.g. investors, regulators, service providers) by, for example, entering a conversation for the fast access to new and relevant information or creating mutual business dependence.	The hedge fund firm 'exports' influence and control across the firm boundary though networks and formal as well as informal business relationships as means to the end of monitoring, influencing or controlling outside sources of uncertainty.
Identity	Hedge fund firms try to establish a firm internal culture and 'way of doing things' that defines the firm and its employees, encourages attachment and helps with sensemaking (e.g. offers collective interpretation of events in a complex/ambiguous environment).	Founder or founding team of hedge fund firm defines organizational identity and assembles a configuration of people, technology and processes with the aim to align the hedge fund firm's activities with its identity.	When new employees, information technology or processes are introduced to and integrated into the hedge fund firm, they are deliberately as well as unconsciously assimilated to fit with the firm's identity and activities.

4.3.4 Resource acquisition as important part of resource asymmetry. Rarely is the firm able to "go it alone" (Schilling and Steensma, 2002, p. 388) and create value without having to acquire resources from the environment. Resource acquisition, as well as value creation and appropriation seem deeply intertwined (Alvarez and Barney, 2004). It seems that "resource asymmetries occur because of the differential flow of resources" and the firm's "differential ability to control such flows" (both quotes: Gnyawali and Madhavan, 2001, p. 431).

These flows of resources crucially involve the firm boundary as an entity, which, on the one hand is open to the inflow of desired resources, but on the other hand does not let pass (a) undesired resources into the firm or (b) valuable resources out of the firm. Although not widely prevalent, the importance of '*permeability'* or '*porousness'* of firm boundaries has been mentioned in prior literature. Scholars have approached the attribute of semi-permeability from a diverse set of angles. Santos and Eisenhardt (2005, p. 497), for example note a "permeable view of boundaries". Meyer and Lu (2004) approach firm boundaries from a horizontal lens and assert that in authoritarian regimes in particular, firm boundaries are porous to exercise of influence by governmental actors, which may not necessarily benefit the firm and its owners. Jacobides and Billinger (2006) approach firm boundaries from a vertical lens and see permeability of firm boundaries in various steps along the value chain where the firm interfaces with internal and external customers.

However, an often overlooked aspect refers to the component of *'semi'* in 'semi-permeability', which implies that resource isolation is as important a function of the firm boundary as the enabling of resource flows. Isolation seems important for the component of value appropriation since "effective "isolating mechanisms" are […] preventing others from competing for a given market opportunity" (Alvarez and Barney, 2004, p. 622). As the world changes to be more interconnected, which may enhance resource mobility, resource isolation

and protection may increase in importance, as implied by Amit and Zott (2001, p. 497): "As information-based resources and capabilities, which have a higher degree of mobility than other types of resources and capabilities, increase in their importance within ebusiness firms, value migration is likely to increase and the sustainability of newly created value may be reduced".

4.3.5 Complexity as determinant of resource acquisition. For a successful resource flow from the firm's environment across the firm boundary, the firm boundary has to create 'resource acquisition arrangements', which mediate two types of complexity: (1) the complexity of the acquired resource and (2) the ex ante complexity of the internal resource setup. Complexity is understood in a sense of Simon (1962) as interconnectedness of parts which interact. More specifically, Simon (1962, p. 468) defines a complex system as "one made up of a large number of parts that interact in a nonsimple way".

This focus on complexity seems to shed light on an essential part of strategy, as Schoemaker (1990, p. 36) notes: "strategy, at its core, concerns the development and testing of heuristics for high stake decisions in environments too unstable and complex to be optimized".

First, the level of complexity of the acquired resource may be determined by (a) the visible interdependence of the resource with other resources in the environment or (b) a causal ambiguity (Barney, 1999) of how the resource may interact with other resources in the environment. An interdependence of a resource with another may imply that it either only realises its value generation potential in combination with another resource or that it is embedded in a set of other resources and cannot be easily isolated from these other resources while still in the environment and not under the full control of the firm. Certain resources for example may not be traded individually due to imperfections in resource markets (Barney,

1986, Schilling and Steensma, 2002). Hence the desired resource may only be available in a bundle with other, potentially not desired resources.

Second, the level of complexity of the internal resource setup *ex ante* (i.e. before the new resource is brought into the firm) depends on the existing interdependencies between resources already employed in the value creation and appropriation activities of the firm. The basic principle of these interdependencies seems to rest on complementarity, because the bundle of resources "together provides more value than the total value of having each" of the resources in isolation (Amit and Zott, 2001, p. 505).

Applied to hedge funds, a complex resource, which the hedge fund firm may want to import, may be a team of experts at another firm (for example an investment bank), who have in-depth knowledge and experience in a specific investment area, in which the firm would like to build a resource asymmetry. The team of experts seems to be a complex resource since there are complementarities and interdependencies between the experts and their individual value creation may be difficult to assess or less valuable if delivered in isolation.

A complex resource set inside a hedge fund firm may relate to the interdependencies in the value creation between different products the hedge fund firm offers. These interdependencies may occur in a sense that multiple products of the hedge fund firm draw on similar resources. For example research insights on the economic development of a specific sector in a country (e.g. the for-profit education sector in North America) may be relevant to both a long-short equity fund, as well as a special situations fund aiming to profit, for example, from mergers and acquisitions.

4.4 Firms and Cells: 'Ontological Communalities' Underlying the Boundaries of Social and Biological 'Units'

4.4.1 Establishing context-independent generalisations from cell biology. Similar to other interdisciplinary approaches, the conceptualisation of the firm boundary as a semi-permeable membrane, which shares attributes of a cell membrane, "does not claim that social or economic phenomena can be explained in biological terms" (Aldrich, Hodgson, Hull, Knudsen, Mokyr and Vanberg, 2008, p. 579). However, in its abstract form, moderation of complexity via a semi-permeable membrane seems to have general applicability beyond biology[37].

On a conceptual level, the paper looks at two types of complex, boundary maintaining systems: one from the social world (i.e. the firm) and one from the biological world (i.e. the cell). Both entities (firms and cells) need to "consume materials and energy in order to survive" (Aldrich et al., 2008, p. 583). Since these 'materials' come from outside the entity, the choice of acquisition mode is crucial in both contexts. The boundaries of both entities are engaged in moderating external and internal complexity, which is why interesting conceptual insights might be gained from cell biology.

The biological context provided in this paper is for illustration only. In the words of Metcalfe (1998, p. 22): "we can learn from the debates on evolutionary biology in order to understand better the logical status of concepts […] without in any sense needing to absorb the associated biological context". This paper compares firm boundaries to cell membranes on a conceptual level, where "common principles will be highly abstract and will not reflect detailed mechanisms unique to any particular domain" (Aldrich et al., 2008, p. 580).

[37] This argument is in line with reasoning presented in essays on 'Generalised Darwinism', e.g. Aldrich et al., 2008; Hodgson and Knudsen, 2010.

4.4.2 Ontological communality, not just analogy. This paper does not attempt to impose a simple biological analogy on the workings of firm boundaries, which may not fit very well once the critical observer delves into the details of the social and biological world. With the comparison to biology, this paper tries to tease out "abstract features in both the social and the biological world; it is essentially a contention of a degree of *ontological communality*, at a high level of abstraction and not at the level of detail" (Aldrich et al., 2008, p. 579, emphasis in original). In other words, there may be "real and severe ontological differences at the level of detail, there are also nevertheless common ontological features at an abstract level" (Hodgson and Knudsen, 2006, p. 14).

There may be critics arguing that the context is important for generalisation, but "the dangers of reckless overgeneralization do not mean that generalizations should be avoided when they are appropriate" (Hodgson and Knudsen, 2010, p. 2). In a sense, by teasing out abstract features across biological and social boundary maintaining systems (e.g. cells and firms), this paper may sketch out basic features of a model (Baden-Fuller and Morgan, 2010) describing how boundaries of complex systems may be designed and governed.

4.5 The Membrane Metaphor

The following paragraphs establish general insights from cell biology, and conceptualise the firm boundary as semi-permeable membrane. This paper is not the first one to propose this conceptualisation. Fey and Birkinshaw (2005) are to the author's knowledge the first researchers to conceptualise the firm boundary as semi-permeable membrane (for knowledge flows). However, their paper did not explore the metaphor in further depth as it focused on an empirical assessment of governance modes for external R&D.

4.5.1 Semi-Permeability. In order to ensure a smooth operation of the firm, its boundary needs to unite two opposing functions: separation and permeability. On the one hand, the firm

boundary serves as a separating barrier, upholding asymmetry, i.e. the unequal distribution of resources between the firm and the environment. On the other hand, the firm boundary serves as a connecting bridge to the environment, enabling permeability and resource flows.

The cell membrane seems to serve as a resourceful metaphor for the firm boundary. The firm boundary, as well as the cell membrane, are 'borders', which contain a living and dynamically changing entity. Both firms and cells are deeply intertwined with their environment, yet also have mechanisms in place, which build and keep up asymmetries to the environment. In biology, a "prerequisite for life is the ability to maintain electrochemical imbalances across biomembranes" (Pedersen, Buch-Pedersen, Morth, Palmgren and Nissen, 2007, p. 1111). Also for the firm, building and upholding resource asymmetries to the environment seems to be a fundamental building block for value creation and appropriation.

Membranes "protect and organize cells" and "serve as barriers and gatekeepers" (Nature Education, 2012a). The firm boundary acts in a similar sense by serving as important architectural element, which unifies two opposing functions: isolation and permeability. This duality is a fundamental attribute of the biomembrane, which is defined by the Oxford English Dictionary as a "thin sheet of tissue or layer of cells, usually serving to cover or line an organ or part, or to *separate or connect* parts" (OED Online 2014c, emphasis added).

4.5.2 Focused resource acquisition across the firm boundary. Briefly considering the biological context, cell membranes consist of a double layer of phospholipids (fat based molecules; University of Utah GSLC, 2012, Nature Education, 2012a and 2012b, Hurtley, 2005, Lee, 2005). Most molecules cannot cross this phospholipid bilayer due to their size, charge, or polarity. Hence, membrane proteins are responsible for the molecule transport in and out of the cell. This transport can happen passively via 'channels' (diffusion with the concentration gradient) or actively via 'transporters' (consuming energy by 'pumping'

molecules against the concentration gradient). The membrane is semi-permeable since only molecules, which fit exactly with the appropriate transport proteins, can cross while other types of molecules are excluded. Each transport protein is tailored to the transport of one molecule (Nature Education, 2012b) or a very narrowly specified set of two molecules (e.g. Na+/K+ co-transporters). As proteins are heavy in mass, their position and distribution across the membrane influences the shape of the membrane (Zimmerberg and Kozlov, 2006).

In the context of firms, this seems to correspond to *focused* resource acquisition via transport across the firm boundary. Generalising from the biological context, the required resource to modify the firm's resource set has to be known and explicated in detail *before* an organisational arrangement to access and acquire the resource is created. For focused resource acquisition to work, the cause and effect relationship between imported resource (cause) and desired modification of the firm's resource set (effect) must be clear.

4.5.3 Bundled resource acquisition across the firm boundary. It may not always be possible to specify which resources are needed in order to complement, refine or reconfigure the firm's resource set. A reason for this may be causal ambiguity (Barney, 1999) and the imperfect link between the import of a new resource and the resulting effects on the firm's overall resource set. If causal ambiguity is present, the focused import of resources via the creation of tailored organisational arrangements may not be the most efficient way to go. Instead, *bundled acquisition* of heterogeneous resources or tightly interlinked systems of resources may be preferable. This section introduces bundled resource acquisition, which is developed via abstraction from endocytosis[38], the biological processes of bundled molecule or macromolecule 'import' across the biomembrane.

[38] The reverse process to endocytosis is exocytosis, in which cell waste or other unwanted baggage is engulfed by the cell membrane and ejected into the environment. Exocytosis plays a key role in expelling cell waste products and is, alongside endocytosis, essential to everyday functioning of the cell.

Briefly considering the biological context, if a large molecule (e.g. protein or polysaccharides) is transported across the cell membrane, a fold in the membrane engulfs the macromolecule and digests it into the cell (Pamies, 2012; Nature Education, 2012a). Endocytosis can be mediated by receptors on the cell membrane, which help to bind macromolecules tightly to the cell membrane before they are engulfed. These receptors ensure that endocytosis, despite the comparably large molecules being transported, is still a highly controlled and selective process, which reduces the import of 'unwanted baggage'.

The key insight for resource flows across the firm boundary is that bundled resource acquisition *does not* require a detailed explication, which resources are needed to modify the firm's resource set. Explicit knowledge how exactly sets of acquired or accessed resources interact with each other is not necessary. In the business world, this process of bundled resource transport across the firm boundary may be approximated with organisational arrangements to acquire large, potentially interacting sets of resources (e.g. acquisitions of whole firms, subunits or teams of people – the '*acq-hire*' phenomenon is prevalent among firms in Silicon Valley[39]). The process is highly resource intensive, given substantial acquisition premia (in the US, premia of approximately 30-50% above the target's market value are paid by acquirers; Laamanen, 2007).

In addition to resource intensity, an acquisition of a bundled set of resources may bring in 'unwanted baggage' (Barney, 1999) that may be useless or even harmful to the overall fit and interdependence of the firm's existing resources and hence has to be bundled, isolated and ejected into the environment. This process resembles the acquisition strategy of several companies, which are aware that certain desired resource sets cannot be easily isolated from

[39] An example is Facebook's 2010 acquisition of 'Chai Labs', a deal that was widely suspected to be almost exclusively about the team of people rather than the other 'assets' of the business (Guardian, 2010).

unwanted parts *before* the acquisition without creating excessive acquisition premia[40]. Hence, the 'cherry picking' may happen *after* the target has been acquired (see for example GE's acquisition strategy; Mitchell, 2008). This deliberate exclusion of resources from the firm may be a driver of 'organisational forgetting' (de Holan and Philips, 2004).

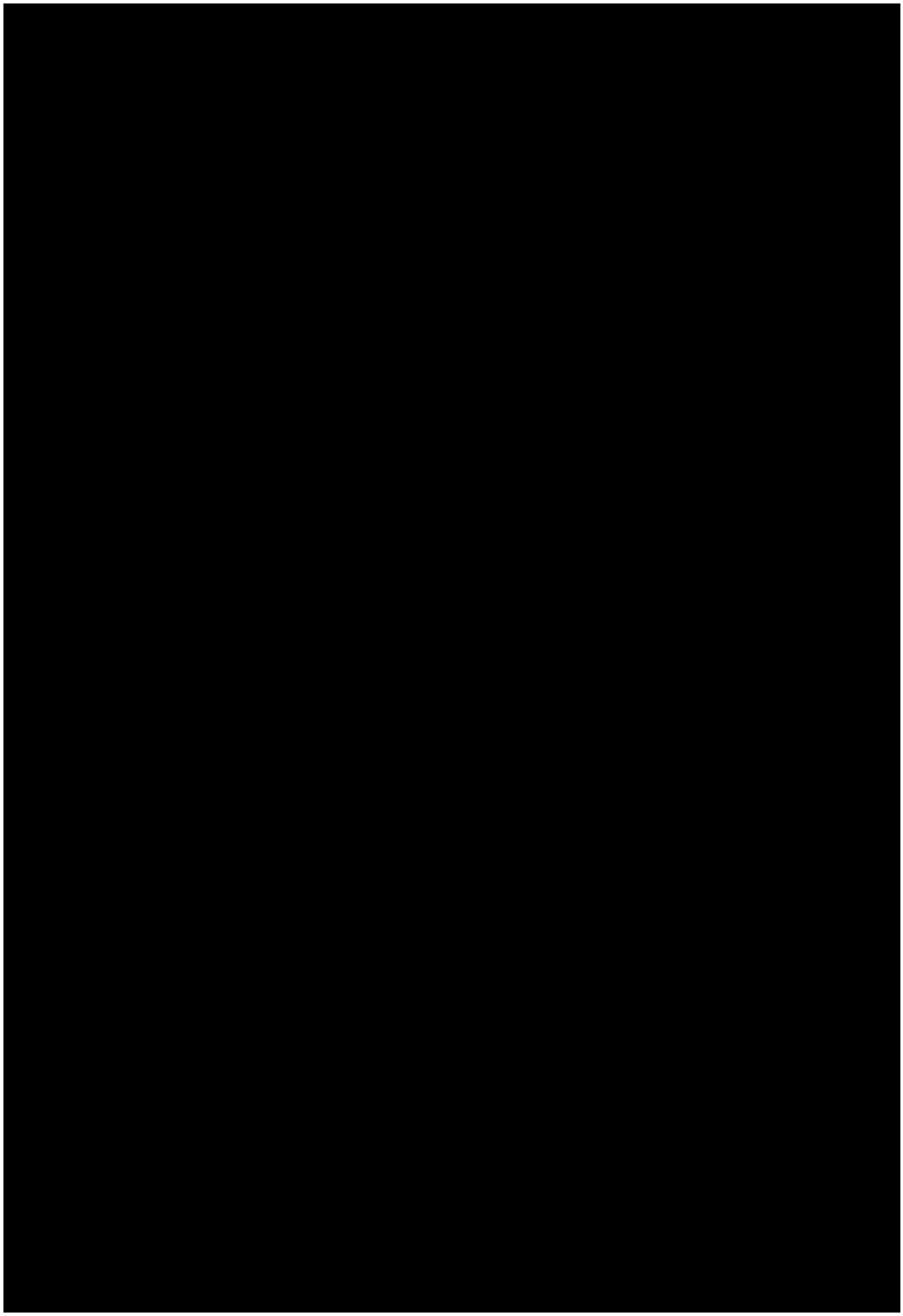
4.6 Modes of Resource Acquisition and the Complexity Moderating Function of the Firm Boundary

4.6.1 Summary and assessment of the resource acquisition modes. Overall, the proposed mode of focused resource acquisition is a rather specific, easily reversible and comparatively inexpensive mode of accessing or acquiring resources. Its potential downside is the requirement to precisely articulate (1) which specific resource is needed and (2) how it fits with the firm's existing resource set. Furthermore, in case a swift re-orientation of the firm's entire resource configuration is needed, creating a single or even multiple organisational arrangements for focused resource import may be a 'drop in the ocean' that is not fast and transformative enough to enable a profound reconfiguration of the firm's resource set.

By comparison, bundled resource acquisition is a resource intensive, rather permanent and not easily reversible mode of acquiring resources. Compared to the focused acquisition of carefully specified resources, it runs a higher risk of bringing in resources as part of the bundle, which the firm considers as 'unwanted baggage'. In addition, bundled resource acquisition addresses the problem of causal ambiguity in a sense that the complete blueprint of an activity, with all its required resources and the interactions between them, does not need to be known as long as a 'functioning', interdependent set of resources is acquired.

[40] For example due to merger arbitrage traders (e.g. hedge funds) betting on a successful acquisition (Mitchell and Pulvino, 2001). They want to capture the 'arbitrage spread' and usually follow the strategy of going short the acquiring firm while going long the acquired firm (often even before a formal announcement of an acquisition is made).

Figure 6: The two proposed modes of resource acquisition enabling semi-permeability of the firm boundary: bundled and focused resource acquisition[41]



[41] Sources of schematic graphical illustrations: Public Domain and Northern Arizona University http://www2.nau.edu/~lrm22/lessons/endocytosis/endocytosis.html (first accessed October, 2012).

4.6.2 A note on resource path dependence. Resource path dependence refers to the condition that a stock of valuable resources may be built within the firm over time, for example, in a process of augmenting undifferentiated 'factors of production' (Dierickx and Cool, 1989 and Teece et al., 1997). Hence, the resource distribution at any point in time may reflect past resource acquisitions or internal upgrading (inspired by reasoning of Argyres and Zenger, 2012 and Dierickx and Cool, 1989). Applying this thinking to the future instead of the past, Wernerfelt (2011, p. 1369) notes that a firm's resource setup creates "asymmetries in competition for new resources".

The membrane metaphor and its proposed modes of resource acquisition show that path dependence in some cases may be desired. In other cases, however, the firm may want to 'break' the path dependence in its resource set. This may be advantageous in cases where a shift in the environment requires a repositioning of the firm's resource set. From the lens of 'resource path dependence', it may seem fair to note that the mode of focused resource acquisition allows for a gradual adjustment of the firm's resource set, hence it emphasises continuity and strengthens the firm's resource path dependence. By comparison, the mode of bundled resource acquisition allows for the swift and profound repositioning of the firm's resource set, hence it gives the firm the opportunity to disrupt or 'break' path dependence.

Hedge fund firms aim to profit from inefficiencies in markets, which are continuously changing, dynamic social systems. In these markets, inefficiencies (i.e. profit opportunities for hedge funds) disappear once enough money is engaged in exploiting them (Beunza, Hardie and MacKenzie, 2006). Hedge fund firms may use deliberate upsetting of the internal resource configuration in order to swiftly adjust their resource set to changed profit opportunities. As Thompson (1967) noted, this agility in response to changed conditions in the environment is key for firm survival in complex and unpredictable environments (such as the hedge fund industry). This deliberate upsetting of the resource configuration may be

understood as spontaneous "self-stabilization" ('homoestasis'; Thompson, 1967, p. 7) from a holistic view of the organisation in its environment (i.e. the organisation restores 'fit' with the environment through reconfiguration of the internal resource set).

4.6.3 Isolation – the resource protection function of the firm boundary. The best 'protection' of firm-internal resources could be achieved if the firm boundary were an impermeable barrier as it would allow for absolute control and "avoid uncertainties associated with external relations" (Yang et al, 2010, p. 239). Without this vital isolation function of firm boundaries, firms' efforts to create an asymmetry vis-à-vis their competitors (e.g. via internally built resources, cf. Dierickx and Cool, 1989) would be in vain as the asymmetry would diffuse across the fully permeable firm boundary until the resource concentration in and outside the firm boundary is in equilibrium again. Although stable equilibria are the desirable state of many models in neoclassical economics, the key function of the firm boundary is to *avoid* resource equilibrium. Thompson (1967) illustrates the importance of resource protection. Regarding a firm's technical core[42], which may be understood a specialised set of resources, Thompson (1967) suggested that a firm attempts to protect or 'buffer' it from the environment (Hargadon, Davis and Weick, 2003).

The hedge fund industry illustrates the potential benefits of low permeability of the firm boundary (for example with respect to information; for an illustration please see Figure 7). Prior literature (e.g. Aggarwal and Jorion, 2012; Hedges, 2005) identified three main categories why some "hedge fund managers […] fiercely resist offering transparency" (Aggarwal and Jorion, 2012, p. 108). First, information revealed though transparency may encourage competitors to replicate or reverse engineer the trading strategy of a hedge fund

[42] As Hargadon, Davis and Weick (2003, p. 499) note, "Thompson himself is vague in defining the technical core", however Thompson seems to use the term rather broadly, as his understanding of 'technology' suggests: "We are thus using the term technology in its broad sense as a system of techniques" (Thompson and Bates, 1957, p. 325).

firm (free riding). Second, understanding the idea behind a trading strategy may give competitors the chance to forecast future trades and enter positions before the hedge fund firm, hence artificially increasing prices (front running). Third, if the hedge fund firm is transparent about specific securities holdings, especially short positions, it may be at risk of corporate retaliation since the management of the shorted company may start a public campaign or exit the dialogue with the hedge fund firm (cf. Hedges, 2005).

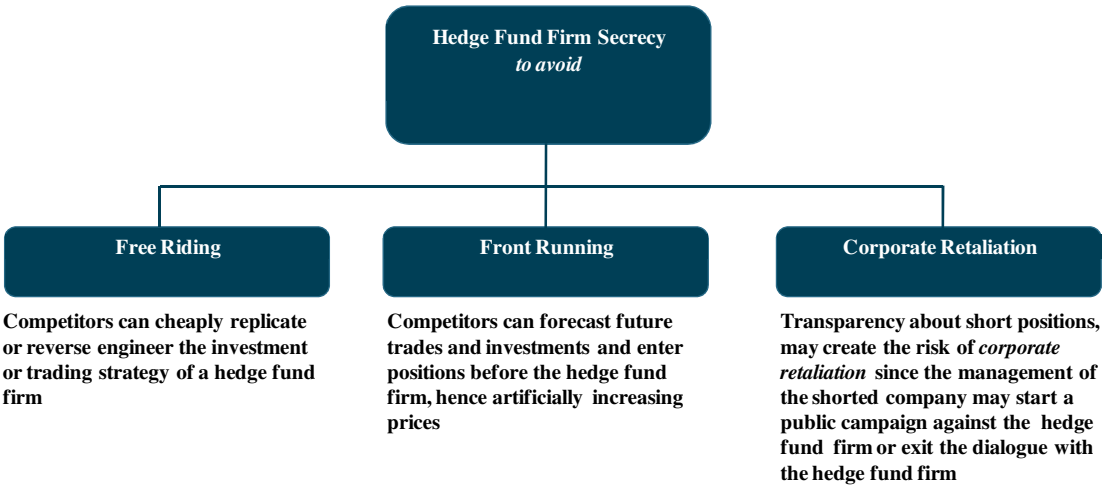


Figure 7: Illustration of the benefits of resource isolation in the hedge fund industry: secrecy avoids free riding, front running and corporate retaliation.

Compared to bundled resource acquisition, firms concerned about the protection of their internal resources seem to be better able to avoid uncontrolled diffusion of their tightly held, valuable resources using focused resource acquisition. This highly controlled mode of resource acquisition minimises the chances that resources can cross the firm boundary by accident or malicious intent. A high level of resource protection, however, is not guaranteed in less controlled modes of resource acquisition (i.e. bundled acquisition). Here, precious resources may 'leak' into the environment, especially when seemingly worthless resources are packaged to heterogeneous bundles of 'unwanted baggage' to be ejected into the environment.

Jacobides, Knudsen and Augier (2006, p. 1201) show an interesting boundary condition to this notion that 'protection of resources is good' since sometimes firms may actually encourage other firms to mimic their resource setup and activities: "innovators may be better off if they encourage imitation […] instead of beating the others to the punch in providing the good or service".

4.6.4 How does the firm boundary moderate internal and external resource complexity?

The firm boundary seems to moderate two types of complexity in order to augment the internal resource set via resource flows from the environment. The first type of complexity refers to the acquired resource, whereas the second type refers to the firm's internal resource set (ex ante to the integration of the new resource).

With regard to the acquired resource, complexity may be characterised by a high interdependence of the target resource with other resources in the environment (i.e. external complexity). This can also be combined with causal ambiguity (Barney, 1999), where it may not be clear whether the target resource is interacting with other resources in order to realise its full value creation potential. Furthermore, the resource may not be traded individually but only in bundles with other, potentially less desirable resources.

As far as the firm internal resource set is concerned, complexity (i.e. internal complexity) may be higher if the resources are complementary (Amit and Zott, 2001) and form a tightly interlinked bundle, which creates more value than the value creation of the sum of the individual resources. However, if a new resource joins a tightly interlinked and carefully fine-tuned system, this may upset the system, which either harms the firm or may be used deliberately in order to 'break the path dependence' in the internal resource set.

Focused and bundled resource acquisition may be useful to moderate these two types of complexity. The following paragraphs distinguish between four resource acquisition modes,

depending on the degree (high/low) of internal and external complexity. For this distinction, it may be helpful to take a slightly more differentiated view on resources. The firm may require basic resources (e.g. commodities, raw materials, basic factors of production; Teece et al., 1997) as pure input to its value creation process. These basic resources 'flow through' or are transformed in the value creation process. 'Flow resources' are vital for the firm, however they are fairly basic and homogenous in their nature and do not alter the value creation process. In short, these 'flow resources' do not contribute to creating a resource asymmetry vis-à-vis the environment. Conversely, 'architectural resources' alter the firm internal resource set, i.e. the 'architecture' of the value creation process. Architectural resources, their level of interdependence and their fit with each other are crucial elements for creating a resource asymmetry.

i. **Low complexity of acquired resource and low complexity of internal resource set: acquisition of flow resources.** Whereas the following three acquisition modes apply to the acquisition and integration of architectural resources, the first mode of resource acquisition (low/low) applies to the attainment of flow resources. These fairly homogenous and abundant resources (e.g. commodities, basic factors of production; Teece et al., 1997) are important as inputs, which flow through the production process, but they do not interfere with the internal configuration of architectural resources. Flow resources may be cost effectively acquired via a regular market transaction with the counterparty that offers the best price.

ii. **Low complexity of acquired architectural resource and high complexity of internal resource set.** Here, the complexity of the internal resource set is high (i.e. the internal resource set is an interacting, carefully fine-tuned system) whereas the complexity of the acquired resource is low. Focused resource acquisition in this case seems to ensure minimum disruption to the 'running system' of internally well configured, interdependent resources. This focused mode of acquisition of carefully selected architectural resources

seems to pose a low risk of upsetting the internal resource configuration and even when some disturbance occurs, it can be rectified speedily by expelling the problematic resource. The acquired resource may be used to complement the internal resource set and to further enhance the resource asymmetry compared to the environment. Hence, this configuration seems to reinforce the path dependence of the resource set.

iii. **High complexity of acquired architectural resource and low complexity of internal resource set.** This is the opposite scenario to the previous point. In this configuration of complexity, the acquired target resource is characterised by high complexity (e.g. it is interdependent with a bundle of other resources or it is not individually traded) whereas the internal resource configuration may be described to be of low complexity (i.e. internal resource set with low interdependence; resource set fairly robust to addition of new resources). Here, bundled resource acquisition may be adequate. This bundled acquisition may help a firm to develop a more complex internal resource set in a short amount of time, which in turn may be a way to quickly build a resource asymmetry in a specific field, hence overcoming time compression diseconomies (Dierickx and Cool, 1989).

iv. **High complexity of acquired architectural resource and high complexity of internal resource set.** In this scenario of high complexity on both sides, it seems necessary for the firm to determine whether it wants to (a) build on or (b) reposition its resource base. In case the firm wants to build on its resource base without substantial disruption of the internal resource set, the firm may want to break down the complexity on the side of the acquired resource. To do so, the firm would create a set of focused resource acquisition arrangements, which in their combination mirror or constitute the originally complex resource to be integrated (principle of decomposability (Simon, 1962); importing resource components and 'assembling' them internally). Due to causal ambiguity, some experimentation or '*selective* trial and error' (Simon, 1962, p. 472; emphasis in original) may

be necessary to discover the 'components' of a complex resource. This reverse engineering avoids upsetting the tightly interlinked internal resource setup as it might happen with bundled import. In case it is difficult or undesired to decompose the complex resource, it may cross the firm boundary via bundled acquisition. This however can upset the internal resource configuration, which may be desirable in cases where the firm intends to reposition its resource set (i.e. build a modified resource configuration with the available resources).

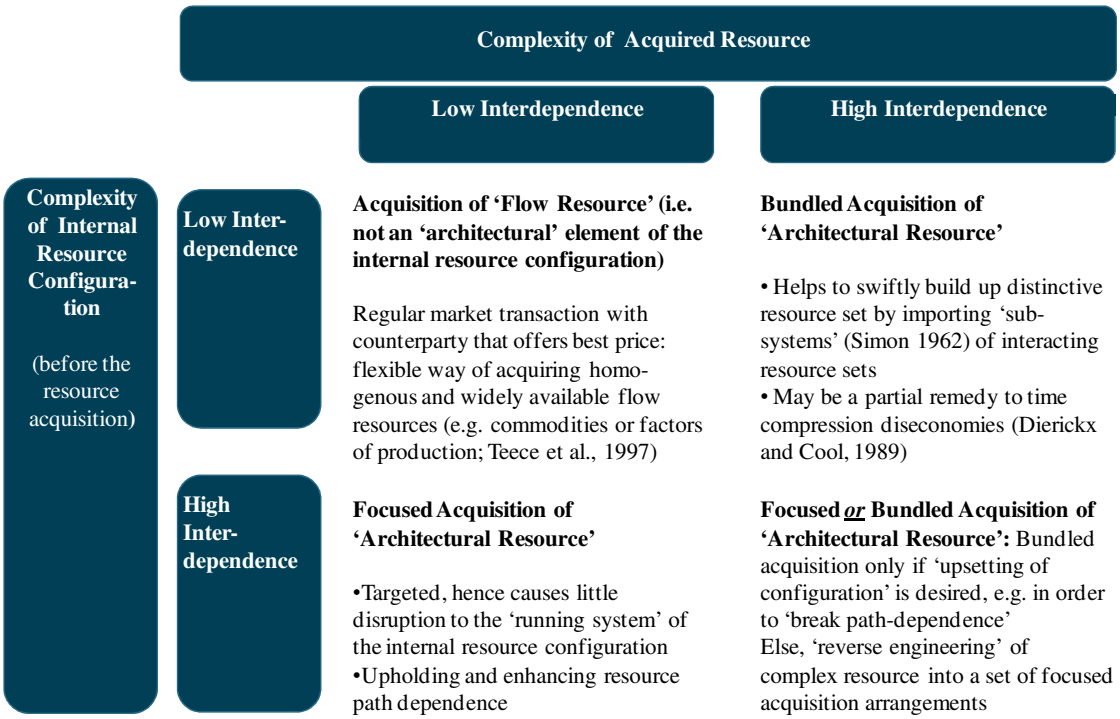


Figure 8: Different modes of resource acquisition depending on different complexity levels of (a) the acquired resource and (b) the internal resource set.

Figure 9 provides an illustration of how the different acquisition mechanisms may moderate internal and external resource complexity using examples from the hedge fund industry. An example for the import of a flow resource with low complexity on both sides would be largely standardised, easily interchangeable services by non-vital service providers such as subscriptions to databases or information services (e.g. Bloomberg, Thomson Reuters;

Albinus, 2011) for market data, market analytics and communication with other market participants (e.g. Bloomberg Messaging for trade confirmations).

A situation in a hedge fund firm, which may involve the acquisition of an interdependent architectural resource into a low complexity internal environment may happen when a fund hires an interdependent, functioning team of experts (for example from an investment bank) in order to quickly build an internal expertise in a novel area of activity for the hedge fund firm. A recent example comes from the US hedge fund firm Fortress, which in May 2014 hired the global investment team of another hedge fund, Centaurus Capital, in order to establish and manage an event-driven investment strategy (Johnson, 2014). Here, the high complexity of the imported resource (interdependent team of experts) is integrated into low complexity internal resource configuration (i.e. no existing internal resource set up to offer event-driven strategy).

The opposite case occurs when the acquired architectural resource is of low complexity but the internal resource configuration is highly interdependent. This case may happen when a hedge fund firm requests specialised knowledge and insights from a specific 'expert' investor on a narrowly defined investment idea (low complexity of imported resource; e.g. hedge fund firm enquires with expert investor regarding a potential investment into a biotech firm developing a cure for a particular type of vision impairment) generated by the hedge fund firm's internal research department (interdependent with other functions in the firm, hence, high complexity of internal resource configuration).

The acquisition and integration of a complex architectural resource into a complex internal resource configuration is challenging for the hedge fund firm. A case, in which the firm may decide to 'upset' and restructure the internal configuration is when it invests into a new (and often fairly expensive) accounting software to substitute or restructure the interdependent and

fine-tuned work of internal hedge fund accountants with the goal to enhance efficiency or save cost over the long-run. Another example, where the hedge fund firm may decide for focused import in order to build on a carefully configured internal resource set is when the hedge fund firm aims to organically expand its investment expertise into related areas and where it has to orchestrate the existing knowledge inside the firm (often created by a carefully built up and collaboratively organised research department) with the (sometimes conflicting) knowledge input from a complex array of external sources: most importantly investors, but also service providers (e.g. prime brokers; Baden-Fuller et al., 2013), other fund managers (Simon et al., 2010), commercial databases or regulators. In this case, the hedge fund firm may decide to reduce the complexity of the externally available knowledge and limit its outreach to a few trusted, competent and experienced investors, whose knowledge, experience and incentive alignment helps to successfully build a new area of investment competence (i.e. an asymmetry vis-à-vis the environment).

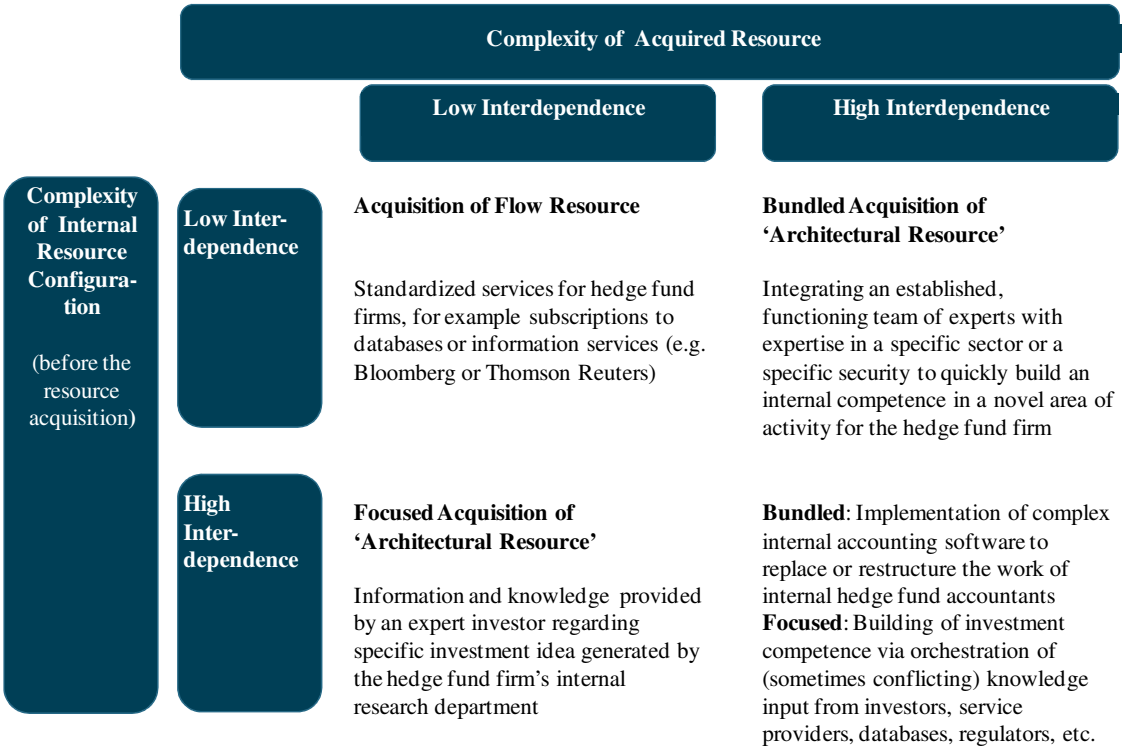


Figure 9: Illustration of the different modes of resource acquisition (depending on complexity) using the example of the hedge fund industry.

4.7 Discussion and Wider Implications

This chapter starts from the firm's decision to acquire a resource, which implies that this chapter does not address arrangements that allow access but not control over a resource (e.g. the building of interfirm resources (Dyer and Singh, 1998) via alliances or interfirm cooperation). The conceptual analysis sheds light on how the firm boundary may enable a differential flow of resources and how the firm boundary moderates the complexity of the acquired resource and the complexity of the internal resource set. Generalised insights from cell biology helped to flesh out important determinants of semi-permeability and the successful moderation of complexity.

It seems important to note that the function of the firm boundary as a resource gatekeeper and a moderator of complexity seems to be dynamic. The firm boundary has to stay adaptable and responsive since firms are complex systems open to the environment, and requirements in terms of resource asymmetry are likely to change as environmental conditions change (Thompson, 1967).

The conceptualisation of the firm as 'open system' (Thompson, 1967) with its boundary acting like a semi-permeable membrane illustrates how the firm boundary contributes to maintaining flexibility and responsiveness to changed internal and external complexity. As internal and external resource complexity may vary *within a firm (over time) or across firms (at a given moment in time)*, the acquisition mode of a resource may change (i.e. in terms of the acquisition modes presented in Figure 8, a resource may 'change quadrant'). In this way, the firm reaches "self-stabilization" (i.e. *homeostasis*), which "keeps the system viable in the face of disturbances stemming from the environment" (both quotes: Thompson 1967, p. 7).

Complexity of a resource for example may vary since technological change may create or eliminate interdependencies with other resources (Afuah, 2003 and Siggelkow and Rivkin,

2005). The casual observer may assume that resource complexity is ever increasing due to, for example, the "quickened pace of innovation and international competition" (Jacobides, Knudsen and Augier, 2006, p. 1200). However there also are environmental changes, which "standardize some interfaces" (Siggelkow and Rivkin, 2005, p. 101) and may lead to decreased resource complexity.

4.7.1 Boundary Conditions. Despite the potentially useful insights derived from the membrane metaphor and the firm boundary's ability to moderate complexity, the concept has to be applied carefully. First of all, if all the resources required for value creation are available inside the firm already (Alvarez and Barney, 2004) resource import from the environment and hence moderation of resource complexity becomes a less important question for the firm.

Furthermore, the dichotomy of bundled versus focused resource acquisition is stylised. In reality, there may be various other resource acquisition modes that lie between these extremes. Schilling and Steensma (2002, p. 388) however remind the reader of the potential virtues of a dichotomy: "As Conner and Prahalad (1996, p. 478) argued, "the polar cases are basic particles from which more elaborate arrangements are constructed." Thus, insights gained from studying the polar cases can potentially be applied to a broader realm of governance modes that include the more complex hybrid structures".

Borders of social and biological systems, such as firm boundaries and cell membranes may be comparable in many characteristics and the study of one may lead to interesting insights and enhanced understanding of the other. However, when using a metaphor from the biological world in order to better understand a social-organisational phenomenon, a note of caution seems appropriate.

It is important for the theorist to keep in mind boundary conditions, which apply to the potentially fruitful intersection of fields, in this case organisational theory and cell biology. Penrose (1952) provided a note of caution regarding the use of biological analogies to economic phenomena, such as the concept of a 'life cycle' in the theory of the firm. Her main criticism of biological analogies is that they impose a notion of *pre-determination* on firms, which are social entities, created by the interaction of individuals. In her view, analogies from the biological world may "implicitly deny, the fact that firms are institutions created by men to serve the purposes of men" (Penrose, 1952, p. 809).

With respect to Penrose's (1952) note, the proposal of the modes of resource acquisition does not deny conscious human decision – it rather emphasises *carefully considered, conscious choice*[43]. Managers decide on how the firm boundary looks like and how it moderates resource complexity. Whereas this 'anti-determinism' critique seems to be an important point given the state of biology in the 1950s, modern biology has pointed out that even in the biological world, processes are not as deterministic as they may have seemed initially (e.g. Clancy, 2008).

Another boundary condition to the conceptualisation of the firm boundary as membrane may be imposed by regulators mandating boundaries to be strictly impermeable instead of semi-permeable. 'Chinese walls' in the finance industry (particularly in investment banking) serve as example to illustrate this point: "Mindful of intrafirm interdependencies and resulting conflicts of interest, banks have set up "Chinese walls" between departments, which, despite their picturesque name, are not physical barriers. Instead, they are a metaphor to describe a set of internal rules and procedures to prevent one department from obtaining information prejudicial to the clients of another" (Hayward and Boeker, 1998, p. 5). An example for a

[43] Please note that even Darwin, who discovered evolution to be a fairly mechanistic process, did not deny intentionality or the 'power of reasoning': As Darwin "believed that animals had powers of reasoning, then he would hardly have belittled or denied them for humans" (Hodgson and Knudsen, 2006, p. 11).

firm-internal 'Chinese wall' in an investment bank is the prohibition of information exchange between the M&A advisory team (which is likely in possession of material non-public information), and the brokerage team of the bank, which releases research reports on specific firms or industries (strictly using publicly available information). Financial regulators such as the Financial Conduct Authority[44] (2013) in the UK provide specific guidance on how a firm has to put in place impermeable boundaries (i.e. Chinese walls) in order to deal with firm-internal, inter-departmental conflicts of interest.

The example in the previous paragraph on regulator mandated impermeable 'intra-firm' boundaries points to a promising avenue for future research: the multi-dimensionality of boundaries. It seems fruitful for future research to build on some of the excellent prior work in the literature on the multi-dimensionality of boundaries. Some examples of prior work alluding to the multi-dimensionality of boundaries are provided below:

Evocative of Simon (1962), Meyer and Lu (2004, p. 57) for example view firms as "open, loosely coupled, hierarchically nested systems", which serve as the touching point between the realms of state-controlled and private enterprise. Looking inside the firm, Bidwell (2012) for example notes the phenomenon that firm units 'outsource' their work to other units within the same firm. In a similar vein, Jacobides and Billinger (2006) note that firm-internal boundaries may exist between steps in the value chain and that certain departments may sell their intermediate product to the market or the departments located in adjacent value chain steps, which results in a 'permeable vertical architecture'. Going beyond the firm boundary, O'Mahony and Bechky (2008) provide an interesting example of 'boundary organisations', which are specialised entities enabling the cooperation of organisations with partially conflicting goals.

[44] Formerly the Financial Services Authority (FSA).

4.7.2 Contributions. This paper attempts to make three contributions to the literature on firm boundaries:

First, the analysis sheds light on how the boundary attribute of semi-permeability may help to create resource asymmetries, which in turn may be a key antecedent of value creation and appropriation. Along the lines of Thompson's (1967) suggestion that organisations combine elements of open and closed systems, the firm may 'isolate' or keep secret within the firm boundary the plan/blueprint of how to create a resource asymmetry. However, the execution of building an asymmetry involves the active interaction with and the import of resources from the environment. Semi-permeability of the firm boundary is examined as a key attribute helping to create a resource asymmetry via the contemporaneous isolation and inflow of resources.

Second, whereas it is established that a key function of the firm boundary is to demarcate and isolate the firm from the environment, there remains room to develop our understanding of how the firm boundary moderates complexity between the acquired resource (i.e. its interdependence with other resources in the environment) and the overall internal resource setup of the firm (i.e. the interdependence of resources inside the firm). This enquiry seems relevant since the fit of (a set of) resources and activities may impact the value creation and appropriation potential of the firm (e.g. Siggelkow, 2002). The analysis considers four combinations of these two types of resource complexity and suggests specific resource acquisition modes.

Third, this paper zooms in on the acquisition of resources under hierarchical governance and illustrates that the firm faces important choices regarding how to 'import' a resource in a way that preserves, enhances or reconfigures the functioning of the firm-internal resource set. The chapter illustrated how the firm boundary helps to (1) build and uphold asymmetry but also

(2) maintain flexibility to react to changed internal or external resource complexity. Hence, the chapter provides insights on the potential mechanisms on the level of the firm boundary behind Thompson's (1967) notion that firms are both open (natural) and closed (rational) systems. The firm boundary and its characteristic of semi-permeability seems to be an interesting example of how organisational structure adjusts to and coevolves with resource complexity.

On a wider note, which regards the relationship between the 'boundary' and the 'entity', boundaries and their underlying mechanics may describe key aspects of the overall entity. Santos and Eisenhardt (2005, p. 505) conclude that "boundaries reflect the essence of organization […], no topic more deeply engages scholars in the fundamental attributes of organizations". In a similar vein, Abbott (1995, p. 862) points out the related meaning of 'boundary' and 'entity' and notes that "in formal topology, boundaries and entities are more or less logically equivalent". Selective bridging of the boundary or 'communication' across the boundary with the environment is crucial for the emergence of a social system, which Luhmann (2006, p. 47) interestingly compares with proteins in biology: "'Communication' is the structural equivalent of biochemical statements by means of proteins and other chemical substances". It is important to note, that 'communication' is understood in a very general sense as any sort of interaction with the environment, hence including flows of resources. According to Luhmann (2006 and 2013), it is this attribute of communication of an entity, which leads to the emergence of an interdependent social system instead of the parallel existence of closed-off, isolated, autarkic entities. Drawing on an analogy to the biological membrane, this paper sketched out how an important part of the firm's 'communication' (i.e. resource acquisition) with the environment may work. Staying with this abstract interpretation of 'communication', the complexity moderating function of the firm boundary

seems to be comparable to 'translation' between the acquired resource and the firm's internal resource set.

4.7.3 Potential implications for practice. Although the reasoning in this chapter was more on a conceptual level, it seems important for managers to develop a deeper understanding of (1) the role of the firm boundary in creating resource asymmetries and (2) the factors, which influence how resources may be acquired without upsetting the existing internal interdependence between resources. If a manager wants to reform the organisation, resource import can also be used to deliberately upset and restructure the internal resource configuration.

Since hedge fund firms aim to profit from inefficiencies in markets, which are continuously changing, complex social systems, they may use this deliberate upsetting of the internal resource configuration in order to swiftly adjust their resource set to changed opportunities for value creation. As Thompson (1967) noted, this agility in response to changed conditions in the environment is key for firm survival in complex and unpredictable environments. Hedge fund investors may observe this adjustment of the resource set as 'drift' in investment style, which despite some investors' concerns about a potentially changed risk and return profile, may actually be positive (or at least not harmful; e.g. Gibson and Gyger, 2007) for hedge fund performance.

Whereas it may be intuitive that the complexity of the acquired resource influences the resource acquisition decision, this paper flagged that another important component is the complexity of the internal resource set. Depending on the configuration of each type of complexity, four modes of resource acquisition were suggested, which may help managers as high-level heuristics in environments that are uncertain and 'chaotic' in a sense that they

"never reach equilibrium but yet are lawful" (Schoemaker, 1990, p. 1188). Management of complexity seems to be a key part of successful resource integration (Gary, 2005).

4.8 Conclusion

This paper conceptualised the firm boundary as semi-permeable membrane. It provided insights on resource acquisition via transport across the firm boundary and proposed that the firm boundary moderates complexity between the acquired resource and the existing firm-internal resource set. Semi-permeability of the firm boundary seems important for the creation and maintenance of resource asymmetries, which may be considered as a key antecedent to the creation and appropriation of value.

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Chapter 5

Conclusion to the Thesis

This thesis took the empirical setting of the hedge fund industry, which is characterised by small, entrepreneurial, knowledge-intensive and asset-light firms, and studied the performance and survival implications of intra-industry diversification and an active relationship between hedge fund firms and their customers (i.e. investors). Furthermore, a theoretical chapter conceptualised the firm-boundary as semi-permeable membrane and investigated the role of the firm boundary in creating resource asymmetries and moderating resource complexity.

The insights from the chapters inform and contribute to the nascent literature stream on intra-industry diversification (advanced for example by Dovev Lavie and colleagues), as well as theories on the active involvement of customers (advanced for example by Eric von Hippel and colleagues). Furthermore, the insights drawn from the membrane metaphor inform and contribute to resource-based theories on the firm-boundary (advanced for example by Jay Barney and colleagues).

Whereas the three main chapters of this thesis are constructed and presented as stand-alone papers, three overarching insights may be drawn from the empirical evidence and conceptual reasoning presented:

First, intra-industry diversification may be divided into the two sub-categories of diversification (a) within and (b) beyond a sub-sector of the industry. The results indicate a positive effect of intra-industry diversification on firm survival, which may be driven by the risk reducing effect of beyond sub-sector diversification. By comparison, the results provide evidence for a negative effect of intra-industry diversification on performance, which may be driven by diversification within the sub-sector. Overall, the empirical and theoretical analysis

contributes to the emerging literature on intra-industry diversification (e.g. Zahavi and Lavie, 2013; Tanriverdi and Lee, 2008; Li and Greenwood, 2004; Stern and Henderson, 2004).

Second, the relationship of investment firms and their investors seems to be much more multifaceted than the views of 'investors as providers of capital' or 'investors as passive consumers of the hedge fund service' would suggest. Some investors seem to be in an ongoing conversation with the fund management as far as the identification, assessment and execution of new investment ideas is concerned. The evidence presented in chapter 3 indicates that hedge fund firms with an active firm-investor network beyond the provision of capital tend to show enhanced performance and survival. Regarding theory development, these insights inform and contribute to theories on the active involvement and tangible added value of a firm's customers as for example discussed in the literatures on 'customer innovation' (e.g. Thomke and von Hippel, 2002; Harhoff et al., 2003; von Hippel, 2007; Hienerth et al., 2014) or 'product co-creation' (e.g. Prahalad and Ramaswamy 2004; Nambisan, 2002; Hoyer et al., 2010).

Third, an important yet underappreciated function of the firm boundary seems to be the selective acquisition of resources and the moderation of two types of resource complexity: the complexity of the acquired resource and the complexity of the internal resource set. The moderation of these two types of resource complexity shapes how the firm boundary enables a differential flow of resources, which in turn contributes to the creation of resource asymmetries as a basis for delivering value to customers and capturing a part of the created value. The analysis contributes to the discourse about resource-based theories of the firm and its boundary (e.g. Barney, 1986; Dierickx and Cool, 1989; Barney, 1999; Gnyawali and Madhavan, 2001; Schilling and Steensma, 2002; Alvarez and Barney, 2004; Wernerfelt, 2011).

The empirical findings and conceptual insights not only aim to build on and contribute to the scholarly body of literature, they may also hold potentially insightful implications for managers (of financial services companies, especially investment funds), investors and regulators:

Regarding insights for managers, the analysis of qualitative as well as quantitative data in chapter 3 showed that engaging with investors can be a source of potentially sustained competitive advantage in an environment where profit opportunities are temporary (e.g. exploitation of imperfections in financial markets). Since the connection to and ongoing conversation with investors seems to be a key task, which impacts hedge fund performance and survival, investment management firms may want to categorise the grooming of 'investor relations' as a key responsibility of the partners in the fund. First, because an informed conversation with the chief investment officers of, for example, endowment funds or pension funds requires the key decision makers of the hedge fund firm to be part of the conversation instead of a 'sales specialist' from the investor relations department. Investment fund managers may want to consider assigning to the investor relations department only the mechanistic/operational part of the firm-investor conversation. Second, partners in an investment fund may want to groom the ongoing conversation with investors since they are guarding a key competitive asset of the firm. If they give it out of their hands it may happen that investors leave alongside with 'their' trusted investment manager, who has been in charge of the ongoing conversation.

When managers consider increasing the scope of their operations via intra-industry diversification, it may be helpful to know that diversification beyond the sub-sector of an industry, although potentially more challenging to execute and communicate to investors, seems to be far more rewarding in terms of enhanced survival and performance than diversification within the same sub-sector.

Furthermore, managers and entrepreneurs (in the hedge fund industry or other knowledge-intensive industries) may think of the boundary of their firm as semi-permeable border to the environment when considering how to build or strengthen their resource advantage. In order to build a resource advantage, managers have to 'import' valuable resources into the firm – hence the firm boundary should be open and permeable. However, the firm boundary should also be a strong barrier around the imported or internally built and carefully interconnected resources in order to protect them from diffusing into the environment. A manager's choice of how to acquire a new resource should not only reflect the complexity of the acquired resource but it should also take into account the effect of the imported resource on the existing internal resource configuration. This seems important as sometimes a seemingly beneficial new resource may not fit with or may even upset the carefully fine-tuned internal resource setup, leading to a loss of resource asymmetry or competitive distinctness.

Regarding insights for investors, chapters 2 and 3 provided evidence for the suggestion that investors may not only consider their (hedge fund) investment from the standpoint of a passive consumer. Widening the perspective from the single fund to the overall investment management firm with its various products seems to ensure a more holistic due diligence (for example with respect to the hedge fund firm's degree of intra-industry diversification) and a wider ground to engage in an active and ongoing conversation with the hedge fund firm, which seems to be associated with enhanced investment returns for investors, as well as an improved assessment of operational risk. Topics of this ongoing conversation between investors and the hedge fund firm seem to be the identification, assessment and execution of new investment ideas, as well as potential areas for improvement in the firm's organisational structure.

Regulators, just like investors, have often focused on the perspective of the product (i.e. the fund) instead of the firm since one of their primary goals is the protection of the investor,

who normally invests in funds, not firms. The adjustment of the regulator's level of analysis from the fund to the firm may yield an enhanced insight as it may uncover hitherto less attended, yet potentially important interlinkages between financial actors (for example the relationship of the hedge fund firm with its investors). In times of market turmoil, these interlinkages seem to be important for the regulator in order to gauge the 'systemic implications' of the collapse of a financial actor and its knock-on effects on the 'real economy' (e.g. non-financial services or the producing sector).

The network with investors potentially needs more regulatory attention and supervision. Although hedge funds are restricted to sophisticated institutional investors, a large scale hedge fund failure can substantially hurt 'ordinary' people since the large institutional investors (e.g. insurance companies or pension funds) administer the money of ordinary people who are neither 'sophisticated investors' nor do they seem to have enough financial resources to be able to absorb a substantial investment loss without compromising their daily lives, their savings for their children's education or their retirement provision.

Overall, the author hopes that the honourable reader found this thesis an insightful read. Executing this research and sparring it with supervisors, peers, as well as scholars from other institutions was an exciting endeavour and an academically as well as personally enriching experience for the author. On a final note, the author would like to thank his supervisors, Charles Baden-Fuller and Hans Frankort, for their helpful advice and the interesting discussions over the past four years.

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