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Geographical specialization and its complex effect on private equity performance in Europe

A financial analysis concerning the effect of geographical specialization on private equity fund and portfolio company performance in Europe

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Abstract

Private equity has been researched extensively since the 1980s, including various types of private equity fund specialization. However, the effect of geographical specialization on private equity performance has not yet been researched elaborately. This research aims to fill this lacuna in the literature by means of OLS regression analyses on fund performance and portfolio company performance. Geographical specialization of the buyout fund is found to have a positive impact on returns, but this effect is significantly less positive for growth equity funds. Moreover, this research finds a positive effect of geographical specialization of the buyout fund on the profitability of the portfolio company. Furthermore, a positive effect has been found of geographical specialization of a growth equity fund on turnover growth of the portfolio company.

Word count: 9475

Keywords: Private Equity, Buyouts, Growth Equity, LBO, Minority investment, Geographical specialization

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Chapter 1 Introduction

The European private equity sector has been growing rapidly in the last decade. The number of mature private equity deals in Europe has increased significantly to 1,473 in 2021, as can be seen in Figure 1.1. The aggregate value of these deals has not yet risen above the 2006 peak of 147.5 bn USD but has been recovering quickly to 131.8 bn USD in 2021. Total assets under management of fund managers with a geographical focus on mature European firms has grown rather steadily since 2000 to 911.3 bn USD in 2021 (Figure 1.2).

The trend of increasing deal counts and sizes, as well as the increase of assets under management has been taking place in North America as well. MacArthur, McKay, and Harris (2022) explain this phenomenon by the systemically decreasing interest rate since the early 2000s in the Bain global private equity report. They also argue that the average North American buyout EV/EBITDA multiple has risen due to the declining interest rate in the last two decades. However, the strong inflation and the Federal reserve's (2022) reaction of announcing interest rate hikes will make it harder to sustain high returns in private equity (MacArthur et al., 2022), making it even more important to further research what drives private equity performance.

Cressy, Munari, and Malipiero (2007) found a positive effect of a PE firm's industry specialization on the operating profitability and turnover growth of its portfolio companies. However, the precise effects of geographical specialization on private equity performance on both the fund level and the portfolio company level have not yet been elaborately researched.

This research will thus answer the main research question: ***how does geographical specialization of the private equity fund affect the performance of the fund and its portfolio companies in Europe?***

This question is not only relevant for academics, but also for practitioners in the private equity industry as the results can help fund managers to strategically improve their returns. This research will specifically focus on buyout and growth equity funds as it aims to add to the existing research on private equity investments in mature and profitable companies (Cressy et al., 2007; Preqin, 2022a; Zeisberger, Prahl, & White, 2017).

There will be two analyses. The fund-level analysis is centered around the effect of geographical specialization on the net internal rate of return and the money multiple (total value per invested capital). The portfolio company analysis is focused on describing the effect of geographical specialization on profitability and turnover growth.

The structure of this paper is as follows: the existing literature concerning the drivers of private equity strategies, performance, specialization, and the impact of geographies on performance will be covered in the next chapter. After that, the samples and the methodologies of the fund-level and the company-level analyses will be explained. This will be followed by the results. In the data, methodology and results sections, the fund performance analysis will be covered first and is followed by the portfolio

company performance analysis to have clear picture of the overall effects of geographical specialization on fund performance before zooming in on the profitability increase and turnover growth of portfolio companies. And lastly, there will be a discussion and conclusion of the findings.

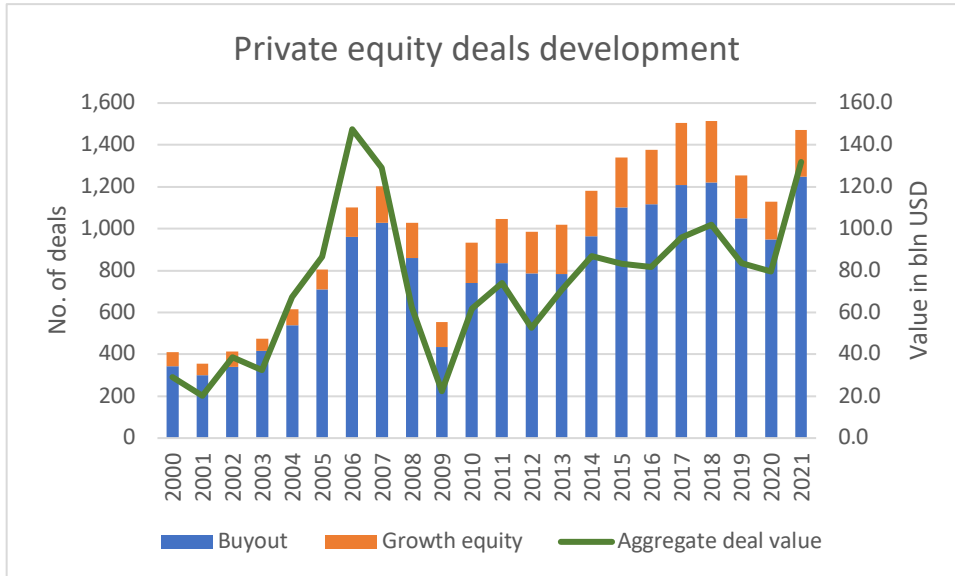*Figure 1.1 The development of the number and size of private equity deals in Europe from 2000-2021.*
Includes buyout and growth equity deals.
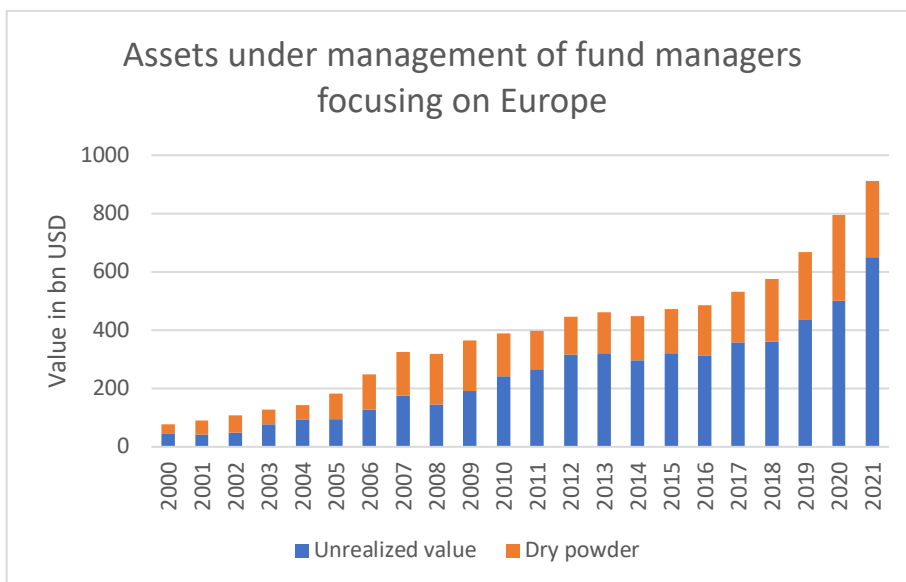Adapted source: Preqin database, 2022.

Figure 1.2 The development of total assets under management of fund managers with a geographical
focus on Europe, specifically applying buyouts and investments in growth equity.
Adapted source: Preqin database, 2022.

Chapter 2 Literature review and hypotheses

2.1 Brief introduction on the private equity fund

A private equity fund is an investment fund that generally invests in private assets that are not publicly traded.[1] Such a private equity fund is set up by a private equity firm. The main differences between the fund and the firm are that the fund has a limited lifespan, and the firm delivers investment expertise to the fund, as a general partner and investment manager (Zeisberger et al., 2017). The typical lifespan of a private equity fund is 10 to 12 years (Kaplan & Schoar, 2005; Zeisberger et al., 2017). External parties that want to invest in a private equity fund can become limited partners by committing capital to the fund. The committed capital will be called upon when the investment team of the private equity firm has found a good investment.

There are various private equity strategies with each having its own set of value drivers. Buyout strategies involve obtaining a controlling stake (Zeisberger et al., 2017) and improving the efficiency of the portfolio company. Contrastingly, growth equity strategies involve obtaining a minority stake and focusing on helping the portfolio company find and realize growth opportunities, usually with little or no leverage (Zeisberger et al., 2017). Researching the effect of geographical specialization on performance of all private equity strategies is outside of the scope of this research. This research, as discussed in the introduction, will specifically focus on buyout and growth equity strategies as target companies are typically mature and profitable.

2.2 Drivers of portfolio company performance

2.2.1 Buyout value drivers

The main value drivers of buyouts are equity control, leverage, and the alignment of incentives of the management of the portfolio company, resulting in a more efficient corporate governance structure (Jensen, 1986; Kaplan, 1989; Lichtenberg & Siegel, 1990; Muscarella & Vetsuypens, 1990; Palepu, 1990; Wright, Thomson, & Robbie, 1992; Zeisberger et al., 2017). The private equity fund will generally gain a majority equity stake to exert control over the management and to transfer the debt to the portfolio company once the fund has acquired the equity stake using leverage. The economic alignment of incentives between the management of the portfolio company and the private equity fund generally happens by giving the management an equity stake in the company as well (Kaplan, 1989; Zeisberger et al., 2017). The leverage has several functions. Guo, Hotchkiss, and Song (2008) argue there are three main explanations for value creation with the use of leverage. First, debt provides a tax shield due to the tax-deductible nature of interest expenses. Second, debt has a disciplining effect on the management as

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[1] Private investments in public equity (PIPE) are an exception, as well as SPACs. SPACs are publicly traded but their operational side resembles a private equity fund with one investment, apart from the complicating rules the SPAC sponsor imposes on itself in the SPAC statutes.

it lowers free cash flows. Jensen (1986) argues that this makes companies with large free cash flows but low profitability good buyout targets as its efficiency can easily be improved by restraining the free cash flows. And third, the debt adds another source of monitoring of the management: the financial institution that provides the debt.

Cressy et al. (2007) found a significant positive effect of industry specialization of 8.5% on profitability and explained this positive effect with two reasons: the industry specialized private equity fund is better at selecting portfolio companies and at creating value by improving the governance structure by having industry-specific knowledge. Although Cressy et al. (2007) researched the effect of the industry specialization on portfolio company performance, its findings are relevant for the effect of geographical specialization on performance. Geographical specialization would suggest more familiarity with the institutional environment (legal system, public policies, culture) in a country, allowing the buyout fund to make better decisions in terms of target selection and its probability of success given the country it is operating in, reducing agency costs, creating a better corporate governance structure, and choosing an optimal capital structure. This leads to the following hypotheses.

H1: Geographical specialization of the buyout fund leads to a higher post-buyout profitability increase of its portfolio company.
H2: Geographical specialization of the buyout fund leads to a higher post-buyout turnover growth of its portfolio company.

Renneboog (2012) mentions that private equity shareholder value in their portfolio companies can be explained by expropriation of wealth from other stakeholders in the company. Warga and Welch (1993) find that an expropriation of wealth takes place from existing debt holders who, on average, lose 6 percent of risk-adjusted wealth upon an LBO announcement. Asquith and Wizman (1990) find a similar but smaller effect of a loss of 3% of bondholder value. This difference could be explained by the selection of the sample, as Warga and Welch (1993) do not consider the fraction of bond covenants in the sample (Asquith & Wizman, 1990).[2] As to the expropriation of workers, an LBO has not been found to significant impact on the number of jobs or worker's salaries in unrelated takeovers (Amess, Girma, & Wright, 2014; Amess & Wright, 2012; Kaplan, 1989).

Not only efficiency improvements are drivers for buyouts. According to Boucly, Sraer and Thesmar (2011), leveraged (growth) buyouts alleviate initial credit constraints of small and mid-sized portfolio companies, allowing it to take on more debt to finance growth opportunities. Note that these targets are different from targets that have grown too large and have therefore become inefficient (Jensen, 1986).

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[2] The results of Warga and Welch (1993) were in 1990 already published in the form of a working paper. This allowed Asquith and Wizman to comment on differences in findings.

Cressy et al. (2007) found that private equity buyouts overall have a more positive effect on profitability than non-private equity takeovers but warn for the limited generalizability of their results due to the maturity of the UK private equity sector. This is relevant for the research conducted in this research as well. The European private equity sector overall is not as developed as in the UK specifically (Andres, Betzer, & Gider, 2012).

2.2.2 Growth equity value drivers

Growth equity differs from buyouts as the private equity fund typically acquires a minority stake in a company. It will have to work together with the other owners and the existing management to make the company achieve the growth opportunities. The added value of the private equity fund lies in the expertise in optimizing capital structures and the contacts it provides in commercial and financial networks (Zeisberger et al., 2017). Especially value added by having a strong local network might be positively affected by geographical specialization of the fund. The private equity fund will thus minimally intervene with the operational side of the company (Zeisberger et al., 2017), but still monitor the company intensively, for example by placing a director on the board with financial expertise (Chen, Kang, Kim, & Na (2014)). Furthermore, improvements of the governance structure by private equity funds with a minority stake have been found to improve post-buyout sales and EBITDA (Battistin, Bortoluzzi, Buttignon, & Vedovato, 2016). Moreover, another factor of added value is in helping a - sometimes poor - management find growth opportunities (Zeisberger et al., 2017). Chen et al. (2014) found that placing a director with industry expertise on the board of a portfolio company has a positive effect on post-buyout operating performance and suggest that the industry expertise of the private equity fund overall can be related to operating performance of the portfolio company in which the fund has a minority stake.

Similar to industry expertise, geographical specialization can have a positive effect on operating performance of the portfolio company as geographically specialized funds are more likely to have a strong local network, and experience with the local institutional environment of the portfolio company. This is hypothesized to help with selecting better targets, improving the governance structure, which would improve the profitability, and with optimizing the capital structure and finding growth opportunities in the local market, which would have a positive effect on turnover growth. This leads to the following hypotheses.

H3: Geographical specialization of the growth equity fund leads to a higher post-buyout profitability increase of its portfolio company.
H4: Geographical specialization of the growth equity fund leads to a higher post-buyout turnover growth of its portfolio company.

2.3 Private equity fund performance

Having discussed private equity strategies at the company level, the performance on the fund-level will also be briefly covered. Assets under management of the fund manager are used as a control for resources and indirectly for experience (Crifo & Forget, 2013). Furthermore, Kaplan and Schoar (2005) find that fund size has a concave effect on fund performance and explain it with decreasing focus when the fund size becomes too large. Moreover, performance can depend on the affiliation of the private equity fund manager (Cressy et al., 2007) since private equity firms that do not have to source funds from third parties, such as private equity firms with a corporate or bank affiliation, can have less pressure to maximize returns.

2.4 Geographical specialization and private equity fund performance

Caselli (2010) notes that successful geographical diversification is difficult to achieve as a single private equity fund. The main reason is that private equity is a sector in which networks are crucial. And as a private equity firm, it is more practical to develop such tight networks in your own vicinity. Although, Caselli (2010) also notes that large global private equity firms can diversify successfully by either launching multiple funds that each invest in many countries or by launching many funds that specialize in one country or geographic area.

Stotz (2011) found that one specific form of geographical specialization has a positive effect on performance: making an investment in the same country. This is consistent with the notion of the strong network that a private equity fund builds up. Another explanation for the same effect is provided by Knill (2009) in her research into the effect of diversification in venture capital; she found that an investment in the same country yields higher returns due to lower monitoring costs.

Given the hypothesized positive effects of geographical specialization on profitability increase and turnover growth in H1-H4, the overall fund performance can be hypothesized to be impacted accordingly by geographical specialization since the fund performance represents the aggregation of the cash flows from the company to the fund.[3] Specifically, the hypothesized better target selection of geographically specialized funds leads to the following hypotheses.

H5: Geographical specialization of the buyout fund leads to higher returns.
H6: Geographical specialization of the growth equity fund leads to higher returns.

The literature does not provide a clear answer to which strategy might be impacted most positively by geographical specialization of the fund: the process of strong network building and actively

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[3] Factors that might distort the relationship between post-buyout operating performance and fund performance are disinvestments of business units (affecting turnover growth) and the price that a private equity fund pays and receives when entering and exiting the portfolio company respectively (affecting cash flows but not profitability increase).

helping find growth opportunities for a company (growth equity) or improving efficiency by means of a specific plan of aligning incentives, increasing leverage, and taking over control within a company (buyout). This leads to the following hypotheses.

H7: The effect of being geographically specialized as a fund on returns is different for a growth equity fund than for a buyout fund.
H8: The effect of being owned by a geographically specialized private equity fund on the profitability increase and turnover growth after the buyout is different for a portfolio company that is owned by a growth fund than for a portfolio company that is owned by a buyout fund.

Appendix A provides an overview of the hypotheses, the results, and the reason for acceptance/rejection.

2.5 Private equity in Europe
Bloom and Van Reenen (2007) find that firms in Europe overall have worse management than in the United States. They argue that this is caused by lower product market competition in Europe, and more family firms where management is passed by primogeniture. This corroborates with the finding of Phalippou and Gottschalg (2009) that private equity funds with a focus on Europe perform worse than those selecting their portfolio companies from the US.

Europe is very pluralistic in terms of its public policies and legal regimes for private equity, which adds to complication. The definition used for Europe in this research is West-Europe, the Nordic countries, and Central & East-Europe. Andres et al. (2012) point out that different institutional environments (in terms of policies, legal system, and culture) influence the profitability of buyouts and the specific strategies private equity funds use to create value in a portfolio company. Controlling for the differences in institutional environment between countries is essential in a pluralistic region as Europe.

Chapter 3 Data and sample selection

The previous chapter has outlined the most relevant findings relating to private equity performance and the effect of specialization on this. The sample selection, variables and summary statistics will be discussed in this chapter. Appendix B provides computation examples for the specialization variables and Appendix C consists of the variable definitions and sample correlations used in this research.

3.1 Sample selection for the fund performance analysis

A sample of private equity funds with vintage years ranging from 2000 to 2015 has been drawn from Preqin. The focus of this research lies with mature portfolio companies. The selected fund strategies are therefore buyout and growth equity. Due to the second analysis, focusing on portfolio companies, funds of funds have also not been included in the sample. Another selection step is that the geographic focus of the fund is Europe. And finally, funds need to have performance data available in 2019 to be included in the sample. This does not mean, however, that only active funds have been selected. A significant portion, 37.5%, of the private equity funds in the sample has been liquidated. The sample selection yielded 387 private equity funds.

Subsequently, a dataset containing basic data on the portfolio companies of the private equity funds in the sample has been used to calculate the portfolio shares of each country and industry and the specialization dummies. Moreover, the data on the ownership type of the fund manager has been gathered from a specific fund manager dataset from Preqin. The annual Stoxx midcap return has been gathered from GFD Finaeon. These datasets have not only been used for the fund-level analysis but for the portfolio company analysis as well to enrich the company performance data.

Not all funds in Preqin have performance data. Harris, Jenkinson, and Kaplan (2014) comment on this phenomenon that there are funds who do not accept certain investors such as public pension funds to keep their performance data private. The rationale is that Preqin gathers performance data from these public investors in funds with Freedom of Information Act requests in the US. However, Preqin (2022b) states that it uses performance metrics provided by both GPs (private equity firms) and LPs (the investors in the private equity fund). Harris et al. (2014) nonetheless found that the performance data in Preqin is reliable for research and does not contain a selection bias.

The performance data of Preqin that are relevant for this analysis are the internal rate of return net of fees (net IRR) and the total value per invested capital (money multiple). The net IRR is a widely used performance metric in private equity but has certain shortcomings. Phalippou (2009) argues that the IRR exaggerates returns either upwards or downwards which is caused by the assumption that distributions to investors are reinvested at the rate of the IRR. Phalippou (2009) even states that the IRR can be manipulated to make a fund look more successful. It is therefore important to include the money multiple in the fund analysis as well since it takes away some of the weaker points of the net IRR (Phalippou, 2009).

The sample consists of both liquidated funds and funds that have closed. This means that the lifespan of a fund can influence the money multiple. However, accurate data on when each fund was liquidated was not present in any of the databases. To exclude outliers, private equity funds of which the IRR exceeds 40% or of which the money multiple exceeded 5 have been excluded.

Table 3.1 This table provides a concise overview of the source and purpose of each dataset used in the fund analysis.

Dataset name in this research	Source	Purpose
Private equity fund dataset	Preqin	Provides the performance and key characteristics of each private equity fund.
Fund manager dataset	Preqin	Providers key characteristics of the fund manager of the private equity fund.
Portfolio dataset	Preqin	Provides basic information on the portfolio companies of the private equity funds in the sample.
Stock return dataset	GFD Finaeon	Provides the annual returns of the Stoxx midcap index. Ticker: MCXPD.

3.2 Variables for the fund performance analysis

The net IRR is defined in this research as the discount rate that makes the net present value of the cash flows from the fund to the limited partners (investors) equal 0. The net multiple is defined as the sum of the cash flows from the fund to limited partners plus the unrealized value of investments divided by invested capital. Table C.1 can be consulted for a detailed explanation of all variables used in the fund performance analysis.

The operationalization of the specialization dummies is the most complex of all variables in this analysis. Appendix B.1 contains a computational example. The Herfindahl indexes for the geographical and industry specialization is computed as:

$$Geographical\ Herfindahl_{\text{fund i}} = \sum_{j=1}^{n} portfolio\ share_{\text{country j}}^2$$

$$Industry\ Herfindahl_{\text{fund i}} = \sum_{j=1}^{n} portfolio\ share_{\text{industry j}}^2$$

And the specialization dummies are defined as follows (Table C.1):

$Geograhically\ specialized_{fund\ i}$

$$= \begin{cases} 1, & Geographical\ Herfindahl_{\text{fund i}} > median(Geographical\ Herfindahl\ \text{of all funds}) \\ 0, & else \end{cases}$$

$Industry\ specialized_{fund\ i}$

$$= \begin{cases} 1, & Industry\ Herfindahl_{\text{fund i}} > median(Industry\ Herfindahl\ \text{of all funds}) \\ 0, & else \end{cases}$$

The portfolio shares of each fund have been computed similarly as in the portfolio company performance analysis. That is by dividing a fund's number of portfolio companies in a certain country/industry by its total number of portfolio companies.

3.3 Summary statistics and sample correlations for the fund performance analysis

Table 3.2 Summary statistics for both the net IRR model and the money multiple model

	Mean	Median	Std. dev.	Min	5%	95%	Max	Count
Dependent variables								
Net IRR in %	14.80	14.00	9.22	-9.10	0.97	31.00	37.50	224
Money multiple	1.70	1.64	0.50	0.46	1.04	2.60	4.44	224
Explanatory variable								
Geographically specialized	0.45	0.00	0.50	0.00	0.00	1.00	1.00	224
Control variables								
Industry specialized	0.46	0.00	0.50	0.00	0.00	1.00	1.00	224
Growth equity	0.10	0.00	0.30	0.00	0.00	1.00	1.00	224
Stoxx midcap return in %	6.12	15.53	24.42	-47.69	-47.69	41.44	41.44	224
Total AUM in EUR	29250	3357	68089	46	280	132718	414011	224
Bank spin-off	0.05	0.00	0.21	0.00	0.00	0.00	1.00	224
Independent PE firm	0.87	1.00	0.34	0.00	0.00	1.00	1.00	224
Captive arm	0.04	0.00	0.20	0.00	0.00	0.00	1.00	224
Corporate spin-off	0.01	0.00	0.12	0.00	0.00	0.00	1.00	224
Independent firm spin-off	0.04	0.00	0.19	0.00	0.00	0.00	1.00	224

Note: only observations included in the regressions have been included.

The average net IRR is 14.80% and the median is 14%. The average money multiple is 1.70 and the median is 1.64 (Table 3.2). These statistics do not deviate much from the findings of Kaplan and Schoar (2005) who found an average net IRR of 14 and an average money multiple of 2.

Table 3.3 The number of funds in the sample per inception year

Inception year (2000s)															
'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15
11	9	10	10	7	17	21	18	19	14	8	17	12	12	15	24

The average inception year is 2008, which is well in between 2000 and 2015. There is an overall good representation of all inception years with 2004 being the least represented in the sample (Table 3.3).

There are no high correlations present among the independent variables that could cause multicollinearity (Table C.2). The only high correlation of 0.81 is between net IRR and the money multiple, which is favorable to the analysis since both are dependent variables that resemble fund performance. A low correlation would be problematic, indicating that one of the two dependent variables (or both) does not explain fund performance well.

3.4 Sample selection for the portfolio company performance analysis

The sample consists of portfolio companies of the private equity funds from the fund performance analysis. The starting point of the sample is the portfolio dataset acquired from Preqin containing basic information on the portfolio companies of the private equity funds from a sample of the fund performance analysis. The Orbis database has been used to collect performance data of the companies. The company name and the city and country where the company is based are the three variables that have been used to connect the portfolio dataset to the company performance dataset in Orbis by means of a batch search. The portfolio dataset and the performance dataset have subsequently been merged into an intermediate dataset. This intermediate dataset has been merged with the adjusted private equity fund dataset (merged on the Preqin fund id), the fund manager dataset (merged on the Preqin firm id), and a specific deal dataset (merged on Preqin portfolio company ID), yielding the full portfolio company dataset that has been used for the portfolio company performance analysis. The private equity fund dataset that was merged with the intermediate dataset was adjusted by the fund performance analysis: the initial portfolios dataset had already been used to compute the shares of each private equity fund's portfolio allocated to each country and industry. These portfolio shares have been added to the original fund performance dataset from Preqin. Important to note is that the specialized dummies have been computed within the adjusted fund performance dataset before it was merged with the intermediate dataset.

Table 3.4 This table provides a concise overview of the source and purpose of each dataset used in the portfolio company analysis.

Dataset name in this research	Source	Purpose
Private equity fund dataset	Preqin	Provides the performance and key characteristics of each private equity fund.
Portfolio dataset	Preqin	Provides basic information on the portfolio companies of the private equity funds in the sample.
Fund manager dataset	Preqin	Providers key characteristics of the fund manager of the private equity fund.
Deal dataset	Preqin	Provides all deals in the Preqin database. The deal data is essential for determining the exact buyout date.
Company performance dataset	Orbis	Provides the yearly performance and key accounting/financial variables of the portfolio companies.
Stock return dataset	GFD Finaeon	Provides the annual returns of the Stoxx midcap index. Ticker: MCXPD.

3.5 Variables for the company performance analysis

The profitability increase is measured by the difference between the mean 2 year after buyout EBIT/Assets ratio and the EBIT/Assets ratio in the buyout year, implying that this research is focused on measuring operational profitability rather than bottom-line profitability. The EBIT/Assets ratio has already been used extensively as an operationalization for efficiency improvement (Cressy et al., 2007). And turnover growth is measured by the log differences of the mean of the turnover of the first two years after the buyout year and the turnover in the buyout year.

It is important to note that the specialization dummies in the portfolio company analysis have been determined differently than in the fund analysis. The question in the fund analysis was whether a fund was generally industry/geographically specialized. However, now the question is different: is the fund specifically specialized in the industry/country of the portfolio company? The geographical and industry specialization dummies are defined as follows (Table C.3):

$Geograhically\ specialized_{i,j}$

$$= \begin{cases} 1, & portfolio\ share_{i,j} > \text{median}(portfolio\ share_j \text{ if greater than } 0) \text{ for each fund i and country j} \\ 0, & else \end{cases}$$

$Industry\ specialized_{i,j}$

$$= \begin{cases} 1, & portfolio\ share_{i,j} > median(portfolio\ share_j\ if\ greater\ than\ 0) \text{ for each fund i and country j} \\ 0, & else \end{cases}$$

The portfolio shares of each fund have been computed similarly as in the fund performance analysis. That is by dividing a fund's number of portfolio companies in a certain country/industry by its total number of portfolio companies.

It is vital to ignore funds that have not allocated any share of their portfolio to industry X when selecting the median. Otherwise, any fund that allocates any non-zero share is likely to be classified as specialized. Computational examples for further clarification can be found in Appendix B.2.

Another variable of which the operationalization is essential is the year of the buyout. The deal dataset from Preqin has been used to establish the buyout year. It classifies the first year a deal has been confirmed to be completed as the buyout year of each company. This way, the effect of efficiency improvements or other advantages such as offering access to a specialized commercial or financial network is reasonably absorbed in the profitability increase and turnover growth.

It is important to note that there were cases in which multiple funds invested in the same company at different dates that only had a couple of months in between. These cases can point toward a syndicated buyout in which multiple private equity funds agree to invest in the same portfolio company. Syndicated deals are characterized by having a lead partner who puts in most of the work regarding the selection and evaluation of the portfolio company (Cressy et al., 2007; Gorman & Sahlman, 1989; Barry, 1994; Meuleman, Wright, Manigart, & Lockett, 2009). Clear data on the lead

partner in these cases was not present. The private equity fund with the earliest deal date is therefore assumed to be the lead partner. The portfolio company will consequently be assigned to the lead partner.

3.6 Summary statistics for the company performance analysis

The second analysis has a sample that consists of the portfolio companies of the private equity funds of the first analysis. The consequence is that there is an interaction between these two analyses as they are indirectly based on the same initial sample. Moreover, the returns of the private equity funds are based on the increase in profitability and the growth of the portfolio companies. This means that the analyses are expected to yield similar inferences and are thus more robust towards omitted variable bias if they do.

Table 3.5 Summary statistics for the portfolio company analysis.

	Mean	Median	Std. dev.	Min	5%	95%	Max	Count
Dependent variables								
Profitability increase	0.00	0.00	0.08	-0.25	-0.14	0.13	0.22	299
Turnover growth	0.14	0.12	0.31	-0.83	-0.34	0.75	1.44	299
Explanatory variable								
Geographically specialized	0.83	1.00	0.38	0.00	0.00	1.00	1.00	299
Control variables								
Industry specialized	0.61	1.00	0.49	0.00	0.00	1.00	1.00	299
Growth equity	0.10	0.00	0.30	0.00	0.00	1.00	1.00	299
Turnover Buyout Year (thousand EUR)	242241	25617	1082820	139	1687	996622	14727000	299
Same country	0.62	1.00	0.49	0.00	0.00	1.00	1.00	299
Stoxx midcap index buyout year	8.59	13.55	16.06	-47.69	-16.96	27.72	41.44	299
Debt-to-equity buyout year	2.06	1.47	1.82	0.02	0.26	6.19	9.24	299
Debt-to-equity ratio growth	0.04	-0.05	0.62	-2.32	-0.79	1.21	2.85	299
Bank spin-off	0.04	0.00	0.20	0.00	0.00	0.00	1.00	299
Independent PE firm	0.86	1.00	0.35	0.00	0.00	1.00	1.00	299
Captive arm	0.04	0.00	0.19	0.00	0.00	0.00	1.00	299

Note: only observations included in the regression have been included.

The average and median profitability increase is 0.00. The profitability increase seems to be rather symmetrically distributed since the 5th percentile is -0.14 and the 95th percentile is 0.13 (Table 3.5). The average turnover growth is 14%. It stands out that 83% of the companies in the sample are owned by a geographically specialized fund. This is a consequence of the operationalization, since specialization is determined by how large the portfolio share of a country/industry is for a fund. If only 3 funds invest in a certain country, and 90% of the companies in that country are owned by a fund that allocates the largest share of its portfolio to that country compared to other funds, then all 90% of the companies in that country would be owned by a specialized fund.

Table 3.6 The number of companies in the sample per buyout year

Buyout year (2000s)																
'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19
2	4	5	12	10	8	7	15	9	11	23	40	43	41	33	25	10

Table 3.6 implies that 2003, 2004, and 2005 are the least represented buyout years in the sample with 5 or less observations each. The years 2014, 2015, and 2016 are the most represented buyout years with over 40 buyouts each.

The sample correlations do not contain any high correlations between the independent variables (Table C.4). It can therefore be assumed that there is no multicollinearity in the sample. It is noteworthy that the correlation between same country and geographically specialized is 0.46, which is not too high, but also not low. A logical explanation for this phenomenon would be that private equity funds tend to be geographically specialized in their own country, to reduce monitoring costs (Knill, 2009).

Chapter 4 Methodology

Whereas the previous chapter explained the sample in detail, this chapter focuses on specifying the models that will be used to test the hypotheses described in Chapter 2.

The standard errors of these regression models have been clustered into 28 clusters for the fund analysis and 27 clusters for the portfolio company analysis. A double cluster combining the inception year and the fund strategy (i.e., the growth equity dummy) has been used. The strategy of the private equity fund is specifically important to cluster on, as there might be various factors that influence performance differences between buyout and growth funds, meaning that residuals are more likely to be correlated within each strategy group.

4.1 Fund performance analysis

Four regression models will be used in the fund performance analysis. Model 1 will be the base model of net IRR. Model 2 will be an extension of the Model 1 by including control variables for the ownership type of the fund manager. Model 3 will be the base model for the money multiple. And Model 4 is an extended version of Model 3 including controls for the ownership type of the fund manager as well. The regression models will be structured as follows:

*Net IRR$_i$ = β$_0$ + β$_1$ Geographically specialized$_i$ +β$_2$ Geographically specialized$_i$ * Growth$_i$ +β Control variables $_i$ + β Country control variables$_i$ + βVintage year control variables$_i$ + βOwnership control variables$_i$ + u$_i$* , for each fund i

*Money multiple$_i$ = β$_0$ + β$_1$Geographically specialized$_i$ +β$_2$Geographically specialized$_i$ * Growth$_i$ +β Control variables $_i$ + Country control variables$_i$ + Vintage year control variables$_i$ + βOwnership control variables$_i$ + u$_i$* , for each fund i

The country and the vintage year control variables will not be displayed in the results section.

4.2 Portfolio company performance analysis

There will be four regression models for the portfolio company analysis. Just as with the fund-level analysis, there will be two dependent variables: profitability increase and turnover growth as defined in Table C.3. Model 5 and Model 7 are base models. Model 6 and Model 8 are extensions with industry and firm ownership control variables. They are not strongly correlated as their correlation is only 0.29 (Table C.4), meaning that the drivers of these dependent variables are likely to be different in these regression models with respect to the effect of geographical specialization on these dependent variables. The complete regression models will be structured as follows:

*Profitability increase$_i$ = β$_0$ + β$_1$ Geographically specialized$_i$ + β$_2$ Geographically specialized$_i$ * Growth$_i$ +β Control variables$_i$ + Country control variables$_i$ + u$_i$, for each company i*

*Turnover growth$_i$ = β_0 + β_1 Geographically specialized$_i$ + β_2 Geographically specialized$_i$ * Growth$_i$ + β Control variables$_i$ + Country control variables$_i$ + Industry control variables$_i$ + Ownership control variables$_i$ + u$_i$, for each company i*

Chapter 5 Results

In this chapter, the results of the regressions based on the models presented in Chapter 4 will be discussed and used to test the hypotheses presented in Chapter 2. Appendix D provides a concise overview of the combined effects of different combinations of fund strategy and specialization on fund performance.

5.1 Fund-level performance analysis

Table 5.1 The regression table for the fund-level performance analysis.

	(1) Net IRR in %	(2) Net IRR in % including firm ownership type	(3) Money multiple	(4) Money multiple including firm ownership type
Geographically specialized	4.169** (1.955)	4.039** (1.874)	0.270** (0.120)	0.261** (0.124)
Growth equity	6.212 (5.008)	5.542 (4.403)	0.243 (0.249)	0.194 (0.208)
Geographically specialized # Growth equity	-6.731* (3.908)	-7.860** (3.203)	-0.318 (0.203)	-0.378* (0.185)
Stoxx midcap return	-0.354*** (0.024)	-0.368*** (0.025)	-0.031*** (0.001)	-0.031*** (0.001)
Total AUM (ln)	0.977* (0.519)	0.976* (0.519)	0.037 (0.031)	0.036 (0.032)
Industry specialized	-0.319 (1.883)	-0.204 (1.933)	-0.042 (0.103)	-0.030 (0.101)
Industry specialized # Growth equity	-0.772 (4.765)	1.470 (4.459)	0.102 (0.250)	0.222 (0.210)
Captive Arm – Corporate		-5.441 (3.946)		-0.255* (0.147)
Corporate Spin-off		-10.456* (5.662)		-0.723** (0.297)
Independent Firm		-0.210 (2.222)		-0.038 (0.086)
Independent Firm Spin-off		-2.222 (2.666)		-0.114 (0.171)
Constant	7.081 (4.639)	7.813 (5.175)	1.440*** (0.303)	1.502*** (0.311)
Observations	224	224	224	224
R^2	0.339	0.361	0.289	0.311

Standard errors in parentheses
Two-tailed p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.2 The combined effect of geographically specialized and the interaction of growth equity and geographically specialized on fund performance

	(1) Net IRR in %	(2) Net IRR in % including firm ownership type	(3) Money multiple	(4) Money multiple including firm ownership type
Geographically specialized and growth equity * geographically specialized	-2.562 (3.413)	-3.821 (2.855)	-0.048 (0.159)	-0.117 (0.138)

Standard errors in parentheses

Two-tailed p-values: * *p < 0.1, ** p < 0.05, *** p < 0.01*

Note: the combined effect of geographically specialized and its interaction with growth equity is post-estimation of the models in Table 5.1. It represents the coefficient of the linear combination of geographically specialized and its interaction with growth equity.

5.1.1 Hypotheses on fund performance

It is important to note that the significance asterisks in Table 5.1 and Table 5.2 are based on the two-tailed p-values, which will need to be corrected to one-tailed p-values when testing H5 and H6. The models in Table 5.1 have also been estimated without geographical specialization. [4]

H5: Geographical specialization of the buyout fund leads to higher returns.

The coefficient of geographically specialized is statistically significant ($p < 0.05$) in all four performance models (Table 5.1). The interpretation in the most extensive model for net IRR is that a geographically specialized buyout fund, on average, achieves a 4.039 percentage point higher net IRR than a geographically non-specialized buyout fund (Model 2, Table 5.1). The most extensive model for the money multiple, implies that geographical specialized buyout funds, on average, have a 0.261 higher money multiple than non-specialized buyout funds (Model 4, Table 5.1). H5 can thus be accepted.

H6: Geographical specialization of the growth equity fund leads to higher returns.

Although the coefficient of this effect can be found in the models in Table 5.1[5], the correct test for this hypothesis must be separately performed. The linear combination of geographically specialized and its interaction with growth equity (post-estimation of the models in Table 5.1) yields a single coefficient and standard error (Woolridge, 2020). The sign of the coefficient is negative in all four models. This

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[4] Excluding geographical specialization and its interaction effect with growth equity from Model 4 (money multiple) results in an insignificant ($p > 0.90$) coefficient and standard error for industry specialization of -0.007 and 0.103 respectively. For Model 2 (net IRR in %) excluding geographical specialization, the insignificant ($p > 0.90$) coefficient of industry specialized and its standard error are respectively 0.190 and 1.945.
Cressy et al. (2007) research buyouts, so only the coefficients for buyout funds can be compared. Cressy et al (2007) find a (significant) positive effect of 6.02 to 8.441 percentage-points (4 models) of industry specialization on profitability. Moreover, they find a mostly positive (albeit insignificant) effect of -0.256 to 8.97 percentage-points (4 models) of industry specialization on turnover growth. These positive effects on operating performance contrast the found effect on the money multiple of 0.019 and on net IRR of -0.007 which have little magnitude and are insignificant. This suggests that industry specialization has little effect on fund performance in Model 2 and Model 4 without including geographical specialization.

[5] Adding the coefficient of geographically specialized to that of its interaction with growth equity.

coefficient should be interpreted similarly as that of geographically specialized, but with growth equity as the reference category. So, a geographically specialized growth equity fund achieves, on average, a 3.821 percentage-points lower net IRR and a 0.117 lower money multiple (Model 2 and 4, Table 5.2). The relevant one-tailed p-values are in all four models (Table 5.2) above 0.6. H6 cannot be accepted.

H7: The effect of being geographically specialized as a fund on returns is different for a growth equity fund than for a buyout fund.

The coefficient of the interaction between geographically specialized and growth equity must be tested to test this hypothesis. The coefficient is significant in the most extensive models on IRR and the money multiple: respectively Model 2 ($p < 0.05$) and in Model 4 ($p < 0.1$) (Table 5.1). Its interpretation is that the effect of geographical specialization on net IRR and the money multiple is, on average, 7.860 percentage-points and 0.378 respectively higher for a buyout fund than for a growth equity fund. H7 can thus be accepted.

5.1.2 Other indications of the fund performance analysis

The Stoxx midcap return in the inception year has a significant ($p < 0.1$) effect in all four fund performance models (Table 5.1). This is consistent with the finding of Kaplan and Schoar (2005) that funds starting in economic boom times ended up with lower performance.

The effect of the fund manager being affiliated and previously having been affiliated to a corporation is negative and significant ($p < 0.1$ and $p < 0.05$ respectively). These effects can be attributed to the lack of pressure to maximize and find funding from an external party such as institutional investors in the case of a corporate captive private equity fund (Cressy et al., 2007). However, the corporate spin-off shows a similar effect. This could be explained by the lack of experience in having to maximize returns to investors since these fund managers used to get funding from the affiliated corporation, but now have to find funding from third parties (Cressy et al., 2007).

5.2 Portfolio company performance analysis

Table 5.3 The regression table for the portfolio company performance analysis.[6]

	(5) Profitability increase	(6) Profitability increase incl. industry and ownership controls	(7) Turnover growth	(8) Turnover growth incl. industry and ownership controls
Geographically specialized	0.024*** (0.008)	0.024** (0.010)	0.003 (0.069)	0.024 (0.069)
Growth equity	0.085*** (0.022)	0.052** (0.022)	-0.277*** (0.094)	-0.416*** (0.148)
Geographically specialized # Growth equity	-0.054** (0.023)	-0.029 (0.019)	0.224* (0.115)	0.331** (0.124)
Industry specialized	0.015 (0.009)	0.013 (0.010)	-0.023 (0.033)	-0.017 (0.030)
Industry specialized # Growth equity	-0.066*** (0.016)	-0.069*** (0.016)	0.192** (0.087)	0.196 (0.117)
Turnover buyout year (ln)	-0.001 (0.002)	0.000 (0.002)	-0.014 (0.012)	-0.008 (0.014)
Same country	-0.006 (0.011)	-0.008 (0.012)	0.050 (0.043)	0.033 (0.046)
Stoxx midcap return buyout year	0.000 (0.000)	-0.000 (0.000)	-0.003*** (0.001)	-0.003*** (0.001)
Debt-to-equity buyout year	-0.000 (0.002)	0.000 (0.002)	0.017** (0.008)	0.019** (0.008)
Debt-to-equity ratio growth	-0.015** (0.006)	-0.014*** (0.005)	-0.053** (0.026)	-0.064** (0.026)
Captive Arm – Corporate		-0.067 (0.045)		0.037 (0.164)
Corporate Spin-off		-0.009 (0.036)		0.160 (0.167)
Independent Firm		-0.022 (0.023)		0.071 (0.088)
Independent Firm Spin-off		-0.098* (0.055)		-0.003 (0.144)
Constant	-0.027 (0.030)	-0.011 (0.045)	0.214 (0.153)	0.042 (0.248)
Observations	299	299	299	299
R^2	0.083	0.172	0.128	0.184

Standard errors in parentheses
*Two-tailed p-values: * p < 0.1, ** p < 0.05, *** p < 0.01*

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[6] Excluding geographical specialization and its interaction with growth equity from Model 6 (profitability increase) yields a slightly insignificant (p > 0.1) industry specialized coefficient of 0.016. This is not much different from Model 6 including geographical specialization. Excluding geographical specialization and its interaction from Model 8 (turnover growth) results in an insignificant (p > 0.5) coefficient for industry specialized of -0.014, which is also close to Model 8 including geographical specialization. Only the coefficient of industry specialization for buyout funds should be used for a comparison with Cressy et al. (2007) since they focus on buyouts specifically. They find a positive effect of 6.02 to 8.441 percentage-points (4 models of EBIT/Assets, whereas this research measures the increase in this ratio) of industry specialization on profitability, which is similar to Model 6 (excluding geographical specialization) in sign, but its magnitude is much larger. Contrary to Model 8 (excluding geographical specialization), they find a mostly positive (albeit insignificant) effect of -0.256 to 8.97 percentage-points (4 models) of industry specialization on turnover growth.

Table 5.4 The combined effect of geographically specialized and the interaction of growth equity and geographically specialized on portfolio company performance

	(5) Profitability increase	(6) Profitability increase incl. industry and ownership controls	(7) Turnover growth	(8) Turnover growth incl. industry and ownership controls
Geographically specialized and its interaction with growth equity	-0.030 (0.021)	-0.005 (0.019)	0.228** (0.106)	0.355*** (0.112)

Standard errors in parentheses

*Two-tailed p-values: * p < 0.1, ** p < 0.05, *** p < 0.01*

Note: the combined effect of geographically specialized and its interaction with growth equity on company profitability increase and turnover growth is post-estimation of the models in Table 5.3. It represents the coefficient of the linear combination of geographically specialized and its interaction with growth equity.

5.2.1 Hypotheses on portfolio company performance

The p-values used to test H1, H3, H2 and H4 are one-tailed and thus different from the two-tailed p-values used in Table 5.3 and Table 5.4. The most extensive models for the profitability increase and turnover growth (Model 6 and Model 8 respectively) will be used to test the hypotheses.

H1: Geographical specialization of the buyout fund leads to a higher post-buyout profitability increase of its portfolio company.

The coefficient of geographically specialized on profitability increase is positive and statistically significant (p < 0.05) in Model 5 and 6 (Table 5.3). Both Model 5 and 6 indicate that portfolio companies owned by a geographically specialized buyout fund have on average a 0.024 higher profitability increase (EBIT/Assets ratio increase) since the buyout year than a portfolio company owned by a geographically non-specialized buyout fund. H1 can be accepted.

H2: Geographical specialization of the buyout fund leads to a higher post-buyout turnover growth of its portfolio company.

The coefficient of geographical specialization on turnover growth is positive (Model 8, Table 5.3), but insignificant (p > 0.35). The interpretation of the coefficient is that a portfolio company of a geographically specialized buyout fund achieves, on average, a 2.4 percentage-points higher turnover growth than a company owned by a non-specialized buyout fund. H2 can thus not be accepted.

H3: Geographical specialization of the growth equity fund leads to a higher post-buyout profitability increase of its portfolio company.

To test the combined effect of geographically specialized and its interaction with growth equity, one coefficient and one standard error of this linear combination (Woolridge, 2020) are displayed in Table

5.4. The coefficient ($p > 0.6$) appears to be negative instead of positive in Model 6 (Table 5.4). H3 can thus not be accepted.

H4: Geographical specialization of the growth equity fund leads to a higher post-buyout turnover growth of its portfolio company.

The coefficient of the linear combination of geographically specialized and its interaction with growth equity on turnover growth is positive and significant ($p < 0.01$) in the most extensive model (Model 8, Table 5.4). The meaning of this coefficient (Model 8, Table 5.4) is that a portfolio company of a geographically specialized growth equity fund, on average, attains a 35.5 percentage-points higher turnover growth than a portfolio company of a geographically non-specialized growth equity fund. H4 can thus be accepted.

H8: The effect of being owned by a geographically specialized private equity fund on the profitability increase and turnover growth after the buyout is different for a portfolio company that is owned by a growth fund than for a portfolio company that is owned by a buyout fund.

The coefficient of the interaction between geographically specialized and growth equity on turnover growth positive and significant ($p < 0.05$) and implies that the effect of geographical specialization of the fund on the turnover growth of its portfolio company, on average, 33.1 percentage-points higher is for growth equity funds than for buyout funds (Model 8. Table 5.3).

The coefficient of the interaction between geographically specialized and growth equity on profitability increase is negative and insignificant ($p > 0.1$). Thus, the effect of geographical specialization on the profitability increase of its portfolio company is 0.029 larger for a buyout fund than for a growth equity fund (Model 6. Table 5.3). H8 can therefore only partially be accepted.

5.2.2 Other indications of the portfolio company analysis

The effect of geographical specialization of the growth equity fund on profitability is positive and significant ($p < 0.05$) and implies that a company owned by a geographically non-specialized growth fund will, on average, achieve a 0.052 higher profitability increase than a company owned by a geographically non- specialized buyout fund (Model 6, Table 5.3). Additionally, the effect of growth equity on turnover growth is negative and significant ($p < 0.01$). On average, a company owned by a geographically non-specialized growth equity fund has a 41.6 percentage-points lower turnover growth than a company owned by a buyout fund (Model 8, Table 5.3). This might seem counterintuitive at first glance, since buyout funds focus on improving profitability (Cressy et al., 2007) and growth equity funds on helping a business expand (Zeisberger et al., 2017). However, this effect on profitability and turnover growth can be attributed to the significant impact of geographical specialization of the buyout fund on profitability geographical specialization of the growth equity fund on turnover growth.[7]

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[7] Specifically, the combination of the acceptance of H1, the rejection of H3, the rejection of H2 and the acceptance of H4

Another interesting effect is the interaction between industry and growth equity on profitability increase (Model 6, Table 5.3), which is significant ($p < 0.01$). A company owned by an industry specialized growth equity fund attains, on average, a 0.069 lower profitability increase than a company owned by an industry specialized buyout fund.

Chapter 6 Conclusion and discussion

6.1 Discussion

In the previous chapter, the regression analyses have been used to describe the effect of geographical specialization on fund and portfolio company performance, and to test the hypotheses that have been constructed in Chapter 2. In the discussion, the findings of the previous chapter will be interpreted and critically discussed.

H5: Geographical specialization of the buyout fund leads to higher returns.

This research finds a significant positive effect of 4.039 percentage-points on net IRR and of 0.27 on the money multiple when the buyout fund is geographically specialized (Model 2 and Model 4 of Table 5.1). One possible explanation for this effect is that the geographically specialized buyout fund is better at selecting portfolio companies than the non-specialized buyout fund.

Another explanation can lie in the creation of value. A geographically specialized buyout fund can be better at reducing agency costs by having more experience with the policies, legal system, and culture of a certain country (Andres et al., 2012).

H6: Geographical specialization of the growth equity fund leads to higher returns.

The (insignificant) effect of geographical specialization on net IRR is -2.381 percentage-points and on the money multiple it is -0.117 (Model 2 and Model 4, Table 5.2). This is counterintuitive as a geographically specialized growth equity fund was hypothesized to be better at selecting portfolio companies, but also better at finding growth opportunities for its portfolio companies, due to its experience with a country's institutional environment. It is possible that geographical specialization has no or only little effect on the performance of growth equity firms because it acquires a minority stake in its portfolio companies and provides the company with advice on growth opportunities. These growth opportunities might rely less on geographical specialization and more on industry specialization. Chen et al. (2014) have already suggested that industry specialization of the fund might be related to post-buyout performance of the company in which it has a minority stake. The effect of industry specialization on fund performance in Model 2 and Model 4 (Table 5.1) is insignificant (p > 0.1) but positive.

H7: The effect of being geographically specialized as a fund on returns is different for a growth equity fund than for a buyout fund.

The significant effect of geographical specialization on net IRR is 7.860 percentage-points higher and 0.278 higher for buyout funds than for growth equity funds (Model 2 and Model 4, Table 5.1). The findings of H5 and H6 concerning the effects of geographical specialization have already been discussed. The finding that the buyout funds seem to gain more from geographical specialization than growth equity funds can be explained in two ways. Geographical specialization yields more advantages for selecting better portfolio companies for buyout funds than for growth equity funds. Or the strategy

for buyout funds requires more geographical specialization than for growth equity funds. This could be explained by the controlling stake that buyout funds take on (Zeisberger et al., 2017).

H1: Geographical specialization of the buyout fund leads to a higher post-buyout profitability increase of its portfolio company & H2: Geographical specialization of the buyout fund leads to a higher post-buyout turnover growth of its portfolio company.

The significant effect of geographical specialization of the buyout fund on the profitability increase of its portfolio company is 0.024, implying that the EBIT/Assets ratio of the portfolio firms increases with 0.024 (Model 6, Table 5.3). However, no significant effect is found for geographical specialization of the buyout fund on the turnover growth of its portfolio company.

The positive effect of geographical specialization on profitability specifically can be explained by the buyout fund's focus on efficiency improvements (Jensen, 1986). It is possible that there is no effect of geographical specialization of the buyout fund on turnover growth of its portfolio company because the geographical specialization of the buyout fund is purely utilized with regards to profitability maximizing strategies. The absence of a significant effect on turnover growth can be explained by the fact that buyout strategies can involve the sale of divisions/business units of the portfolio company to downsize the portfolio company to increase efficiency (Jensen, 1986; Liebeskind, Wiersema, & Hansen, 1992).

H3: Geographical specialization of the growth equity fund leads to a higher post-buyout profitability increase of its portfolio company & H4: Geographical specialization of the growth equity fund leads to a higher post-buyout turnover growth of its portfolio company.

Growth equity funds show a mirrored effect of buyout funds. No significant effect is found of geographical specialization on profitability increase (Model 8, Table 5.4). Contrastingly, geographical specialization of the growth equity fund has a significant positive effect of 35.5 percentage-points on turnover growth of its portfolio company. The same explanation as for buyout funds can be used: any positive effect of geographical specialization is utilized for the focus of the growth equity fund which is helping its portfolio company find and realize growth opportunities and thus increase its turnover (Zeisberger et al., 2017).

H8: The effect of being owned by a geographically specialized private equity fund on the profitability increase and turnover growth after the buyout is different for a portfolio company that is owned by a growth fund than for a portfolio company that is owned by a buyout fund.

The effect of geographical specialization on the profitability increase is not significantly different for growth equity funds than for buyout funds. The coefficient, -0.029 (Model 6, Table 5.3), has a negative sign, which corresponds to the outcomes of H1 and H3 where there is a significant positive effect of geographical specialization of the buyout fund on the profitability increase of its portfolio companies.

This effect for portfolio companies owned by growth equity firms is negative and insignificant. Even though the difference in effects of geographical specialization is not statistically significant, it can be explained by the notion that buyout funds focus on increasing profitability and that increasing

profitability is less important for growth equity funds where the focus lies on (turnover) growth. This also explains the significant difference in the effect geographical specialization has on turnover growth: this significant effect is 33.1 percentage-points higher for growth equity funds than for buyout funds.

6.2 Conclusion

6.2.1 Findings

Whereas the discussion focused on interpreting the results, the conclusion will summarize the findings, its implications, and the limitations of this research. Appendix A can be consulted for a concise overview of the hypotheses and their results. This research finds evidence that geographical specialization of a buyout fund leads to higher fund returns (H5, Table 5.1). Moreover, the effect of geographical specialization is significantly more positive for buyout funds than for growth equity funds (H7, Table 5.1). However, this research does not provide evidence for a positive effect of geographical specialization on the fund performance of growth equity funds (H6, Table 5.1).

Additionally, portfolio companies owned by a geographically specialized buyout fund achieve a higher profitability increase after the buyout than a company owned by a geographically non-specialized fund (H1, Model 6, Table 5.3). Furthermore, geographical specialization of the growth equity fund leads to a higher post-buyout turnover growth of its portfolio company (H4, Model 8, Table 5.4). And the effect of being owned by a geographically specialized private equity fund on turnover growth after the buyout has been found to be more positive for a portfolio company that is owned by a growth equity fund than for a portfolio company that is owned by a buyout fund (H8, Model 8, Table 5.3). No such interaction effect has been found between geographical specialization of the fund and being owned by a growth equity fund on the profitability increase (H8, Model 6, Table 5.3). Moreover, no significant effect has been found of geographical specialization of the buyout fund on turnover growth of its portfolio companies (H2, Model 8, Table 5.3). Neither has a significant effect been found of geographical specialization on the profitability of its portfolio company (H3, Model 6, Table 5.4)

These findings can jointly answer the research question: *how does geographical specialization of the private equity fund affect the performance of the fund and its portfolio companies in Europe?* Private equity funds use their geographical expertise most effectively towards their main objective (H1 and H4). For buyout funds, this is increasing profitability (Jensen, 1986), and for growth equity funds this is finding growth opportunities (Zeisberger et. al., 2017). Overall, geographical specialization has a more positive effect on fund performance for buyout funds than for growth equity funds. Geographical specialization is found to have a positive effect on fund performance for buyout funds. However, no significant positive effect has been found for the effect of geographical specialization on the fund performance of growth equity funds.

6.2.2 Implications

The findings suggest that investors who aim to maximize returns should not merely look for geographically specialized private equity funds. Geographical specialization is found to have a positive

effect of 4.039 percentage-points on net IRR for buyout funds, but not for growth equity funds (Model 2, Table 5.1 and Table 5.2).

Furthermore, the positive effect of geographical specialization on profitability of the buyout fund's portfolio company together with the absence of a significant effect on turnover growth, indicates that the buyout fund manager can effectively utilize his/her geographical specialization for his focus, which is increasing profitability of the portfolio company.

The implication for growth equity fund managers suggested by the findings is that geographical specialization does not seem to increase fund performance for growth equity funds. Although geographical specialization has a positive effect of 35.5 percentage-points on turnover growth, geographical specialization of the growth equity fund does not significantly affect the profitability increase in its portfolio companies.

6.2.3 Limitations and further research

A limitation of this study is potentially endogeneity. If private equity fund managers adapt their strategies to the findings of this research, the population coefficients of geographical specialization on profitability increase, turnover growth, net IRR, and the money multiple might change. Assuming that geographical specialization leads to a better selection of portfolio companies, a possible consequence of more funds becoming geographically specialized is that these funds start targeting the same portfolio companies, which could increase the price of an equity stake in the portfolio company and decrease returns eventually.

Another limitation is that a high raw performance is not always what an investor is interested in. In line with portfolio theory (Markowitz, 1952), an investor is interested in maximizing returns compared to the risk that is taken on. For fund managers, maximizing raw performance is more attractive as it positively affects the performance fee (carried interest) they earn. Further research could adjust the performance data to the risk that has been taken on. This would make the findings more relevant for institutional investors who allocate part of their portfolios to private equity funds.

A third limitation is the lack of (private) company performance data. The sample of the fund performance analysis consists of 224 private equity funds. However, due to a significant portion of missing performance data in the Company performance dataset from Orbis, the sample size for the portfolio company analysis dropped from 2,476 to 299. Further research could include a more complete dataset with sufficient data on private company performance.

As mentioned in the literature review, private equity fund strategies differ greatly and so do their value drivers. This research underlines this notion and plants the seed for further research into the effect of geographical specialization on private equity fund performance with different strategies, such as venture capital, real estate, turnaround, and infrastructure. Further research could also compare the effect of geographical specialization on private equity performance across these various strategies as the findings in this research suggest that the effect differs per strategy.

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Appendix A: Summary of the hypotheses and the results.

Table A.1 An overview of the hypotheses, whether these are accepted, and the reason for rejection if applicable.

	Hypothesis	Result	Reason for rejection
H1	Geographical specialization of the buyout fund leads to a higher post-buyout profitability increase of its portfolio company.	Accepted	
H2	Geographical specialization of the buyout fund leads to a higher post-buyout turnover growth of its portfolio company.	Rejected	Insignificant ($p > 0.35$)
H3	Geographical specialization of the growth equity fund leads to a higher post-buyout profitability increase of its portfolio company.	Rejected	Insignificant ($p > 0.1$) and opposing sign
H4	Geographical specialization of the growth equity fund leads to a higher post-buyout turnover growth of its portfolio company.	Accepted	
H5	Geographical specialization of the buyout fund leads to higher returns.	Accepted	
H6	Geographical specialization of the growth equity fund leads to higher returns.	Rejected	Insignificant ($p > 0.6$) and opposing sign
H7	The effect of being geographically specialized as a fund on returns is different for a growth equity fund than for a buyout fund.	Accepted	
H8	The effect of being owned by a geographically specialized private equity fund on the profitability increase and turnover growth after the buyout is different for a portfolio company that is owned by a growth fund than for a portfolio company that is owned by a buyout fund.	Partially accepted	Difference of effects on profitability increase is insignificant ($p > 0.1$)

Appendix B: Examples for the specialization dummies

The operationalization of the geographical and industry specialization dummies are the most complex variables in this analysis. Furthermore, while the specialization dummies are computed similarly within each analysis (industry and geographical specialization), they are not computed in the same way across analyses (fund-level and portfolio company-level). To clarify any arising confusion, the reader is provided with computational examples for the specialization dummies in each analysis.

B.1 Fund performance analysis

The question that the geographical and industry specialization dummies aim to answer is: is the private equity fund relatively geographically or industry specialized in general?

Private equity fund A has 30% of its portfolio allocated to companies in industry X, and 70% to industry Y. The Herfindahl index of the fund will then be $0.3^2 + 0.7^2 = 0.58$. The Herfindahl index of each fund in the sample will be computed accordingly. Then compare each fund's Herfindahl index to the median Herfindahl index. If the Herfindahl index of a fund is greater than the median Herfindahl index, the fund will be considered specialized. The exact same process applies to the geographically specialized dummy.

B.2 Portfolio company performance analysis

The question that the geographical and industry specialization dummies aim to answer is: is the fund relatively specialized in the specific industry/country of the portfolio company?

Portfolio company 1 belongs to industry X. The owner of this portfolio company, private equity fund A, has several specialized dummies: one for each industry (and one for each country). For portfolio company 1, the relevant specialized dummy is private equity fund A's dummy for industry X. If fund A has 40% of its portfolio allocated to industry X and 60% to industry Y, the share of fund A's portfolio allocated to industry X, 40%, will be compared to the shares that other private equity funds have allocated to industry X. If fund B and C have allocated portfolio shares of 10% and 20% respectively to industry X, and no other fund in the sample invests in industry X, the median share allocated to industry X will be 20%. Any fund with a larger share than 20% allocated to industry X will be considered specialized in that industry (or country).

Appendix C Tables of variable definitions and sample correlations

Table C.1 The variables and their definitions for the fund performance analysis

Variable	Explanation
Dependent variables	
Net IRR in %	The internal rate of return net of fees measured by Preqin. This is the discount factor that sets the net present value of the cash flows for the limited partners to zero.
Money multiple	Total distributions to limited partners plus unrealized value of investments net of fees measured by Preqin divided by invested capital.
Explanatory variable	
Geographically specialized	1 if the Herfindahl index of the shares of the portfolio based on the fraction of portfolio companies allocated to each country is greater than the median Herfindahl index in the sample; 0 otherwise
Control variables	
Industry specialized	1 if the Herfindahl index of the shares of the portfolio based on the fraction of portfolio companies allocated to each industry is greater than the median Herfindahl index in the sample; 0 otherwise
Growth equity	1 if the private equity fund is a growth equity fund; 0 if the fund is a buyout fund. Preqin (2022a) defines growth equity is: "Typically takes significant minority positions in companies without the use of leverage. Targets profitable, but still maturing, investee companies with significant scope for growth. Investment horizons are mid-to-long term, similar to those seen with buyout funds." (p. 12)
Stoxx midcap return in %	The return of the Stoxx midcap index in the inception year of the private equity fund
PE fund inception year	The year in which the private equity fund started investing
Total AUM in EUR	Total assets under management of the fund manager in mln EUR. The regression uses the natural logarithm of this number.
Bank spin-off	The fund manager behind the private equity fund used to be affiliated to a bank but has spun off to start as an independent firm.
Independent PE firm	The fund manager behind the private equity fund is an independent private equity firm, not specifically affiliated with another institution.
Captive arm	The fund manager behind the private equity fund is affiliated with a corporation.
Corporate spin-off	The fund manager behind the private equity fund used to be affiliated with a corporate but has spun off and become independent.
Independent firm spin-off	The fund manager behind the private equity fund used to affiliated with an independent private equity firm but has spun off and become independent.

Table C.2. The sample correlation table of the variables for the fund-level analysis.

	1	2	3	4	5	6	7	8	9	10	11
Net IRR in % (1)	1										
Money multiple (2)	0.81	1									
Geographically specialized (3)	0.13	0.16	1								
Industry specialized (4)	0.04	0.03	0.29	1							
Growth (5)	0.03	0.04	0.17	0.22	1						
Stoxx midcap return in % (6)	-0.07	-0.08	0.06	-0.03	0.03	1					
Total AUM in EUR (7)	-0.05	-0.07	-0.31	-0.14	0.11	-0.07	1				
Bank spin-off (8)	-0.01	-0.03	-0.15	-0.16	0.07	-0.06	0.05	1			
Independent PE firm (9)	0.07	0.10	0.09	0.07	0.04	-0.00	0.04	-0.55	1		
Captive arm (10)	-0.11	-0.09	-0.05	0.04	-0.16	0.03	-0.03	-0.04	-0.52	1	
Corporate spin-off (11)	-0.03	-0.07	0.05	0.13	0.04	0.06	-0.05	-0.05	-0.30	-0.02	1
Independent firm spin-off (12)	0.02	0.01	0.02	-0.08	-0.01	0.01	-0.07	-0.07	-0.49	-0.04	-0.02

Note: only observations included in the regressions have been included.

Table C.3 The variables and their definitions for the fund performance analysis

Variable	Explanation
Dependent variables	
Profitability increase	The mean of the EBIT/Assets ratios of the first two years after the buyout minus the EBIT/Assets ratio in the year of the buyout
Turnover growth	The log differences of the mean of the turnover of the first two years after the buyout year and the turnover in the buyout year
Explanatory variable	
Geographically specialized	1 if the share of the portfolio allocated to companies in the country of the portfolio company is larger than the median of all private equity funds whose portfolio share allocated to that country is greater than 0
Control variables	
Industry specialized	1 if the share of the portfolio allocated to companies in the industry of the portfolio company is larger than the median of all private equity funds whose portfolio share allocated to that industry is greater than 0
Growth equity	1 if the fund is a growth fund; 0 if the fund is a buyout fund.
Turnover buyout year	Turnover of the portfolio company in the buyout year in mln EUR. The regression uses the natural logarithm of this number. Preqin (2022a) defines growth equity is: "Typically takes significant minority positions in companies without the use of leverage. Targets profitable, but still maturing, investee companies with significant scope for growth. Investment horizons are mid-to-long term, similar to those seen with buyout funds." (p. 12)
Same country	1 if the portfolio is based in the same country as the private equity fund; 0 otherwise
Stoxx midcap return buyout year in %	The Stoxx midcap return in the buyout year.
Debt-to-equity buyout year	Total liabilities / shareholders' funds
Debt-to-equity ratio growth	Log differences of the mean of the debt-to-equity ratio in the first two years after the buyout and the debt-to-equity ratio in the buyout year
Bank spin-off	The fund manager behind the private equity fund is an independent private equity firm, not specifically affiliated with another institution.
Independent PE firm	The fund manager behind the private equity fund is affiliated with a corporation.
Captive arm	The fund manager behind the private equity fund used to be affiliated with a corporate but has spun off and become independent.
Corporate spin-off	The fund manager behind the private equity fund used to work for an independent private equity firm but has spun off and become independent
Independent firm spin-off	The fund manager behind the private equity fund is an independent private equity firm, not specifically affiliated with another institution.

Table C.4 Correlation table for the company-level analysis.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Profitability increase (1)	1													
Turnover growth (2)	0.29	1												
Geographically specialized (3)	0.14	0.06	1											
Industry specialized (4)	0.09	0.02	0.21	1										
Growth equity (5)	-0.02	0.07	0.12	-0.01	1									
Turnover buyout year (6)	-0.04	-0.05	-0.14	-0.08	0.04	1								
Same country (7)	0.09	0.17	0.46	0.13	-0.20	-0.17	1							
Stoxx midcap return (8)	0.03	-0.12	0.05	0.04	-0.06	-0.15	0.07	1						
Debt-to-equity buyout year (9)	0.00	0.09	-0.05	0.01	0.04	0.10	-0.04	0.00	1					
Debt-to-equity-growth (10)	-0.15	-0.11	-0.02	-0.08	0.03	-0.02	-0.06	-0.12	-0.27	1				
Bank spin-off (11)	0.04	-0.02	-0.04	-0.01	0.01	0.27	-0.01	-0.13	0.00	0.01	1			
Independent PE firm (12)	0.03	-0.02	-0.01	0.12	0.28	-0.14	-0.09	0.04	0.01	0.03	-0.50	1		
Captive arm (13)	-0.14	-0.02	-0.10	0.01	-0.05	0.02	-0.10	-0.04	0.03	-0.01	-0.04	-0.48	1	
Corporate spin-off (14)	0.08	0.06	0.11	-0.16	-0.40	-0.05	0.19	0.05	-0.02	-0.03	-0.05	-0.60	-0.05	1
Independent firm spin-off (15)	-0.09	0.01	0.05	-0.06	0.03	0.03	0.08	0.07	-0.05	-0.03	-0.02	-0.25	-0.02	-0.02

Note: only observations included in the regression have been included.

Appendix D Overview of the combined effects of strategy and specialization on fund performance

Table D.1 Average combined effects of specialization and fund strategy on net IRR (%) and the money multiple compared to a geographically and industry non-specialized buyout fund.

Growth Equity	Geographically specialized	Industry specialized	Average effect on net IRR (%) holding other factors constant (Model 2)	Average effect on the money multiple holding other factors constant (Model 4)
No	No	Yes	-0.204 (1.933)	-0.03 (0.101)
No	Yes	No	4.039** (1.874)	0.261** (0.124)
No	Yes	Yes	3.835 (2.686)	0.231 (0.160)
Yes	No	No	5.542 (4.403)	0.194 (0.208)
Yes	No	Yes	6.808*** (2.297)	0.386** (0.143)
Yes	Yes	No	1.721 (4.367)	0.077 (0.209)
Yes	Yes	Yes	2.987 (3.336)	0.269 (0.181)

Standard errors in parentheses
Two-tailed p-values: * p < 0.1, ** p < 0.05, *** p < 0.01
Note: The average combined effects on net IRR and the money multiple represent a single coefficient with a single standard error of the linear combination of growth equity, geographically specialized, geographically specialized # growth equity, industry specialized, and industry specialized # growth equity, and are post-estimation from Model 2 and Model 4 respectively and can be found in Table 5.1.

Table D.1 displays the average effects of seven combinations of strategy, geographical specialization and industry specialization that have been compared to a geographically and industry non-specialized buyout fund. This gives more context to the findings of the effect of geographical specialization on fund performance. According to Table D.1, industry specialized buyout funds perform, on average, slightly worse than non-specialized buyout funds by 0.204 percentage-points in net IRR and 0.03 in the money multiple.

Industry specialized buyout funds and non-specialized buyout funds are indicated to be the worst performing funds on average by Table D.1, although statistically insignificant (p > 0.1) compared all other funds except for geographically specialized buyout funds and industry specialized growth equity funds. The best performing type of fund in the sample is the industry specialized growth equity fund (Table D.1), outperforming a non-specialized buyout fund, on average, by 6.808 percentage-points (p < 0.01) in net IRR and 0.386 in the money multiple (p < 0.05). Furthermore, the best performing type of buyout fund in this sample is a geographically specialized buyout fund, outperforming the non-specialized buyout fund by, on average, 4.039 in net IRR (p < 0.05).