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Impact Fund Performance and the Influence of the European Union

Investigation into the European Private Equity Landscape

Author: Sara Ługowska
Student number: 608355
Thesis supervisor: Amy Yazhu Li, PhD
Second Assessor: Ruben de Bliek, PhD
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ABSTRACT

This thesis explores the previously under-researched landscape of European impact private equity funds, focusing on the potential effects of economic partnerships, such as the European Union (EU), on all private equity funds, including impact funds. Multiple regression models are constructed to measure performance using both net IRR and net multiple metrics, investigating the influence of being an impact fund and the effect of EU membership on private equity returns. The analysis reveals no significant difference in returns between non-impact and regular European funds when controlling for variables such as vintage year, fund sequence, fund size, geography, industry, and specific asset class. Furthermore, EU or EEA membership does not appear to increase the returns of impact funds, although the effects on the broader private equity landscape remain unclear even under a more specific domicile investigation. Notably, UK funds with vintage years post-Brexit referendum exhibit lower performance compared to pre-referendum years. These findings suggest that the impact of EU membership and Brexit on private equity performance requires further evaluation in future research to gain a more comprehensive understanding of their long-term effects.

Keywords:

Private Equity, Venture Capital, Impact Investing, European Union, Impact Fund

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CHAPTER 1 Introduction

The impact investing market size is expected to more than double in the next 10 years (Yahoo Finance, 2024). This shows the significant shift of investor preferences towards more sustainable investments. One of the sectors that might contribute to this high growth is private equity (PE) which will be the focus of this thesis.

There are a lot of contradicting theories when it comes to impact investing. The more traditional view expects lower performance of impact funds, as they pose a certain constraint on the possible investment opportunities. That means impact funds are more selective in their investments and therefore suffer a lower performance. Barber et al. (2021) find that the ex-post returns of impact venture capital (VC) funds are significantly lower than those of non-impact funds. However, the professional expertise of impact funds' general partners might bear higher utility for entrepreneurs with impact-related venture, and they might restrict their choice to impact funds, discarding the previously mentioned theory. A similar phenomenon occurs for investors who are proven to intentionally seek impact when investing in impact funds, and hence limiting their choice (Geczy et al., 2018).

The Socially Responsible Investing (SRI) theory, one that incorporates ethical, social, and governance (ESG) criteria, suggests that companies with good ESG practices will likely outperform in the long run due to lower risk and higher sustainability. According to the blended value theory, impact funds might generate greater value by seeking social and environmental impact alongside financial returns, as value is inherently a blend of economic, social, and environmental factors (Emerson, 2003). Also, a more recent version of the cost benefit analysis, called an environmental one, calls for incorporating environmental costs (Atkinson and Mourato, 2008). This could be used for screening potential investment; however, it proves quite sensitive to a chosen discount rate, which could be hard to settle on.

When it comes to geography, the European private equity market focused on impact investing beats that of the US (Brouwers, 2023) which makes it an interesting context to study, as the location of the fund may have some impact on its financial returns. Furthermore, membership of some European institutions, such as the European Union (EU) or the European Economic Area (EEA), can be a significant source of competitive advantage of economic integration (Alvarez-Garrido and Alcacer, 2023). This might in turn affect the PE asset class and its performance. EU membership can also be of interest due to EU's high efforts in promoting sustainability in many industries, including the financial sector.

Considering the contradicting views of the performance of impact investments, and the potential influence of geographical location, the main research question for this study is: '*Is there a difference of financial returns between impact and non- impact private equity funds in Europe?'*. This will be mainly tested through linear regressions of European private equity funds and funds of the UK domicile.

Some divergences of the essential assumptions of impact investing have been found (Hochstadter and Scheck, 2015), therefore explanations of concepts used throughout the thesis will be provided. Whereas finance-first investing seeks financial returns regardless of ESG factors, impact-first investing focuses on high impact with lower focus on performance, often accepting below market returns. In between the two, lay responsible investing and impact investing. The former considers ESG factors while looking at

investment opportunities, but it does not imply impact. Asset managers and organizations who sign the United Nations Principles of Responsible Investment (UNPRI) are an example of that. They comply to not necessarily tilt investment toward impact, but rather to adhere to the principles when considering investment opportunities. As of June 2024, there are 3,826 organizations who are signatories to the UNPRI, representing $121.3 trillion in asset under management. Both responsible investing and impact investing care for strong financial performance. Impact investing, as opposed to responsible investing, has a strong dual objective: financial returns and generated impact are both required. Therefore, it has more strict criteria than responsible investing as it mandates measurable positive social and environmental outcomes alongside financial returns.

The asset class of PE is an alternative investment partnership that allows buying and selling stakes of privately-owned firms. We refer to PE as the asset class that includes buyout funds (also referred to as PE) and VC funds. It is a vast area that can involve different strategies and firms of varying maturities. Whereas PE funds, in the buyout sense, invest in more mature companies, VC funds finance startups, seed investments and other younger ventures.

Most studies focus on regular US funds such as the paper of Higson and Stucke (2012). The study of Harris et al. (2016) looks at the European market and mentions differences in comparison to the US for both buyout and VC funds. Only a few studies look at impact investing of the PE asset class, none of which focus exclusively on Europe. Also, the potential benefit of the EU on impact funds' returns has not been investigated when it comes to their aggregate performance. Moreover, the measurement of the effect of the EU on PE firms through the study of Brexit has not been conducted. These gaps are what this research aims to address.

This study is also important from a societal point of view. Proof of equal returns of impact and non-impact funds could encourage more investors to be selective about the funds they choose and assure them of the possibility of competitive financial returns alongside positive social and environmental outcomes. Also, the paper could be influential for policymaking and politics of Europe. Potential benefits of the EU could influence a country to seek its membership or change the way the Union creates its regulation regarding PE. On the other hand, a possible case of disappointing results of the EU, could perhaps lead to a rethinking of polices and incentives provided to funds who harmonize financial returns with social and environmental objectives.

This thesis investigates the largely unexplored landscape of European impact PE funds, shedding light on the implications of economic partnerships such as the EU on PE funds, particularly impact funds. Through multiple linear regression analysis, the study finds no significant difference in returns between impact and non-impact European PE funds when controlling for various factors such as vintage year, fund size, and geography. This contrasts with findings from the US, where impact funds reportedly underperform (Barber et al., 2021). Additionally, the analysis reveals that EU or EEA membership does not seem to significantly enhance the returns of impact funds compared to their non-EU (or non-EEA) counterparts, suggesting that any benefits from such memberships are likely non-monetary or uniformly distributed across Europe. Moreover, the study highlights a nuanced finding regarding the UK's post-Brexit referendum PE

performance, indicating potentially lower returns, thus hinting at broader implications of the UK's exit from the EU. Also, a further analysis into the domicile effects on fund performance suggest some countries and regions achieve consistently different returns. These insights contribute to a deeper understanding of the dynamics affecting impact investing within the European private equity sector.

The setup of this thesis is the following: Chapter 2 provides a literature review and the formation of hypotheses to be tested, Chapter 3 gives an overview of the data used, Chapter 4 provides a description of the methodology used, Chapter 5 provides the results of the analysis, and finally Chapter 6 concludes and discusses paper’s potential limitations and ideas for future research.

CHAPTER 2 Literature Review and Hypotheses

2.1 Returns of Public Mutual Funds

Cuthbertson et al. (2010) provide a critical review of empirical studies on the performance of mutual funds, mostly for the US and the UK. They find that only the top 0 – 5% of mutual funds have a net positive-alpha performance (adjusted for risk). Most of the funds they examine do not perform better than the public market benchmark, when adjusted for fees and risk. Otten and Bams (2008) discovered that European mutual fund performance significantly differs from the widely accepted underperformance observed in most US studies. The results of their study suggest that European mutual funds can add value, proven by their positive net alphas. Also, there seems to be high persistence in mean returns of UK funds. Apparently, the domicile of mutual funds has a significant effect on their performance, perhaps through affecting other determining factors of performance.

When it comes to the performance of US mutual funds focused on SRI, it has not been statistically different than that of other mutual funds in the years 1999 – 2011 (Bialkowski and Starks, 2016). The authors argue that the tilt toward SRI does not necessarily reflect a higher willingness to pay for nonpecuniary benefits. The study of Munoz et al. (2014) has partly contradictory findings, with varying returns for socially responsible funds of the US and Europe. Their analysis, which distinguishes between crisis and normal periods, indicates that European socially responsible funds consistently achieve statistically insignificant performance regardless of market conditions. In contrast, US socially responsible funds perform comparably to regular funds during crises but underperform during normal periods. This suggests that the domicile of the funds influences their performance.

2.2 Returns of Private Equity Funds

The performance of private equity is a highly discussed and researched topic, and many findings seem contradictory. Harris et al. (2014) find the consistent overperformance of private equity compared to the public market, with the former having an average performance that is three percentage points higher annually in the US. Phalippou and Gottschalg (2009) argue that most research overstates the performance of private equity funds due to inflated accounting valuations and a sample selection bias. According to the authors, the net performance of a sample of European and US funds, adjusted for risk, equals around 6% less than that of the S&P 500. Kaplan and Schoar (2005) find however, that the average net fund return approximately equals that of the public benchmark. They argue that there are many differences between the nature of mutual and private equity funds, such as a different relationship between fund flows and past performance. It is important to note that the two latter studies, those of Phalippou and Gottschalg (2009), and Kaplan and Schoar (2005), have a sample that ends in the early 2000s, with the cut-off years 2003 and 2001 respectively.

2.2.1 Returns of Impact Funds

Barber et al. (2021) find that investors are willing to sacrifice 4.7 percentage points of returns ex-post for the impact objectives of funds when controlling for industry, vintage year, fund order, and geography. They focus on venture capital and growth funds and omit buyout funds due to the limited data availability, which Harris et al. (2016) argue against as they find great differences between venture and buyout funds, hence the results might not be representative of the whole private equity landscape. Barber et al. (2021) also find that some institutions or groups such as Europeans and United Nations Principles of Responsible Investment (UNPRI) signatories seem to have high willingness to pay for the nonpecuniary objectives of impact funds compared to other groups. The reduced-form estimations, however, do not give enough evidence to conclude that investors may be willing to forego returns. The authors also mention that the sample selection bias might affect the analysis which is consistent with NVCA (National Venture Capital Association) 2013 Yearbook (2013) claiming returns of failed funds are often not reported causing a disparity between observed and actual values. The returns of the Barber et al. (2021) paper are measured primarily by internal rates of return (IRRs), value multiples (VMs), and imputed public market equivalents (PMEs). They claim VMs are qualitatively similar to the analysis of IRRs. The method of VMs would be consistent with Harris et al. (2014) who claim that multiples of invested capital are a better method of summary measures than IRRs as they have more explanatory power.

When it comes to the risk-adjusted performance of impact investing funds, Jeffers et al. (2021) find that impact funds have lower market betas than the rest of funds. When accounting for those betas, they find that impact funds' underperformance compared to the public market, is not necessarily different than that of comparable strategies of other private funds. The higher market betas of regular PE funds might be explained by the reputational and financial risks associated with the strategy (Prisco, 2024). On the other hand, impact funds and their strong ESG performance can increase long-term value whilst hedging for some outside risks, possibly resulting in a lower beta.

2.2.2 European Fund Returns

The private equity landscape seems to differ a lot between the US and Europe especially when it comes to venture capital, with the wedge between them becoming larger with time (Bottazzi and Da Rin, 2002). Hege et al. (2003) investigate that difference as well and find that US venture capital firms have a significantly better performance on average than the equivalent European funds, influenced by type of exit and IRRs. Harris et al. (2016) also find the underperformance of European VC funds, compared to those of the US. When it comes to buyout funds though, they argue that the performance between the two is very similar. Kelly (2012) also finds a division between the determinants of VC and buyout

investments on the European market suggesting the two are quite different. Moreover, there also seems to be a division of factors that drive European PE investments into cyclical and structural ones.

Considering the difference between the returns of US funds and European ones, only the latter ones will be considered in this paper. Also, due to opposing findings of impact funds' returns, and the lack of a study focused on European impact funds, the two hypotheses will be tested:

H1: The performance of European impact funds, as measured by the net IRR, is not significantly different than that of regular European funds.

H2: The performance of European impact funds, as measured by the net multiple, is not significantly different than that of regular European funds.

2.2.3 European Impact Fund Returns and EU Influence

In their study of impact funds, Barber et al. (2021) mention that fund geography and industry can explain some of the variation of returns between impact and non-impact funds, but the spread of that variation remains reliably negative. One possible way that geography could affect the financial returns is through exits such as Initial Public Offerings (IPOs) as it is the strongest driver of VC investing (Jeng and Wells, 2000). While investigating the influence of geography on IPO performance, Baker et al. (2021) find a tendency for the IPO underpricing to be lower for countries with higher ESG Government Ratings. Moreover, the effect is 'more pronounced in countries with more transparent financial disclosures, higher liability standards, and stronger shareholder protections' (Baker et al., 2021, Abstract).

That could be influential for members of the European Union who must adhere by the institution's rules such as strong sustainability and reporting standards and hence might have higher ESG Government Ratings leading to better financial returns of IPOs, and hence better performance of private equity funds in general. Venture capital funds of EU members are affected by these to a higher extent than non-EU members and therefore might attract higher capital funds (Prisco, 2024). An example of a European Union's incentive ensuring better investor protection through transparency measures and disclosure requirements of funds is AIFMD, initially proposed in 2011, which stands for Alternative Investment Fund Managers Directive (Directive - 2011/61 – AIFMD - EUR-Lex, n.d.). There is however some discussion on regulating the private equity asset class, and its potential negative effects resulting from the overprotection of investors (Franks et al., 2012). The European Union could also provide other benefits to its members, such as market and currency commonality, which have been proven to increase cross-border VC flows (Alhorr et al., 2008).

Stofa and Soltes (2020) find some significant determinants of PE investments in the EU. Although they look solely within EU, some determinants such as labor market rigidity could be important when looking at the overall influence of the Union's membership on financial returns of PE funds. Labor market rigidity can harm VC activity through lower incentivization to found new ventures, or higher costs of

qualified human capital (Black and Gilson, 1998; Jeng and Wells, 2000; Kelly, 2012; Schertler, 2013). The broad scale integration of the European Union decreases labor rigidity and hence can have a positive effect on PE investments.

Since there might be some benefits of the EU membership that affect the performance of private equity funds, but there seems to be a lack of their measurement, the two hypotheses are formed:

H3: The performance of impact funds, as measured by the net IRR, is higher for funds of EU members compared to funds of non-EU countries.

H4: The performance of impact funds, as measured by the net multiple, is higher for funds of EU members compared to funds of non-EU countries.

2.3 The Influence of Brexit

Leaving the European Union, and therefore some of the benefits of its membership, might play a significant role for the private equity landscape of a country. Groh et al. (2010) investigate the attractiveness of 27 different European countries, 25 of which were a member of the EU at the time of the study, for institutional investments into the private equity asset class. The authors find the UK to be the leader of the sample while it is also important to mention that the measured attractiveness of the group is very varied. The United Kingdom is believed to be similar in many respects to the other countries in the sample, and the two detrimental criteria making it a leader are its investor protection and corporate governance rules, and the liquidity and size of its capital market (Groh et al., 2010). As the paper was published in 2010, it did not take into effect the potential benefits of the previously mentioned AIFMD directive that came into effect only in 2013 (Schwarze, 2024). Also, since the UK left the European Union, it means they no longer have to abide by the AIFMD directive, potentially increasing the uncertainty of investors and making the UK's private equity market less attractive.

Dietlmeier (2018) believes that after Brexit, the asset class of private equity might face issues and obstacles that have not existed thus far in the UK. He believes that the United Kingdom's decision to leave the European Union will influence private equity activity in two ways: either indirectly through the overall economic and financial sector development, or directly by restricting the cross-border activity between the UK and EU and thus decreasing the attractiveness of the UK's market and its locational advantage for the PE landscape.

A later paper of Huang (2023), who focuses on the activities of nine top British PE firms through a regression analysis, mentions that Brexit had a significant impact on UK PE firms but not on direct investment in those firms. The research does not, however, conclude whether the impact would be negative or positive in aggregate as the author mentions the negative effect of the investors' uncertainty, but also the possible positive effect of reformulating new policies to boost the PE sector. Huang (2023) uses data from six and two years, pre- and post-Brexit respectively. Alvarez-Garrido and Alcacer (2023)

use an alternative methodology, of treating Brexit as a natural experiment to measure the effect of economic disintegration on entrepreneurial investment through a difference-in-difference method. They analyze the scale of capital inflows of both the UK and the EU. The authors find a greater negative effect on investment in UK startups than on EU startups caused by Brexit, although a negative effect is also observed in the EU. Surprisingly, the effects differ a lot by industry: some affect the European Union more negatively, while some the United Kingdom.

With Brexit having a possibly significant effect on the returns of private equity funds, it raises a question on the extent of the European Union's influence on PE asset class performance. Therefore, the two hypotheses will be investigated:

H5: There is a positive effect of the EU membership on the performance of private equity funds as measured by the net IRR.

H6: There is a positive effect of the EU membership on the performance of private equity funds as measured by the net multiple.

CHAPTER 3 Data

3.1 Data Collection

The data was collected through Preqin, an alternative assets database, with information from over 135,000 funds (Preqin, n.d.). Although the database is quite comprehensive, it is important to note that due to the nature of the data, the private industry, there are no regulations that require the reporting of data. Therefore, there is some selection bias towards better performing funds that is unavoidable (Phalippou and Gottschalg, 2009). Harris et al. (2014), however, argue that the Preqin data is reliable for research and the observed performance metrics do not differ significantly from their actual values.

The collection of the performance data of funds from the asset class of Private Equity, with the domicile of all available European countries, leads to 1,609 observations. The data is composed of both venture capital and buyout private equity funds. The funds with no observations of their net IRR have been dropped, resulting in 1,263 observations left. Moreover, 14 observations have been dropped due to their net IRR having highly unrealistic values - being over 100% or lower than -80%. Due to observations of impact funds only existing after 2000, and due to some Dot-Com bubble considerations, the dataset is further limited to funds with vintage years 2001 – 2021. That results in dropping additional 53 observations and arriving at a final number of 1,196 observations.

The information on whether a fund is impact-focused has been gathered in two ways. The first method involves the Principles for Responsible Investment (PRI) signatory database (PRI, n.d.). The internationally recognized PRI, supported by the UN, allow organizations to 'publicly demonstrate its commitment to responsible investment' (PRI, n.d.). Within the Preqin dataset of European funds there are 890 funds of firms that have been signatories to the PRI. However, when considering solely the funds created after, or the year of the signing, there are 423 of those funds – 35.4% of the database observations.

The second method involves creating a non-exhaustive list of European impact funds using third-party websites such as Impact Yield (Impact Yield, n.d.), Sifted (Pratty, 2023), Impact Europe (Impact Europe, n.d.), Finetic (Finetic, n.d.), and Dealroom (Dealroom, n.d.). Secondly, the websites of leftover funds were scraped and parsed to look for key words such as 'Impact', 'Sustain(ability)', 'ESG' and manually verified for positive results. Funds that express the double objective have been appointed as impact funds. In case no information could be found, or there was significant uncertainty about the funds' objectives, the fund was appointed as a regular fund. This method leads to 283 observations of impact funds, equal to around 23.7% of all funds. For the resulting funds of both methods, binary variables of *PRI Signatory*, *Post-PRI Fund*, and *Impact Fund* were created.

3.2 Dot-Com Considerations

There is a lot of discussion regarding the PE asset class in the times of the dot-com investments. Harris et al. (2014) mention that VC returns have outperformed public equities in the 1990s, while using S&P500 as a benchmark, but failed to do so in the 2000s - the VC returns underperformed that same benchmark in the 2000s. The authors based their study in the US, using the Burgiss data set, whilst controlling for the Preqin database as well. According to Korteweg (2019), the average VC net-of-fee returns have been zero or negative after 2001. The extremely high returns of late 90's might be disadvantageous for impact funds, the majority of which started after 2001. The paper of Barber et al. (2021) that looks at the difference of returns of impact and regular venture capital funds mentions the influence of the dot-com bubble. Because of the lack of impact funds during the dot-com bubble and the highly right-skewed returns of traditional VCs, one of the regressions they perform, looks only at the sample post-2000 and finds that the difference between returns of impact and regular funds decreases, but still remains negative.

As presented in Figure 1, there have been no impact funds until the year 2001 in the sample. That is important as the possibly high returns of 90's connected to the Dot-Com bubble could not be enjoyed by any impact funds. This is also a reason for only considering funds with vintage years between 2001-2021.

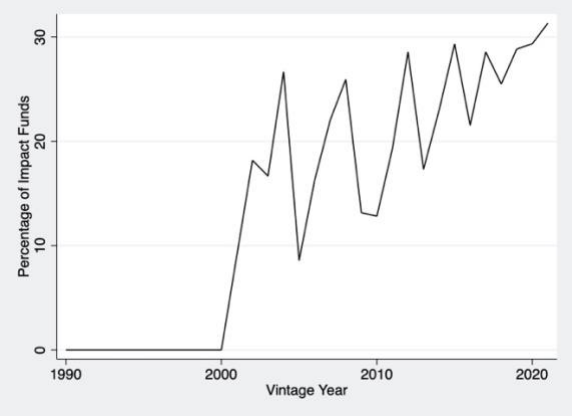

Figure 1. Percentage of impact funds as a function of all funds created in the corresponding vintage year.

3.3 Variables

This section includes the descriptions of all variables used in later analysis.

3.3.1 Fund-Specific Variables

The first variable, *Vintage Year*, is the year of the funds' first investments. In the dataset it ranges from 2001 until 2021. Ljungqvist and Richardson (2003) find that the IRR of an average fund is negative until its eighth year and the IRR raises with additional years. Therefore, this variable is very important when

it comes to benchmarking and controlling for some business cycle related effects. Additionally, *Vintage Groups* are created that combine the effects of three subsequent years – e.g. 2001 until 2003 and so on. Following variables *Impact Fund*, *PRI Signatory*, and *Post-PRI Fund* are all related to the subject of sustainability and impact. A comprehensive review of over 2,000 studies found that that over 60% argue there is a strong correlation between ESG performance and positive returns, with only 10% of the studies arguing a negative effect (Friede et al., 2015). That is why all three variables might be influential when looking at returns of private equity funds.

Based on the domicile of a fund, additional binary variables were created for members of both the EU, and the European Economic Area (EEA). The *EEA* and *EU* binary variables are equal to 1 for funds of countries that are a part of the corresponding union. For the UK, the variables are equal to 1 for vintage years until 2016 (including), and 0 afterwards. Although the UK left the EU and the EEA officially in 2020, the Brexit referendum of 2016 will be used as the cut-off date for the *EU* and *EEA* binary variables. That means all funds created until 2016 (including) are treated as EU and EEA funds, and the funds with vintage years of 2017 and after are treated as non-EU and non-EEA funds. This method led to the appointment of 79 out of 328 of UK's funds as created whilst not belonging to the unions. The referendum date was used instead of the actual exit date due to the two main reasons. Firstly, the results of the referendum have been a sort of an exogenous shock, supported by the methodology of Alvarez-Garrido and Alcacer (2023) who have used the 2016 date in their difference in differences study of Brexit implications. Secondly, the overall sentiment and forward-looking expectations of investors might have been influenced by the initial decision more, rather than the official exit date. A limitation arises for the funds created before the referendum but still active during the time of exiting, but it is treated as an idea for further research and lays outside the scope of this thesis.

Both studies, those of Barber et al. (2021) and Kaplan and Schoar (2005), control for the fund order when looking at the performance of private equity funds, therefore a variable *Fund Sequence* will also be of interest. The importance of the fund order could be explained by the smaller sensitivity of established funds to the business cycles compared to new entrants. A logarithmic transformation is applied in all models for the fund sequence variable, as its distribution is skewed.

The categorical variable *Core Industry* has values of 1-5 for the corresponding industries and respective number of observations that have been noted in parentheses: 1 - Information Technology and Business Services (156), 2 - Diversified and Consumer Discretionary (874), 3 - Health Care (77), 4 - Media and Communications (32), and 5 - Other Industries (57). This division of industry dummies follows the methodology of Barber et al. (2021).

This section also includes the categorical variable *Primary Region Focus*, also referred to as the geography (focus) of a fund, equal to 1 if the region of interest is Europe, 2 for the region of North America, and 3 for other regions. There are 1015, 119, and 62 observations of each fund group respectively.

Lastly the binary variable *Private Equity*, that is equal 1 in case of private equity (buyout) funds, and 0 otherwise (venture capital). One reason it might be important is the stronger cyclicality of VC performance compared to buyouts (Robinson and Sensoy, 2016). There are 205 VC funds in the dataset. For the further investigation of hypotheses 5 and 6 additional domicile-related variables were examined. The variables include a categorical variable *Country* (funds' domicile) which includes 28 European countries, from which the fund data was available on the Preqin database. Another categorical variable *Region*, which sorts countries into four distinct regions: Eastern Europe (Poland, Russia, Czech Republic, Estonia, Lithuania, Hungary), Southern Europe (Italy, Spain, Portugal, Greece, Cyprus), Northern Europe (Denmark, Norway, Sweden, Finland, Iceland), and finally Western Europe (UK, France, Germany, Netherlands, Belgium, Luxembourg, Ireland, Switzerland, Austria, Liechtenstein). There are 15, 153, 126 and 902 observations from each region, respectively.

3.3.2 Financial Variables

Two of the financial variables are regarding the performance of the funds and will be used later as the dependent variables of regressions. The first one, *Net IRR* (%), is the measure of the internal rate of return of the fund, after fees and carry. The IRR measure is an estimated figure since it relies on both cash flows and the valuations of the remaining stakes in firms. Therefore, it is quite sensitive to timing of cash flows and could be potentially manipulated by fund managers, to get new investors. Also, the method of net IRR assumes that interim cash flows are reinvested at the same rate as the IRR, which is often impossible in real life.

The second measure of performance, the *Net Multiple,* is the ratio of the limited partners' derived value from the fund to its initial investment. An important consideration is that the net multiple does not consider the time value of money. Therefore, the actual returns of funds will be lowered when accounted for inflation, which could be significant for a regular 10-year fund. That also means that comparisons between funds with different durations could be misleading.

Due to many pitfalls of both measurement methods, I will be testing the hypotheses using both metrics. That might reveal if the findings are robust to various metrics used.

The last financial variable is *Fund Size* (measures in USD millions) and will be used as a control variable. It is an important variable as fund size in private equity usually affects investment size which in turn influences the funds' performance, as measures by IRRs (Humphery-Jenner, 2012). Humphery-Jenner (2012) argues that the biggest PE firms earn higher IRRs when investing in bigger companies. The distribution of the fund size variable is very skewed; therefore, a logarithmic transformation is applied in all models. The same transformation is performed by Barber et al. (2021) in their study of VC performance.

3.4 Descriptive Statistics

At first sight, there does not seem to be a vast difference between the returns of non-impact and impact funds, presented in Table 1. Impact funds have a slightly higher net IRR performance with a mean (median) of 15.88 (15.00) compared to the non-impact funds' 15.56 (14.8). Also, the standard deviation of performance metrics seems to be similar. Non-impact funds, however, have a slightly better net multiple performance of 1.75 (1.61) compared to 1.70 (1.58). Although we use a sample post-2000, some leftover volatility of the dot-com era might be influential of slightly higher standard deviation of non-impact funds for both the net IRR and net multiple. This can also be explained by other differences in the samples though. The fund size of non-impact funds seems to vary a lot more than that of impact funds although a mean fund has a very similar size (620.34 and 617.71 mln dollars for non-impact and impact funds respectively). A slightly bigger portion of impact funds are venture capital funds and funds that are created in EU countries.

There seems to be a higher disparity between the returns of PRI and non-PRI funds, presented in Table 2. That might be explained by some other characteristics of the funds, such as the fund size, which also seems to differ significantly. What is also important to mention, is the higher standard deviation of the non-PRI funds of both performance measurements. This could again be explained by the differences in other fund characteristics, but perhaps the role of ESG risk factors also plays a role. Being mindful of the ESG-associated risk, might help decrease the overall volatility and riskiness of a fund. Linear regressions will be conducted to account for those differences.

Table 1. Descriptive statistics for impact and non-impact funds of vintage years 2001 - 2021.

	Non-Impact Fund				Impact Fund			
	N	Mean	Median	St. Dev.	N	Mean	Median	St. Dev.
Net IRR (%)	913	15.56	14.80	15.11	283	15.88	15.00	14.31
Net Multiple (x)	843	1.75	1.61	0.883	253	1.70	1.58	0.737
Fund Size (USD mln)	897	620.34	209.03	1,544.82	281	617.71	265.00	1,041.45
EEA (UK's exit in 2016)	913	0.931	1.00	0.254	283	0.926	1.00	0.263
EU (UK's exit in 2016)	913	0.887	1.00	0.317	283	0.915	1.00	0.279
Fund Sequence	854	7.36	4.00	10.59	276	9.33	5.00	10.46
Core Industry	913	2.08	2.00	0.801	283	2.28	2.00	0.960
Primary Region Focus	913	1.12	1.00	0.479	283	1.24	1.00	0.618
Private Equity	913	0.836	1.00	0.371	283	0.806	1.00	0.396

Notes: The data has been constructed using (1) the Preqin database, (2) the official UNPRI signatory, and (3) previously mentioned sources used for the *Impact Fund* variable. Some variables have less observations than the full sample due to missing data.

Table 2. Descriptive statistics for PRI and non-PRI funds of vintage years 2001 - 2021.

	Non-PRI Fund				PRI Fund			
	N	Mean	Median	St. Dev.	N	Mean	Median	St. Dev.
Net IRR (%)	773	14.91	14.00	15.65	423	16.96	16.40	13.40
Net Multiple (x)	703	1.81	1.65	0.978	393	1.61	1.50	0.534
Fund Size (USD mln)	763	453.09	173.92	1,041.71	415	926.04	360.13	1,938.02
EEA (UK's exit in 2016)	773	0.959	1.00	0.199	423	0.877	1.00	0.329
EU (UK's exit in 2016)	773	0.906	1.00	0.293	423	0.872	1.00	0.334
Fund Sequence	747	4.78	3.00	6.19	380	13.82	8.00	14.23
Core Industry	773	2.14	2.00	0.908	423	2.11	2.00	0.716
Primary Region Focus	773	1.19	1.00	0.509	423	1.23	1.00	0.527
Private Equity	773	0.775	1.00	0.418	423	0.927	1.00	0.261

Notes: The data has been constructed using (1) the Preqin database, (2) the official UNPRI signatory, and (3) previously mentioned sources used for the *Impact Fund* variable. Some variables have less observations than the full sample due to missing data. Vintage years of PRI funds are 2005 – 2021.

CHAPTER 4 Methodology

This chapter delves into the models and methods that will be used to test the hypotheses of Chapter 2.

4.1 Impact Fund Performance Analysis

First, t-tests are conducted to test the equal mean of net IRR and net multiple of (1) impact and non-impact funds, and (2) pre-PRI and post-PRI funds as a proxy for impact funds. The alternative hypotheses of a higher mean of one group will also be tested.

Next, six regression models will be constructed for the impact fund performance analysis. The same models will be applied for both the net IRR, and the net multiple dependent variables. The same clustering of standard errors has also been applied to both performance metrics – the first model in both cases uses simple robust standard errors, whilst the remaining models use clustered standard errors by vintage years, amounting to 21 clusters.

Model 1 will be the base model that includes only the *Impact Fund*, and *Private Equity* dummy. Model 2 builds on the previous model and adds controls for the *Fund Sequence*, *Fund Size*, and *Vintage Year*. Model 3 adds additional controls for the *Core Industry* of the fund, and its *Primary Region Focus*. Models 4, and 5 introduce Vintage Groups in place of previous Vintage Year controls. Instead of controlling for the categorical geographical control, Model 4 looks at the interaction effect of *Vintage Groups* and the *Primary Region Focus*. Model 5 is very similar to Model 4, but it controls for the categorical variable of Primary Region Focus, and in turn looks at the interaction effect of *Vintage Groups* and the *Core Industry* variable. Model 6 is the same as Model 3, only replaces the *Impact Fund* dummy with the binary variable *Post-PRI Fund*, which is used as a proxy of impact funds.

Therefore, for each fund i, the regression equation is some variation of the following equation, for the net IRR measurement:

$$net\ IRR_i = \beta_0 + \beta_1 Impact\ Fund_i/Post - PRI\ Fund_i + \beta_2 Private\ Equity_i + \beta_3 Log\ (Fund\ Size_i) + \beta_4 Log\ (Fund\ Sequence_i) + \beta_5 Vintage\ Year_i/Vintage\ Group_i + \beta_6 Core\ Industry_i + \beta_7 Primary\ Region\ Focus_i + \beta_8 Vintage\ Group_i * Primary\ Region\ Focus_i + \beta_8 Vintage\ Group_i * Core\ Industry_i + \mu_i,$$

and the net multiple measurement:

$$net\ multiple_i = \beta_0 + \beta_1 Impact\ Fund_i/Post - PRI\ Fund_i + \beta_2 Private\ Equity_i + \beta_3 Log\ (Fund\ Size_i) + \beta_4 Log\ (Fund\ Sequence_i) + \beta_5 Vintage\ Year_i/Vintage\ Group_i + \beta_6 Core\ Industry_i + \beta_7 Primary\ Region\ Focus_i + \beta_8 Vintage\ Group_i * Primary\ Region\ Focus_i + \beta_8 Vintage\ Group_i * Core\ Industry_i + \mu_i.$$

4.2 Influence of the European Union

T-tests will also be conducted to test the equal mean of net IRR and net multiple of (1) non-EU and EU funds, (2) non-EEA and EEA funds, as a proxy for EU funds, and (3) non-EU impact funds and EU impact funds. The alternative hypotheses of a higher mean of one group will also be tested.

Next, six models of linear regression will be conducted for both the net IRR measurement of performance, as well as the net multiple, to investigate the influence of the European Union membership. All models use standard errors that have been clustered by vintage year. The base model of all the regressions is Model 3 from section 4.1, which includes the variables *Impact Fund*, *Private Equity*, the logarithm of *Fund Sequence*, the logarithm of *Fund Size*, *Vintage Year*, *Core Industry*, and *Primary Region Focus*. In this section, Models 1 and 2 will include the *EU* and *EEA* dummy controls, respectively, in addition to the previously mentioned variables. Model 3 incorporates a control for the interaction effect between the *EU* and the *Impact Fund* into Model 1, while Model 4 applies the interaction effect between the *EEA* and the *Impact Fund* to Model 2. Model 5 replicates Model 3 but restricts the observations to only UK-domiciled funds. Model 6 focuses exclusively on a sample of impact funds and replicates Model 1, excluding the *Impact Fund* control.

Therefore, for each fund i, the regression equation is some variation of the following equation, for the net IRR measurement:

$$net\ IRR_i = \beta_0 + \beta_1 Impact\ Fund_i + \beta_2 EU_i + \beta_3 EEA_i + \beta_4 Private\ Equity_i + \beta_5 Log\ (Fund\ Size_i) + \beta_6 Log\ (Fund\ Sequence_i) + \beta_7 Vintage\ Year_i + \beta_8 Core\ Industry_i + \beta_9 Primary\ Region\ Focus_i + \beta_{10} EU_i * Impact\ Fund_i + \beta_{11} EEA_i * Impact\ Fund_i + \mu_i,$$

and the net multiple measurement:

$$net\ multiple_i = \beta_0 + \beta_1 Impact\ Fund_i + \beta_2 EU_i + \beta_3 EEA_i + \beta_4 Private\ Equity_i + \beta_5 Log\ (Fund\ Size_i) + \beta_6 Log\ (Fund\ Sequence_i) + \beta_7 Vintage\ Year_i + \beta_8 Core\ Industry_i + \beta_9 Primary\ Region\ Focus_i + \beta_{10} EU_i * Impact\ Fund_i + \beta_{11} EEA_i * Impact\ Fund_i + \mu_i.$$

4.2.1 Further Investigation into Domicile Effects

Further investigation into hypotheses 5 and 6, and the effect of EU membership on the performance of private equity funds, measured by the net IRR and the net multiple will be conducted through linear regression models incorporating the fund's domicile country or region. This method will also be used to ensure the robustness of previous findings, under more precise geographical criteria, of the effect of being an impact fund and the interaction effect of being an impact fund in the European Union.

The same control variables are used for both performance metrics and all models use standard errors clustered by vintage year. The first model of this section includes dummy variables of *Impact Fund, EU, Private Equity*; the interaction effect of *EU* and *Impact Fund*; logarithms of *Fund Size* and *Fund Sequence*; categorical variables *Vintage Year*, *Primary Region Focus*, and *Core Industry*. The second model includes the categorical variable *Region* in place of individual countries, while Model 3 builds on the second model through an addition of interaction terms of *Region* and *Impact Fund*. The fourth and fifth model are identical to the first, but they focus exclusively on observations of impact funds, with Model 4 considering individual countries and Model 5 considering regions.

Therefore, for each fund i, the regression equation is some variation of the following equation, for the net IRR measurement:

$$net\ IRR_i = \beta_0 + \beta_1 Impact\ Fund_i + \beta_2 EU_i + \beta_3 EU_i * Impact\ Fund_i + \beta_4 Private\ Equity_i + \beta_5 Log\ (Fund\ Size_i) + \beta_6 Log\ (Fund\ Sequence_i) + \beta_7 Vintage\ Year_i + \beta_8 Core\ Industry_i + \beta_9 Primary\ Region\ Focus_i + \beta_{10} Country_i + \beta_{11} Region_i + \beta_{12} Region_i * Impact\ Fund_i + \mu_i,$$

and the net multiple measurement:

$$net\ multiple_i = \beta_0 + \beta_1 Impact\ Fund_i + \beta_2 EU_i + \beta_3 EU_i * Impact\ Fund_i + \beta_4 Private\ Equity_i + \beta_5 Log\ (Fund\ Size_i) + \beta_6 Log\ (Fund\ Sequence_i) + \beta_7 Vintage\ Year_i + \beta_8 Core\ Industry_i + \beta_9 Primary\ Region\ Focus_i + \beta_{10} Country_i + \beta_{11} Region_i + \beta_{12} Region_i * Impact\ Fund_i + \mu_i.$$

CHAPTER 5 Results

5.1 Impact Fund Performance Analysis

The null hypothesis H1 stating that the performance of Impact and Non-Impact Funds, as measured by the net IRR, is not statistically different from each other, and the null hypothesis H2 stating that the performance of Impact and Non-Impact Funds, as measured by the net multiple, is not statistically different from each other, are both initially tested using a t-test and secondly with ordinary linear regression models.

5.1.1 T-tests Regarding Impact Fund Influence

The null hypothesis of equal means cannot be rejected in both measurement cases for impact funds, as presented in Table 3. That means that there is not a significant difference in impact fund returns when compared to regular funds for both net IRR and net multiple performance measurement.

Additional tests of the hypotheses using the Post-PRI Fund variable as a proxy for impact funds, result in the rejection of the null hypotheses for both types of performance measurements at the 5% significance level. This indicates a significant difference between the returns of PRI and non-PRI funds. The mean difference results for PRI-funds show opposite signs for the two different performance measurements. For the net IRR measurement, the average return of a PRI-fund is higher than that of a non-PRI fund (p-value 0.012), while for the net multiple measurement, the average return is lower (p-value 0.000).

The hypotheses H1 and H2, however, cannot be rejected yet. They will additionally be tested using a regression analysis as the t-tests do not take into considerations the possible significant differences of the two populations and controls that are applied through linear regressions.

Table 3. Two sample t-tests with equal variances related to impact funds.

		Difference of means	Standard Error	T-stat	P-value	Number of Observations
Non-Impact – Impact Funds	Net IRR (%)	-0.328	1.02	-0.32	0.747	1,195
	Net Multiple (x)	0.056	0.061	0.921	0.357	1,095
Pre-PRI – Post-PRI Funds	Net IRR (%)	-2.05**	0.901	-2.28	0.023 (0.012**)	1,195
	Net Multiple (x)	0.205***	0.053	3.843	0.000 (0.000***)	1,095

Notes: Testing the null hypothesis of no mean difference. The p-value of the one-sided test in the direction of the mean difference in noted in the parentheses.

5.1.2 Ordinary Linear Regressions of Impact Fund Influence

The same hypotheses, H1 and H2, will now be tested through multiple linear regression models. First, the assumptions of the CLRM will be investigated.

The assumption of zero-mean error term does not cause great concern as the regression constant will not be analysed. To ensure correct standard errors that have constant variance, and are not autocorrelated, I use robust standard errors, cluster them by vintage year for models 2 – 6 and add controls to the regressions. The assumption of the normality of the errors should also not be a great concern due to the size of the sample used. The last assumption, the one of exogeneity, cannot be ensured. There might be some endogeneity in our model due to some possible measurement error, or omitted variable bias, preventing causal claims.

The null hypothesis H1: performance of impact and non-impact Funds, as measured by the net IRR, is not statistically different from each other, cannot be rejected at the 5% significance level in any of the five linear regression models (1 – 5). Although the variable Impact Fund is positive in all the five models, it is not statistically significant. That implies that the returns of non-impact European funds, measured by the net IRR, do not seem to be significantly different than those of regular European funds when controlling for vintage year, asset class, fund size, fund sequence, industry, or regional focus. The same holds for model 6 that uses post-PRI funds as a proxy for impact funds.

The dummy variable Private Equity is highly significant in each of the six models and suggests higher net IRR returns of European private equity funds, in comparison to European venture capital funds. The difference of the returns between PE and VC is found to be in the range of 5.4 – 7.9% depending on the model. The higher returns of private equity is in agreement with Harris et. al (2014), who find better buyout fund performance in the US in comparison to VC, post-2000.

The logarithm of the Fund Sequence variable is negative and statistically significant at the 5% confidence level in models 2 – 5. That is the opposite of the finding of Kaplan and Schoar (2005). Most of the vintage year dummies are also statistically significant, supporting the belief of high cyclicity of the private equity industry Higson and Stucke (2012). The vintage groups show less persistence, with only few of them significant.

The categorical variable Primary Region Focus is not significant for the North America region, but negative and significant at the 10% confidence level for the regions of outside of Europe and North America, which include a lot of emerging countries in Africa, Asia and South America. That means the net IRR returns of European private equity funds seem to be 2.9 – 3.1 % lower, dependent on the model, for those regions in comparison to investments in Europe. That might be explained by the early-mover disadvantages of investing in those economies, or the drastically slowed growth of the asset class in emerging countries in 2000s (Sannajust and Groh, 2020; Leeds and Sunderland, 2005).

The logarithm of the Fund Size variable is negative, but not statistically significant in any of the 6 models. The categorical variable Core Industry also suggests no significant difference in returns of funds

with different industry specializations. None of the interaction terms of vintage groups and geography or industry are statistically significant.

Table 4. The regressions related to impact funds with net IRR as the dependent variable.

Net IRR (%)							
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Number of Observations		1,196	1,118	1,118	1,118	1,118	1,118
Impact Fund		0.492	0.244	0.616	0.500	0.599	
Post-PRI Fund							-0.056
Log Fund Size			-0.093	-0.174	-0.223	-0.237	-0.158
Private Equity		5.44***	6.77***	7.88***	7.89***	7.90***	7.80***
Log Fund Sequence			-1.44***	-0.174**	-1.27**	-1.25**	-1.20**
Constant		11.01***	14.50***	15.98***	16.00***	16.94***	15.95***
Vintage Year	Vintage Group						
2002			-1.22***	-1.25***			-1.23***
2003			0.253	0.883			0.856
2004	2		-2.58***	-1.61***	-8.26***	-9.02***	-1.57***
2005			-7.82***	-7.74***			-7.78***
2006			-12.16***	-11.64***			-11.92***
2007	3		-11.85***	-11.64***	-7.25***	-8.84***	-11.60***
2008			-6.76***	-6.42***			-6.35***
2009			-4.28***	-4.06***			-4.06***
2010	4		-3.32***	-3.10***	-1.01	-3.40	-3.11***
2011			-1.48***	-1.21***			-1.16**
2012			-2.08***	-2.02***			-1.92***
2013	5		-1.69***	-1.68***	0.318	-2.87	-1.64***
2014			0.967**	0.882*			0.947*
2015			-2.41***	-2.35***			-2.25***
2016	6		2.06***	1.82***	4.04**	0.053	1.89***
2017			0.591	0.437			0.545
2018			4.45***	4.26***			4.36***
2019	7		0.189	-0.167	1.17	-3.58	-0.050
2020			-0.714	-1.04			-0.906
2021			-1.08*	-1.50*			-1.36
Core Industry							
2				-2.32	-2.04	-3.27	-2.24
3				-1.52	-0.850	-3.20	-1.45
4				-1.98	-1.78	-5.21	-1.97
5				-4.21	-3.98	-8.23	-4.02
Primary Region Focus							
North America				-1.22		-1.28	-1.28
Rest				-3.08**		-2.87*	-2.96**

Vintage Group * Primary Region Focus	-0.258	
Vintage Group * Core Industry		0.221

Notes: Model 1 uses robust standard errors, while models 2-6 have clustered standard errors by vintage year. Models 4 and 5 use vintage groups instead of vintage years. Models 2-6 have 78 observations less compared to model 1 due to missing observations of some variables. Each categorical variable has an omitted reference category: Vintage Year 2001, Core Industry 1, and Primary Region Focus of Europe. The Core Industry categorical variables include: 1 - Information Technology and Business Services, 2 - Diversified and Consumer Discretionary, 3 - Health Care, 4 - Media and Communications, and 5 - Other Industries. The coefficients are reported as significant at 1% (***), 5% (**), and 10% (*) significance level.

The results of the regressions, using the net multiple as the dependent variable, presented in Table 5, are mostly very similar to the ones of net IRR, when it comes to their sign and significance. The second hypothesis, H2: the performance of Impact and Non-Impact Funds, as measured by the net multiple, is not statistically different from each other, cannot be rejected. In all the five models, the variable Impact Fund is insignificant at the 5% confidence level, therefore the returns of European impact and non-impact funds do not seem to differ. The performance of funds in the sixth model of Table 5, that uses post-PRI funds as a proxy for impact funds, also does not measure a significant difference of net multiple performance between the two types of funds.

In the case of performance measurement by the net multiple, the logarithm of the fund size variable is negative and significant at the 5% level in models 2 – 5 of Table 5, which agrees with Lopez-de-Silanes et al. (2015) who find evidence of diseconomies of scale of private equity funds. Another difference with the net IRR regressions is the lower, or lack of significance of the private equity binary variable.

Contrary to the net IRR results, most of the core industry categorical variables are negative and significant at the 10% level, meaning lower expected net multiple for industries other than 'Information Technology and Business Services'. Last difference in results, compared to net IRR models, is the insignificance of the categorical variable of Primary Region Focus.

Table 5. The regressions related to impact funds with net multiple as the dependent variable.

Net multiple (x)						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Number of Observations	1,096	1,026	1,026	1,026	1,026	1,026
Impact Fund	-0.061	-0.015	0.022	0.006	0.013	
Post-PRI Fund						0.011
Log Fund Size		-0.033**	-0.037***	-0.043***	-0.041***	-0.037***
Private Equity	-0.091	-0.028	0.117	0.126*	0.121*	0.113
Log Fund Sequence		-0.053**	-0.056**	-0.053**	-0.055***	-0.058**
Constant	1.83***	2.30***	2.43***	2.33***	2.36***	2.43***

Vintage Year	Vintage Group					
2002		-0.271***	-0.265***			-0.262***
2003		-0.261***	-0.152***			-0.152***
2004	2	-0.484***	-0.446***	-0.250***	-0.272***	-0.444***
2005		-0.352***	-0.325***			-0.325***
2006		-0.431***	-0.386***			-0.385***
2007	3	-0.441***	-0.414***	-0.142	-0.186	-0.412***
2008		-0.282***	-0.264***			-0.262***
2009		-0.045**	-0.012			-0.012
2010	4	-0.139***	-0.102***	0.196*	0.129	-0.103***
2011		0.079***	0.133***			0.134***
2012		0.117***	0.144***			0.145***
2013	5	0.038	0.043	0.171	0.086	0.043
2014		0.027***	0.271***			0.271***
2015		-0.156***	-0.148***			-0.146***
2016	6	0.043*	0.041	-0.047	-0.158	0.040
2017		-0.238***	-0.243***			-0.244***
2018		-0.295***	-0.292***			-0.291***
2019	7	-0.581***	-0.583***	-0.555***	0.686***	-0.583***
2020		-0.718***	-0.736***			-0.737***
2021		-0.747***	-0.745***			-0.746***
Core Industry						
2			-0.289*	-0.284*	-0.335**	-0.287**
3			-0.035	-0.024	-0.131	-0.035
4			-0.394**	-0.380**	-0.523*	-0.396**
5			-0.557***	-0.581***	-0.759**	-0.552***
Primary Region Focus						
North America			0.055		0.050	0.054
Rest			-0.062		-0.081	-0.058
Vintage Group * Primary Region Focus				0.001		
Vintage Group * Core Industry					0.010	

Notes: Model 1 uses robust standard errors, while models 2-6 have clustered standard errors by vintage year. Models 4 and 5 use vintage groups instead of vintage years. Models 2-6 have 70 observations less compared to model 1 due to missing observations of some variables. Each categorical variable has an omitted reference category: Vintage Year 2001, Core Industry 1, and Primary Region Focus of Europe. The Core Industry categorical variables include: 1 - Information Technology and Business Services, 2 - Diversified and Consumer Discretionary, 3 - Health Care, 4 - Media and Communications, and 5 - Other Industries. The coefficients are reported as significant at 1% (***), 5% (**), and 10% (*) significance level.

5.2 Influence of the European Union

In this section hypotheses H3, H4, H5, and H6 will be tested through both t-tests and linear regressions. An overview of them is given here:

H3: The performance of impact funds, as measured by the net IRR, is higher for funds of EU members compared to funds of non-EU countries.

H4: The performance of impact funds, as measured by the net multiple, is higher for funds of EU members compared to funds of non-EU countries.

H5: There is a positive effect of the EU membership on the performance of private equity funds as measured by the net IRR.

H6: There is a positive effect of the EU membership on the performance of private equity funds as measured by the net multiple.

5.2.1 T-tests of the EU Influence

The results of t-tests, presented in Table 6, suggest no significant difference of returns between the EU and non-EU funds for both performance metrics. There is, however, a significant difference between EEA and non-EEA funds, with a higher net IRR performance of non-EEA funds at a 10% confidence level, and a higher net multiple performance of EEA funds, compared to EEA funds, at a 1% confidence level. Lastly, at the 10% confidence level, the net IRR performance of non-EU impact funds seems to be significantly higher that than of EU impact funds, whilst the opposite is true for the net multiple performance metric. That would suggest the rejection of H3, and the acceptance of H4. More tests, however, must be performed to take into consideration the specific traits of funds and possible differences of samples of the two types of funds.

Table 6. Two sample t-tests with equal variances related to the EU membership.

		Difference of means	Standard Error	T-stat	P-value	Number of Observations
Non-EU - EU Funds	Net IRR (%)	1.53	1.40	1.10	0.273	1,194
	Net Multiple (x)	-0.096	0.082	-1.17	0.244	1,094
Non-EEA - EEA Funds	Net IRR (%)	2.63(*)	1.69	1.56	0.120	1,194
	Net Multiple (x)	-0.260***(***)	0.099	-2.64	0.009	1,094
Non-EU Impact - EU Impact Funds	Net IRR (%)	4.68(*)	3.05	1.53	0.126	281
	Net Multiple (x)	-0.227(*)	0.164	-1.38	0.168	251

Notes: Testing the null hypothesis of no mean difference. The p-value of the one-sided test in the direction of the mean difference in noted in the parentheses.

5.2.2 Ordinary Linear Regressions Regarding the EU Influence

Hypotheses H3 and H4 will be checked through (1) a regression with an interaction term between the variables European Union and Impact Fund, and (2) a regression of only impact fund observations with the EU dummy. The first method seeks to measure the added effect of the EU membership combined with being an impact fund. A positive interaction term would suggest higher EU-related benefits for impact funds, in comparison to regular funds. The second method investigates solely impact funds and whether there is a difference in their returns dependent on whether the funds' domicile is in the EU, or not.

For the regressions with net IRR as their dependent variable, the interaction term of model 3 of Table 7, is not statistically significant. Therefore, it cannot be concluded whether there is an interaction effect between the variables of the EU and Impact Fund. An additional check of the effects for the EEA instead of the EU, for Model 4 of Table 7, also reveal no significant effects for the membership of an economic union at the 10% confidence level. In the regression of only impact fund observations, Model 6 of Table 7, the dummy variable EU is also statistically insignificant at the 10% confidence level. That means, there does not seem to be a significant difference between the returns of impact funds of the EU members, compared to non-EU members. Considering the two methods, and lack of a significant effect in either of them, I reject hypothesis 3, *H3: The performance of impact funds, as measured by the net IRR, is higher for funds of EU members compared to funds of non-EU countries.* Therefore, being a member of the EU, or the EEA does not seem to increase the returns of impact funds, as measured by the net IRR.

The results of regressions with net multiple as the dependent variable, presented in Table 8, are very similar to the results of the net IRR regressions. Neither of the interaction effects, EU or EEA with Impact Fund are statistically significant in Models 3 and 4 of Table 8, respectively. Therefore, the membership of the fund's domicile in either of the two unions, is not associated with any additional performance benefits for the impact funds, measured by the net multiple. The second method, the regression of only impact fund observations, Model 6 of Table 8, does not give a statistically significant coefficient at the 10% confidence level, either. Hence, I reject hypothesis 4, *H4: The performance of impact funds, as measured by the net multiple, is higher for funds of EU members compared to funds of non-EU countries.* Therefore, being a member of either the EU, or the EEA, does not seem to increase impact funds' performance, measured by the net multiple.

Hypotheses H5 and H6 aim at measuring the effect of the EU membership on returns of any private fund created in a member country. These hypotheses will be tested through (1) a regression of all observations with an EU dummy, and (2) a regression of only UK fund observations with an EU dummy. The first method aims to measure the effect of the EU membership for private equity returns measured in both the net IRR and net multiple. The second method aims at discovering differences in returns of UK's funds pre- and post-Brexit to see if there is potential influence of the EU on their returns.

The first method, a regression of all observations with an EU dummy presented in column 1 of the Table 7, gives an insignificant coefficient of the EU dummy. Therefore, there does not seem to be a positive effect, nor a negative effect of EU membership on the funds' returns, measured by the net IRR. The second method of verifying the hypothesis, a regression of only UK fund observations with an EU dummy, gives a positive, and significant coefficient of the EU dummy variable at the 1% confidence level. Model 5 of the Table 7 gives an EU coefficient of 9.13, associated with a positive effect of EU membership of 9.13% net IRR. That means the funds of the UK with a vintage year post-Brexit referendum had a net IRR 9.13% lower than those with vintage years pre-referendum, before controlling for vintage year and others. The effects, though, might be UK-specific, and cannot be confirmed as a universal effect. The results might also be influenced by the high dependency of the measurement method on time, and the high possible estimation error for valuations of leftover stakes of funds who have not been liquidated yet. Considering both methods applied, hypothesis 5, *H5: There is a positive effect of the EU membership on the performance of private equity funds as measured by the net IRR,* cannot be rejected, nor accepted. There is not enough evidence to conclude the potential effect of EU membership on the performance of private equity funds, as measured by the net IRR.

The results of the regressions with net multiple as the dependent variable, presented in Table 8, are again very similar to the net IRR regressions from Table 7. Neither the EU, nor EEA dummy of models 1 and 2 of Table 8, respectively, are statistically significant at the 10% confidence level. Surprisingly, the EU dummy variable is significant in Model 3 of Table 8, although the interaction term of the EU and Impact Fund is not. The coefficient of the dummy variable suggests a negative -0.11 effect on the net multiple performance of EU-membership on private equity funds. The variable is significant at the 10% confidence level. That is a difference between the net IRR models, and measures an opposite compared to the positive effect of EU membership from model 5 Table 8, that looks solely at funds of UK domicile. That coefficient, equal to 0.70, and significant at the 1% level, suggests a positive association of EU membership for funds from the UK – funds with vintage years before the referendum seem to have higher net multiple compared to funds with vintage years post-referendum, before controlling for vintage year and others. The opposite effects of the EU membership on fund performance means that the hypothesis 6, *H6: There is a positive effect of the EU membership on the performance of private equity funds as measured by the net multiple,* cannot be rejected, nor accepted.

Table 7. The regressions related to the EU membership with net IRR as the dependent variable.

Net IRR (%)						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Number of Observations	1,118	1,118	1,118	1,118	299	275
Impact Fund	0.651	0.623	2.317	2.199	-1.493	
EU	-1.067		-0.695		9.129***	-3.754
EEA		-1.118		-0.640		

EU*Impact				-1.822		2.645	
EEA*Impact					-1.696		
Private Equity		7.852***	7.842***	7.822***	7.829***	2.230	7.981
Log Fund Size		-0.172	-0.195	-0.166	-0.181	-0.240	0.913
Log Fund Sequence		-1.229**	-1.209**	-1.211**	-1.198**	-0.609	-2.658**
Constant		16.985***	17.225***	16.644***	16.709***	17.816***	21.589***
Vintage Year							
	2002	-1.184**	-1.248***	-1.199***	-1.241**	2.798***	-10.418***
	2003	0.956	0.885	0.928	0.877	-0.455	1.339
	2004	-1.622***	-1.622***	-1.607***	-1.606***	4.516***	-3.865
	2005	-7.748***	-7.747***	-7.765***	-7.760***	-15.037***	-17.693***
	2006	-11.919***	-11.927***	-11.923***	-11.928***	-14.820***	-16.563***
	2007	-11.621***	-11.645***	-11.631***	-11.644***	-13.214***	-18.034***
	2008	-6.380***	-6.426***	-6.381***	-6.411***	-8.473***	-13.723***
	2009	-3.997***	-4.064***	-4.026***	-4.064***	-7.812***	-10.455***
	2010	-3.043***	-3.110***	-3.070***	-3.113***	-9.335***	-10.795***
	2011	-1.173**	-1.216***	-1.188**	-1.214***	-6.702***	-9.363***
	2012	-1.950***	-2.025***	-1.969***	-2.022***	-4.565***	-8.264***
	2013	-1.653***	-1.719***	-1.670***	-1.708***	-7.561***	-13.835***
	2014	0.920*	0.873*	0.908*	0.878*	-5.780***	-6.597***
	2015	-2.321***	-2.358***	-2.350***	-2.349***	-8.180***	-7.901***
	2016	1.882***	1.821***	1.860***	1.820***	-3.403***	-8.015***
	2017	0.264	0.165	0.253	0.213	7.943***	-8.564***
	2018	4.134***	4.074***	4.127***	4.104***	7.353***	-3.253
	2019	-0.258	-0.320	-0.280	-0.308	5.259***	-7.934***
	2020	-1.126	-1.188*	-1.290*	-1.287**	14.741***	-10.572***
	2021	-1.579*	-1.659**	-1.618**	-1.633**	0.000	-6.350**
Primary Region Focus							
	North America	-1.374	-1.221	-1.314	-1.221	0.575	0.958
	Rest	-3.017**	-3.035**	-2.993**	-3.021**	-5.531**	-3.141
Core Industry							
	2	-2.310	-2.301	-2.314	-2.324	-4.754	0.413
	3	-1.510	-1.545	-1.570	-1.575	-6.729	-4.704
	4	-2.027	-2.069	-1.996	-2.030	-4.677	5.885
	5	-4.210	-4.173	-4.207	-4.170	-13.911**	-5.636
R^2		0.11	0.11	0.11	0.11	0.20	0.17
Adjusted R^2		0.08	0.08	0.08	0.08	0.11	0.07

Notes: All models use clustered standard errors by vintage year. Model 5 only uses observations with domicile "UK", while model 6 looks solely at impact funds. Each categorical variable has an omitted reference category: Vintage Year 2001, Core Industry 1, and Primary Region Focus of Europe. The Core Industry categorical variables include: 1 - Information Technology and Business Services, 2 - Diversified and Consumer Discretionary, 3 - Health Care, 4 - Media and Communications, and 5 - Other Industries. The coefficients are reported as significant at 1% (***), 5% (**), and 10% (*) significance level.

Table 8. The regressions related to the EU membership with net multiple as the dependent variable.

Net Multiple (x)						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Number of Observations	1,026	1,026	1,026	1,026	282	246
Impact Fund	0.024	0.022	-0.040	0.104	-0.020	
EU	-0.090		-0.105*		0.701***	-0.075
EEA		-0.023		0.002		
EU*Impact			0.071		-0.057	
EEA*Impact				-0.089		
Private Equity	0.112	0.117	0.113	0.116	0.133	0.150
Log Fund Size	-0.036***	-0.037***	-0.037***	-0.036***	-0.061**	-0.005
Log Fund Sequence	-0.058**	-0.056**	-0.058**	-0.056**	-0.041	-0.084*
Constant	2.515***	2.455***	2.528***	2.428***	1.731***	2.475***
Vintage Year						
2002	-0.260***	-0.265***	-0.259***	-0.264***	0.153***	-0.310***
2003	-0.147***	-0.152***	-0.146***	-0.153***	0.005	-0.094
2004	-0.447***	-0.446***	-0.448***	-0.446***	-0.140*	-0.920***
2005	-0.326***	-0.325***	-0.326***	-0.325***	-0.200***	-0.519***
2006	-0.386***	-0.386***	-0.386***	-0.387***	-0.467***	-0.590***
2007	-0.413***	-0.414***	-0.413***	-0.414***	-0.228***	-0.483***
2008	-0.262***	-0.264***	-0.262***	-0.264***	-0.147***	-0.332***
2009	-0.007	-0.012	-0.006	-0.012	-0.085***	-0.171**
2010	-0.098***	-0.103***	-0.097***	-0.103***	-0.187***	-0.358***
2011	0.135***	0.132***	0.136***	0.133***	-0.077	0.007
2012	0.150***	0.144***	0.151***	0.144***	0.224***	-0.088
2013	0.045	0.042	0.046	0.043	0.088***	-0.111
2014	0.275***	0.271***	0.276***	0.271***	0.177**	0.547***
2015	-0.146***	-0.148***	-0.145***	-0.148***	-0.108***	-0.230*
2016	0.046	0.041	0.046	0.041	0.037	0.048
2017	-0.259***	-0.249***	-0.259***	-0.246***	0.632***	-0.420***
2018	-0.304***	-0.296***	-0.303***	-0.294***	0.487***	-0.352***
2019	-0.593***	-0.586***	-0.592***	-0.585***	0.170***	-0.707***
2020	-0.743***	-0.739***	-0.737***	-0.744***	0.315***	-0.853***
2021	-0.753***	-0.748***	-0.752***	-0.747***	0.000	-0.815***
Primary Region Focus						
North America	0.040	0.055	0.038	0.055	0.050	0.465
Rest	-0.057	-0.061	-0.058	-0.061	-0.262*	0.004
Core Industry						
2	-0.285*	-0.288*	-0.285*	-0.290**	-0.245	-0.337
3	-0.032	-0.035	-0.030	-0.036	-0.260	-0.426
4	-0.401**	-0.397**	-0.402**	-0.394**	-0.342	-0.053
4	-0.554***	-0.556***	-0.553***	-0.557***	-0.364	-0.559*
R^2	0.15	0.15	0.15	0.15	0.20	0.30
Adjusted R^2	0.13	0.12	0.13	0.12	0.10	0.20

Notes: All models use clustered standard errors by vintage year. Model 5 only uses observations with domicile "UK", while model 6 looks solely at impact funds. Each categorical variable has an omitted reference category: Vintage Year 2001, Core Industry 1, and Primary Region Focus of Europe. The Core

Industry categorical variables include: 1 - Information Technology and Business Services, 2 - Diversified and Consumer Discretionary, 3 - Health Care, 4 - Media and Communications, and 5 - Other Industries. The coefficients are reported as significant at 1% (***), 5% (**), and 10% (*) significance level.

5.2.3 Further Investigation into Domicile Effects

It is important to note that there might not be enough observations to properly estimate specific geographic and impact-related effects due to lack of impact fund observations of some countries. Therefore, the discussion of measured effects is limited to the sample and might not be representative of the population.

Consistent with Groh et al. (2010), some countries (and regions) have consistently different performance of private equity funds compared to other countries (regions), presented in both Table 9 and 10. Groh et al. (2010) argue this could be due to their varied initial attractiveness levels. Some of the influential factors could be cultural differences, the depth and advancement of the financial sector and many others. Surprisingly, some countries seem to perform better than the reference domicile UK, the leader according to the Groh et al. (2010) paper (but not consistently for both performance measurements). This could perhaps be attributed to the UK's departure from the EU or simply to changing levels of attractiveness across countries over the years. The models with domicile specification are created as some of the effects previously attributed to EU membership could be due to the characteristics of individual countries instead.

Consistent with previous findings, being an impact fund does not seem to affect the performance of European funds, measured by the net IRR and the net multiple. None of the models of Table 9 or Table 10 find statistically significant differences between the returns of impact and non-impact funds in the sample at the 10% significance level when controlling for the domicile effects. Therefore, the domicile robustness check would be in alignment with acceptance of hypotheses 1 and 2. Moreover, in accordance with previous rejection of hypotheses 3 and 4, all relevant models of Tables 9 and 10 do not find a significant effect of the interaction term of EU and being an impact fund on the funds' returns measured by the net IRR or net multiple at the 10% significance level. Also, none of the interaction effects of an impact fund in specific domicile regions are significant at the 10% significance level in Models 3 of Table 9 and 10. That suggests the returns of impact funds in all regions are not statistically different from each other, and the country specification of the funds' domicile is more influential for the funds' returns than its region. At the 5% significance level, Model 5 of Table 9 and 10 suggests lower net IRR and net multiple of Eastern European impact funds of -6.258 and -0.424 correspondingly. However, there is only one observation of such fund, hence the coefficients should not be interpreted.

While none of the models in Table 9 find a significant effect of being an EU member on fund performance measured by the net IRR, two models in Table 10 (Model 1 and Model 4) find a negative effect of the EU membership on fund performance measured by the net multiple, with coefficients of -0.179 and -0.459 at the 5% significance level, when controlling for the country domicile of the fund.

Therefore, the results from Table 10 suggest that being a member of the EU has a negative effect on the net multiple performance of a fund. However, due to insufficient evidence, neither hypothesis 5 nor hypothesis 6 can be definitively rejected or accepted, but the more thorough investigation indicates that the effects of the EU could be negative and need to be examined further.

Table 9. Domicile robustness regression models with net IRR as the dependent variable.

Net IRR (%)					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Number of Observations	1118	1118	1118	275	275
Impact Fund	1.790	2.169	-3.822		
EU	-2.036	-0.107	-0.085	-6.090	-3.459
EU*Impact	-0.783	-1.862	-1.868		
Private Equity	6.426***	7.315***	7.330***	8.631	7.900
Log Fund Size	-0.318	-0.335	-0.333	0.319	0.883
Log Fund Sequence	-1.212**	-1.229**	-1.234**	-2.342**	-2.771***
Constant	19.492***	17.567***	17.504***	24.765**	21.005***
Vintage Year					
2002	-0.610	-0.885	-0.590	-9.490***	-9.022**
2003	0.659	1.038	1.056	-1.484	1.573
2004	-1.269*	-1.289**	-1.294**	-3.523	-3.508
2005	-7.259***	-7.526***	-7.525***	-17.341***	-17.357***
2006	-11.629***	-11.833***	-11.826***	-15.570***	-15.946***
2007	-11.183***	-11.189***	-11.178***	-17.983***	-17.296***
2008	-6.008***	-5.843***	-5.841***	-13.642***	-12.562***
2009	-4.279***	-4.051***	-4.043***	-13.300***	-10.178***
2010	-2.117***	-2.512***	-2.513***	-11.911***	-9.442***
2011	-1.026	-1.073**	-1.054*	-8.789***	-8.940***
2012	-2.363***	-1.928***	-1.925***	-8.696***	-7.767***
2013	-1.543**	-1.559***	-1.547**	-14.802***	-13.039***
2014	1.207**	1.356**	1.370**	-7.180***	-5.942**
2015	-2.639***	-2.380***	-2.382***	-9.525***	-7.336***
2016	1.446**	2.104***	2.114***	-9.856***	-7.801***
2017	-0.354	0.448	0.474	-10.856***	-8.224**
2018	3.827***	4.393***	4.394***	-4.608	-2.641
2019	-0.592	0.244	0.249	-9.804***	-7.219**
2020	-1.913*	-0.743	-0.714	-11.345***	-10.136***
2021	-3.106***	-1.473**	-1.458*	-9.419***	-5.897*
Primary Region Focus					
North America	-2.030	-1.531	-1.522	-0.448	0.847
Rest	-3.345***	-3.347**	-3.364**	-3.310	-3.314
Core Industry					
2	-1.667	-1.965	-1.972	0.697	0.819
3	-2.353	-1.923	-1.939	-4.234	-4.473
4	-1.162	-2.380	-2.384	6.113	6.077
5	-2.888	-3.809	-3.840	-5.531	-5.010
Country					
Germany	0.695			9.773	
Italy	-5.872**			1.105	
Denmark	-0.202			10.339	
Luxembourg	1.895			4.724**	
Ireland	-0.181			2.473	
Norway	0.912			10.981	

Spain	-0.540			0.631	
France	-1.645			1.993	
Finland	-0.228			-5.801	
Switzerland	-3.976			-11.484**	
Sweden	2.497			5.448	
Netherlands	6.470***			11.025**	
Belgium	-7.476*			-13.489*	
Portugal	-9.493**			-17.389***	
Cyprus	-15.254***			-14.768***	
Austria	-8.940			-5.802	
Russia	-13.508**				
Poland	-4.804***			-4.325**	
Greece	8.788				
Estonia	19.061				
Lithuania	4.111				
Liechtenstein	-5.467*				
Malta	-17.723***				
Hungary	-2.164				
Iceland	-7.491**				
Czech Republic	-1.108				
Latvia	-4.153***				
Region					
Southern Europe		-4.096**	-4.101**		-2.952
Northern Europe		0.120	0.236		1.477
Eastern Europe		0.923	1.394		-6.258**
Western * Impact			6.075		
Southern * Impact			6.125		
Northern * Impact			5.476		
R^2	0.14	0.11	0.11	0.25	0.17
Adjusted R^2	0.10	0.08	0.08	0.09	0.06

Notes: All models use clustered standard errors by vintage year. Models 4 and 5 only use observations of impact funds. Each categorical variable has an omitted reference category: Vintage Year 2001, Core Industry 1, Primary Region Focus of Europe, Country UK, and Region of Western Europe. For the interaction terms between the region and impact fund, Eastern * Impact has been omitted due to the lack of sufficient observations. The Core Industry categorical variables include: 1 - Information Technology and Business Services, 2 - Diversified and Consumer Discretionary, 3 - Health Care, 4 - Media and Communications, and 5 - Other Industries. The coefficients are reported as significant at 1% (***), 5% (**), and 10% (*) significance level.

Table 10. Domicile robustness regression models with net multiple as the dependent variable.

Net Multiple (x)					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Number of Observations	1026	1026	1026	246	246
Impact Fund	-0.007	-0.015	-0.121		
EU	-0.179**	-0.049	-0.042	-0.459**	-0.061
EU*Impact	0.058	0.037	0.040		
Private Equity	0.078	0.079	0.078	0.240	0.149
Log Fund Size	-0.026**	-0.037***	-0.038***	0.007	-0.007
Log Fund Sequence	-0.069***	-0.063***	-0.064***	-0.092**	-0.089*
Constant	2.474***	2.450***	2.430***	2.581***	2.452***
Vintage Year					
2002	-0.169***	-0.208***	-0.184***	-0.348*	-0.205*
2003	-0.128**	-0.119**	-0.112**	-0.332*	-0.083

2004	-0.463***	-0.436***	-0.437***	-0.981***	-0.901***
2005	-0.332***	-0.324***	-0.325***	-0.548***	-0.503***
2006	-0.353***	-0.365***	-0.359***	-0.498***	-0.560***
2007	-0.405***	-0.382***	-0.373***	-0.552***	-0.448***
2008	-0.249***	-0.213***	-0.205***	-0.495***	-0.296***
2009	-0.046	0.010	0.015	-0.388***	-0.159**
2010	-0.057	-0.050	-0.042	-0.514***	-0.291***
2011	0.150***	0.166***	0.177***	0.000	0.028
2012	0.142***	0.174***	0.182***	-0.199	-0.061
2013	0.078**	0.083**	0.098**	-0.242	-0.076
2014	0.298***	0.314***	0.321***	0.351**	0.570***
2015	-0.119***	-0.111***	-0.103**	-0.452*	-0.203*
2016	0.036	0.074**	0.079**	-0.236	0.059
2017	-0.292***	-0.228***	-0.210***	-0.683***	-0.397***
2018	-0.326***	-0.252***	-0.245***	-0.652***	-0.322**
2019	-0.604***	-0.541***	-0.534***	-1.064***	-0.674***
2020	-0.804***	-0.693***	-0.677***	-1.040***	-0.831***
2021	-0.811***	-0.710***	-0.697***	-1.155***	-0.791***
Primary Region Focus					
North America	0.044	0.044	0.043	0.398	0.461
Rest	-0.065	-0.075	-0.087	0.024	-0.006
Core Industry					
2	-0.240	-0.247*	-0.246*	-0.271	-0.322
3	-0.037	-0.037	-0.039	-0.190	-0.418
4	-0.342*	-0.371*	-0.368*	-0.255	-0.054
5	-0.493***	-0.514***	-0.514***	-0.515*	-0.533*
Country					
Germany	0.262			1.162	
Italy	-0.167*			0.255	
Denmark	0.219**			0.760**	
Luxembourg	0.170*			0.517***	
Ireland	-0.012			0.148	
Norway	0.447**			0.046	
Spain	0.046			0.114	
France	-0.016			0.263**	
Finland	0.422			0.118	
Switzerland	-0.581***			-0.907**	
Sweden	-0.085			0.262	
Netherlands	0.314**			0.445	
Belgium	-0.052			-0.728**	
Portugal	-0.088			0.035	
Cyprus	-1.100***				
Austria	-0.103			0.231	
Russia	-0.638***				
Poland	-0.315***			-0.235*	
Greece	1.218				
Estonia	0.129				
Lithuania	0.159				
Liechtenstein	-0.519***				
Malta	-1.187***				
Hungary	-0.315**				
Iceland	-0.231***				
Czech Republic	-0.145				
Latvia	-0.249***				
Region					

Southern Europe		-0.132	-0.116		-0.117
Northern Europe		0.198**	0.247**		0.048
Eastern Europe		-0.205*	-0.192*		-0.424***
Western * Impact			0.135		
Southern * Impact			0.048		
Northern * Impact			-0.122		
R^2	0.19	0.16	0.16	0.40	0.30
Adjusted R^2	0.14	0.13	0.13	0.26	0.20

Notes: All models use clustered standard errors by vintage year. Models 4 and 5 only use observations of impact funds. Each categorical variable has an omitted reference category: Vintage Year 2001, Core Industry 1, Primary Region Focus of Europe, Country UK, and Region of Western Europe. For the interaction terms between the region and impact fund, Eastern * Impact has been omitted due to the lack of sufficient observations. The Core Industry categorical variables include: 1 - Information Technology and Business Services, 2 - Diversified and Consumer Discretionary, 3 - Health Care, 4 - Media and Communications, and 5 - Other Industries. The coefficients are reported as significant at 1% (***), 5% (**), and 10% (*) significance level.

CHAPTER 6 Conclusion and Discussion

6.1 Conclusion

This thesis explores the landscape of European impact private equity funds and investigates the potential effects of economic partnerships such as the European Union and its effects not only on the whole of the private equity asset class, but also more intricate effects on impact funds.

The multiple linear regression models do not reject the null hypothesis that the performance of impact and non-impact funds, as measured by the net IRR or the net multiple, is statistically different from each other. Hence, there seems to be no significant difference in returns between non-impact European funds and regular European funds, when controlling for vintage year, fund sequence, fund size, geography, industry, and specific asset class. This finding is consistent even when using post-PRI funds as a proxy for impact funds and robust to more specific country or region domicile effects. It suggests that the European impact market, in comparison to the US one, performs better. Whilst for the US, the difference of returns was significant and negative (Barber et al., 2021), it does not hold true for Europe.

Another finding is that being a member of the EU, or the EEA does not seem to increase the returns of impact funds. The interaction term between the EU membership and being an impact fund is not statistically significant meaning there is no evidence to support the idea that EU membership increases the returns of impact funds compared to non-EU funds. The same conclusion holds when considering the EEA instead of the EU. The finding is also robust to domicile effects at the country and region level. The effects were measured for both net IRR and net multiple regressions. Therefore, EU or EEA membership might provide benefits for impact funds other than monetary ones. Or else, they might affect the whole European continent, despite a country being a member.

The differing effects across models cannot conclude on the effect of the EU membership on private equity returns. When considering all observations, the EU dummy was not significant, indicating no clear effect of EU membership on fund returns measured by net IRR. However, when focusing on UK funds, the EU dummy is positive and significant, suggesting that UK funds with vintage years post-Brexit referendum had lower net IRR compared to pre-referendum years. That might suggest the UK model's findings is only true for the sample, and the EU membership might affect other countries differently. It might also mean, that the exit of the UK from the European Union had a negative effect on the returns of private equity.

The results of a further investigation into the domicile effects are consistent with Groh et al. (2010), indicating that some countries and regions show consistently different private equity fund performances compared to others. Although, there is not enough evidence to definitively conclude on the effect of the EU membership, adding additional effects of country domicile revealed negative associations of the Union on fund performance in some of the net multiple models. This could perhaps mean that the previously estimated effect of the EU was in fact a blend of the actual European Union membership

effect with an addition of individual domicile effects. Further investigation is needed to fully understand the effects of EU membership on fund performance.

6.2 Discussion

The first limitation of the paper is its sample. As mentioned before, private equity funds do not need to be officially reported, hence the sample might not be fully representative of the entire population. There might also be some performance measurement errors due to the nature of net IRRs – they often involve estimating the value of remaining stakes of firms the funds have invested in.

When it comes to the European Union considerations, the chosen method of using the Brexit-referendum might not give full insights to the effects of leaving the European Union, as usually the funds take years to collect capital and start investing. The sample for now, however, is not big enough to consider the case of using the official leave of the UK from the EU as it happened in 2020. It is also important to note that the referendum cut-off point did not account for the effects on funds created before 2016 but still active during the turbulent period following the EU departure. These considerations should be further evaluated in future research to gain a more comprehensive understanding of the long-term impacts of EU membership and Brexit on the performance of private equity.

There is also the limitation of the method used to sort funds into impact and non-impact categories. Although most funds were checked manually, there were instances where no information about a fund could be found, leading to potential inaccuracies. Additionally, there is a probability of mistakenly assigning a fund to the incorrect category. Without official information about a fund's objectives, some degree of error is unavoidable. Faulty data could result in coefficients that are not properly estimated or could increase standard errors, thereby compromising the reliability of the statistical analysis. Such data inaccuracies might result in biased or misleading conclusions, undermining the validity of the study.

Moreover, there is an issue with using funds that have been signatories to the Principles for Responsible Investment (PRI). Signing the PRI does not necessarily imply that the firm’s previous funds did not have similar objectives. It is possible that some funds were simply late in becoming signatories or were unaware of the initiative. This could lead to a misclassification of funds, affecting the accuracy of the study. Future research should address these limitations by implementing more rigorous data verification processes, seeking access to comprehensive and accurate fund information, and considering the historical objectives of funds irrespective of their PRI signatory status. This would help minimize errors and enhance the robustness and credibility of the findings.

REFERENCES

(n.d.). Retrieved April 2024, from Preqin: https://www.preqin.com/

Alhorr, H. S., Moore, C. B., & Payne, G. (2008). The Impact of Economic Integration on Cross–Border Venture Capital Investments: Evidence from the European Union. *Entrepreneurship Theory and Practice, 32*(5), 897-917.

Alvarez-Garrido, E., & Alcacer, J. (2023). Deglobalization and Entrepreneurial Investment: The Natural Experiment of Brexit. *Harvard Business School Strategy Unit Working Paper*(24-017).

Atkinson, G., & Mourato, S. (2008). Environmental cost-benefit analysis. *Annual review of environment and resources, 33*, 317-344.

Baker, E. D., Boulton, T. J., Braga-Alves, M. V., & Morey, M. R. (2021, April). ESG government risk and international IPO underpricing. *Journal of Corporate Finance, 67*(101913).

Barber, B. M., Morse, A., & Yasuda, A. (2021). Impact Investing. *Journal of Financial Economics, 139*(1), 162-185.

Bialkowski, J., & Starks, L. T. (2016). SRI funds: Investor demand, exogenous shocks and ESG profiles. *BlackRock Research Conference.* San Francisco, CA, USA: University of Canterbury. Department of Economics and Finance.

Black, B., & Gilson, R. (1998). Venture Capital and the Structure of Capital Markets: Banks versus Stock Markets. *Journal of Financial Economics, 47*(3), 243-277.

Bottazzi, L., & Da Rin, M. (2002). Venture capital in Europe and the financing of innovative companies. *Economic Policy, 17*(34), 229-270.

Brouwers, B. (2023, October 11). *Europe Beats the US when it comes to impact investing*. Retrieved from IO: https://innovationorigins.com/en/europe-beats-the-us-when-it-comes-to-impact-investing/#:~:text=Start%2Dups%20%2D%20Research%20report%20shows,funds%2C%20outpacing%20the%20US's%20773

Cuthbertson, K., Nitzsche, D., & O'Sullivan, N. (2010). Mutual Fund Performance: Measurement and Evidence. *Financial Markets, Institutions & Instruments, 19*(2), 95-187.

Dealroom. (n.d.). *European VC funds focusing on impact investing.* Retrieved April 2024, from Dealroom: https://app.dealroom.co/lists/14252/list

Dietlmeier, S. F. (2018, August 26). Retrieved from SSRN: http://dx.doi.org/10.2139/ssrn.3316383

Emerson, J. (2003). The blended value proposition: Integrating social and financial returns. *California management review, 45*(4), 35-51.

Finetic. (n.d.). *The Impact Investor List.* Retrieved April 2024, from Finetic: https://finetic.eu/investors

Franks, J., Mayer, C., & da Silva, L. C. (2012). Asset Management in Europe. In X. Freixas, P. Hartmann, & C. Mayer, *Handbook of European Financial Markets and Institutions* (Vol. 812, pp. 374-388). Oxford U. Press.

Friede, G., Lewis, M., Bassen, A., & Busch, T. (2015). *ESG & Corporate Financial Performance: Mapping the global landscape.* DWS Asset Management, University of Hamburg.

Geczy, C., Jeffers, J. S., Musto, D. K., & Tucker, A. M. (2021). Contracts with (social) benefits: The implementation of impact investing. *Journal of Financial Economics, 142*(2), 697-718.

Groh, A. P., Von Liechtenstein, H., & Lieser, K. (2010). The European Venture Capital and Private Equity country attractiveness indices. *Journal of Corporate Finance, 16*(2), 205-224.

Harris, R. S., Jenkinson, T., & Kaplan, S. N. (2014). Private Equity Performance: What Do We Know? *The Journal of Finance, LXIX*(5), 1851-1882.

Harris, R. S., Jenkinson, T., & Kaplan, S. N. (2016). How do private equity investments perform compared to public equity? *Journal of Investment Management, 14*(3), 14-37.

Hege, U., Palomino, F., & Schwienbacher, A. (2003). Determinants of venture capital performance: Europe and the United States (Working Paper).

Higson, C., & Stucke, R. (2012). The Performance of Private Equity. *SSRN, 2009067*.

Hochstadter, A. K., & Scheck, B. (2015). What's in a name: An analysis of impact investing understandings by academics and practitioners. *Journal of Business Ethics, 132*, 449-475.

Huang, Y. (2023). The Impact of Brexit on UK Private Equity Firms' Activity Based on the Case Study of Private Equity Firms Pre- and Post- Brexit. EAI.

Humphery-Jenner, M. (2012). Private Equity Fund Size, Investment Size, and Value Creation. *Review of Finance, 16*(3), 799–835.

Impact Europe. (n.d.). *Members.* Retrieved April 2024, from Impact Europe: https://www.impacteurope.net/members

Impact Investing Market Size Worth $7.78 Trillion by 2033; The Global Pursuit of Sustainable Development to Propel Growth. (2024, February 20). Retrieved from Yahoo Finance: https://finance.yahoo.com/news/impact-investing-market-size-worth-230000781.html

Impact Yield. (n.d.). *Private Impact Funds database.* Retrieved from Impact Yield: https://impactyield.com/funds

Jeffers, J., Lyu, T., & Posenau, K. (2021). *The risk and return of impact investing funds.* Retrieved from https://doi.org/10.2139/ssrn.3949530

Jefferson Kaduvinal, A., Olbert, M., & Vasvari, F. P. (n.d.). ESG disclosures in the private equity industry. *TRR 266 Accounting for Transparency Working Paper Series*(132).

Jeng, L. A., & Wells, P. C. (2000). The determinants of venture capital funding: evidence across countries. *Journal of Corporate Finance, 6*(3), 241-289.

Jeng, L., & Wells, P. (2000). The determinants of venture capital funding: Evidence across countries. *Journal of Corporate Finance, 6*(3), 241-289.

Kaplan, S. N., & Schoar, A. (2005). Private equity performance: Returns, persistence, and capital flows. *The Journal of Finance, 60*(4), 1791-1823.

Kelly, R. (2012). Drivers of private equity investment activity: are buyout and venture investors really so different? *Venture Capital, 14*(4), 309-330.

Korteweg, A. (2019). Risk Adjustment in Private Equity Returns. *Annual Review of Financial Economics, 11*, 131-152.

Leeds, R., & Sunderland, J. (2003). Private equity investing in emerging markets. *Journal of Applied Corporate Finance, 15*(4), 111-119.

Ljungqvist, A., & Richardson, M. (2003). The cash flow, return and risk characteristics of private equity. *Working paper 9454*.

Lopez-de-Silanes, F., Phalippou, L., & Gottschalg, O. (2015). Giants at the Gate: Investment Returns and Diseconomies of Scale in Private Equity. *Journal of Financial and Quantitative Analysis, 50*(3), 377-411.

Munoz, F., Vargas, M., & Marco, I. (2014). Environmental Mutual Funds: Financial Performance and Managerial Abilities. *Journal of Business Ethics, 124*, 551-569.

NVCA 2013 Yearbook. (2013). National Venture Capital Association.

Otten, R., & Bams, D. (2008). European Mutual Fund Performance. *European Financial Management, 8*(1), 75-101.

Phalippou, L., & Gottschalg, O. (2009). The Performance of Private Equity Funds. *Review of Financial Studies, 22*(4), 1747-1776.

Pratty, F. (2023, July). *All the Article 8 and Article 9 VC funds in Europe.* Retrieved April 2024, from Sifted: https://sifted.eu/articles/article-8-article-9-venture-capital-sfdr

PRI. (n.d.). *Signatories*. Retrieved May 2024, from UNPRI: https://www.unpri.org/signatories

PRI. (n.d.). *Signatory Directory [Dataset]*. Retrieved May 2024, from UNPRI: https://www.unpri.org/signatories/signatory-resources/signatory-directory

Prisco, M. (2024). The Impact of ESG Considerations on Private Equity and Venture Capital Transactions: the Western Scenario. *Business Law International, 25*(1), 5-22.

Robinson, D. T., & Sensoy, B. A. (2016). Cyclicality, performance measurement, and cash flow liquidity in private equity. *Journal of Financial Economics, 122*(3), 521-543.

Sannajust, A., & Groh, A. P. (2020). There's no need to be a pioneer in emerging private equity markets. *Journal of Corporate Finance, 65*(101781).

Schertler, A. (2003). Driving forces of venture capital investments in Europe: A dynamic panel data analysis. *Kiel Working Paper, No. 1172*.

Schwarze, T. (2024, March 14). *AIFMD II - a moderate reform after more than 10 years of application of the AIFMD*. Retrieved from Morgan Lewis: https://www.morganlewis.com/pubs/2024/03/aifmd-ii-a-moderate-reform-after-more-than-10-years-of-application-of-the-aifmd

Stofa, T., & Soltes, M. (2020). Private Equity Determinants In European Union. *Montenegrin Journal of Economics, 16*(2), 131-141.