A comparative analysis: The differences in performance between venture capital strategies

Maximiliaan Joël Jasper

Student number: 152122048

Msc. International Management – Corporate Finance

Catolica Lisbon School for Business and Economics

Dissertation written under the supervision of professor Dr. Fátima Shuwaikh.

Dissertation submitted in partial fulfilment of requirements for the MSc in International Management with Specialization in Corporate Finance, at the Universidade Católica Portuguesa, 02-04-2024.

Acknowledgements

I would like to express my sincerest gratitude to my supervisor, Fatima Shuwaikh, PhD, HDR, for her support, enthusiasm on the topic and feedback during the process of writing my thesis. Without her in-depth insights on the topic and help that went beyond required, I am sure this thesis would not have reached the same quality as it currently reached. I would also like to thank my family with supporting me through this process and with providing me with the needs that were required to finish this thesis in the quality as it has now. Lastly, I would like to thank Leonor Silva for translating my abstract to Portuguese.

Abstract English

This thesis looks into the differences in financial performance of venture capital (VC) funds that use traditional, ESG, and impact-driven focused methods. After retrieveing fund data from Preqin database of 1903 funds, the funds are classified into one of the three assessed strategies: traditional approach, ESG investing, or impact investing. Through the analysis of our study we assesses fund performance using metrics such as Net Internal Rate of Return (Net IRR) and Multiple on Invested Capital (MOIC). Our empirical investigations challenge the status quo by indicating that impact-driven funds outperform their ESG counterparts in terms of financial performance and refute the presumption that obtaining competitive financial returns must be sacrificed in favour of creating social and environmental consequences. In addition, the need of accounting for vintage year impacts becomes apparent, emphasising the impact of industry and macroeconomic shifts on fund performance. By providing information on the financial viability of impact and ESG investing in the venture capital industry, this study adds to the body of knowledge on VC investment methods and performance. It contributes factual support to the discussion of socially conscious investing techniques and has important ramifications for investors and fund managers who aim to strike a balance between monetary gains and environmental and social aims.

Key words: Comparative analysis, Venture capital, Impact investing, ESG investing, Financial performance, Investment strategies, Fund performance analysis, Sustainable finance

Maximiliaan Joël Jasper

A comparative analysis: The differences in performance between venture capital strategies

Português abstrato

Esta tese analisa as diferenças no desempenho financeiro dos fundos de capital de risco (VC) utilizando métodos tradicionais, ESG e orientados para o impacto. Após a recolha de dados sobre os fundos de 1903 na base de dados Preqin, estes são classificados numa das três estratégias avaliadas: abordagem tradicional, investimento ESG ou investimento de impacto. Através da análise do nosso estudo, avaliamos o desempenho dos fundos utilizando métricas como a taxa interna de rendibilidade líquida (Net Internal Rate of Return - Net IRR) e o múltiplo do capital investido (Multiple on Invested Capital - MOIC). Esta investigação empírica desafia

o status quo, indicando que os fundos orientados para o impacto superam os seus homólogos ESG em termos de desempenho financeiro e refuta o pressuposto de que a obtenção de retornos financeiros competitivos deve ser sacrificada em favor da criação de consequências sociais e ambientais. Além disso, torna-se evidente a necessidade de ter em conta os impactos do ano de colheita, salientando o impacto das mudanças industriais e macroeconómicas no desempenho dos fundos. Ao fornecer informações sobre a viabilidade financeira do investimento de impacto e ESG no sector do capital de risco, este estudo contribui para o conjunto de conhecimentos sobre métodos de investimento e desempenho do capital de risco. Contribui com apoio factual para a discussão de técnicas de investimento socialmente conscientes e tem ramificações importantes para os investidores e gestores de fundos que pretendem encontrar um equilíbrio entre ganhos monetários e objectivos ambientais e sociais.

Palavras-chave: Análise comparativa, Capital de risco, Investimento de impacto, Investimento ESG, Desempenho financeiro, Estratégias de investimento, Análise do desempenho do fundo, Finanças sustentáveis

Maximiliaan Joël Jasper
Uma análise comparativa: As diferenças de desempenho entre as estratégias de capital de risco

Table of Contents

1 Introduction *1*

2 Literature review and hypotheses *3*

2.1 Performance of financial markets **3**

2.1.1 The performance of venture capital in Europe and North America 3

2.1.2 Impact investing performance 5

2.2 Venture Capital practices **6**

2.2.1 Venture capital strategies 6

2.3 Hypotheses formulation **10**

3 Research methodology *11*

3.1 Data and sample collection **11**

3.1.1 Criteria for the data sample 11

3.1.1 Composition of the sample 12

3.2 Variables **14**

3.2.1 Dependent variables 14

3.2.2 Independent variables 15

3.2.3 Fixed effects and control variables 15

3.3 Empirical tests **16**

3.4 Descriptive statistics **17**

3.4.1 Control group 17

3.4.2 ESG status group 18

3.4.3 Impact-driven status group 19

4 Results *20*

4.1 Preliminary analyses **20**

4.2 Statistical analyses **21**

4.2.1 General results 21

4.2.2 H1: Financial performance 21

4.2.3 H2: Risk-adjusted returns 23

4.2.4 H3: Financial performance differences between Europe and North America 24

4.3 Limitations and robustness tests **26**

4.3.1 Limitations 26

4.3.2 Robustness tests 27

5 Conclusions *28*

5.1 Discussion **28**

5.1.1 The performance of different strategies 29

5.1.2 Vintage year fixed effects 30

5.2 Final Conclusions **31**

5.2.1 Managerial implications 31

5.3 Future research **32**

Bibliography *33*

Appendix *38*

Appendix I – Picture I - Comparison of actions taken during the investment stage **38**

Appendix II – Picture II – Different investment models to achieve ESG goals **39**

Appendix III – Table I – Overview used variables 40
Appendix IV – Table II – Pairwise Correlations 41
Appendix V – Table III – Regression results models Net IRR, MOIC 42
Appendix VI – Table IV – Regression results models Excess returns, Sharpe ratio ... 43
Appendix VII – Table V – Regression results models Net IRR, differences Europe, North America 44
Appendix VIII – Table VI – Regression results models MOIC, differences Europe, North America 45
Appendix IX – Graph I – Distribution residuals of regressions 46
Appendix X – Table VII – Funds per year 47
Appendix XI – Table VIII – Robustness test hypothesis 1: Net IRR, MOIC 48
Appendix XII – Table IX – Robustness test hypothesis 2: Excess returns, Sharpe ratio 49
Appendix XIII – Graph II – Mean of dependent variables over time 50
Appendix XIV – Graph III – Predictive margins over time dependent variables 51
Appendix XV – Graph IV – Distribution of dependent variable metrics 52

1 Introduction

The venture capital (VC) industry evolved over the years as an important source of financing companies for innovation and start-up growth in the global finance (Gompers, Gornall, Kaplan, & Strebulaev, 2020). It has emerged as a significant middleman, giving money to businesses that might struggle to attract financing (Gompers & Lerner, 2001). With billions of dollars invested a year, VC does not only contribute to the growth of the industry, but also to economic growth. The optimisation of investments techniques to maximize profits and sustainability is a topic of constant dispute. There has been a lot of discussion how to achieve more sustainable, equitable, and efficient developments in the industry (Luo, Zhao, Han, & Wang, 2023). VC could have the potential to catalyse sustainable development through the integration of environmental, social, and governmental (ESG) practices into the investment strategies, which refers to ESG investing.

There are many VCs already executing the approach of ESG investing. However, ESG investing still prioritizes financial returns over incorporating these factors. Contrary to ESG investing, new approaches have developed such as impact investing. The Global Impact Investing Network (GIIN) describes impact investing as "investments made in businesses, institutions, and funds with the goal of achieving both a financial return and a social and environmental benefit" (Global Impact Investing Network, 2024). VC plays a crucial role in the impact investing industry, as they are seen as the accelerators of technological innovation and the closest to new innovations as money providers. A VC fund with an impact mandate, tend only to lend money to early-stage businesses that produce a social or environmental return in addition to a financial return. Also, VCs play a crucial role in the development of the growth of the start-ups as, it is their own responsibility as well to generate positive returns for their stakeholders, resulting in guidance and collaborations with the business to expand and grow as much as possible (Holtslag, Chevrollier, & Nijhof, 2021).

As the industry evolves, academic research is still focused on frameworks and effects of certain aspects on decision-making processes in this new approach of investing. This thesis will add to the existing knowledge and will execute a performance analysis on the differences in investments strategies. Here, we make a difference between investments strategies taken into consideration a control group without any incorporation or focus on environmental or social matters, an ESG investing group, which is classified having an approach of ESG investing. Furthermore, we look at VC funds with an impact-driven approach, where making a social or

environmental impact is crucial and taken as focus of the investment strategy. Next to that we add another analysis between the differences of these approaches and their effects on VC funds with a regional focus on Europe and North America. This thesis' main research question is: "How do VC funds with explicit ESG and Impact-driven strategies perform financially in comparison to traditional VC funds?"**.** This will give a clear and broad overview of how impact-driven VC funds perform against their peers who use the traditional or ESG investing approach. It will contribute to the growing literature on financial performance of VC funds in general. Secondly, and more important, it contributes to the little existing literature on financial performance of impact-driven funds. Furthermore, the research contributes to a better understanding between incorporating ESG factors into the investment strategy and impact investing as main approach in VC.

The thesis will start with revising the scarcely existing literature on the performance between these different strategies. Where we will discuss the overall performance of the VC industry, in combination with the performance of impact investing over the last couple of years. Secondly, we will look at VC practices. We will look at the different strategies used by VC funds, including the three mentioned prior. From this literature we developed 3 main hypotheses, where will focus mainly on the return and risk-adjusted return metrics in the first two hypotheses, and the differences between the classified groups.

After the hypotheses formulation we explain in detail the methodology used to assess these different hypotheses. Starting with an explanation about the data and sample collection, which is gathered from Preqin, a private market database. According to Agudelo et al. (2019), since the late 1990s, a growing number of investors and shareholders have adopted corporate social responsibility (CSR) as a strategic concern. Therefore, we decided to retrieve the available data on Preqin from 1995 to latest date as possible, which is in 2021. After this we will talk about the composition of the sample, which explains the extracted 3953 VC funds with different kinds of variables, such as Net internal rate of return, Multiple on invested capital, vintage year, fund size, and geographic and industry focus. After filtering out the funds with incomplete information, 1903 funds were left to assess for our research. After the composition we discuss the variables used, such as the extra calculated variables Excess returns and Sharpe Ratio. Furthermore, we only use variables directly provided by Preqin to have the most reliable data.

After the methodology and executing the research in Stata, we will discuss the implications of the study, including the results, limitations, and robustness tests. Our research results in a clear performance difference between the different VC investment strategies. Our Control Group outperforms our reference group, the ESG status group, as the ESG status group showed

cautious results, and lower variability in performance, suggesting a lower performance. The Impact-driven status group outperformed the ESG status group as well in all financial metrics used to measure the performance, dispelling the myth of the trade-off between generating impact alongside positive financial returns (2024). Additionally, our robustness tests, validates our results.

Another finding is the importance of incorporating the vintage year fixed effects. It is important for the fund managers to take into consideration the vintage year to construct their investment strategy, as macroeconomic and industry changes can have a big impact on the fund performance of the VC (Choi & Kim, 2020).

Lastly, our conclusions states: It is better to fully incorporate an impact-driven investment strategy rather than only incorporating the ESG factors next to focusing on the financial retruns. Additionally, taking vintage years into consideration is an important factor of constructing the investment strategy as it could have major impact on the performance of the VC fund (In Mo Yeo, 2024).

2 Literature review and hypotheses

2.1 Performance of financial markets

2.1.1 The performance of venture capital in Europe and North America

The performance of venture capital (VC) funds has been a subject of considerable debate. In the past, the U.S., academia considered the VC industry broken. Kedrosky (2009) stated VC could be a source which provides high-growth opportunities for entrepreneurial firms, but its poor returns make the asset class uncompetitive and at risk of large declines in capital commitments. Kedrosky predicted the VC industry would shrink. However, the narrative presented by Kaplan and Lerner (2010) paints a more resilient and positive image of the industry. They contend the VC model is not only intact but also does not appear to be overfunded. Contrary to Kedrosky's viewpoint, Kaplan and Lerner observe the VC industry has endured boom-and-bust cycles with a level of commitments and investments since 2002 that aligns with long-term historical averages. Their findings suggest the VC industry has maintained returns are not unusually low or high when compared to the overall stock market. This observation is especially striking as it counters the prediction of a forthcoming downturn. Instead, it suggested a favourable growth trajectory for VC investments initiated between 2001

and 2007, strengthened by an increase in initial public offerings (IPOs) and the reduced costs linked to going public (Kaplan, 2010).

In the same year, 2009, Hege, et al. (2009) conducted research on the differences in performances of VC between the United States and Europe. The researchers examined the internal rate of return of 146 investment projects across Europe to compare the performance of portfolio companies of European funds against 233 American investments projects. Their findings, revealing Europe lagged the U.S. in the VC industry. The comparative analysis suggests, despite the shared objective of fostering high-growth ventures, European funds have struggled to keep pace with the American VC industry. According to Hege, et al. (2009), the implications of these findings are multifaceted, indicating potential variations in operational, regulatory, and entrepreneurial frameworks between the two regions. These differences underscore the necessity for a tailored approach to understanding and enhancing the European VC model, considering the distinct market dynamics and investment climates that shape its outcomes (Hege, Palomino, & Schwienbacher, 2009).

Lagging the U.S. VC industry is not relevant anymore, even though the VC market in Europe is 10 times smaller than the market in the U.S., the numbers of the European market are increasing and showing positive results. Over the last decade, the VC landscape in Europe has seen a remarkable surge, with investments increasing by nearly 600%. Back in 2013, venture capitalists (VCs) invested a total of €3.5 billion. This figure witnessed a substantial growth, culminating in €20.4 billion by 2021, marking a significant increase in the industry (Statista, 2019). Breaking down the 2021 investments, seed-stage companies attracted €1.2 billion, start-ups garnered €7.1 billion, and companies in the later stages of development secured the most substantial portion of VC funding in Europe, receiving €12.1 billion. The majority of the €20.4 billion invested in European VC during that period was predominantly allocated to France, the Benelux, and the DACH region (Statista, 2019). Even though, these numbers are small relatively to the U.S., which had total amount of invested VC money of $345 billion, a report by Invest Europe (2022), complements the data on the rapidly expanding European landscape. According to the report, European VCs invested €96 billion in nearly 27,000 companies over the past decade. It shows a record high in 2021 (€21,7 billion) with a small decline in 2022 to €18,2 billion.

Additionally, a performance report provided by Invest Europe and Cambridge Associates (2023) shows that over the medium time horizon, European VC has delivered strong performance, surpassing the North American benchmarks with net IRRs of 31.44% over a five-year period and 23.07% over ten years. Demonstrating a robust VC environment and indicating

that the returns up to the 20-year mark for European VC are now outperforming those in North America. This highlights the expansion and growth potential for start-ups across Europe (Invest Europe & Cambridge Associates, 2023).

2.1.2 Impact investing performance

In the last 15 years, impact investing did not only become a discussed topic in public policy, but also in the business realms (Trelstad, 2016). As mentioned in the introduction, impact investing is described as investments with dual objectives, making impact alongside positive financial returns (Global Impact Investing Network, 2024). Depending on the strategic objectives of the investor, impact investments can be made in both developed and emerging markets, with the aim of achieving a range of returns from below market to market rate.

A study on mission preservation and financial performance in impact investing by Jacob Gray et al. (2015), concludes in the results that impact investing private equity can successfully balance mission-driven goals with competitive financial returns. Their preliminary analysis shows a gross internal rate of return of 12.94%, which was a comparable rate as for the S&P500 index for a period between 2000 and 2015 (Jacob Gray, 2015).

According to the "GIINsight – Impact investing allocations, activity & performance report" (2023) published by the GIIN, shows positive results on the growth of the impact investing industry. In the sample used for the report, the total assets under management (AUM) are $371 billion. Of this $371 billion, 29% of the investors were in the U.S. and Canada, followed by Western, Northern & Southern Europe with 23%. Furthermore, the private equity industry (including VC) accounted for 26%, with a compounded annual growth rate of 21%. Of this 26%, 39% was allocated across the VC stages of business: growth, venture, and seed/start-up (Global impact investing network, 2023). However, even though it is hard to find a specific market size of the VC stake in the impact investing industry, another report of GIIN (2022), shows that 3,349 organisations currently manage $1.164 trillion in impact investing worldwide. However, for the report 1,289 organisations are used as data sample for their research. After excluding 34 outliers of the subset, which accounted for a total of $343 billion, a representation of 55% of impact assets under management in this subset, suggests the average of these remainder organisations remains small. However, the subset has an AUM mean of $224 million. Of this subset, 63% of the subset were classified as fund managers and 50% of all the investors were in North America, and 31% in Europe. (The Global Impact Investing Network, 2022).

2.2 Venture Capital practices

2.2.1 Venture capital strategies

A traditional approach

VC represents a focused type of financing directed at small, privately held businesses that are perceived to possess significant potential for growth. The primary objective of VCs will be focusing on achieving capital gains that substantially exceed the initial investment. Often the funds are aiming for multiple times return compared to the investment within a timeframe of less than seven years. These financial gains are realized by divesting their ownership via mergers or by taking the company public with an IPO (Kenney, 2001). VCs receive hundreds of applications for funding; although, VCs are always looking for the "home run", only ten will receive a careful consideration and, initially, only one will be funded, this is due to the high criteria standards, which are assessed during the due diligence process (Vinturella & Erickson, 2013). The first thing VCs look for are industries within the economy that have both substantial market potential and fast growth rates, ideally, market values that exceed the criteria of the VC fund (Vinturella & Erickson, 2013). For example, in the 1980's most of the VC investments went to the energy industry. However, after the 1980's, there was a rapid shift from genetic engineering, computer hardware, and specialty retailing to multimedia, telecommunications, and software companies (Zider, 1998). After the 2000s till now the VC industry developed a shift to companies which are operating in artificial intelligence, blockchain, biotechnology, sustainability, electrical vehicles, and energy transitions (Fernandes, 2023).

Besides looking for the best industry to invest in, VCs try to reduce their risk by staged financing. Staged financing refers to a funding strategy in which money is provided to the companies in different stages. In this way, investors are able to reduce risk by assessing the company's success at every moment the VC is funding the company. It gives the VC the opportunity to monitor the company closely, which also offers an opportunity for VCs to reward successful milestones (Gompers P. A., 1995). Staged financing can also be seen as a substitute for intensive monitoring of the company (Tian, 2011). This monitoring increases the transaction costs due to the additional due diligence, legal expenses, and administrative efforts to manage the multiple financing rounds (Witt & Brachtendorf, 2006). However, when a company does not perform or is not achieving its stage targets on the deal, the VC is able to withdraw the investments (Gompers P. A., 1995).

Incorporation of ESG in venture capital strategies

Sustainable or ESG investing refers to the practice of making investments which not only provide financial returns, but also have an impact on environment, social, and governmental (ESG) issues (Cote, 2022). ESG established between the 1980s and the 1990s as Socially Responsible Investing (SRI). It is the progression with deep roots from the 1960s and 1970s in movements for social justice, civil rights, and environmentalism (Townsend, 2020). It developed further as Corporate Social Responsibility in the late 1990s, and developed towards ESG as it is called today. The incorporation of ESG factors in investment strategies is a common thing for today's investment realm. The focus on ESG as a mean to sustainable investing has been on the rise in the last years. In 2005, an international consortium of institutional investors initiated The Principles for Responsible Investment (PRI). The principles focus on increasing the relevance of ESG issues to investment practices. This initiative was supported by the United Nations (PRI, 2024). At the time of initiation, it included 100 signatories with $6.5 trillion in AUM (Robert G. Eccles & Kastrapeli, 2017). Today, it contains of more than 5000 signatories, which more than half of it is categorized as investments managers. Additionally, it has more than $121 trillion AUM (PRI, 2024).

The UNPRI's consists of six principles focusing on incorporating ESG issues into investment analysis and decision-making process; implementation of ESG issues in the investment industry; and reporting on these ESG issues (PRI, 2024). Integrating The Principles for Responsible Investing confirms that a firm is integrating the ESG issues in their investment strategy, also called ESG investing (PRI, 2024).

ESG investing is also used as a signalling tool for volatility and risk. There are three elements that created the foundation for this growth, consisting of the legislation and regulation around ESG issues. Since 2017, the EU implemented a Non-Financial Reporting Directive which required 6,000 companies to report their ESG information (2015). Secondly, a growing number of empirical research demonstrate positive correlation between ESG factors and corporate financial performance (Friedea, Busch, & Bassen, 2015). This counts for alternative investments as well, such as private equity. The study of E. Teti et al. (2012) on the UNPRI and private equity returns, results in the conclusion that fund managers that pay higher attention to ESG requirements in their investment strategies can benefit from higher financial performance. This supports the notion that integrating ESG consideration into investment strategies can enhance financial returns, disproving myths that sustainable practices come at the expense of profitability. Additionally, incorporating ESG matters can reduce risk, particularly non-financial risks like reputation, regulatory, and litigation risk. This can benefit the fund manager

and generate higher risk-adjusted returns (Sourd, 2024). Lastly, the industry took initiatives in developing standard for measuring and reporting ESG performance, which reflect a broader response to demographic and societal shifts, innovations in data and analytics, and the pursuit of better risk and return opportunities within the competitive landscape (Robert G. Eccles & Kastrapeli, 2017).

The paradox of ESG integration

Although, academic articles prove the integration of ESG practices and requirements into the investment strategy generate higher financial performance, the integration of ESG also has a paradox. According to Michael Cappucci (2018) in his article "The ESG Integration Paradox", he confirms that previous literature proves that ESG integration in investment strategies generated higher financial performance on the long-term. However, in his research he finds differences in the theoretical advantages of ESG integration and its actual use. There is still a lack of real adoption and the use of ESG principles in investment strategies. He points out several paradoxes, such as imprecise definitions and unreliable data that prevent the complete integration of ESG components.

According to Cappucci's (2018) survey, most investment strategies worldwide do not completely incorporate ESG factors, even in spite of investors' growing demand for ESG-integrated solutions. According to his research, most investment strategies receive low scores for ESG consideration, and just a tiny percentage receive high ratings for ESG integration. This disparity points to a weak dedication to ESG principles on the part of financial firms, who might pretend to take ESG aspects into account in their investment strategy without changing their way of investing (Cappucci, 2018). This can also be referred to the term "Greenwashing" (2022). The rapid ascent of ESG investing comes also with a rise in misleading practices. Impact Washing occurs when fund managers misrepresent the extent to which their investments benefit society or environment (Cote, 2022).

Impact investing

As described in the section "Impact investing performance", impact investing had a major growth in importance in the business realms (Trelstad, 2016). ESG investing is mainly focused on generating financial returns and with incorporating the ESG principles. Impact investing goes beyond this strategy. Caré and Wendt (2018) attest that impact investing has emerged as one of the most significant and discussed market strategies in existence today. Impact investors are not the same as traditional socially conscious investors. Their objectives are to actively invest capital in businesses or projects that aim to further social or environmental goals. Due to

the fact impact investors go beyond these principles, there are quiet some differences with ESG investing and the traditional strategy of VC (Carè & Wendt, 2018).

In his book Scaling Impact, Kusisami Hornberger (2023), describes these differences in a detailed way. To start with the actions taken during the investment process by fund managers with different the strategies. Hornberger divides the investment process into 4 categories: origination, deployment, management, and the exit (appendix I). As Hornberger (2023) mentions there is some overlap between ESG investing and impact investing, there are some major differences, as impact investing is a unique approach from ESG investing. For example, most impact investors include ESG risk management and screening in their investments processes. If an investor's investments satisfy these three criteria, they can be guaranteed to be impact investments rather than ESG investments: 1) assets selected with impact in mind; 2) investments that boost the impact of the investee company; 3) The influence is measured objectively (Hornberger, 2023).

In comparison with ESG investing, there is not much academic evidence that confirms the positive correlation with impact investing and financial returns. Due to the fact impact investing strategies have a focus on prioritizing the goal of making impact or increase the impact of investee company (Global Impact Investing Network, 2024), a lot of investors believe that impact investing comes with a trade-off between the return on impact and risk adjusted returns (Triodos investment management, 2024). However, in the last 10 years, impact investing has developed into a sophisticated method to risk management and investing that allows investors to incorporate ESG factors into their investment portfolios without sacrificing returns (Triodos investment management, 2024).

Seeing ESG and impact investing as points on a continuum of investment strategies at achieving both financial returns and beneficial effects on the environment and society is one way to conceptualise the differences between them (Scognamiglio, Rizzello, & Chiappini, 2018). However, when both strategies compared to traditional investment strategies, ESG strategies prioritise financial performance, and in addition they analyse, monitor, and manage risks related to environmental, social, and governmental issues. Impact investment strategies deliberately select and manage investments that have measurable effects, placing more emphasis on environmental and social considerations (Appendix II) (Hornberger, 2023).

Over the years multiple organisations are established for the impact investing industry. Likewise, the UNPRI principles, organisations such as the Global Impact Investing Network (GIIN) and Impact Assets, have set up initiatives where companies which having a positive impact on environmental and social issues into their strategy are able to join. GIIN is a non-

profit organization committed to advancing the scale of effectiveness of impact investing. Through their mission of establishing essential infrastructure and supporting through research, education, and initiatives they strive to drive growth within the impact investing sector (Global Impact Investing Network, 2024). ImpactAssets is an impact investing trailblazer, dedicated to change the industry and offering impact investing products and services to enable individuals, family offices and institutions to reach their goals. With more than 2000 clients and $3 billion AUM they are one of the major organisations shifting the industry to a more sustainable world (ImpactAssets, 2023). The ImpactAssets50 highlights the newer fund managers to watch that may demonstrate future potential to create meaningful impact (ImpactAssets, 2023). Additionally, companies or investment fund managers can receive a B-Corp certification. A company with the B-Corp certification satisfies rigorous requirements, such as demonstrating excellent social and environmental performance, make a formal commitment by altering their corporate governance structure to all stakeholders, and demonstrate transparency by reporting their performance to the B-Corp organization (B Corp, 2024).

2.3 Hypotheses formulation

Based on the discussed academic research on VC performance, the integration of ESG and impact driven practices into the investments strategy four hypotheses are formulated. The first hypothesis is based on the substantial shift towards the incorporation of ESG factors into the investment strategies. It predicts that funds which incorporate the ESG factors generate higher financial returns than funds that do not. The hypothesis is relevant due to the empirical evidence of the positive correlation financial performance and ESG incorporation (Friedea, Busch, & Bassen, 2015). Additionally, E. Teti, et. al. confirms that private equity fund managers that incorporate ESG requirements in their investment strategy can benefit from higher returns. Hence, this hypothesis tests the existing literature with assessing the financial performance of VC fund managers that incorporate ESG factors in their investment strategy.

H1.1: ESG incorporation in investment strategy gives higher financial performance.

The second part of hypothesis 1, focuses on the differences between ESG and impact investing. Even though the two strategies are similar to each other, there are differences. It is a fact impact investing select and manage investments with a measurable effect comparing to ESG investing, which still prioritizes financial returns. The hypothesis tests if impact investing strategies

indeed lose financial returns when implementing a strategy more focused on making impact or increasing the impact of the investee company (Hornberger, 2023).

H1.2: Impact-driven investment strategies has higher financial performance than ESG incorporation.

Additionally, to have a better perspective on the biases of many investors on impact investing, which think focusing on making more impact in their investment strategy has a trade-off with the risk-adjusted financial returns (Triodos investment management, 2024), the third and fourth hypotheses focus on the differences in the risk-adjusted returns between ESG incorporation and control group, and impact-driven and ESG incorporation investment strategies.

H2.1: ESG incorporation in investment strategy gives higher risk-adjusted returns.
H2.2: Impact-driven investment strategies give higher risk-adjusted returns.

For the last hypothesis we will explore the impact of the various factors taken into consideration on the performance of the VC funds, focusing on the differences between funds with regional focuses on Europe and North America. In this way we can identify potentially unique characteristics of the VC environment and fund performance in these two regions:

H3: Impact-driven investment strategies demonstrate higher financial performance than ESG incorporation for VC funds located in Europe.

3 Research methodology

In this section it is discussed how the sample is determined and what data sources are used to retrieve the data. Then there is an explanation about the variables used. Thirdly, the different empirical methods and models are discussed used to test the hypotheses. And lastly, it will conclude with a thorough description of the descriptive statistics.

3.1 Data and sample collection

3.1.1 Criteria for the data sample

To assess the performance of different funds the most important variables are the metrics for the financial return. This data is collected using the Preqin database. Preqin is used in previous

literature as a reliable source by Harris, et al. (2014). They conclude that the performances indicated in Preqin are similar to those in Burgiss (MSCI company) and Cambridge Associates. Additionally, Wharton Research Data Services (WRDS) added Preqin as data source to access the extensive information of private equity and VC, including intelligence on deals, fund performance and hard-to track indicators (2019). Consequently, it can be concluded that Preqin database constitutes a dependable source of information. Preqin offers comprehensive data pertaining to various categories of private equity funds and fund managers, encompassing VC sectors. It includes, but not limited to, the denomination of the fund, the fund manager, vintage year, investment phase specialization, fund size, geographic and industry focus, and financial metrics such as the Net Internal Rate of Return (Net IRR) and the Multiple on Invested Capital (MOIC).

To compile the dataset, we set criteria for the sample period. The sample period comprises funds with vintages ranging from 1995 to 2021. As described in the literature review, ESG is established from SRI and CSR. According to Agudelo et al. (2019), since the late 1990s, a growing number of investors and shareholders have adopted corporate social responsibility as a strategic concern. Including the inclusion of The UNPRI in 2005, it is seen that this shift was feasible in the business realm. Furthermore, it is important to consider the fact the average fund lifetime was 10 years (Phalippou & Gottschalg, 2003) in this period. Taking these considerations into account, we can say that 1995 was the first contingent relationship between performance and the incorporation of CSR or ESG. This moment marks a strategic change in favour of CSR while also enabling a more thorough evaluation of the effect of the UNPRI's release on sustainable investments. However, as the period from 1995 and 1999 consisted of only a few funds, we added the funds of these 4 years to the vintage year 1999, so we would have a time period between 1999 and 2021.

3.1.1 Composition of the sample

To compile the dataset, we set filters in Preqin to find a general data sample, by selecting the VC investment strategy, this gave us a total of 3953 funds. After extracting the data into excel, we filter the funds without complete information. We exclude the funds without the Net IRR, MOIC, vintage year, fund size, and geographic, and industry focus. To have a better statistical data sample, we excluded outliers for every criterion (more than one standard deviation from the mean). After excluding these funds, we have our sample of 1903 funds.

To see the differences in the different investment strategies, we classified all funds under three different groups: the control group, the ESG status group, and the impact-driven status group.

Preqin does classify funds in two groups, (1) those with an environmental or socially ethos and (2) those without. However, this data was not accessible due to an access constraint. The Preqin ESG status is determined according to different standards. These standards include signatories with The UNPRI or being part of the GIIN (Preqin, 2024). To classify the funds and be eligible for the ESG or impact-driven status, we checked several databases of organisations which are eligible to conclude the investment fund integrates ESG or impact into their investment strategy. For the ESG status, we checked the list of signatories of the UNPRI, we matched the funds included in the UNPRI list with the ones in our dataset. This gave a result of a total of 137 funds. For the impact-driven status we looked at different organisations mentioned in the literature review: the GIIN, the Impact Assets 50, and the B-Corp certification. We matched again the funds which were included in the data sample with the lists, and this resulted in 48 funds. Due to the fact, some of the funds received a ESG status and an impact-driven status, we excluded the companies with both statuses from the ESG group, which resulted in a total of 118 funds. The rest of the funds, a total of 1737, was classified under the control group. Table 1 gives an overview of all the funds:

Table 1: Overview of data composition

This table gives an overview of the composition of the data sample, which is constructed from Preqin, the UNPRI signatory list, the GIIN members, B-certified companies, and the IA50. The ESG status is only given to funds who signed the UNPRI. The Impact-driven status is only given to funds who are part of one of the three impact investing organisations. The control group is constructed from the other funds who were not included in the criteria for the other groups and assumed that they did not practice ESG or impact investing.

Variable	Funds	Fund managers
All funds with vintage between 1999 and 2021	3952	1475
Net IRR and MOIC availble	2818	1098
All other criteria availble and excluded outliers	1903	769
Of which: Control group	1737	703
Of which: ESG status	118	46
Of which: Impact-driven status	48	20

3.2 Variables

In this section we will discuss the various dependent and independent variables used for the empirical tests. In Appendix III shows an overview of the relevant variables, including descriptions and from which data source the variables are retrieved from. As this thesis reiterates research of Ulrich Hege, et al. (2009), we use similar variables used in their research.

3.2.1 Dependent variables

Performance: the dependent variable for this thesis is performance, measured with different financial metrics. The returns on the investments are measured by the primary measures of success for VCs, the Internal Rate of Return (IRR), and the Multiple on Invested Capital (MOIC). The IRR can be defined as the discount rate that brings a project's net present value to zero. Or in other words, it represents the anticipated compounded annual rate of return on an investment (RAMSINGHANI, 2021). The MOIC can be defined as a relative where return is measured by looking at the total value of the company at exit and the total invested capital at the beginning of the project, expressed as a multiple (RAMSINGHANI, 2021).

From Preqin, we retrieved the Net IRR, and the Net Multiple. The Preqin Glossary (2024) states that a fund manager's Net Internal Rate of Return is what's left over after carry and fees. based on unrealized asset value, partnership stake remaining after valuation, and realised cash flows. The Net Multiple, or Multiple on Invested Capital (MOIC), is the ratio between the total value that the fund manager has derived from its interest in the partnership, and its total cash investment in the partnership (Preqin, 2024). To have a better understanding for the risk-adjusted returns, we also calculated the Excess returns by deducting the risk-free rate from the Net IRR. For the risk-free rate we used the yields of the US risk-free rate retrieved from Fama French's 3-factor model (2024) for all the funds with a regional focus on North America, and the yields of German government bonds for all the funds with a regional focus on Europe. We cumulated all the yields together, starting from the vintage year of the fund till 2021. For the Sharpe ratio we divided the excess returns by the standard deviation of the whole dataset of the Net IRR, which is 0,3420. To have a normal distribution, we have put all the dependent variable metrics in a logarithm. The distributions still contain some outliers, but we will adjust for this in the regression model by using robust standard errors (Appendix …).

3.2.2 Independent variables

To test what the differences are between the different strategies we determined three independent variables and classified all the funds under one of these groups. These groups are the control group, the ESG status group, and the Impact-driven status group. As explained in the section 3.1.1, the ESG status group are all funds which signed the UNPRI. The impact-driven status group holds the criteria the fund needs to be part of at least one of the mentioned organisations (GIIN, IA50, or hold a B-Corp). For every group a dummy is created in which funds gain a score of 1 when they hold the criteria of the specific group type.

3.2.3 Fixed effects and control variables

Fixed effects

Vintage year fixed effects: the vintage year, or inception year is taken as a fixed effect for this research. The vintage year is stated by the Preqin as the first year of investment from the investor (Preqin, 2024). To include vintage year fixed effects is in line with previous research, such as from Robinson and Sensoy (2013) to emphasize cross-sectional variation holding market conditions fixed. We control for the time-specific economic and market condition that impact all funds equally within a given year. It allows us to account for fluctuations in market conditions, regulatory changes, economic cycles that could affect fund performance irrespective of other factors.

Industry Fixed Effects: In assessing the performance variations across the different strategies employed by the VC funds, it is crucial to isolate the effects of the different sectors. These sectors may have specific characteristics or performance drivers which can have an influence on the performance of the VC funds. In line with Ferson and Wang (2021), we aim to control for unobserved effects across the different sectors. This allows us to estimate a more precise result of the impact of our variables of interest on the fund performance. We divided all the industries given by Preqin in our data sample (a total of 38 industries) into 6 groups of industries: Technology and information services, Healthcare pharmaceuticals, Finance and insurance, Consumer goods and retail, Energy and utilities, and others.

Control variables

Fund Size: We control for the size of the fund, as measured by the total amount of money available in million dollars directly retrieved from Preqin to account for the potential scale effects on fund performance. According to research of Paz et al. (2017) there is a positive relationship on the fund size and its performance. However, it depended on the type of fund, as they conducted research on retail funds and institutional funds. We will control for the fund size to see if there are any relationships between the performance of the different fund strategies and the fund size. Larger funds may benefit from economies of scale, access to larger investment opportunities, or have different risk-profiles compared to the smaller funds.

Geography: As in the research of Hege et al. (2009), we will look for the differences in performance between Europe and North America. We created a control variable Europe, which is structured as a dummy variable. Funds gain a score of 1 when its primary regional focus is Europe and a 0 when it is North America. In this way we can see the differences in effects when a fund has a different regional focus, which helps to give a clearer view for H1 and H2. For H3 we look at the Net IRR and the MOIC separately per region.

Investment Stage Focus: Recognizing that funds may target companies at different stages of growth (Tian, 2011), we control for the fund's investment stage focus. The stages are directly retrieved from Preqin and divided in General early stage, Early stage: start-up, Early stage: seed, Expansion late stage, and venture general. Appendix III gives an overview of the definitions of every stage. The General early-stage phase is taken as a reference group to see the effects of the other stages in comparison.

3.3 Empirical tests

For our empirical test we built 4 models. For the first hypothesis, the complete model is written as follows:

$$Performance\ (IRR\ \&\ MOIC) = \alpha + \beta_1 dControl\ group + \beta_2 dImpact\ driven\ status + controls + industryFE + yearFE + \varepsilon_i$$

The ordinary least squares (OLS) regression models will be nested in each other, which means that the model includes at least one additional parameter to be estimated while utilising the same variables as the other models (Portland State University, 2023). Model 1 starts only with

the control variables. Model 2 includes the specific groups where we test for, (dummy) control group, and (dummy) Impact-driven status group, as our ESG status group is our reference group. Model three includes industry fixed effects and model 4, includes all the variables, including the vintage year fixed effects. The models aim to explain the variation in performance by the membership of the different groups we identified, while controlling for the other factors and accounting for industry and vintage year specific effects.
For hypothesis 2, we built the same model. We only changed the dependent variables for the Excess returns and the Sharpe ratio:

$$Risk-adjusted\ returns\ (Excess\ returns\ \&\ Sharpe\ ratio) = \alpha + \beta_1 dControlGroup + \beta_2 dImpactDrive + controls + industryFE + yearFE + \varepsilon_i$$

The regression models are nested in each other again, so it is possible to see the effects of different variables on the performance and the dependent variables.
For the last hypothesis, we built the same models again, except we separated the regional focus of the funds, by dividing the funds into two groups with the dummy variable Europe. If Europe had a score of 1, it was added to the region focus group of Europe, if the fund had a score of 0, it was added to the region focus of North America. We look at the Net IRR and the MOIC separately, so we can see the different effects of the independent variables on these performance metrics per regional focus group:

$$Performance\ (IRR\ \&\ MOIC) = \alpha + \beta_1 dControlGroup + \beta_2 dImpactDrive + \gamma\ \mathrm{dEurope} + controls + industryFE + yearFE + \varepsilon_i$$

3.4 Descriptive statistics

3.4.1 Control group

For the descriptive statistics, we are looking per group we classified the data sample. To start with the control group with a mean of the Net IRR of 11.8%, and a MOIC of 0.38. However, both metrics are widely spread, the Net IRR has a standard deviation of 20.9% and a spread

between -35.7% and +181.5%. The MOIC has a standard deviation of 0.72, but the spread is wide between -3.24 and 3.66. When looking at the metrics for the risk-adjusted returns, the Excess returns are less widely spread than the Net IRR, as the standard deviation is 17.3%. Additionally, we can see that there is moderate mean of the Sharpe ratio, which indicates a moderate risk-adjusted return, with some funds performing poorly and some funds exceptionally well. Most funds had a vintage year of 2008 located in North America.

Table 2: Group 1: Control group

This table shows the descriptive statistics of all the data for the Control group. We see that the 1737 funds are included in this group. 14,6% of these funds are located in Europe with an average vintage year of 2008.

	N	Mean	SD	Median	Min	Max	Skewness	Kurtosis
NET IRR	1737	.118	0.209	.09	-.357	1.815	2.329	15.115
MOIC	1737	.38	0.719	.343	-3.236	3.656	.038	5.529
Excess returns	1737	.657	0.173	.672	-.033	1.904	.754	8.929
Sharpe ratio	1737	1.322	0.260	1.355	-.019	2.878	.037	6.835
Vintage year	1737	2008.718	7.704	2008	1999	2021	.126	1.54
Fund size	1737	4.749	1.364	4.916	-2.303	8.294	-.621	3.807
Europe	1737	.146						
Early-stage start-up	1737	.046						
Early-stage seed	1737	.064						
Expansion late stage	1737	.092						
Venture general	1737	.477						

3.4.2 ESG status group

The ESG group has significantly less members, which could affect the robustness. However, the group has a lower average Net IRR (6.9%) with less variability as the spread is between -35.2% and +37.6%. The MOIC is lower and has less extreme negative values. For the risk-adjusted returns, both metrics, the Excess returns and the Sharpe ratio are both lower on average, and with a negative skewness, which indicates that more funds have lower risk-adjusted returns. Most funds had a vintage year in 2013, indicating that these funds have less mature investments. Most of the ESG status funds are located in Europe.

Table 3: Group 2: ESG status group

This table shows the descriptive statistics of all the data for the ESG status group. We see that the 118 funds are included in this group. 72,9% of these funds are located in Europe with an average vintage year of 2011.

	N	Mean	SD	Median	Min	Max	Skewness	Kurtosis
NET IRR	118	.069	0.140	.079	-.352	.376	-.405	3.325
MOIC	118	.293	0.563	.24	-1.51	1.86	-.351	4.13
Excess returns	118	.632	0.178	.685	-.118	.875	-1.539	5.86
Sharpe ratio	118	1.28	0.304	1.374	-.288	1.642	-2.186	9.68
Vintage year	118	2011.712	6.901	2013	1999	2021	-.531	2.078
Fund size	118	4.349	1.226	4.202	1.435	6.715	-.128	2.321
Europe	118	.729						
Early-stage start-up	118	.051						
Early-stage seed	118	.119						
Expansion late stage	118	.093						
Venture general	118	.585						

3.4.3 Impact-driven status group

Lastly, looking at the Impact-driven status group, it has again significantly less members. However, the Net IRR and the MOIC are both the highest of the whole data sample. Net IRR has an average of 16.8%, with a standard deviation of 24.2%, indicating a high spread with higher but more variable returns. The MOIC has an average of 0.56, with a standard deviation of 0.61, which could indicate potentially better investment outcomes. When looking at the risk-adjusted returns, the Excess returns peak with 73.2% and the Sharpe ratio as well with a value of 1.43. However, standard deviations of both metrics are the highest as well. As this group shows promising returns, it can also be a sign of higher risk which come with the investments and a higher degree of uncertainty. As seen and confirmed in the literature, Impact-driven status funds are a newer strategy, seen in the median of the vintage year of 2017. Lastly, most of these funds are located in North America.

Table 4: Group 3: Impact-driven status group

This table shows the descriptive statistics of all the data for the Impact-driven status group. We see that the 48 funds are included in this group. 25% of these funds are located in Europe with an average vintage year of 2014.

	N	Mean	SD	Median	Min	Max	Skewness	Kurtosis
NET IRR	48	.168	0.242	.133	-.2	1.406	2.761	15.394
MOIC	48	.555	0.612	.531	-.799	2.234	.222	2.981
Excess returns	48	.732	0.207	.731	.121	1.625	.781	10.273
Sharpe ratio	48	1.429	0.304	1.441	.374	2.565	-.277	8.728
Vintage year	48	2014.812	5.830	2017	1999	2021	-1.509	4.562
Fund size	48	3.354	1.926	3.275	-.357	6.323	-.299	1.903
Europe	48	.25						
Early-stage start-up	48	.188						
Early-stage seed	48	0						
Expansion late stage	48	.021						
Venture general	48	.562						

4 Results

4.1 Preliminary analyses

Before we can execute the actual regressions to test the hypotheses, it is essential to conduct preliminary diagnostics to check for heteroskedasticity and multicollinearity. These phenomena can impact the reliability of the regression results. Heteroskedasticity, refers to the violation of the assumption of the constant variance of the error terms in a linear regression model (2020). To test the heteroskedasticity we used a Breusch-Pagan test to determine if heteroskedasticity occurs on the regressions on the different dependent variable metrics. The Breusch-pagan test is designed to test the variance of the error term from a regression model and is dependent on the value of the independent variables. In this test 0 hypothesis is given as: H0: Constant variance. For the metrics Net IRR, Excess Returns, and Sharpe ratio, the outcome indicates that there is heteroskedasticity in the error terms of the regression models ($P < 0.01$). This could be correlated with the fact that the Excess returns and the Sharpe ratio are estimated from calculation using the Net IRR. For the MOIC, we can reject the 0 hypothesis and say there is no evidence of heteroskedasticity ($P > 0.10$). To treat the heteroskedasticity we have employed robust standard errors in all subsequent regressions. By adjusting the standard errors of the regression coefficients to take the residuals' heteroskedasticity into consideration, this method improves the reliability of statistical inference (Giraitis, Li, & Phillips, 2024). Even in the presence of heteroskedasticity, using this method guarantees that our estimation stays consistent, and the hypothesis tests are valid. To test the chance on multicollinearity, we used the Variance Inflation Factor (VIF) as a metric. Multicollinearity in multiple regression analyses refers to the linear relationship between the independent variables. When many factors in the regression model have a substantial correlation with not only the dependent variable, but also with each other (Shrestha, 2020). According to Alin (2010), the threshold for deviating small from large linear dependency is a VIF score of 10. As we adjusted the regressions in the methodology to have reference groups in the different variables, such as ESG status group for the comparisons with the control group and the Impact-driven group for hypotheses 1 and 2, or Europe to see the comparison with North America for hypothesis 3, we do not detect multicollinearity in the regressions.

4.2 Statistical analyses

4.2.1 General results

To have a general overview of the effect of every variable on each other, we ran a pairwise correlation analysis (Appendix IV).

According to Jacob Cohen (1988), a correlation coefficient between 0.60 and 0.79 can be classified as strong correlations and everything above as very strong. The results in the correlation matrix show that the Net IRR and the MOIC are strongly correlated with each other. The coefficient is 0.77, which supports the expectation that these two measures of financial performance are related. The probability significance of the correlation is lower < 1%, indicating a low probability that this correlation is due to random chance. Furthermore, the Excess returns and the Sharpe ratio are both highly correlated with the Net IRR, due to the calculations using the same values. However, when looking at the correlation between the MOIC with the Excess returns and the Sharpe ratio, the coefficients are slightly lower, but both significant with a probability of < 1%.

When we look at the independent variables, it seems that the Impact-driven status group only has a significant positive effect on the financial performance metrics. The coefficients are small as these are only 0.04 and 0.07.

Additionally, the control variables have some interesting findings, as the Fund size has negative significant impacts on the Net IRR and the MOIC, and on the ESG status group and the Impact-driven status group. However, the Fund size has a positive significant effect on the Control group. Europe has negative significant impact on three of the four financial metrics, on the Control group, but positive significant impact on the ESG status group. For the investment stage focus, it shows that if the fund does not specialize in one of the stages (Venture General), it loses the positive impact on the Excess returns and the Sharpe ratio and creates a significant negative impact on the MOIC.

4.2.2 H1: Financial performance

As discussed in the section Empirical tests, we ran the regression for hypothesis 1 on the Net IRR and the MOIC (Appendix V). Model 1 consist only of the control variables on the ESG status group. The models are nested in each other, which means, every model will add one variable to see if there are any differences. Model 2 adds the Control Group and the Impact-driven status group. Model 3 adds the industry fixed effects, and lastly, model 4 adds the vintage year fixed effects. As literature mentions the importance of the normal distribution of the

residuals after running a regression (RF Osemeke, 2024), we looked if the residuals would be normal distributed, which was the case (Appendix IX). However, this decreases the chance of heteroskedasticity.

4.2.2.1 The financial performance of ESG incorporation

In contrary to the findings in the literature that states a positive correlation between ESG incorporation and financial performance. Results of such works by Friede et al. (2015) discuss the positive correlation between these two. However, our empirical evidence paints a different picture. The t-tests and regressions ran on the Net IRR and the MOIC, show that the control group, without any incorporation of ESG investment strategies, have significant better results than the ESG status group, the reference group. This is quantified in the Net IRR across all four models, with a notably significance of 1% in model 4. This statistical significance implies a robust trend where the lack of ESG integration corresponds with higher financial returns, rather than being merely a variation in the data, resulting in contradicting the existing literature and prior research. Regarding the MOIC, the model becomes only significant when we fix the vintage years and the industries, suggesting a nuanced relationship that depends on market circumstances and temporal variables.

Additionally, to the literature discussed, Teti et al. (2012) found that the incorporation of ESG requirement and the financial performance of private equity returns, taking the UNPRI as a criterion to classify these funds the same way as we did. However, our outcomes differ, especially when vintage years fixed effects are considered, which significantly raises the R-squared values. Especially looking at the models, where model 4 incorporates vintage year fixed effects, the R-squared increases with more than 10%. This increase does signify a better model fit. Furthermore, our analysis shows that funds located in Europe have significantly lower Net IRRs than the funds located in North America, which will be discussed later in our research. Lastly, the investment stage focus does not have a significant impact on the results.

4.2.2.2 The financial performance of impact driven strategies

For the second part of the first hypothesis, the performance of the Impact-driven status group versus the ESG status group was examined. We used the same regression models as for hypothesis 1.1. Unlike the broader literature, which sometimes lacks making a clear distinction between impact investing and ESG investing, our research assesses each group's performance indicators separately. While ESG investing often prioritizes financial returns, with some consideration of ESG factors (Trelstad, 2016), Impact investment is committed to generating

quantifiable and positive social and environmental results in addition to financial gains. (Global Impact Investing Network, 2024).

However, our empirical analysis reveals that Impact-driven status VC funds outperform their ESG counterparts on both Net IRR and MOIC measures. Remarkably, despite the surge of established impact-driven funds post-2010 (Appendix X), their historical performance has outperformed that of ESG funds. Not only, has the inclusion of the vintage years fixed effects confirmed the importance of these findings, but it also highlights the importance of the time dimension in fund performance. Additionally, for the MOIC the results show that the impact-driven funds performed better than their ESG peers. Together with the increased R-squared in model 4 and 8, by the vintage year fixed effects, we can say that the results show significant better results. This shows that fully incorporating impact-driven investment strategies could be beneficial and generate better returns than only considering the ESG factors.

4.2.3 H2: Risk-adjusted returns

For hypothesis 2, we ran the regression on the Excess returns and the Sharpe ratio (Appendix VI). The structure of the models is the same as in the hypothesis 1. Model 1 consist only of the control variables on the ESG status group. Model 2 adds the Control Group and the Impact-driven status group. Model 3 adds the industry fixed effects, and lastly, model 4 adds the vintage year fixed effects. Also, for this hypothesis and its dependent variables we checked if the residuals were normal distributed (Appendix IX).

4.2.3.1 Risk adjusted returns of ESG integration

The Excess returns are calculated by subtracting the risk-free rate from the Net IRR of the fund. The Excess returns serve as a metric to see how much more return the investment generated above and beyond the return of a proxy (PEROTTI & WAGENHOFER, 2014). This proxy is in our case the risk-free rate retrieved from Fama French's 3-factor model (2024), and the historical German government bond yields. The Sharpe ratio is calculated by dividing the Excess returns by the standard deviation of the Net IRRs of the data sample. According to the literature (Bagamery, 2001), we can conclude that these two measures are suitable to look at the risk-adjusted returns and to have a clearer view how much more return was generated for the extra risk taken. We are looking at the differences between our different classified groups. As mentioned in previous literature (Sourd, 2024), ESG incorporation could provide the benefit of generating higher risk-adjusted returns, as it reduces non-financial risks. According to our

results (Appendix VI), we can see that the theory is confirmed in the second (2 & 6) and third (3 & 7) models, where the Control Group has outperformed by the ESG status group. However, these models do not show any significance. Model 4 and 8, where we incorporate the Vintage year fixed effects, shows a significance of 5%. The coefficient of the models is higher for the control group than for the ESG status group in both cases, meaning that the theory of implementing ESG factors into the investment strategy can increase risk-adjusted returns is controverted.

4.2.3.2 Risk adjusted returns of Impact-driven strategies

As stated by Triodos investment management (2024) a lot of investors believe that impact investing comes with a trade-off between the return on impact and risk-adjusted returns. However, Jacob Gray (2015), counters this by showing significant results in the financial results, while balancing mission-driven goals.

Looking at our results (Appendix VI), we see that indeed, it could be the case that Impact-driven VC strategies perform better than only incorporating the ESG factors besides the focus on financial performance. Our models show significant positive results in models 2, 3, 6, and 7 on the metrics. All 4 with a significance level of 5%. However, in contrary with the Control Group, where models 4 and 8 became significant because of incorporating the Vintage year fixed effects, here we lose the significance.

Furthermore, we can see in the model that funds with a regional focus on Europe have strong significant negative influence on the dependent variables. And that the R-squared and F-values are increasing significantly as the models include more variables, suggesting that these models are better explaining the variation of the dependent variables (Gupta & Singh, 2024).

4.2.4 H3: Financial performance differences between Europe and North America

To have extra analysis on the differences between Europe and North America, we developed the last hypothesis, which evaluates the financial performance of the Net IRR (Appendix VII) and the MOIC (Appendix VIII) of the ESG status groups compared to the other classified groups. To analyse these differences in strategy and regional focus we employed the same framework as for the other hypotheses. Models 1 and 4 incorporate only the control variables. Models 2 and 5, we expand by incorporating the two groups we are measuring against our reference group. Models 3 and 7 incorporate the industry fixed effects. Our last models, model

4 and 8, incorporate the vintage year fixed effects. However, we made a difference in adding the separation in regional focus, by assessing the Net IRR and the MOIC separately per regional focus.

4.2.4.1 Net internal rate of return

The Cambridge Associates (2023) reported that the European VC industry surpassed the North American benchmark with an average ten-year Net IRR of 23.07%, and even a higher Net IRR for the 5-year period (31.44%). In our research we look if the European Impact-driven VC funds outperform their peers who do integrate ESG in their investment strategy.

Europe counts for 23% of all the impact investing AUM globally. The GIIN (2023) calculated a compounded annual growth rate of 33% over the past 5 years. 26% of this 23% was allocated to private equity investments, including VC. However, there is little literature found on the comparison if Europe or North America is better suited for Impact-driven investments strategies with higher performance. Therefore, we conducted analysis on the effects and comparisons to VC funds only integrating ESG factors.

Looking at our results (Appendix VII), we can see that in Europe, the Impact-driven status group outperforms its peers of the ESG status group. However, the second and third model are not significant. Again, like in the other hypotheses testing, when we incorporate Vintage year fixed effects, we have significancy in our model. However, the significancy is low, only 10%. The coefficient in model 4 is only significant in Europe, suggesting Impact-driven funds are associated with a higher performance. Additionally, the R-squared value for model 4 is also three times bigger as the previous model, indicating a better prediction of the model and the data. However, when we look at North America, we can see those results of the Impact-driven status group gain significance in model 3 but loses it again when incorporating Vintage year fixed effects.

Furthermore, when we look at the table, we can see that the Control Group outperforms its peers from the ESG status group in both Europe and North America. The fund size tends to have a high significant negative effect on fund performance in North America, suggesting that larger funds in North America are associated with lower Net IRRs.

4.2.4.1 The effects per continent on MOIC

Besides to the Net IRR, we also looked at the MOIC (Appendix VIII). To start with the results in Europe, we did not find any significant results, which were promising for our research. In North America, we found low significant results in the performance of the Impact-driven group in all the 3 models, when comparing against the ESG status group. Additionally, we found the same results of the fund size on the Net IRR are supported, as fund performance has negative influence on the MOIC as well in all 4 models.

4.3 Limitations and robustness tests

4.3.1 Limitations

The first limitation regards to the use of Preqin as a database. Even though Preqin collects performance data through voluntarily submitted data from over 2,200 fund managers worldwide, FOIA filings, public filings and industry-recognised news sources (Preqin, 2024), the dataset may not completely represent the vast landscape of the VC industry due to possible selection bias and limitations in data completeness. For instance, due to the limitations of the subscription to access all the data, it was not possible to access the ESG data on the VC funds. Because of it was not possible to access ESG and impact investing data through a renowned database, we had to classify our funds by hand, which caused our second limitation. Funds were classified by hand according to databases of members from certain organisations. To classify the funds only in three categories, we might not capture the nuanced spectrum within these categories of VC investment strategies. Assessing all the funds manually might have captured some human errors in the process. Another problem with classifying these funds manually is the fact that we are never hundred per cent sure the frameworks of the organisations are completely reliable. It could be possible that it is used for greenwashing (Cote, 2022) by signing to one of these organisations. In this way it is possible we did not fully capture the depth or the effectiveness of the strategies. As fourth, while we make a difference between Europe and North America, we do not capture the global performance of VC funds, as this would also contain too much data and differences in markets to analyse for the research. However, this could have limited our research to different insights from other markets and other performances the different VC markets are highly influenced by market dynamics, cultural nuances, and regulatory frameworks. Operating in an emerging market is different than operating in well-developed market such as the European of the North American market. Furthermore, we adjusted the returns for risk with a risk-free rate, using this as the risk-adjusted returns.

However, only using risk-free rate of government bond yields does not capture all the risks that might occur during the investment process. Especially in the ESG and the impact investing approaches, the funds deal with different risks than the funds using a traditional approach. Lastly, we only used quantitative research. In cases such as ESG or impact investing, it could benefit of framework building from qualitative research which could give insights from key players in the industry who experience challenges and different risks first hand.

4.3.2 Robustness tests

In quantitative research a robustness test is used to verify and validate the results of the research to check if the results are consistent and reliable (Kariya & Sinha, 1989). As our results showed a significance change when incorporating vintage year fixed effects, we will test our statistical models by a robustness test in the form of changing the period of the data sample. As we already explained in the section "Criteria for the data sample", we added the funds between the years 1995 and 1999 to the year 199 to have a better statistical distribution. However, according to our results, we see that the vintage year fixed effects have a big effect on our results. The UNPRI was initiated in 2005 (PRI, 2024), meaning the funds with vintage years before 2005 and an ESG status do not give a proper indication for our results (Appendix X). However, as we did not expect this effect on our results according to the existing literature, we did not control for it in the first place. To check if our results will change when we adjust the period for this effect, we change our period to 2005-2021. In this case, we can see the results of vintage years on the performance for a period where we hold all the effects the same. For the robustness check, we will look at hypothesis 1 and 2, therefore, we will run the regressions on Net IRR, MOIC, Excess returns, and Sharpe ratio again with dropping the funds before 2005 (Appendix XI, XII). As we did not expect the Vintage year fixed effects had such major impact on our results, we did not incorporate this topic in our literature review, therefore we conducted subsequent literature research. When looking for academic research papers on vintage years effects on VC fund performance, we discover that there is little literature on this topic. Most of the literature is focused on factors influencing fund performance of VC. However, also this topic, has little literature. According to In Mo Yeo et al. (2024), several factors are important to consider when looking at the vintage year effects on fund performance. The fact that fund performance differs according to the year of formation highlights how important it is to take both internal and external aspects into account in addition to the vintage year when investing in VC funds in order to build a well-rounded investment portfolio (In Mo Yeo, 2024). This is important due to

macroeconomic and industry changes in that specific year, as these can have big effects on the fund performance (Choi & Kim, 2020).

When looking at our results of the robustness test for first hypothesis (Appendix XI), we see similar effects. However, notably, we can see stronger effects of the independent variables on the dependent variables. We can see three things, which confirms this observation. First, the coefficients for the Control Group and the Impact-driven status group are higher in comparison to the results of the first regression. Secondly, the significance levels change among the models as well. Where the significance in the first regression results were only 10% or 5%, they are in the robustness test results 5%, or 1% for both the Control Group and the Impact-driven status group. Lastly, the R-squared values are higher than in the previous results, resulting a model that fits the data better than when we used the longer period.

When we look at the results of the robustness test for the second hypothesis (Appendix XII), we look at the same regression model on the Excess returns and the Sharpe ratio. Here we see some significant differences well. First, the coefficients are lower, which means that the effects are smaller. However, the second thing we see, is that the Control Group outperforms the ESG status group in all the models. Although, models 2, 3, 6, and 7 are not significant, the Control Group gains significance in model 4 and 8 to a 1% significance level. The Impact-driven status group gains significance in model 4 and 8, resulting in a more reliable model than the previous regression models. Lastly, the R-squared values are lower in this model, indicating that the model explains less of the variance in the dependent variable. However, in combination with the higher significance levels, we can say that this model correctly adjusts for the period and gives better results.

5 Conclusions

5.1 Discussion

This study offers an empirical analysis of the financial performance of VC funds, with emphasizing the contrast between impact-driven, traditional, and ESG investment strategies. Using a dataset of 1,903 funds retrieved from Preqin, classified in three groups: Control Group, ESG status group, Impact-driven status group, this research undertakes a detailed examination to determine the relative financial benefit of these different investment approaches. We try to answer the research question: “How do VC funds with explicit ESG and Impact-driven strategies perform financially in comparison to traditional VC funds?”**.** Additionally, we looked

at the differences of effects of our independent variables on our dependent variables in Europe and North America separately.

Given the limited literature on performance differences between ESG investing and Impact investing investment strategies, our studies contribute to this field of research. Current literature finds different outcomes on the difference of performance of incorporating ESG factors into the investment strategies. Incorporating ESG factors into investment strategies has become common, leading many investors to sign the UNPRI as a commitment to world change (2024). Research finds that the relationship between being part of the UNPRI and private equity returns is positively correlated (2012). Additionally, it can reduce non-financial risk, such as reputation and regulatory risks (2024). However, today, signing the UNPRI is often used as a form of green washing, resulting in not fully incorporating the ESG principles into the investment strategy (2018). In contrast, impact investing targets businesses, institutions, and funds aiming to achieve both financial returns and social and environmental benefits (2024). Even though lots of investors think there is a trade-off between making an impact and risk-adjusted returns (2024), the few studies on the correlation between financial performance and impact investing show that it is possible in private equity to balance mission-driven goals and competitive financial returns (2015).

However, our research had some limitations, including a manual classification process due to limited access to ESG data. This situation might have influenced the comprehensiveness of our dataset, despite our best efforts to ensure accuracy and completeness. Additionally, there remains some uncertainty regarding the complete reliability of the organizational frameworks, which we navigated as carefully as possible.Another limitation is the geographical coverage of only Europe and North America, as it could be possible, we missed effects of different markets. Furthermore, we calculated risk-adjusted returns using the risk-free rate, without incorporating other types of risks into our assessment. Lastly, because our research focuses solely on quantitative analysis, we may miss insights that qualitative research, such as stakeholder interviews, could provide.

5.1.1 The performance of different strategies

In contrary to the existing literature on the positive correlation between UNPRI signatories and private equity fund performance (Emanuele Teti, 2012), our results show different results. In all the regressions we ran on our dependent variables, we can see that the ESG status group is outperformed by the Control Group and the Impact-driven status group. As one of our limitations is the fact that we are not sure if the organizational frameworks are reliable, it could

be possible that many funds which signed up the UNPRI, are using this as a form of green washing (Cappucci, 2018).

For the Control Group, we have some mixed results, however, in most of the models, the Control Group outperforms the ESG status group. For the Excess returns and the Sharpe ratio, we can see that the Control Group is outperformed by the ESG status group in the first two models of the regressions. However, these coefficients are not significant. When using the robustness test, we can see that these coefficients change to different results. The Control Group outperforms the ESG status group. Therefore, we can say that these models are not reliable, and we will only look at the results of the full models. In both regressions for the original model and the robustness test, models 4 and 8 are both significant with 1% and outperform the ESG status group.

The results show that the Impact-driven status group outperforms the ESG status group significantly in most of the models on every dependent variable. Only in the models where we incorporate vintage year fixed effects, we lose our significancy.

On contrary, when using the robustness test, where we shorten the period with 6 years, we exclude the funds that have a vintage year before 2005, as in 2005 the UNPRI was founded. In these regressions, our models and results are even stronger in which the Impact-driven status group does not lose significance when we adjust for the vintage year fixed effects. For every dependent variable the Impact-driven status groups significantly outperforms the ESG status group.

5.1.2 Vintage year fixed effects

Resulting from our first 2 hypotheses we can see a big effect from the Vintage year fixed effects. Although the results for our hypotheses are not all significant, this effect has significant effect on our results. R-squared values increasing more than 10 times, or coefficients changing from significant to non-significant, indicating that these effects need further investigation. As In Mo Yeo et al. (2024) explain in their research on factors effecting fund performance, it is important to take both internal and external aspects into account in addition to the vintage year to have a well-rounded investment portfolio. Additionally, macroeconomic and industry changes can have a significant impact on the fund performance (2020).

Statistically we can see and say, that our models expand in predictors when incorporating Industry fixed effects (14 predictors) and Vintage year fixed effects (36 predictors). This could explain the increase in the R-squared values. Furthermore, our residuals distributions

(Appendix IX) are normal distributed, which indicates the appropriate fit of the model for the data, constant variance of the errors across all levels, and the predictive accuracy (2013). Additionally, we ran our own analyses on the means of the dependent variables over time (Appendix XIII). We can see that the means of the dependent variables steadily grow with time with a small decrease during the 2008 crisis, and a big decrease during the COVID-19 crisis in 2021. However, the MOIC shows more extreme fluctuations in these periods, especially the fact that the value decreases from 2016 on until 2021. Additionally, we looked at the predictive margins over time for all the dependent variable metrics (Appendix XIV). We can see a similar result in the four metrics. From 2008 on the metrics increased exponentially, with small fluctuations and a decrease again in last years. Here we see in excess returns and Net IRR a decline from 2016 as well, with bigger error bars. This could be explained by the decline in economic growth of 2016 (European Union, 2016) (Reuters, 2019).

5.2 Final Conclusions

As we did not find any significance in our research about the differences between Europe and North America, our conclusions will only focus on the findings found in the first two hypotheses on the performance and the risk-adjusted returns of the different VC strategies.

5.2.1 Managerial implications

Based on the extensive examination of the financial performance of the different VC fund investment strategies, this research offers some crucial insights with the importance to managerial implications, especially for fund managers navigating the changing terrain of impact driven and ESG investment strategies. Even though studies from researchers such as Friedea et al. (2015), and E. Teti et al. (2012), show significant positive correlations between the incorporation of ESG into the investment strategy and financial performance, our results are showing different outcomes. As Cappucci confirms (2018), most of the fund managers do not fully incorporate the ESG factors into their investment strategy. On contrary, impact investing deliberately select and manage investments that have measurable effects, placing more emphasis on the environmental and social issues (Hornberger, 2023). The empirical data from the 1903 funds in our data sets illustrates a complex picture of the effectiveness of incorporating impact driven goals and environmental sustainability concerns into the VC investment frameworks. As the ESG status group is outperformed by the Control Group and the Impact-driven status group, we can conclude that it is better to incorporate Impact investing practices into the investment strategy or keep to the traditional VC approach. Using the

approach of making an impact alongside financial returns has better outcomes than only being part of the UNPRI. Additionally, we can say that doubts abouts the reliability of the UNPRI framework is supported by our outcomes, as the ESG in this case does not correlate with higher financial performance. It may be used as a form of green washing by most of the members who signed the UNPRI (Cote, 2022).

Additionally, to the outcomes on financial performance and the advice on incorporating impact investing rather than ESG investing into the investment strategy, we also found that it is important for fund managers to consider the vintage year of the fund. From our results, it is shown that the Vintage year fixed effects have a big effect on our results on the fund performance. It is important for the fund manager to take macroeconomic and industry events into consideration when constructing the investments strategy (2020).

5.3 Future research

Future research can go in several directions. First, future studies could gather a larger and more comprehensive data set. As we look at the limitations, this could be executed with three important pillars. First, future research could gather data on cash flows, instead of data on a single point in time. Second, additional information on the ESG status group and Impact-driven status group is required generally. For example, with more comprehensive research on the dedication of the funds towards the different strategies, we could see the differences between these different approaches, instead of generalizing the whole classified group. Additionally, to have a better understanding of the relationships towards the different dedication levels towards the specific strategy, through qualitative research it could be possible to have a more comprehensive elaboration of the frameworks. Likewise in the study of Gompers et al. (2020), it could be possible to look at the different factors that the fund managers use when they make decisions.

As we assessed the performance of the different VC strategies, with limited incorporating the risk, future research could develop a framework for the specific risks measured in the different strategies. According to this framework, it could be quantified with risk metrics to get a better understanding. Traditional VC has different risk metrics than ESG or impact-driven VC strategies. Incorporating metrics such as social and environmental returns (2013) could give a more comprehensive view of the financial returns in these investments. As it is hard to quantify these metrics, development in frameworks and quantification has to be more extensive.

Bibliography

Kedrosky, P. (2009). RIGHT-SIZING THE U.S. VENTURE CAPITAL INDUSTRY. *Ewing Marion Kauffman Foundation*.

Kaplan, S. N. (2010). it Ain't Broke: The past, present, and Future of Venture Capital. *Journal of APPLIED CORPORATE FINANCE*, 36.

Hege, U., Palomino, F., & Schwienbacher, A. (2009). Venture Capital Performance: The Disparity Between Europe and the United States*. *Association Française de Finance*, 7-50.

Statista. (2019). *Venture capital Europe.* Statista.

Invest Europe. (2022). *The Performance of European Private Equity Benchmark Report 2021.* Bruxelle: Invest Europe.

Invest Europe & Cambridge Associates. (2023). *The Performance of European Private Equity Benchmark Report 2022.* Invest Europe & Cambridge Associates.

Cote, C. (2022, August 4). *IMPACT WASHING: WHAT IT IS & HOW TO STOP IT*. Retrieved from Havard Business School: https://online.hbs.edu/blog/post/what-is-impact-washing

PRI. (2024). *About Us*. Retrieved from Principles for Responsbile Investment: https://www.unpri.org/about-us/what-are-the-principles-for-responsible-investment

Robert G. Eccles, P., & Kastrapeli, M. D. (2017). *The Investing Enlightment.* Boston: State Street.

Friedea, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, Vol. 5, No. 4, 210–233.

Emanuele Teti, A. D. (2012). UN PRI and private equity returns. Empirical evidence from the US market. *Investment Management and Financial Innovations, Volume 9*.

Kenney, M. (2001). Venture Capital. In M. Kenney, *International Encyclopedia of the Social & Behavioral Sciences* (pp. Pages 16158-16161). Elsevier.

Vinturella, J. B., & Erickson, S. M. (2013). Venture Capital. In J. B. Vinturella, & S. M. Erickson, *Raising Entrepreneurial Capital* (pp. pages 175-209). Elsevier.

Zider, B. (1998, November). *How Venture Capital Works.* Retrieved from Harvard Business Review: https://hbr.org/1998/11/how-venture-capital-works

Fernandes, A. (2023, November 8). *Global Venture Capital Outlook: The Latest Trends*. Retrieved from Bain & Company: https://www.bain.com/insights/global-venture-capital-outlook-latest-trends-snap-chart/

Gompers, P. A. (1995). Optimal Investment, Monitoring, and the Staging of Venture Capital. *The Journal Of Finance*, 1461-1489.

Tian, X. (2011). The causes and consequences of venture capital stage financing. *Journal of Financial Economics* , 132-159.

Witt, P., & Brachtendorf, G. (2006). Staged financing of start-ups. *Financial Markets and Portfolio Management*, Vol. 20, No. 2.

Cappucci, M. (2018). The ESG Integration Paradox. *Journal of Applied Corporate Finance*, 22.

Trelstad, B. (2016). Impact Investing: A Brief History. *Capitalism and Society*, Volume 11, Issue 2, Article 4.

Global Impact Investing Network. (2024). *What is impact investing?* Retrieved from Global Impact Investing Network: https://thegiin.org/impact-investing/need-to-know/#what-is-impact-investing

Carè, R., & Wendt, K. (2018). Investing with Impact: An Integrated Analysis Between Academics and Practitionersv. In M. L. TORRE, & M. CALDERINI, *Social Impact Investing Beyond the SIB* (p. 6). Cham, Switzerland: Palgrave Macmillan.

Hornberger, K. (2023). Scaling Impact. In K. Hornberger, *Scaling Impact.* Palgrave Macmillan.

Global Impact Investing Network. (2024). *About*. Retrieved from Global Impact Investing Network: https://thegiin.org/about/

ImpactAssets. (2023). *IMPACTASSETS 50™*. Retrieved from ImpactAssets: https://impactassets.org/ia50/?filters=

Triodos investment management. (2024). *Impact investing: choosing between impact and financial return?* Retrieved from Triodos investment management: https://www.triodos-im.com/knowledge-centre/choosing-between-impact-and-financial-return

Townsend, B. (2020). From SRI to ESG: The Origins of Socially Responsible and Sustainable Investing. *The journal of impact & ESG investing*, Volume 1, issue 1.

HARRIS, R. S., JENKINSON, T., & KAPLAN, S. N. (2014). Private Equity Performance: What Do We Know? *The Journal of Finance*.

Wharton Research Data Services. (2019, September 29). *WRDS Adds Preqin Data, Covering Alternative Asset Markets*. Retrieved from Wharton University: https://wrds-www.wharton.upenn.edu/pages/news/preqin-data-covering-alternative-asset-markets/

Agudelo, M. A., Jóhannsdóttir, L., & Davídsdóttir, B. (2019). A literature review of the history and evolution of corporate social responsibility. *International Journal of Corporate Social Responsibility* , volume 4, Article number: 1.

Phalippou, L., & Gottschalg, O. (2003). The Performance of Private Equity Funds. *Review of Financial Studies*, 1747-1776.

Preqin. (2024). *Preqin Glossary.* Preqin. Retrieved from Preqin.

RAMSINGHANI, M. (2021). *THE BUSINESS OF VENTURE CAPITAL.* Canada: Wiley.

B Corp. (2024). *ABOUT B CORP CERTIFICATION*. Retrieved from B Corp: https://www.bcorporation.net/en-us/certification/

Robinson, D. T., & Sensoy, B. A. (2013). Do Private Equity Fund Managers Earn Their Fees? Compensation, Ownership, and Cash Flow Performance . *The Review of Financial Studies, Vol. 26, No. 11*, pp. 2760-2797 (38 pages).

Ferson, W., & Wang, J. L. (2021). A Panel Regression Approach to Holdings- Based Fund Performance Measures. *The review of asset pricing studies*, v 11 n 4.

Fama, & French. (2024). *U.S. Research Returns Data (Downloadable Files)*. Retrieved from Darthmouth: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Lazo-Paz, R., Iquiapaza, R. A., & Bressan, A. A. (2017). Influence of Investors' Monitoring on Equity Mutual Funds' Performance. *Revista de Gestão, Finanças e Contabilidade*, v. 7, n. 2, 79-101.

Alabi, O. O., Ayinde, K., Babalola, O. E., Bello, H. A., & Okon, E. C. (2020). Effects of Multicollinearity on Type I Error of Some Methods of Detecting Heteroscedasticity in Linear Regression Model. *Open Journal of Statistics*, 10, 664-677.

Shrestha, N. (2020). Detecting Multicollinearity in Regression Analysis. *American Journal of Applied Mathematics and Statistics*, Vol. 8, No. 2, 39-42.

Alin, A. (2010). Multicollinearity. *WIREs Comp Stat* , 370-374.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* New York: Lawrence Erlbaum Associates, Publishers.

Portland State University. (2023). *Nested Models, Model Modifications, and Correlated Errors.* Retrieved from Portland State University: https://web.pdx.edu/~newsomj/semclass/ho_nested.pdf

Gompers, P. A., Gornall, W., Kaplan, S. N., & Strebulaev, I. A. (2020). How do venture capitalists make decisions? *Journal of Financial Economics*, 169–190.

Gompers, P., & Lerner, J. (2001). The Venture Capital Revolution. *Journal of Economic Perspectives*, 145-168.

Luo, R., Zhao, B., Han, C., & Wang, S. (2023). Does venture capital improve corporate social responsibility performance? *International Review of Economics and Finance*, 1138–1150.

Holtslag, M., Chevrollier, N., & Nijhof, A. (2021). Impact investing and sustainable market transformations: The role of venture capital funds. *Wiley Business ethics, the environment and responsiblity*, 522–537.

RF Osemeke, J. I. (2024). DETECTION AND CORRECTION OF VIOLATIONS OF LINEAR MODEL ASSUMPTIONS BY MEANS OF RESIDUALS. *Journal of Science and Technology Research*.

Scognamiglio, E., Rizzello, A., & Chiappini, H. (2018). Social Risk and Financial Returns: Evidences from Social Impact Bonds . In M. L. TORRE, & M. CALDERINI, *Social Impact Investing Beyond the SIB* (p. 47). Rome, Italy: Palgrave Macmillan.

Jacob Gray, e. a. (2015). Gr e a t E x p e c t a t i o n s: Mission Preservation and Financial Performance in Impact Investing . *Wharton University of Pennsylvania Social impact initiative*.

Global impact investing network. (2023). *GIINSIGHT IMPACT INVESTING ALLOCATIONS, ACTIVITY & PERFORMANCE.* Global impact investing network.

Sourd, V. L. (2024). *DOES ESG INVESTING IMPROVE RISK-ADJUSTED PERFORMANCE?* Retrieved from EDHEC-Risk Climate Impact Institute : https://climateimpact.edhec.edu/does-esg-investing-improve-risk-adjusted-performance

PEROTTI, P., & WAGENHOFER, A. (2014). Earnings Quality Measures and Excess Returns. *Journal of Business Finance & Accounting*, 545-571.

Bagamery, B. D. (2001). Ranking Differences Among the Sharpe Ratio and Related Total Portfolio Risk Adjusted Performance Measures. *JOURNAL OF BUSINESS AND BEHAVIORAL SCIENCES*, 10.

Gupta, R. K., & Singh, R. C. (2024). Optimizing high-speed rotating shaft vibration control: Experimental investigation of squeeze film dampers and a comparative analysis using Artificial Neural Networks (ANN) and Response Surface Methodology (RSM). *Expert Systems with Applications*.

In Mo Yeo, e. a. (2024). A Study on the Factors Influencing the Performance of Korea Venture Capital Funds. *Big Data and Data Science Engineering*, 93-106.

Choi, H., & Kim, Y. (2020). An Empirical Study on Performance Determinants of Korean Venture Funds. *korean management review*, 279-303.

European Union. (2016). *Spring 2016 Economic Forecast*. Retrieved from European Union: https://economy-finance.ec.europa.eu/economic-forecast-and-surveys/economic-forecasts/spring-2016-economic-forecast_en

Reuters. (2019, December 18). *Much of 'Trump country' was in recession during 2016 campaign - data*. Retrieved from Reuters: https://www.reuters.com/article/idUSKBN1YM0HL/#:~:text=For%20the%20U.S.%20economy%20as,however%2C%20was%20not%20equally%20spread.

Preqin. (2024). *Private Capital Performance Data Guide.* Preqin.

The Global Impact Investing Network. (2022). *SIZING THE IMPACT INVESTING MARKET.* The Global Impact Investing Network.

Kariya, T., & Sinha, B. K. (1989). *Robustness of statistical tests.* Boston: Academic Press, Inc.

Henn, J., & ̈nleber, A. S. (2013). More about residual values. *Foundations of Crystallography*, 549-558.

Reeder, N., & Colantonio, A. (2013). Measuring Impact and Non-financial Returns in Impact Investing: A Critical Overview of Concepts and Practice. *European Investment Bank Institute*.

Giraitis, L., Li, Y., & Phillips, P. C. (2024). Robust inference on correlation under general heterogeneity Author links open overlay panel. *Journal of Econometrics*.

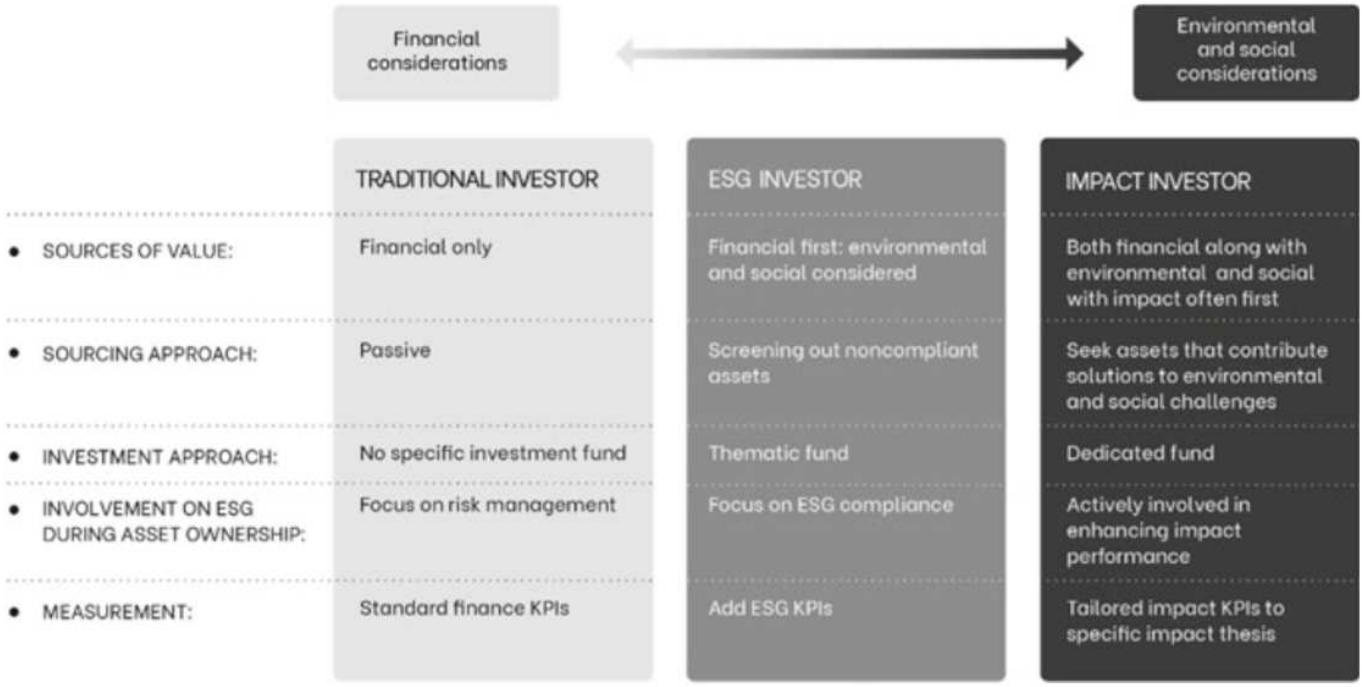
Appendix

Appendix I – Picture I - Comparison of actions taken during the investment stage

This picture represents a table constructed by Kusisami Hornberger. Hornberger divides the investment process into 4 categories: origination, deployment, management, and the exit. It shows the differences between ESG investing and Impact investing. (Hornberger, 2023)

Appendix II – Picture II – Different investment models to achieve ESG goals

This picture represents a table constructed by Kusisami Hornberger. It shows the differences between the traditional investor, ESG investor, and the Impact investor. Impact investment strategies deliberately select and manage investments that have measurable effects, placing more emphasis on environmental and social considerations (Hornberger, 2023)



Appendix III – Table I – Overview used variables

This table shows all the variables used for the research, the description of the variable, where the data is retrieved from, and how the variable is measured. The varaibles are ordered according to the use, dependent, independent, fixed effects, and control.

Type	Variable	Name	Description	Data Source	Measurement
Dependent	Net Internal Rate of Return	Net IRR	The net IRR earned by a fund manager to date, after fees and carry. Based upon realized cash flows, the valuation of the remaining interest in the partnership, and the valuation of unrealized assets.	Preqin	Directly retrieved from Preqin (%)
	Multiple on Invested Capital	MOIC	The ratio between the total value that the fund manager has derived from its interest in the partnership, and its total cash investment in the partnership, expressed as a multiple.	Preqin	Directly retrieved from Preqin
	Excess Returns	Excess Returns	Net Irr - cum risk-free rate	Calculated from Net IRR	Percentage
	Sharpe Ratio	Sharpe Ratio	Excess return / stdev portfolio	Calculated from Excess returns	Percentage
Independent	Control Group	Control Group	All the funds classified in the control group do not hold an ESG or Impact-driven status		Dummy(0 = part of the other groups, 1 = part of the control group)
	ESG status	-	All the with an ESG status signed the UNPRI. Taken as reference group to compare control and ID-status group at the same time (therefore not variable name)	UNPRI	Dummy (0 = NO, No ESG status, 1 = YES, ESG status)
	Impact-driven status	Impact driven status	All the fund with an Impact-driven status are part of one of the three organisations GIIN, IA50, or B-Corp	GIIN, IA50, B-Corp	Dummy (0 = NO, No Impact-driven status, 1 = YES, Impact-driven status)
Fixed Effects	Vintage year	Vintage FE	Defined as the first year of investment/drawdown from the investor.	Preqin	Directly retrieved from Preqin (integer)
	Industry	Industry FE	Industries are categorized in 6 groups: Technology and information services, Healthcare pharmaceuticals, Finance and insurance, Consumer good and retail, Energy and utilities, and others.	Preqin	Dummy (0 = NO, does not invest in industry, 1 = YES, does invest in industry)
Control	Fund size	Fund size	Final close size of the fund	Preqin	Directly retrieved from Preqin (integer)
	Geography	Europe	Funds are located in Europe or North America, to have a reference, we look at the effects of Europe.	Preqin	Directly retrieved from Preqin, Dummy (1 = Located in Europe, 0 = Located in North America)

Investment stage focus	General Early stage	Invests in both early stage phases	Preqin	Dummy (0 = does not invest in stage, 1 = does invest in stage)
	Early-stage start-up	Invests in ventures looking for start-up capital (i.e., first time professional investment)	Preqin	Dummy (0 = does not invest in stage, 1 = does invest in stage)
	Early stage seed	Invests in ventures looking for seed capital (i.e., first round of financing of the venture)	Preqin	Dummy (0 = does not invest in stage, 1 = does invest in stage)
	Expansion late stage	Invests in ventures who want to expand their business	Preqin	Dummy (0 = does not invest in stage, 1 = does invest in stage)
	Venture general	Invests in all stages	Preqin	Dummy (0 = does not invest in stage, 1 = does invest in stage)

Appendix IV – Table II – Pairwise Correlations

This table shows the pairwise correlations between the variables. We see that the dependent variables have a strong correlation with each other. For the Excess returns and the Sharpe ratio, this is due to the fact that these values are calculated starting from the Net IRR. As well we can see that the ESG status group has a negative effect on all the dependent variables, with significancy on the Excess returns and the Sharpe ratio.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Net IRR	1.00												
(2) MOIC	0.77***	1.00											
(3) Excess returns	0.79***	0.62***	1.00										
(4) Sharpe ratio	0.75***	0.61***	0.99***	1.00									
(5) Control group	0.03	0.00	-0.01	0.00	1.00								
(6) ESG status	-0.06**	-0.03	-0.04*	-0.04*	-0.83***	1.00							
(7) Impact-driven status	0.04*	0.04*	0.07***	0.07***	-0.52***	-0.04*	1.00						
(8) Fund size	-0.08***	-0.09***	0.01	0.02	0.14***	-0.06***	-0.15***	1.00					
(9) Europe	-0.05**	-0.02	-0.12***	-0.13***	-0.32***	0.36***	0.03	-0.14***	1.00				
(10) Early-stage start-up	-0.02	0.00	0.04*	0.04*	-0.06**	0.00	0.10***	-0.12***	0.07***	1.00			
(11) Early-stage seed	-0.02	0.02	0.06**	0.06**	-0.02	0.05**	-0.04*	-0.19***	0.04*	-0.06***	1.00		
(12) Expansion late stage	0.00	0.01	0.04*	0.05**	0.02	0.00	-0.04*	0.12***	-0.05**	-0.07***	-0.08***	1.00	
(13) Venture general	0.00	-0.07***	-0.14***	-0.15***	-0.06**	0.05**	0.02	0.13***	0.00	-0.22***	-0.26***	-0.31***	1.00

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix V – Table III – Regression results models Net IRR, MOIC

This table shows the results of the regression ran on the first two metrics for hypothesis 1.1 and 1.2, Net IRR and MOIC. We took the ESG status group as the reference group as we compare this group with the control group and the impact-driven status group. The models are nested in each other. The first model contains only the control variables. Model two adds the two other groups for the comparison. Model 3 includes industry fixed effects, and model 4, the complete model adds vintage year fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	NET IRR				MOIC			
Control Group		0.0377**	0.0392**	0.0542***		0.0627	0.0586	0.125**
		(0.0157)	(0.0155)	(0.0154)		(0.0594)	(0.0599)	(0.0586)
Impact-driven status		0.0726**	0.0805**	0.0613*		0.196*	0.215**	0.206**
		(0.0366)	(0.0363)	(0.0347)		(0.101)	(0.100)	(0.0910)
Fund size	-0.0149***	-0.0144***	-0.0143***	-0.00782**	-0.0477***	-0.0454***	-0.0458***	-0.0227*
	(0.00348)	(0.00344)	(0.00344)	(0.00348)	(0.0116)	(0.0118)	(0.0117)	(0.0118)
Europe	-0.0339***	-0.0255**	-0.0263**	-0.0218*	-0.0632	-0.0493	-0.0513	-0.0633
	(0.0114)	(0.0125)	(0.0126)	(0.0118)	(0.0400)	(0.0436)	(0.0434)	(0.0404)
Early-stage start-up	-0.0252	-0.0273	-0.0346*	-0.0283*	-0.0827	-0.0912	-0.123*	-0.0813
	(0.0178)	(0.0177)	(0.0179)	(0.0163)	(0.0727)	(0.0721)	(0.0724)	(0.0670)
Early-stage seed	-0.0293	-0.0257	-0.0273	-0.0245	-0.0613	-0.0528	-0.0575	-0.0644
	(0.0180)	(0.0180)	(0.0179)	(0.0167)	(0.0714)	(0.0713)	(0.0709)	(0.0658)
Expansion late stage	0.000156	0.00189	-0.000569	0.000907	-0.0216	-0.0186	-0.0262	-0.0186
	(0.0143)	(0.0143)	(0.0143)	(0.0130)	(0.0500)	(0.0500)	(0.0501)	(0.0472)
Venture general	0.000217	0.00124	0.00509	0.00992	-0.105***	-0.104***	-0.0876**	-0.0558
	(0.0111)	(0.0112)	(0.0113)	(0.0106)	(0.0389)	(0.0391)	(0.0395)	(0.0372)
Constant	0.195***	0.154***	0.128***	0.139***	0.676***	0.600***	0.517***	0.343***
	(0.0187)	(0.0238)	(0.0278)	(0.0315)	(0.0630)	(0.0829)	(0.0945)	(0.103)
Observations	1,903	1,903	1,903	1,903	1,903	1,903	1,903	1,903
R^2	0.012	0.015	0.025	0.140	0.014	0.016	0.028	0.144
F-value	4.048	4.142	4.377	15.97	5.072	4.335	4.892	15.08
Industry FE	NO	NO	YES	YES	NO	NO	YES	YES
Vintage year FE	NO	NO	NO	YES	NO	NO	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix VI – Table IV – Regression results models Excess returns, Sharpe ratio

This table shows the results of the regression ran on the third and fourth metrics for hypothesis 2.1 and 2.2, Excess returns and Sharpe ratio. We took the ESG status group as the reference group as we compare this group with the control group and the impact-driven status group. The models are nested in each other. The first model contains only the control variables. Model two adds the two other groups for the comparison. Model 3 includes industry fixed effects, and model 4, the complete model adds vintage year fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Excess returns				Sharpe ratio			
Control Group		-0.0137	-0.00624	0.0326**		-0.0216	-0.0108	0.0492**
		(0.0187)	(0.0184)	(0.0126)		(0.0314)	(0.0305)	(0.0215)
Impact-driven status		0.0770**	0.0833**	0.0328		0.113**	0.121**	0.0441
		(0.0339)	(0.0339)	(0.0254)		(0.0523)	(0.0518)	(0.0378)
Fund size	0.00234	0.00402	0.00373	0.000310	0.00591	0.00841*	0.00784*	0.00184
	(0.00306)	(0.00303)	(0.00302)	(0.00240)	(0.00462)	(0.00462)	(0.00457)	(0.00352)
Europe	-0.0539***	-0.0569***	-0.0581***	-0.0656***	-0.0886***	-0.0935***	-0.0950***	-0.108***
	(0.0116)	(0.0130)	(0.0129)	(0.00906)	(0.0182)	(0.0204)	(0.0202)	(0.0141)
Early-stage start-up	0.0164	0.0105	0.00540	-0.0168*	0.0283	0.0195	0.0119	-0.0238
	(0.0153)	(0.0150)	(0.0150)	(0.00995)	(0.0233)	(0.0228)	(0.0228)	(0.0148)
Early-stage seed	0.0230	0.0254*	0.0265*	-0.0108	0.0384*	0.0418*	0.0438**	-0.0158
	(0.0141)	(0.0142)	(0.0141)	(0.0100)	(0.0213)	(0.0215)	(0.0213)	(0.0150)
Expansion late stage	-0.00171	-0.00218	-0.00503	-0.00541	-0.00153	-0.00229	-0.00654	-0.00719
	(0.0116)	(0.0116)	(0.0115)	(0.00836)	(0.0175)	(0.0175)	(0.0173)	(0.0125)
Venture general	-0.0449***	-0.0469***	-0.0430***	-0.000589	-0.0737***	-0.0767***	-0.0709***	-0.00386
	(0.00932)	(0.00929)	(0.00939)	(0.00720)	(0.0140)	(0.0139)	(0.0141)	(0.0104)
Constant	0.676***	0.680***	0.670***	0.491***	1.342***	1.350***	1.337***	1.048***
	(0.0161)	(0.0248)	(0.0266)	(0.0243)	(0.0241)	(0.0399)	(0.0419)	(0.0377)
Observations	1,903	1,903	1,903	1,903	1,903	1,903	1,903	1,903
R^2	0.035	0.041	0.049	0.415	0.042	0.048	0.056	0.444
F-value	10.34	9.400	7.365	76.80	11.45	10.35	7.934	72.91
Industry FE	NO	NO	YES	YES	NO	NO	YES	YES
Vintage year FE	NO	NO	NO	YES	NO	NO	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix VII – Table V – Regression results models Net IRR, differences Europe, North America

This table shows the results of the regression ran on the Net IRR for hypothesis 3, looking at the differences between Europe and North America. We took the ESG status group as the reference group as we compare this group with the control group and the impact-driven status group. The models are nested in each other. The first model contains only the control variables. Model two adds the two other groups for the comparison. Model 3 includes industry fixed effects, and model 4, the complete model adds vintage year fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Europe				North America			
Control Group		0.0244	0.0219	0.0363*		0.0462	0.0452	0.0779***
		(0.0187)	(0.0197)	(0.0206)		(0.0293)	(0.0278)	(0.0284)
Impact-driven status		0.0682	0.0617	0.0696*		0.0803	0.0851*	0.0773
		(0.0479)	(0.0411)	(0.0373)		(0.0514)	(0.0502)	(0.0498)
Fund size	-0.00296	-0.00332	-0.00813	-0.00800	-0.0171***	-0.0165***	-0.0160***	-0.00860**
	(0.00826)	(0.00826)	(0.00804)	(0.00763)	(0.00383)	(0.00378)	(0.00379)	(0.00387)
Early-stage start-up	-0.0530	-0.0571*	-0.0617*	-0.0549*	-0.0228	-0.0243	-0.0327	-0.0200
	(0.0359)	(0.0342)	(0.0345)	(0.0323)	(0.0207)	(0.0208)	(0.0210)	(0.0191)
Early-stage seed	-0.0831**	-0.0775**	-0.0917***	-0.0869***	-0.0159	-0.0139	-0.0154	-0.0123
	(0.0321)	(0.0326)	(0.0321)	(0.0297)	(0.0213)	(0.0213)	(0.0211)	(0.0198)
Expansion late stage	-0.0739**	-0.0674*	-0.0687*	-0.0508	0.0139	0.0144	0.0138	0.0110
	(0.0366)	(0.0361)	(0.0386)	(0.0381)	(0.0155)	(0.0155)	(0.0155)	(0.0142)
Venture general	-0.0622***	-0.0617***	-0.0630***	-0.0314	0.0142	0.0151	0.0181	0.0168
	(0.0228)	(0.0238)	(0.0232)	(0.0225)	(0.0126)	(0.0127)	(0.0127)	(0.0120)
Constant	0.152***	0.133***	0.125**	0.0677	0.197***	0.147***	0.121***	0.126***
	(0.0383)	(0.0407)	(0.0520)	(0.0549)	(0.0204)	(0.0341)	(0.0377)	(0.0410)
Observations	351	351	351	351	1,552	1,552	1,552	1,552
R^2	0.028	0.033	0.072	0.220	0.013	0.014	0.023	0.139
F-value	2.255	2.030	2.842	4.570	4.110	3.194	4.166	15.03
Industry FE	NO	NO	YES	YES	NO	NO	YES	YES
Vintage year FE	NO	NO	NO	YES	NO	NO	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix VIII – Table VI – Regression results models MOIC, differences Europe, North America

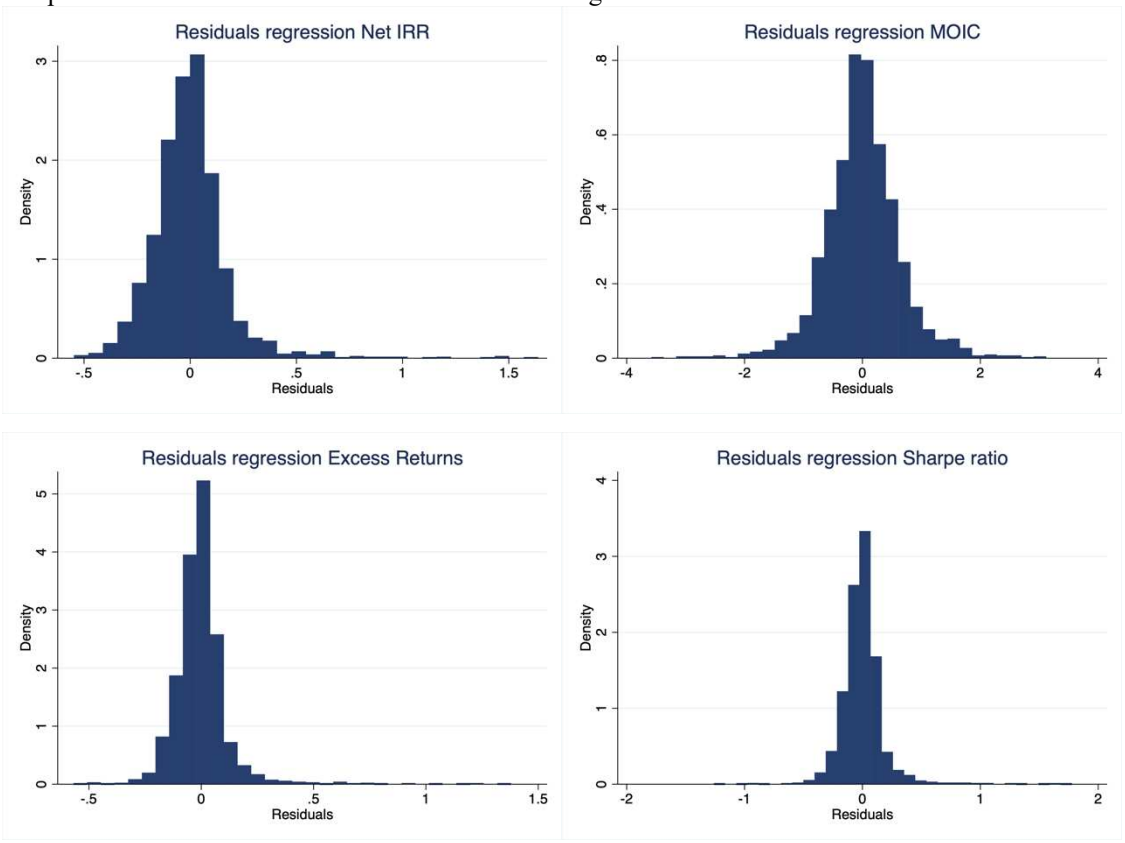
This table shows the results of the regression ran on the MOIC for hypothesis 3, looking at the differences between Europe and North America. We took the ESG status group as the reference group as we compare this group with the control group and the impact-driven status group. The models are nested in each other. The first model contains only the control variables. Model two adds the two other groups for the comparison. Model 3 includes industry fixed effects, and model 4, the complete model adds vintage year fixed effects.

VARIABLES	(1) Europe	(2)	(3)	(4)	(5) North America	(6)	(7)	(8)
Control Group		0.0118	-0.0121	0.0374		0.0712	0.0644	0.177*
		(0.0719)	(0.0792)	(0.0796)		(0.101)	(0.0969)	(0.1000)
Impact-driven status		0.102	0.0954	0.168		0.238*	0.253*	0.248*
		(0.147)	(0.139)	(0.116)		(0.144)	(0.140)	(0.137)
Fund size	-0.0148	-0.0152	-0.0365	-0.00871	-0.0541***	-0.0507***	-0.0495***	-0.0250*
	(0.0324)	(0.0326)	(0.0308)	(0.0301)	(0.0124)	(0.0126)	(0.0126)	(0.0128)
Early-stage start-up	-0.307**	-0.317**	-0.354**	-0.307**	-0.0368	-0.0450	-0.0794	-0.0292
	(0.140)	(0.141)	(0.150)	(0.144)	(0.0858)	(0.0847)	(0.0843)	(0.0773)
Early-stage seed	-0.394***	-0.391***	-0.439***	-0.384***	0.0231	0.0311	0.0278	0.00149
	(0.151)	(0.148)	(0.140)	(0.134)	(0.0805)	(0.0808)	(0.0802)	(0.0751)
Expansion late stage	-0.408***	-0.405***	-0.396***	-0.407***	0.0493	0.0504	0.0453	0.0471
	(0.110)	(0.109)	(0.117)	(0.124)	(0.0549)	(0.0549)	(0.0549)	(0.0511)
Venture general	-0.410***	-0.413***	-0.407***	-0.319***	-0.0380	-0.0376	-0.0257	-0.00992
	(0.0861)	(0.0878)	(0.0926)	(0.0908)	(0.0432)	(0.0435)	(0.0439)	(0.0414)
Constant	0.692***	0.683***	0.737***	0.498**	0.660***	0.570***	0.470***	0.257*
	(0.162)	(0.160)	(0.187)	(0.213)	(0.0669)	(0.119)	(0.128)	(0.140)
Observations	351	351	351	351	1,552	1,552	1,552	1,552
R^2	0.074	0.074	0.113	0.257	0.014	0.015	0.026	0.140
F-value	5.133	3.694	3.199	4.276	4.789	3.919	4.280	13.27
Industry FE	NO	NO	YES	YES	NO	NO	YES	YES
Vintage year FE	NO	NO	NO	YES	NO	NO	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix IX – Graph I – Distribution residuals of regressions

These graphs show the distributions of the residuals after the regression were ran. This is important as. We see a comparable distribution as for the metrics before the regressions.



Appendix X – Table VII – Funds per year

This table shows the number of venture capital funds per vintage year per group. This means that the funds are ordered by the year the funds made their first investment. The funds are categorized per group to have a good comparison. The results show that the control group has funds with vintage years from the beginning, the ESG status group increases the number of funds per vintage year from 2011, and the Impact-driven status group has an exponential increasing line from 2015. These results are comparable with the descriptive statistics.

Year	Group			
	Control	ESG status	Impact-driven status	Total
1999	314	11	2	327
2000	120	3	2	125
2001	70	2	0	72
2002	45	1	0	46
2003	39	4	0	43
2004	49	2	0	51
2005	58	4	0	62
2006	84	2	1	87
2007	76	2	1	79
2008	61	7	0	68
2009	30	0	0	30
2010	36	4	2	42
2011	45	7	1	53
2012	46	8	2	56
2013	51	4	3	58
2014	71	6	2	79
2015	70	5	2	77
2016	66	8	5	79
2017	78	8	6	92
2018	74	11	6	91
2019	93	7	4	104
2020	76	4	7	87
2021	85	8	2	95
Total	1737	118	48	1903

Appendix XI – Table VIII – Robustness test hypothesis 1: Net IRR, MOIC

This table shows the results of the robustness test of the regression ran on the first two metrics for hypothesis 1.1 and 1.2, Net IRR and MOIC. We adjusted for the time period and changed it to 2005-2021. The model stays the same, as we took the ESG status group as the reference group as we compare this group with the control group and the impact-driven status group. The models are nested in each other. The first model contains only the control variables. Model two adds the two other groups for the comparison. Model 3 includes industry fixed effects, and model 4, the complete model adds vintage year fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	NET IRR				MOIC			
Control Group		0.0487***	0.0467***	0.0586***		0.131**	0.104*	0.138**
		(0.0185)	(0.0179)	(0.0180)		(0.0620)	(0.0604)	(0.0602)
Impact-driven status		0.0867**	0.0986**	0.0815**		0.232**	0.264***	0.295***
		(0.0402)	(0.0396)	(0.0382)		(0.105)	(0.101)	(0.0956)
Fund size	-0.00973***	-0.00901**	-0.00925***	-0.00496	-0.0337***	-0.0318**	-0.0317**	-0.00387
	(0.00371)	(0.00354)	(0.00353)	(0.00353)	(0.0125)	(0.0128)	(0.0128)	(0.0123)
Europe	-0.0232*	-0.0107	-0.0107	-0.00928	-0.0703*	-0.0369	-0.0409	-0.0558
	(0.0127)	(0.0143)	(0.0143)	(0.0138)	(0.0426)	(0.0459)	(0.0448)	(0.0424)
Early-stage start-up	-0.0192	-0.0226	-0.0313*	-0.0320*	-0.110	-0.118*	-0.167**	-0.116*
	(0.0189)	(0.0189)	(0.0188)	(0.0182)	(0.0684)	(0.0673)	(0.0662)	(0.0621)
Early-stage seed	-0.0252	-0.0203	-0.0223	-0.0244	-0.0641	-0.0509	-0.0616	-0.0473
	(0.0191)	(0.0190)	(0.0190)	(0.0187)	(0.0746)	(0.0744)	(0.0738)	(0.0710)
Expansion late stage	-0.0254*	-0.0231	-0.0270*	-0.0156	-0.148***	-0.142***	-0.151***	-0.112**
	(0.0147)	(0.0146)	(0.0145)	(0.0129)	(0.0526)	(0.0525)	(0.0529)	(0.0488)
Venture general	-0.0142	-0.0129	-0.0100	-0.000319	-0.142***	-0.139***	-0.117***	-0.108***
	(0.0113)	(0.0112)	(0.0112)	(0.0105)	(0.0418)	(0.0420)	(0.0423)	(0.0396)
Constant	0.190***	0.137***	0.110***	-0.0220	0.727***	0.583***	0.468***	0.00557
	(0.0193)	(0.0258)	(0.0294)	(0.0360)	(0.0680)	(0.0862)	(0.0993)	(0.151)
Observations	1,239	1,239	1,239	1,239	1,239	1,239	1,239	1,239
R^2	0.013	0.020	0.045	0.162	0.022	0.026	0.066	0.190
F-value	2.561	3.107	4.704	10.11	4.517	4.102	6.395	14.38
Industry FE	NO	NO	YES	YES	NO	NO	YES	YES
Vintage year FE	NO	NO	NO	YES	NO	NO	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix XII – Table IX – Robustness test hypothesis 2: Excess returns, Sharpe ratio

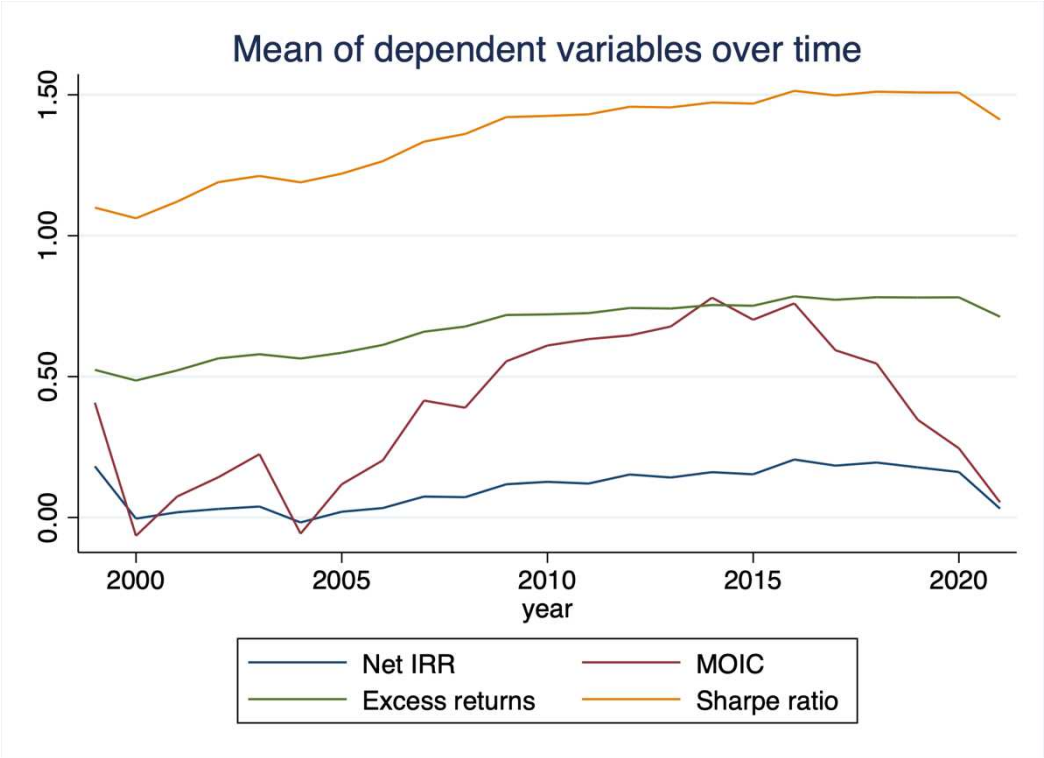
This table shows the results of the robustness test of the regression ran on the third and fourth metrics for hypothesis 2.1 and 2.2, Excess returns and Sharpe ratio. We adjusted for the time period and changed it to 2005-2021. The model stays the same, as we took the ESG status group as the reference group as we compare this group with the control group and the impact-driven status group. The models are nested in each other. The first model contains only the control variables. Model two adds the two other groups for the comparison. Model 3 includes industry fixed effects, and model 4, the complete model adds vintage year fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Excess returns				Sharpe ratio			
Control Group		0.0131	0.0137	0.0288***		0.0171	0.0181	0.0404***
		(0.0122)	(0.0119)	(0.0104)		(0.0177)	(0.0173)	(0.0150)
Impact-driven status		0.0533**	0.0615**	0.0449*		0.0727**	0.0846**	0.0611*
		(0.0257)	(0.0255)	(0.0237)		(0.0346)	(0.0343)	(0.0317)
Fund size	-0.00469**	-0.00374*	-0.00380*	-0.00211	-0.00640*	-0.00508	-0.00513	-0.00259
	(0.00236)	(0.00222)	(0.00221)	(0.00207)	(0.00327)	(0.00313)	(0.00312)	(0.00287)
Europe	-0.0303***	-0.0265***	-0.0266***	-0.0213**	-0.0460***	-0.0410***	-0.0411***	-0.0334***
	(0.00905)	(0.0102)	(0.0103)	(0.00870)	(0.0127)	(0.0142)	(0.0143)	(0.0118)
Early-stage start-up	-0.00112	-0.00446	-0.00995	-0.0159	-0.000698	-0.00531	-0.0134	-0.0216
	(0.0110)	(0.0110)	(0.0110)	(0.0102)	(0.0158)	(0.0157)	(0.0157)	(0.0144)
Early-stage seed	-0.00989	-0.00707	-0.00837	-0.0126	-0.0142	-0.0104	-0.0123	-0.0184
	(0.0113)	(0.0113)	(0.0113)	(0.0102)	(0.0163)	(0.0163)	(0.0163)	(0.0146)
Expansion late stage	-0.0196**	-0.0189*	-0.0223**	-0.0114	-0.0288**	-0.0279**	-0.0329**	-0.0168
	(0.00973)	(0.00968)	(0.00966)	(0.00742)	(0.0141)	(0.0140)	(0.0140)	(0.0106)
Venture general	-0.0163**	-0.0168**	-0.0144*	-0.00205	-0.0252**	-0.0259**	-0.0222**	-0.00427
	(0.00739)	(0.00738)	(0.00732)	(0.00621)	(0.0104)	(0.0104)	(0.0103)	(0.00863)
Constant	0.765***	0.747***	0.727***	0.570***	1.487***	1.462***	1.432***	1.199***
	(0.0121)	(0.0163)	(0.0187)	(0.0210)	(0.0168)	(0.0232)	(0.0269)	(0.0308)
Observations	1,239	1,239	1,239	1,239	1,239	1,239	1,239	1,239
R^2	0.022	0.027	0.052	0.325	0.025	0.030	0.056	0.346
F-value	3.932	3.616	5.271	28.70	4.379	3.850	5.455	28.00
Industry FE	NO	NO	YES	YES	NO	NO	YES	YES
Vintage year FE	NO	NO	NO	YES	NO	NO	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

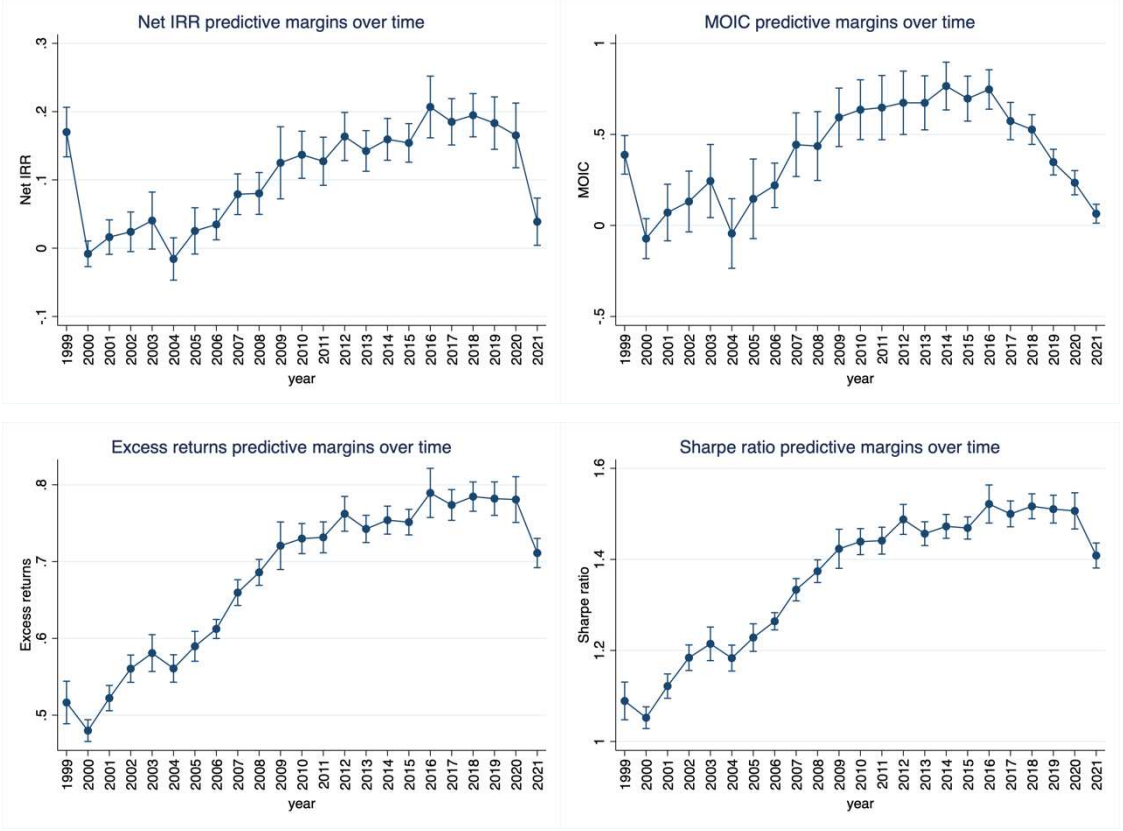
Appendix XIII – Graph II – Mean of dependent variables over time

This graph shows the means over time of all the metrics used for the dependent variable. Net IRR, MOIC, Excess returns, and Sharpe ratio. We see a steady growth along the Net IRR, Excess returns, and Sharpe ratio over time, with some downfalls during 2008 and 2021.



Appendix XIV – Graph III – Predictive margins over time dependent variables

This table shows a set of graphs that represents the predictive margins over time for the performance metrics used for the dependent variable. In all graphs we can see them increasing from 2008 on and declining from 2016.



Appendix XV – Graph IV – Distribution of dependent variable metrics

These graphs show the distributions for all the metrics used as dependent variables to assess the performance of the funds: Net IRR, MOIC, Excess returns, Sharpe ratio. For all metrics an adjusted logarithm is used to have a better and more normal distribution. The graphs show that most of the Net IRR values are between -0,5 and 0,5. Most of the MOIC values are between -2 and 2. The values of the Excess returns are slightly higher than the Net IRR and are between 0,3 and 1. Lastly, the values of the Sharpe ratio, Excess returns divided by the standard deviation of the Net IRR, gives us values between 0,6 and 2.