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# The Value of Sustainable Investments for Private Equity Firms.

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The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

## Abstract

This study examines the difference in added value of environmental, social, and governance (ESG) funds compared to non-ESG funds in private equity (PE). With a dataset obtained from Preqin, a total of 3,971 funds has been examined, of which 107 are ESG funds. The net internal rate of return (IRR) is used as a primary proxy variable for added value. They are controlled for size, vintage year, venture capital funds, and liquidated funds. ESG funds have a significantly lower average net IRR and multiple of money invested compared to traditional funds. However, ESG funds outperform their private market equivalent with a larger difference compared to regular funds. Nevertheless, since the rise of sustainable investments in PE is quite recent, it is still too early for a good comparison.

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# 1. Introduction

## 1.1 Background

There is much pressure for companies and governments to take care of global challenges, after the established Sustainable Development Goals (SDGs) in 2015<sup>1</sup>. Regulations and policies have to change to solve these global challenges. A more recent development regarding global challenges is the Paris Agreement, which aims to reduce emissions and encourage countries to achieve the SDGs. These developments have consequences for private equity (PE) funds. The investment performance of PE investments, for example in energy-intensive industries, will be impacted by climate change and policy responses. This can raise challenges as well as new investment opportunities. Consequently, responsible investment and sustainable development has become a higher priority for PE firms. Nowadays, about 80 percent of PE fund managers incorporate environmental, social and governance (ESG) goals in their portfolio strategy (Yang et al., 2019).

In 2019, the PE market has had less pressure from institutions compared to the public market (MacArthur et al., 2015). The public market has experienced an increase in sustainable funds for a longer period. A lot of research has been done on the effect of ESG funds on performance in the public market and an overall positive relation has been found (Friede et al., 2015). However, the leading institutions of the PE market have recently become more vocal for responsible investments. Showing a good example, smaller institutions have been following. Yet, not much research has been done on sustainable funds for the private PE market.

After the global pandemic of the coronavirus Goldman Sachs expects that sustainable investments in the equity market will increase even more (Stevens, 2020). Covid-19 may have a long-lasting effect on Wall-street. The pandemic results in a major turning point for ESG investing. US-listed sustainable funds experience a record of cash inflows, despite the overall market downturn caused by the virus. This quick shift in investment portfolios has led to the research question:

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<sup>1</sup> <https://www.undp.org/content/undp/en/home/sustainable-development-goals.html>

*What is the difference in return of ESG investments by private equity funds compared to traditional funds?*

In practice, PwC Global Sustainability Leader Malcolm Preston observed that good ESG management can add value, while poor ESG management can destroy it (PwC, 2016). ClearBridge Investments believes that ESG funds are the future form of investing and that someday the funds will no longer be labeled as ESG, but they will be a fundamental part of how investors analyze companies (ClearBridge, 2017). Schroders (2017) explains that the long holding period of ESG funds can result in a significant impact on the risk, and therefore the value of investments in the long run. Yang et al. (2019) rejects this by discussing that it is too early to know whether ESG funds in PE can consistently achieve returns in the long term that match investors' expectations. As a survey by PwC (2016) shows, more than 40 percent of the respondents would pay a premium for an investment with strong ESG performance.

If this premium is objectively valid, ESG funds should have a higher return compared to regular funds. ESG funds can potentially increase return by reducing risk and costs, as well as improving efficiency and competitive advantage.

## 1.2 Relevance

Several studies have found a negative relation in the financial returns of investing in ESG, while other studies have found a positive relation (Friede et al., 2015). Almost two thirds found a positive link between ESG and financial performance, 30 percent found a neutral link, and 8 percent found a negative link. However, most of the provided empirical evidence is generally inconclusive, ambiguous, or contradictory. The inconsistent measurements and durability result in a continuing debate regarding the impact of ESG funds in the financial sector. Friede et al. combined data from over 2000 earlier studies and found a small overall correlation average. Based on the distribution analysis and this correlation, they generalized that ESG is on average positively correlated to cash flow performance.

Puche, Braun, and Achleitner (2015) examined the value creation of PE funds on the proxy times multiple (TM), controlling for size, industry, geography, and time. The findings suggest that smaller transactions increase the created value, and tech companies show a higher

return compared to other industries. Funds in North America have a significant higher created value compared to European and Asian funds. In addition, they found that funds started before the year 2000 have a higher return and funds after the year 2008 have a significant lower return.

Indahl and Jacobsen (2019) examined the effect of ESG funds for the Nordic PE firm Summa Equity. The firm even closed its second funds because the first ESG fund had high enough returns and obtained large enough social benefits. The ESG fund resulted in a competitive advantage by distinguishing itself from its competitors and bringing significant improvements in the financial performance of its portfolio companies while providing benefits for their stakeholders. The ESG fund also saw a significant drop in risks.

Cunha et al. (2019) examined if sustainable investments could outperform their traditional benchmarks in global stock markets. They compared the performance of numerous Dow Jones Sustainability Indices with their respective market benchmarks from 2013 to 2018. The ESG performance is still heterogenous, but it looks promising for investors. However, they did not distinguish classes of assets, such as private equity or venture capital, and estimated only portfolio analysis, and not ESG performance analysis.

This study will specifically examine the impact of ESG funds in the private equity market. By using a global database, obtained from Preqin, instead of solely data from the Nordic country, the results are representative of a larger market. The observed time frame is from the year 1997 till 2017. This study will also control for size, industry, geography, and time. In addition to North America, Europe, and Asia, the dataset includes Africa, South America, and Australia as well. The main difference in this research compared to the previous research of Puche et al. (2015) is the investigation of the difference in created value between ESG funds and traditional funds. The impact on performance is measured by the main proxy net internal rate of return (IRR) of the funds. The PME+ benchmark will also be used to measure the difference in performance of ESG funds compared to traditional funds in the PE market.

Previous literature examines the influence of the investment size on the performance. Kaplan and Schoar (2005) provide evidence that fund size has a concave relation with PE performance. Humphery (2012) also found that investment size is positively correlated with returns for PE funds. This study will add to these findings by exploring how the influence of

investment size on performance regarding ESG funds compares to the influence on regular funds.

The recent development of increased pressure to make positive social contributions and seize commercial opportunities at the same time, indicates that this research is relevant for private equity investors. For a long time, private equity has had a bad reputation. Investing in sustainable funds could potentially lead to finally acquiring the desired reputation, which in turn reduces reputational risk and increases performance. For PE investors, the findings of this study can be used when electing funds for their investment portfolio.

### 1.3 Thesis Overview

Private equity fund performance can be measured by the IRR, which balances the net present value (NPV) and the cash flows of a transaction. The higher the IRR is, the higher the net cash flows and thus the returns are. The research question “What is the impact of sustainable investments for private equity firms?”, is answered by examining the main hypothesis. This hypothesis states that the net IRR of ESG funds is significant positively different compared to regular funds. To test this hypothesis descriptive statistics, t-tests and a regression analysis will be run.

The remainder of this thesis will be structured as follows. In the second part, literature on value creation of private equity funds will be discussed, after which the way of value creation of ESG funds and their effect on performance of PE firms will be explained. In Chapter 3, the data will be presented. In Chapter 4, the analytical framework will be discussed, including a description of the research question and the hypotheses. Chapter 5 will elaborate on the methodology. The results will be interpreted in Chapter 6, after which the conclusion follows in Chapter 7. In the final chapter, further research and limitations of the study will be discussed.



## 2. Literature Review

This chapter will elaborate on the theoretical foundation of the study. In order to explain the factors that may influence created value, academic literature will be presented and discussed. First, value creation by private equity firms will be analyzed. Second, literature about the impact of ESG funds on created value will be discussed, and the question “Why should private equity firms care?” will be answered.

### 2.1 How does Private Equity create value?

PE funds are used to finance capital-intensive and risky investments (Breuer & Pinkwart, 2018). In return for the financial- and operational risk, PE investors expect sufficient returns. The question whether PE investors create added value or whether they are simply good at picking winners is widely discussed in the academic literature (Robert et al., 2007). Baum and Silverman (2004) conclude both: value is created because of expertise in selection, but also due to investment monitoring and advice.

The increase in performance can be explained by the cash flow, return and risk characteristics of PE firms. Ljungqvist and Richardson (2003) find evidence that PE funds achieve higher excess returns relative to the aggregated public equity benchmark. However, the IRR of the average fund only turns positive eight years after the first investment. Since the average fund life is around 10 years, excess returns are obtained at the end of the fund life. Thus, private equity investments are highly illiquid. The excess returns of PE funds per annum should compensate investors, at least partly, for the illiquidity of the funds.

Higson and Stucke (2012) shows a cross-sectional variation in funds’ performance. They found that 60% of the funds outperformed their S&P 500 benchmark and suggested that excess returns are mainly driven by positive outliers, since the average was much higher than the median. In addition, their results show a (weakly) significant positive relationship between fund size and performance. After they control for economic downturn, by vintage years, this relationship becomes highly significant. Ljungqvist and Richardson (2003) included the effect of the vintage year on the return as well. They found that if the first investment has been made in a time of excessive asset prices, the funds’ performance is relatively worse. Additionally,

they found an indication for higher returns when the fund life is longer. By estimating the average IRR for all funds at the end of year T, with T being 1 till 20 years, they found a significant increase of the average IRR over time. This can also be seen in the volatility of venture capital (VC) funds. VC funds hold their investments longer than PE funds (Davies, 2018). VC funds are, generally, more volatile than regular funds. In the long term, high volatility is good because it results in more investment opportunities. However, the returns are highly uncertain and therefore VC has more failures, but also more rewarding winners. Both characteristics explain the higher average return for VC funds compared to PE funds.

With a longer fund life, investors have more time to compensate for any losses and therefore face less risk. Brooks and Ferreira (2008) finds that investors gain a third of the total created wealth by the fund because of the low marginal costs and the reduction in risk from a less financially leveraged company. On the contrary, PE faces from the same liquidity risk factor as public equity does (Francesco et al., 2012). In their model, they include a 3% liquidity risk premium annually, which reduces the alpha to zero.

Puche, Braun and Achtleiner (2015) also examined the effects of the size and timing of the fund on the value creation in the PE market. They found that general partners (GPs) were able to create value over the holding period of their investments, by measuring the TM. Almost a third of the created value was achieved by reducing the risk through levered financing of the transactions. Half of the created value was obtained through operating improvements assigned by the operating management of the GP and advantageous changes in the industry. Lastly, they found that 15% of the created value comes from an increase in the transaction-multiple from entry to exit. This could reflect the increase in growth prospects, the GP's skill or luck in market timing, or negotiations with buyers or sellers. In line with Puche et al., the value creation for PE invested firms in the chemical industry mostly depends on improvements in operational performance and growth instead of the investors' negotiation skills or timing in the market (Chang, 2020). The created value is for 60-70% a result of operational improvements achieved by better management, operation efficiency, pricing, and supply chain planning.

Puche et al. (2015) showed that the region and industry of an investee as well as the size and time period of the transaction are all important for value creation in PE transactions. North American transactions have a higher value creation compared to European and Asian deals. They also found that there is a difference in value creation for each industry. Technology

deals create more value due to the investor expectations for growth. Bernstein et al. (2017) also examined PE and industry performance. They found that industries in which PE funds invest grow more quickly in terms of employment and production and are less sensitive to aggregate shocks. This could be a result of investments in higher growth prospects. However, Puche et al. discussed that fund size played the biggest roll in value creation. Deals with an enterprise value below \$100 million created significantly more value compared to larger deals. Smaller transactions gained more than mid-cap and large-cap transactions, since they tend to be purchased at a lower multiple and see a relatively higher increase in sales. Lastly, they found that transactions before the year 2000 showed higher created value and transactions after 2008 showed significantly lower created value. All the value creation components showed decreased effects over time, except the sales component. However, the effect of increase in EBITDA has remained constant, in the form of increases in margins and in sales. This shows the importance of operational improvement to increase the created value for portfolio companies.

The higher returns of PE funds in general might also be a reflection of the investment skills of the fund manager. PE investors do not only want to be compensated for the risk they take by investing in the company, but they want a premium for adding value to the portfolio companies as well (Moon, 2006). This premium relates to the contribution of complementary skills to the management teams and companies that the active investors sponsor. Moon finds that PE funds with a track record of success have a significant higher chance of success in future funds. This implies that past performance appears to be a predictive factor in PE. Which indicates the difference in long-run sustainable performances between public equity investors compared to PE investors.

Cohn and Towery (2014) explained that private equity creates value by helping struggling firms with their financial constraints or by leading operational turnarounds that limit the firm's growth. Due to the partnership with the PE firm, the growth firm can drive value creation by new suppliers, access to new markets, economies of scale, improved management, and industry expertise. PE firms are specialized to be more knowledgeable of the competitive environment of acquired companies (Robert et al., 2007). PE firms understand the investees strengths and weaknesses better, and are therefore able to provide better advice. As a result, a competitive advantage can be created, and the sales of the investee can be improved. Kaul, Nary, and Singh (2018) examined the role of PE firms in divested business and compared these with their public equivalent. PE investors help the business by long-term investments of

resources and capabilities and are better able to support, evaluate, and monitor the investee compared to the equivalent public market investors.

PE is a relatively new form of general management, and if done correctly, it increases the value of firms by closing the information gap between the shareholders and the current management of the investee firm (Baldwin, 2012). This is in line with Jensen (1986), who claims that, theoretically, private equity can improve the operations of the investee firm by reducing the agency costs.

In addition to the operational improvements and market effects, leverage plays an important part in explaining the value creation of PE funds within the investee firms (Achleitner, Braun, Engel, Figge, & Tappeiner, 2010). A higher return on equity can be realized by using additional debt. This effect of debt on the return on equity is referred to as the leverage effect. It occurs when the total return on the investment is higher than the cost of the additional debt. The leverage impact on value creation is expected to be higher than one third of the total created wealth. Achleitner et al. also found that the leverage impact is higher for larger deals, while revenue growth plays a more important role for smaller deals.

The drawback of the leverage effect is that it may not create value, but is the result of redistribution effects. This redistribution effect is at the expense of stakeholders, resulting in a potential agency cost problem. According to Jensen (1986), higher agency costs result in lower operating performances. Regarding the redistribution effects on employees, two effects play a role (Litgerink et al., 2017). In general, PE funds impose a downward effect on the wage levels, but at the same time there is a shift to higher functions. Smith (1990) however, did not find any evidence for redistribution effects, but shows the opposite: the positive changes in operating performance were not the result of the reduction of jobs or investments. Davis et al. (2014) found that the added value is a consequence of divesting in less productive divisions and investing in more productive ones. Therefore, the net job losses were less than one percent of the initial employment.

However, most empirical studies show that the operational changes are caused by an increase in efficiency instead of cost reductions (Friede et al., 2015). They agree with Kaplan (1989) that buyouts indicate an increase in operating performance and cash flows. The three

years after the buyout, an increase in revenue and net cash flow and a decrease in capital expenditure was realized in the investee companies.

## 2.3 The differences of ESG funds

The private equity industry has had quite a few developments regarding sustainability, since this century. In 2005, the UN and the private finance sector collaborated to create the UNEP FI. The UNEP FI established the Principles for Responsible Investment (PRI), which helps investors to add ESG funds to their investment portfolio (<https://www.unepfi.org>). In 2015, new sustainable goals have been set. Since then, the amount of investments in ESG funds has increased rapidly, from 1,050 investments in 2012 to almost 2,400 investments today (MacArthur et al., 2020). In 2019, large institutional investors such as CDPQ, CalPERS, Allianz, Swiss Re, and PensionDanmark, joined the Net-Zero Asset Owner Alliance and have promised that their investment portfolio will become carbon neutral by 2050.

ESG funds are a great opportunity for PE firms to contribute to a sustainable world and act against climate change. GPs are also starting to realize that sustainable investments can improve the returns and limit risk, due to the changing consumer behavior and business conditions towards social and environmental issues. In practice, funds such as Kohlberg Kravis and Roberts (KKR), Carlyle Group, and Apax Partners have managed to reduce costs and risks, and enhance reputations by sustainable investments (MacArthur et al., 2020). KKR recognizes sustainable funds as drivers for value creation by boosting the earnings, reducing the risk, and lastly, satisfying the investors. In the public opinion, sustainable strategies will improve the bad reputation of the PE sector. Firms with a relatively good reputation were able to maintain remarkable profit outcomes over time. In addition, ESG funds provide new business opportunities due to innovation and new product developments (PwC & Waterman, 2010). Effective management can reduce operating costs and therefore enhance cost-efficiency and profitability of the investee firm. ESG investment could also open up new markets and provide access to new customers that are more sensitive towards responsibility.

Indahl and Jacobsen (2019) examined the ESG funds for the Nordic PE firm Summa. They found that the ESG fund can create a competitive advantage by significantly reducing the risk, distinguishing itself from other competitors, and improving the financial performance of the investee. The accomplishment of these results is not at the cost of the stakeholders.

However, a company should be more careful with ESG funds. Failure in ESG funds can significantly damage the development of the company and could increase the risk, which can be substantial. Indahl and Jacobsen discussed the challenges of the market, arguing that the global economic growth is slowing down. Across the globe, debts have been increasing after the global financial crisis. What's more, climate change is not helping, causing more natural disasters. Sectors affected by natural disasters could be disrupted by the increasing sea level and climate volatility. Besides, the global population is expected to grow rapidly in the coming 30 years. These challenges and concerns provide some interesting investment opportunities, by investing in ESG funds. In the long-run, addressing ESG issues can increase the competitiveness and operating performance by removing the inefficiencies and waste in the value chain and creating innovation and solutions that reduce externalities. Helping the world with the challenges it's facing, investing in ESG funds might lead to a more promising future.

However, this does not necessarily mean that every ESG fund will result in a profit. Sustainable funds are comparable with funds in general, in which the investment return depends on the internal and external conditions of the investee (Orsato, 2009). Despite the large increase of investors in ESG funds, there is still limited literature on sustainability in the PE industry. In theory however, responsible investments by public investors are not that different from PE investors. For that reason, the literature on the effect of Socially Responsible Investing (SRI) on performance will be discussed.

Firms with responsible investments acquire a competitive disadvantage (Aupperle et al., 1985). This is a result of costs that could otherwise have been avoided, compared to regular investments, or costs that should have been borne by others, such as stakeholders. In neoclassical literature, a negative relation between financial and social performance has been attributed (Friedman, 1970). On the other hand, there are so many variables that involve both social and financial performance, that any relationship is probably caused by chance (Ullman, 1985). Feldman et al. (1997) find that environmental performance indicates good managerial quality and enhances financial performance. Nidumolu et al. (2009) argues that sustainability will be the main factor for competitive advantage.

ESG funds could also potentially reduce risk. Sassen et al. (2016) investigates the impact of ESG factors on firm risk in Europe, including private equity firms. They measure three kinds of risk: systematic, idiosyncratic, and total risk. Results show that the environmental part of the investment decreases idiosyncratic risk, while the total risk and

systematic risk are affected negatively only in environmentally sensitive industries. Their findings suggest that ESG funds can increase firm value through lower firm risk.

Cunha et al. (2019) identified that sustainable investments are still heterogeneous worldwide. Yet, ESG funds are promising for the future. They analyzed the performance of Dow Jones Sustainability Indices (DJSIs) and compared these with their market benchmarks. They found that investing in ESG funds in certain regions has potentially superior risk-adjusted returns. In a recent study, Yang et al. (2019) found that the median multiple on invested capital was higher for deals with social and environmental impact compared to other deals in the Asia-Pacific region. They found a lower variability in returns for ESG deals, making ESG deals not only sustainable investments but also sustainable long-term returns.

Crifo et al. (2015) made a distinction between the three different sustainable factors. They found that with good ESG practice, socially responsible investments have a larger impact on a firm's value, with environmental responsible investments and government responsible investments respectively on the second and third place. It should be noted that all factors have a positive effect on the firm's value when the investment has good ESG practice. However, when there is bad ESG practice, results show a larger negative effect of the sustainable factors. Government responsible investments are higher sensitive towards bad ESG practice and environmental and social on the second and third place respectively. They argue that positive ESG does add value, but negative ESG has a higher sensitivity towards decrease in firm value due to the risk premium for socially irresponsibility practices.

Friede et al. (2015) examined the ESG criteria on the corporate financial performance (CFP). By combining more than 2,000 empirical studies, they try to find generalized results. For the ESG-CFP relation, vote-counted and meta-analyzed studies found non-negative findings, around 90 percent. However, in the asset class "equities", they just found a positive ESG-CFP relation in 50 percent of the cases. A third of the studies examined the E, S and G as categories on the CFP relation. Observing only the governmental part, more than 60% of the studies found a positive effect and only 9 percent a negative effect. For the components E and S, this was a little bit less (58.7 and 4.3 percent, and 55.1 and 5.1 percent, respectively). Controlling for regions, they found that the number of studies for positive ESG-CFP results is higher for developed markets.

Table 1. Overview of studies on the ESG and performance relation.

Study	Asset Class	Sample Size	Geography	Time Period	Overall results	Citations
Galbreath (2013)	Equities	300	Australia	2002 - 2009	Positive	46
Crifo et al. (2015)	Equities	110	Global	2008 - 2012	Ambiguous	31
Friede et al. (2015)	Equities, bonds, and real estate	2,200 studies	Global	1972 - 2012	Ambiguous, positive on average	509
Stellner et al. (2015)	Bonds	872	Europe	2006 - 2012	Positive	95
Henke (2016)	Bonds	103	US and Europe	2001-2014	Positive	70
Polbennikov et al. (2016)	Bonds	4,366	U.S.	2007 - 2015	Positive	15
Sassen et al. (2016)	Bonds	8,752	Europe	2002 - 2014	Positive	24
Verheyden et al. (2016)	Equities	2,267	Global	2010 - 2015	Positive	2
Cunha et al. (2019)	Bonds	1,565	Global	2013 - 2018	Heterogeneous, but promising	9
Eliwa et al. (2019)	Equities	6,018	Europe	2005 - 2016	Positive	6
Indahl & Jacobsen (2019)	Private equity	1	Sweden	2016 - 2019	Positive	3
Kiesel & Lücke (2019)	Equities	3,719	US and Europe	2004 - 2015	Positive	3
Landi & Sciarelli (2019)	Bonds	40	Italy	2007 - 2015	Positive	16
Yang et al. (2019)	Private equity	450	Asia-Pacific	2014 - 2019	Positive	-

### Why should private equity firms care?

Cutlip and Faith (2011) examined the relation between emissions and economic development. Low-income countries shift towards higher levels of development, resulting in



even higher emissions. Pereira (2011) discussed that a sustainable civilization can only be acquired when all industries, including finance, work together on sustainable principles. Sustainable development is based on four dimensions: the economic, the social, the environmental, and the institutional (Spangenberg, 2004). Spangenberg argues that with respect to sustainability, economic growth should be minimalized. There is no evidence of a linear relation between overall growth and the impact of environmental responsibility. However, the Brundtland report (1987) mentions that economic growth is needed to create enough wealth to solve the environmental problems. Investments in sustainable funds could potentially satisfy all of these: an increase in growth and a reduction in carbon emissions, without losses on earnings.

However, the differences in return of ESG funds could be a result of the differences in fund characteristics. As stated in the literature, fund size, life, industry, geography, status, and asset class all influence the created value. These different characteristics could cause a difference in performance of the ESG funds compared to traditional funds, regardless of the element 'ESG'. Particularly, fund size and fund life have a big influence on the created value. Therefore, the relation between fund size and ESG funds, and fund life and ESG funds is examined in the second and third hypotheses.

### 3. Data

In this chapter, the data collection and the dataset used for the quantitative analysis will be discussed. Section 3.2 describes how the data was obtained, and section 3.3 elaborates and discusses the variables of the dataset.

#### 3.1 Data Collection

The dataset used has been obtained from the database Preqin. Preqin is an online database with financial data and information on the alternative assets market. Preqin covers the asset classes private equity, venture capital, hedge funds, real estate, private debt, infrastructure, and natural resources and secondaries. The data used was filtered by its asset class “Private Equity”. The fund status was filtered for “closed to investment” and “liquidated”, so that the funds are not open for more investments, to ensure the fund has a net IRR and closing size. After filtering the data, the total observations were 7,212 funds. These funds consisted of a worldwide investment portfolio for the years 1969 till 2019. Next, the funds without a net IRR were taken out of the observation, resulting in a total of 5,750 funds. Only a small amount, 110, of these funds were ESG responsible. The data of ESG Ethos is obtained from the firms’ website or LP board minutes (Preqin, n.d.). It can be applied when the fund or firm level of the investee have ESG factors that have a material impact on the performance of an investment.

The interval of the vintage years of ESG funds is different from the interval of the vintage years of regular funds. With the regular funds, the vintage years start in 1969 and end in 2017, while the first vintage year of ESG funds is 1997. The vintage year influences the net IRR. Ljungqvist and Richardson (2003) argued that the IRR of the average fund stays negative until the eighth year of the fund's life. Therefore, they examined that the longer the fund life is, the higher the IRR is. Phalippou and Zollo (2005) found that young funds are expected to have a 4% lower IRR compared to quasi-liquidated funds. When correcting for the capital raised for the fund, they even estimated a decrease of the IRR of 9.5%. On the other hand, Fernyhough et al. (2018) found that younger funds show higher IRRs for a given TVPI level compared to older funds. For example, if two funds both report a TVPI of 1.7x, but one fund is from 2010 and the other fund from 2012, the IRR reported is higher for the younger fund, since the cash

return is equal but over a shorter time period. After 12 years of the fund's life, they found lower IRRs. This would limit my dataset to the year 2005, however, because of the recent development of ESG funds, this would not be applicable on the dataset. To neutralize these effects, the interval of the vintage year has been taken into account, which means that the difference in added value cannot be a result from the differences in interval periods. The interval used is the interval of the ESG funds, from 1997 till 2017. This reduces the total amount of observations to 4,956, of which 110 are ESG funds.

Since there were a lot more observations on non-ESG funds than on ESG funds, the characteristics of the groups could be different. For example, the average of the variable size could be significantly different for the non-ESG group compared to the ESG group. To control for this, matching will be used. After matching the fund size of ESG funds with the fund size of non-ESG funds, the number of observations is a total of 3,767 funds, of which 107 are ESG funds. The difference between 110 and 107 ESG funds is caused by the fact that three ESG funds had no fund size data.

### 3.2 Variables

The net IRR is used as the proxy for added value. IRR is a time-weighted return expressed as a percentage, which is important since funds might have a different fund life. For example, one fund has a 2x cash-on-cash return after 4 years, while another fund has the same return, but after 6 years. The last fund is clearly less attractive. Therefore, the differences in time span need to be taken into account when comparing funds. The IRR distinguishes between the (4 and 6 year) time horizons.

The IRR also takes the differences in cash flow into account. The net cash flow is discounted, so that the net present value equals zero, making funds with differences in initial investments and returns comparable. Therefore, the IRR is the annual yield of investment, and a good proxy for added value. In general, the higher the IRR is, the higher the net cash flows and thus the returns are. The net IRR refers to the IRR with account management fees and carried interest taken into account.

There is a debate on the reliability of IRRs as measurements of performance, since it does not take the liquidity of the cash flows into account (Higson & Stucke, 2012). For example, a fund with a lower IRR but longer duration could have a higher Net Present Value (NPV) compared to a fund with a similar size, but a shorter duration and a higher IRR. To maximize value, an investor should look at the return multiples instead of the IRR. Therefore, the differences in return multiples for ESG funds have been analyzed. However, these do not account for the time variances of the cash flows and investments, and are less preferable among investors than net IRRs. In an article from INSEAD, Alsberg-Schoenberg (2019) explains that the IRR is misleading in financial publications. It gives the impression that it measures the actual return on an investment and is therefore incorrectly used by investors. However, A possible alternative, the money of multiple (MoM), which shows the total return, fluctuates over time. Therefore, investors should use a market-adjusted return, such as the Public Market Equivalent (PME+) or the direct Alpha. Comparing funds with their PME+ benchmark provides a better insight into the performance of the fund. Hence, the PME+ benchmark is added as a measurement of performance. For European funds, the European benchmark is used, and for the rest of the world, the S&P benchmark is used (Preqin, 2015).

To estimate the differences between the effects of ESG funds on the proxy variable, a dummy variable is added to the regression and descriptive analytics, which has non-ESG funds as the reference group. This dummy variable will also be used to investigate the difference in return multiples and the PME+ benchmark for ESG funds. The used variables and their relation to added value and performance are presented in Table 2 and 3.

Table 2. The Determinants of Net IRR

This table provides an overview of the variables obtained from Preqin and their expected relationship with the net IRR. The third column provides a description of how the variable is used in the model. \*The fund size was calculated from the final investment size in the local currency times the exchange rate at the reported date. Therefore, the currency is equivalent for all funds, and can be used for comparison.

Variable	Expected relation net IRR	Analysis
Dummy = 1 if funds is ESG responsible	Positive	T-test & Regression
Investment Size*	Positive	T-test, PS-test & Regression
Dummy = 1 if Venture Capital	Positive	T-test & Regression

Dummy = 1 if funds is liquidated	Positive	T-test & Regression
Geography	Ambiguous	Chi-squared & Regression
Industry	Ambiguous	Chi-squared & Regression
Vintage Year	Ambiguous	Chi-squared & Regression

**Table 3. Ratios of Private Equity Performance**

This table explains the ratios that can be used to determine the performance of Private Equity. The variables are all obtained from Preqin and are used in the analysis of the value creation by ESG funds.

Variable	Expected relation with ESG funds	Description	Interpretation <sup>2</sup>	Limitations
Net IRR	Positive	$NPV = 0 = \sum \text{cash flows} / (1 + \text{discount rate})^n$	Thumb rule: Invest if IRR in the mid-teens or higher	Sensitive to cash flows early in the calculation period
MoM	Positive	TVPI / 100	Thumb rule: Invest if the ratio is 2.0x	Dynamic and changes with time
TVPI	Positive	Total Value / Paid-In Capital	Reflects the realized and predicted cash-on-cash returns by its investments at the valuation date	Dynamic and changes with time
DPI	Negative	Distributions / Paid-In Capital	Reflects the realized cash-on-cash returns by its investments at the valuation date	Dynamic and changes with time
RVPI	Positive	Residual Value / by Paid-In Capital	Reflects the predicted cash-on-cash returns by its investments at the valuation date	Dynamic and changes with time
PME+ IRR,	-	Index-return measure that	Invest if the PME+ IRR is lower than	It does not match cash flow

<sup>2</sup> INSEAD 2019

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(market- takes into account the the IRR of the PE fund perfectly  
adjusted irregularities of timing of cash  
equivalent) flows

---

## 4. Analytical Framework

In this chapter, the framework of the used model will be discussed. The model will test if there is a difference in added value of ESG funds compared to regular funds in PE. Section 4.1 will elaborate on the research question and section 4.2 will present the hypotheses.

### 4.1 Research Question

The main goal of PE firms is to add value to their investments. This added value can be obtained by increasing performance and efficiency and reducing costs and risk. Due to the recent developments in the world, there is a substantial awareness regarding sustainable investments. Besides being ethical, sustainable investments might add extra value through differences in risk and competitive advantage. Therefore, the research question is the following:

*“What is the difference in return of ESG investments by private equity funds compared to regular funds?”*

The existing literature argues that ESG investments could lead to higher returns, due to an increase in competitive advantage and a reduction of costs and risks. However, the differences in return could potentially be a result of differences in fund characteristics. Therefore, different hypotheses are examined.

### 4.2 Hypotheses

With the insights from the literature, the research question will be answered with the following questions. Is the net IRR significantly different between ESG funds and regular funds in PE? Is the fund size of ESG funds different compared to regular funds? And the last question: is there a difference in the average vintage year of ESG funds compared to regular funds? The quantitative data from Preqin will provide a good outline whether the added value is higher for ESG funds. In the following subsections, the different questions will be discussed based on their hypotheses.

### 4.2.1 Added Value

There are different valuation measurements for performance in PE funds. It is frequently argued that the return on a PE fund should be measured by the IRR (Diller & Kaserer, 2004). The IRR is a good method since it adjusts for time variances of cash flows and is value-weighted. However, there is a lot of research that examines the overestimation of the IRR, which states that the M-IRR should be used (Gottschalg & Phalippou, 2007 and Cheng, 2009). Liu et al. (2002) and Higson and Stucke (2012) argue that the return multiples need to be used to measure performance. Alsberg-Schoenberg (2019) finds that the PME+ benchmark should be used for measuring the outperformance of a PE fund. However, the preferred measurement in practice, and the most commonly used for comparison of funds, is the IRR. Therefore, the used proxy variable of created value is the net IRR. To examine if there is a positive difference in net IRR between ESG funds and regular funds, the first hypothesis states:

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Hypothesis 1

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ha : There is a positive difference in the net IRR of ESG funds compared to regular funds

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### 4.2.2 Fund Size

The size of an investment can influence the net IRR. Kaplan and Schoar (2005) found a concave relation between fund size and return in PE. Humphery (2012) and Higson and Stucke (2012) also examined a positive relation between investment size and returns for PE funds. Achleitner et al. (2010) found that the leverage effect is higher for larger funds, but smaller funds have a relatively higher revenue growth. Mason and Harrison (2002) found a positive relation as well: large investments were more likely to perform well compared to smaller investments. Higson and Stucke (2012) showed a significant systematic positive relationship between the fund size and the IRR. However, Ljungqvist and Richardson (2003) did not find evidence that fund size affected the IRR of their buyout funds. However, their value-weighted average indicates that smaller funds perform slightly better than large ones. If the fund size is related to the return, it is interesting to examine if there is a significant difference in size of ESG funds and regular funds. If this difference is significant, a matching procedure



for size should be used to equal the characteristics of the type of funds. Therefore, the second hypothesis is:

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Hypothesis 2

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ha : There is a negative difference in fund size for ESG funds compared to regular funds.

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### 4.2.3 Fund Life

Achleitner et al. (2010) find that deals in a recessionary environment (2001 - 2003) have a higher median return. This is a result of a higher use of leverage, which results in a greater leverage-effect, and a more significant multiple expansion. Ljungqvist and Richardson (2003) identify that when the vintage year was in an economic bubble, more money was raised, and the fund's subsequent performance was lower. Harris, Jenkinson and Kaplan (2015) examine that performance is lower for funds that had a vintage year when there are large accumulated inflows of capital into the sector. Investing in ESG responsible funds is relatively new with respect to traditional funds. As such, it is interesting to first examine whether there is a significant difference in reported IRR for younger and older funds, and second, whether there is a difference in fund age for ESG funds compared to regular funds. If there is a significant difference, a weighted variable could be added to the net IRR to increase validation of the results. Therefore, the third hypothesis is stated:

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Hypothesis 3

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ha : There is a negative difference in the vintage year for ESG funds compared to regular funds.

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## 5. Methodology

In this chapter, the research methodology will be discussed. In section 5.1, the descriptive statistics of the main variables are discussed, which have been obtained from Prequin. In section 5.2, the estimation statistics such as the t-test are discussed. In the last section, the regression analysis to measure the influence of the independent variables on the proxy variable for the added value is described.

### 5.1 Descriptive Statistics

The descriptive statistics will be used to find the variability of the variables. The proxy variable, net IRR, has been winsorized at a 1% and 99% level, to make sure that the residuals follow a more normal distribution. Winsorizing replaces the outliers of the values, in this case, outside the 1% and 99% percentiles. After winsorizing, the net IRR will follow a more normal distribution, and the residuals will have a smaller kurtosis and better symmetry. For the first hypothesis, the measures of central tendency will analyze the difference of net IRR with ESG funds. In addition, a plot will be used to indicate the direction of the relation of ESG funds and created value.

The independent variable size has been adjusted with its logarithm. The logarithm is used to transform the variable of size, which is highly skewed, to a more normal distribution. The rest of the independent variables used in the regression have not been adjusted, since the dataset is existing data, which means that an adjustment could lead to a bias in the results. After adjusting the variables, a potential correlation is examined. A correlation of the independent variables could have an impact on their coefficient, and therefore, the coefficient could imply an incorrect relation with the dependent variable. For this reason, a correlogram is made. To calculate the correlation between two variables, the following formula is used:

$$\text{corr}(Y, Z) = \frac{\text{cov}(Y, Z)}{\sqrt{\text{var}(Y)\text{var}(Z)}}$$

Variables with a high collinearity need to be adjusted or replaced by an instrumental variable in the regression analysis. For the second hypothesis, the descriptive statistics on size of ESG

funds are run. For the third hypothesis, the descriptive statistics of ESG funds on the vintage year are run.

For the matching procedure, the effect of the treatment, compared to the non-treated group, is evaluated. In this study, the treatment is sustainable funds. The idea of matching is to create two groups that are similar in their characteristics, except for the treatment. By estimating the average treatment effect (ATE), a weight is added to the net IRR. The ATE is a measurement that can be used to compare treatments. The ATE measures the difference in average between funds in the treated group (ESG funds) and the control group (non-ESG funds). As a result, the weighted net IRR can be used as the dependent variable in the regression.

The descriptive statistics will also be used to measure the differences between sustainable investment in the MoM and the PME+ benchmark of the fund. For the PME+ benchmark, a variable is made that calculates the difference between the net IRR of the funds and the IRR of the PME+ benchmark. A dummy variable will take the value 1 if the PE fund outperformed their PME+ benchmark. Both the MoM and PME+ will be tested for their variability. The variable MoM and the difference with PME+ are also winsorized outside a 1% and 99% level to remove the largest outliers and make sure they follow a normal distribution.

The measures of central tendency, such as the mean and median, will help to give an indication of the relation between the different variables and the potential added value of ESG funds. The measures of variability will help adjust the dependent variables in such a way that the estimated model satisfies the multiple regression assumptions.

To endure significant results, a 95% confidence interval will be used, which is determined by the standard errors (SE). The SE measures the standard deviation to the mean of random variables within the dataset. The SE will be calculated by the following formula:

$$SE_{\mu_x} = \frac{s}{\sqrt{n}}, \text{ with } s = \sqrt{\frac{\sum_{i=1}^n (x_i - \mu_x)^2}{n-1}} \text{ and } \mu_x = \frac{\sum_{i=1}^n x_i}{n}$$

To control for heteroskedasticity in the regression, robust standard errors will be used. Homoskedasticity is important for the data since the error term, and therefore the noise, would

be the same for all the independent variables. Noise is irregularities that are random in real life data. The homoskedasticity assumption is needed for the usage of the multiple regression analysis.

## 5.2 Inferential Statistics

To test whether there is a significant difference between the net IRR of ESG funds and regular funds, a two-way t-test will be run. The t-test is two-way, because of an interest in the effect of ESG funds on the net IRR, either positive or negative. This test provides an indication of the effect of ESG funds on the net IRR compared to regular funds. To measure the effect of ESG funds on performance by the MoM and PME+ benchmark, a two-way t-test will be used.

The t-test is also used for the difference in size of ESG funds and regular funds. Once more, the t-test is two-way, since there is an interest in either a significant positive or negative difference. This test is used for the second hypothesis, to give an indication whether ESG funds already have a (dis)advantage for having a difference in investment size compared to regular funds. To solve this problem the matching procedure will be used. For the third hypothesis, the t-test will show whether there is a significant difference in vintage year of ESG funds compared to regular funds. If there is a difference between the average vintage year of the types of funds, a weighted variable will be used to measure the net IRR. The weighted variable is calculated by the relative amount of ESG funds per year. The IRR of non-ESG funds from a specific year will then be weighted for that year, to even out the differences in vintage years of non-ESG funds and ESG funds. Therefore, the results will not be influenced by the fact that non-ESG funds or ESG funds might, on average, be older or younger. A chi-square test is used for the other control variables, geography, industry, VC invested, and liquidated funds, if these variables have a significantly different net IRR.

To test if the matching procedure results in a better estimation compared to no matching and solely adding size as a control variable, a propensity score test will be run. This test will calculate for each variable if the means are equal in the two samples. The results of the test will show if the bias percentage is below ten and if the variance ratio is within 0.7 and 1.5. The B should be less or equal to 0.25. The t-test in this model calculates if the mean of the treated and control variable is significantly different. When the null hypothesis cannot be rejected and the reported values fall within the given intervals, the matching model provides a better estimation

compared to the unmatched model. Therefore, the weighted net IRR for size after matching should be used as the dependent variable in the regression analysis.

### 5.3 Regression Analysis

The dependent variable net IRR is the proxy for added value of the PE funds. The ESG funds are added as a dummy with the value 1 if the funds are responsibly invested and 0 if the funds are regular. A multiple regression is run to account for the factors that influence the net IRR. These independent variables are used to test the different hypotheses. The various variables that affect the net IRR and the direction are stated in Table 4.

Table 4. Factors of the regression

This table illustrates the variables used, their description, and their expected direction for the value added, illustrated by the literature. *ETHOS* is the dummy variable for regular funds or ESG funds, respectively.

Variable	Description	Expected direction
Net_IRR	The net IRR is a discount rate that makes the net present value (NPV) of all cash flows equal to zero. Formula: $0 = NPV = \sum_{n=0}^N \frac{CF_n}{(1 + IRR)^n}$	
D.Ethos	Dummy for ESG funds with regular funds as the reference group	Positive
Fund_Size	Fund size at date of final closing	Positive
i.Geography	Categorical variable of in which continent the fund is operating	Ambiguous
i.Industry	Categorical variable of the industry the fund is operating in	Ambiguous
i.Vintage_Year	Categorical variable of the first year of funds investment	Ambiguous
D.Class	Dummy for the class of the asset with the value 1 for Venture Capital and Private Equity as the reference group	Positive
D.Status	Dummy variable which has the value 1 for liquidated funds and closed funds as the reference group	Positive

In response to the second and third hypotheses, the variables fund size, vintage year, geography, industry, class, and status are added to the regression as independent variables. The coefficients of the variables will show if the variable has a significant positive or negative relation with the net IRR. After the regression, the independent variables will be tested for multicollinearity with the Variance Inflation Factors (VIF). This will measure the strength of the correlation between independent variables. VIFs between 1 and 5 indicate a modest correlation, which is too small to justify adjusted measurements. To obtain valid results, the independent variables used should have a low collinearity. This results in the following regression analysis:

$$\text{Net}_{\text{IRR}} = \alpha + \beta_1 \text{Ethos} + \beta_2 \text{Fund}_{\text{Size}} + \beta_3 \text{i. Geography} + \beta_4 \text{i. Industry} + \beta_5 \text{i. Vintage\_Year} \\ + \beta_6 \text{D. Class} + \beta_7 \text{D. Status} + \varepsilon_i$$

The second model includes an interaction effect between ESG funds and class to account for their joint effect. ESG funds are mainly raised by PE, due to fact that VC investors think that for them, ESG is less relevant.<sup>3</sup> They argue that tech companies do not emit that many greenhouse gases or pollute the rivers. However, VC invested funds do have on average a higher net IRR. Therefore, the interaction effect of VC invested ESG funds is introduced. This interaction effect will examine whether VC ESG funds have a higher or lower impact compared to VC invested regular funds. If the impact is higher, ESG integration with investing could provide long-term success for VC firms. Therefore, the following regression is estimated:

$$\text{Net\_IRR} = \alpha + \beta_1 \text{Ethos} \text{##i. Class} + \beta_2 \text{Fund}_{\text{Size}} + \beta_3 \text{i. Geography} + \beta_4 \text{i. Industry} + \\ \beta_5 \text{i. Vintage\_Year} + \beta_6 \text{D. Class} + \beta_7 \text{D. Status} + \varepsilon_i$$

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<sup>3</sup> <https://ventureexchange.hr/why-esg-is-core-to-a-venture-capital-success/>

## 6. Empirical Results

In this chapter, the results of the empirical analyses will be discussed. In section 6.1, the results of the descriptive analysis are described. Section 6.2 will show the results of the t-tests and Chi-squared tests. In the last section, the regression analysis will be examined.

### 6.1 Descriptive statistics

Because the dataset was obtained from Preqin, not all factors for value creation were provided. Therefore, suitable estimation techniques were limited. Figure 1 shows the differences in the median and mean IRR for ESG and non-ESG funds during the researched time period, to give a visual perception of the possible outcome of the regression analysis. As follows from the figure, the mean IRR of ESG funds clearly dropped during the recession years 2007-2008, which is in accordance with the literature. For regular funds, the average mean IRR follows an upward trend. In figure 1, Appendix A, the other measurements of value creation and their differences for ESG funds and regular funds are displayed.

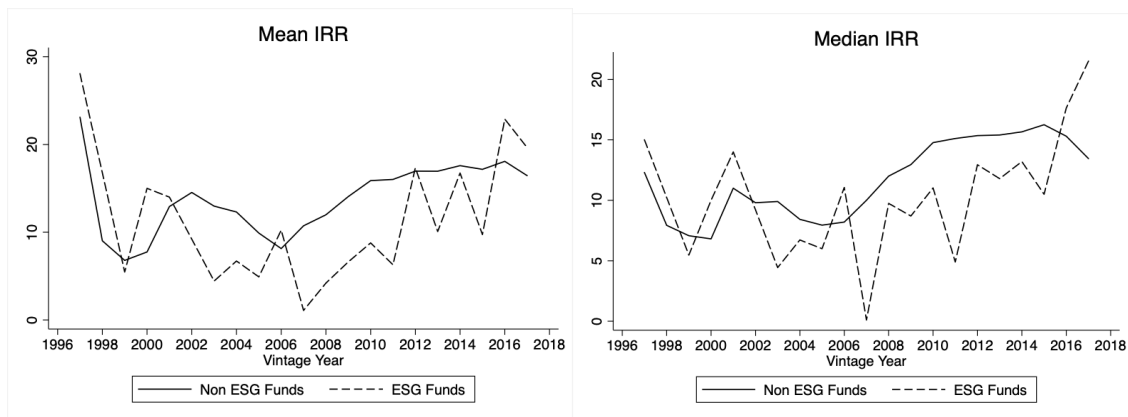


Figure 1: The mean and median net IRR for ESG funds and regular funds during the time period of 1997 and 2017. This figure describes the trend of the net IRR by taking the mean and median of each year for either the ESG funds or the non-ESG funds.

A quick sample overview with the characteristics of ESG funds and non-ESG funds is given in Table 1 and 2, Appendix A. In contrast to the empirical literature, this table gives an indication that ESG funds actually perform worse compared to regular funds. The results could potentially be a consequence of the differences in fund size, the percentage of VC funds within

ESG funds and the percentage of liquidated funds. The results show that ESG funds have on average a lower mean and MoM.

Despite the on average worse performance of ESG funds, they still outperform their public equity benchmark (Table 3, Appendix A). Non-ESG funds outperform their PME+ IRR benchmarks slightly more compared to ESG funds and their PME+ IRR. However, ESG funds do a better job in outperforming their benchmark. ESG funds differ substantially higher compared to regular funds. The results suggest a lower volatility for ESG funds, and therefore lower risk.

## 6.2 T-Tests and Chi-squared test

T-tests are used to analyze whether the difference in net IRR is a result of significant differences between the two types of funds. As stated above, the net IRR has been winsorized to replace extreme outliers in the 99%-percentile value. This adapted net IRR is used for the t-tests and the regressions. Regarding the size, all estimations were adjusted to the same currency, the dollar, to make sure that currency would not influence the results. Table 5 shows the results of the t-tests.

The t-test shows that the types of funds are significantly different in their characteristics. Therefore, the characteristics should be added to the regression. The t-test also provides a strong indication that ESG funds add less value compared to regular funds. Since the average vintage year of ESG funds is significantly different compared to regular funds, the net IRR has to be weighted for vintage year. The propensity score test shows that when matching is used, the conditioning variables are not significantly different between the two groups (Table 6). The bias percentage is below 10 percent and the variance ratio of 1.01 is after matching within the given interval. Also, B is under the 0.25. Therefore, the weighted net IRR for size should be used. To examine the extent of the difference, a regression analysis will be run on the proxy variable of the weighted net IRR of vintage year and size.

Table 5. Results of the specific tests of the variables

Variable	Test	Mean Non ESG Funds	Mean ESG Funds	Difference	T-stat / Chi-stat	P-value
Net IRR	T-test	13.554	11.086	2.468	1.536	0.125



Weighted net	T-test	14.206	11.086	3.120	1.562	0.118
IRR						
Size	T-test	276.075	217.514	58.561	2.4975	0.013
Geography	Chi-squared	Africa: 0.59%	Africa: 6.73%	-	100.534	0.000
		Asia: 11.55%	Asia: 14.42%			
		Australia: 1.41%	Australia: 0%			
		Europe: 21.75%	Europe: 46.15%			
		North America: 63.61%	North America: 30.77%			
		South America: 1.08%	South America: 1.92%			
Industry	Chi-squared	Undefined: 81.70%	Undefined: 67.27%	-	35.492	0.000
		AI: 0.19%	AI: 0%			
		Clean Technology: 4.42%	Clean Technology: 15.45%			
		Cloud Computing: 0.17%	Cloud Computing: 0%			
		E-Commerce: 0.19%	E-Commerce: 0.91%			
		Infrastructure: 1.14%	Infrastructure: 1.82%			
		Manufacturing: 11.25%	Manufacturing: 12.73%			
		Diversified: 0.95%	Diversified: 1.82%			
Vintage Year	T-test	2007	2010	-2.266	-3.923	0.000
Class	Chi-squared	PE: 69.77 %	PE: 79.44 %	-	4.636	0.031
		VC: 30.2 3%	VC: 20.56 %			
Status	Chi-squared	Closed: 71.48 %	Closed: 83.18 %	-	7.035	0.008
		Liquidated: 28.52 %	Liquidated: 16.82 %			
MoM	T-test	1.624	1.412	.212	3.4785	0.001
Benchmark	T-test	0.738	0.969	-.231	-.114	0.910

**Table 6. Propensity Score Test.**

Test for measuring if the sample matched for size results in a better model for the regression compared to the unmatched regression. The dependent variable is the weighted net IRR for vintage year and the logistic regression for propensity score matching is used. The ties are included in the estimation. For the matched model, the variable bias percentage is below ten, the variance ratio lies between the given interval and the beta is lower than 0.25. The t-test also shows an insignificant coefficient, and therefore the null hypothesis of no significant differences in the

mean between the treated and control group cannot be rejected. Thus, the model used for the regression analysis should be the matched model.

Variable	Unmatched	Mean		%bias	t-test	Variance ratio	B
	Matched	Treated	Control		t		
ln(size)	U	4.854	5.469	-46.6	-4.28***	0.60*	46.6**
	M	4.854	4.857	-0.2	-0.02	1.01	0.2

\* if variance ratio outside [0.69; 1.46] for U and [0.68; 1.47] for M

\*\* if B>25%, R outside [0.5; 2]

### 6.3 Regression

The regression analysis will be used to predict the degree of influence of the independent variables on the dependent variable. The variables first have been tested on correlation (Table 1 and 2, Appendix B). The covariance measures the variation of two random variables. A positive covariance implies that two variables tend to vary in the same direction and a negative variable implies a variation in the opposite direction. If two variables are independent, the covariance should be zero. The variance measures the spread of the variable. The independent variables in this sample could vary in the same direction. Especially the independent variable class and fund size could be correlated, since VC raised capital could potentially be on average larger in size. In addition, an older investment year makes it more likely that the fund is liquidated. Liquidated funds means all the fund's assets are sold; closed funds are closed for new investors, temporarily or permanently. The status of the fund and the investment year could therefore be strongly correlated. After the regression, the VIF is also estimated. There is no valid reason to adjust the variables, since there is no multicollinearity (Table 3, Appendix B).

It should be noted that the models do not have a high R-squared, which is probably a consequence of the limited data. Therefore, only half of the weighted net IRR can be explained by the independent variables. To ensure valid results, the assumptions of the multiple linear regression model are tested. To account for homoscedasticity, robust standard errors are used. The results of the VIF imply that there is no multicollinearity. The residuals are predicted and checked with the Jarque-Bera normality test. However, this result is significant, and therefore, the residuals do not follow a normal distribution. The sample does have a high number of

observations, and therefore, the test results are reliable, even when the residuals do not follow a normal distribution.

The first regression, Model 1, tested the correlation of the independent variables on the proxy variable for added value (Table 7). A significant equation has been found ( $F(36, 3730) = 67.45, p < .00$ ), with an  $R^2$  of 0.4821. This dataset shows a significant positive coefficient of size on the weighted net IRR under a 99% significance level. This is in line with the literature, which finds that investment size has a positive relation with the net IRR. The dummy variable for ESG funds shows a significant positive coefficient of 3.948 on the net IRR. This implies that, in line with the literature, the proxy for performance is positively impacted by ESG funds by 3.95 pp. Thus, ESG funds create more value compared to regular funds after weighting for size and vintage year. The time of investment has a positive effect on the net IRR for each year, implying that every year after 1997 has a higher weighted net IRR in respect of the year 1997. The coefficients for the years of economic downturn and upturn are not very different from each other, implying that after weighting the net IRR, a possible explanation of differences in the net IRR could be the result of differences in fund size. This is in contrast with Achleitner et al. (2010). VC funds have a significant positive relation of 0.119 with the weighted net IRR. The fund's status, when it is liquidated, shows a positive significant relation of .159. The categorical variable geography is for each continent not significant, and therefore, the variable coefficients could not be interpreted. For the categorical variable industry only cloud computing, infrastructure, and manufacturing show a positive significant coefficient for a 95%-confidence level. The variables artificial intelligence and diversified show a positive and negative, respectively, coefficient for a 90%-confidence level. The other categorical variables show an insignificant coefficient and could therefore, not be interpreted.

The second regression, Model 2, also includes the interaction effect between ESG funds and class to control for the interaction between these variables (Table 7). The coefficient is significantly positive. Therefore, if a fund is sustainable and is VC-raised, the net IRR will increase with 3.617 in 99% of the cases. This information is useful for investors that want to invest in VC responsibly. The coefficient of the dummy of ethos was significantly less positive after the interaction effect. This implies that ESG funds that are PE-raised have a lower positive effect on the net IRR compared to VC-raised ESG funds.

According to the literature, it is unclear whether ESG funds add value because of better competitive advantage or if they simply cost more, thus being less valuable. The results of this dataset show that ESG funds do have, on average, a higher weighted net IRR. Therefore, the first hypotheses can be rejected. Besides, ESG funds do a better job in outperforming their benchmark based on the descriptive statistics.

Table 7. Results of the regression analysis.

Regression analysis of the independent variables on the proxy variable weighted net IRR. The net IRR is weighted for the investment size and year of investment between the treatment group, ESG funds, and the non-treated group, traditional funds. The first model implies a regression with all the independent variables and the second model introduces an interaction effect between ESG funds and the class of the fund.

	Model 1	Model 2
Constant	5.317 (11.80)***	5.353 (13.16)***
Fund Size	.980 (40.75)***	.987 (41.04)***
D.Ethos	3.948 (9.66)***	3.242 (7.95)***
D.Class	.119 (2.29)***	.055 (1.17)
D.Status	.159 (2.37)***	.149 (2.30)***
D.Ethos##Class	-	3.617 (11.43)***
i.Continent		
Asia	-.133 (-0.31)	-.165 (-0.43)
Australia	-.187 (-0.42)	-.204 (-0.50)
Europe	-.164 (-0.38)	-.151 (-0.39)
North America	-.122 (-0.29)	-.145 (-0.38)

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South America	-095	-.168
	(-0.18)	(-0.36)
i.Industry		
Artificial Intelligence	.619	.647
	(1.73)**	(1.80)**
Clean Technology	.037	-.012
	(0.31)	(-0.10)
Cloud Computing	.505	.550
	(4.38)***	(5.05)***
Diversified	-.385	-.482
	(-1.88)**	(-2.51)***
E-Commerce	.028	-.217
	(-0.06)	(-0.41)
Infrastucture	.443	.461
	(2.48)***	(2.42)***
Manufacturing	.168	.163
	(2.55)***	(2.48)***
i.VintageYear		
1998	.410	.392
	(2.84)***	(2.76)***
1999	.307	.287
	(2.16)***	(2.06)***
2000	.240	.234
	(1.70)**	(1.68)**
2001	.485	.463
	(3.20)***	(3.07)***
2002	.406	.381
	(2.51)***	(2.38)***
2003	.501	.480
	(3.21)***	(3.10)***
2004	.527	.505
	(3.47)***	(3.38)***
2005	.485	.448

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	(3.32)***	(3.17)***
2006	.592	.568
	(4.13)***	(4.06)***
2007	.527	.458
	(3.52)***	(3.22)***
2008	.451	.401
	(2.95)***	(2.63)***
2009	2.629	1.542
	(1.28)	(0.67)
2010	.633	.563
	(3.58)***	(3.28)***
2011	.543	.511
	(3.44)***	(3.33)***
2012	.733	.712
	(4.70)***	(4.59)***
2013	.608	.601
	(3.70)***	(3.69)***
2014	.427	.417
	(2.74)***	(2.74)***
2015	.545	.514
	(3.53)***	(3.45)***
2016	.831	.781
	(5.35)***	(5.30)***
2017	.500	.466
	(2.93)***	(2.76)***

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## 7. Conclusion

This research examined the difference in created value of ESG funds compared to regular funds. In the literature, the opinions are mixed: some argue that ESG funds potentially lead to a higher added value, while others argue that the costs are higher, as a result of which ESG funds add less value than regular funds. When looking at the results of this study, ESG funds add significantly more value than regular funds. Likewise, when compared with their benchmark, ESG funds do a better job in outperforming the public market than regular funds do.

Regarding the first hypothesis, the t-test indicates that the net IRR for ESG funds is significantly different compared to non-ESG funds. However, testing for the differences in characteristics between the two types shows a possible explanation for the difference of the net IRR. ESG funds clearly have, on average, a smaller size, younger vintage year, less VC invested funds and less liquidated funds. The fund size and younger vintage year are used to match the data and weight the net IRR. The variables have also been added to the regression analysis. In the second regression, an interaction effect of ESG funds and class was added to estimate the effect of VC-raised funds that are also ESG responsible. A significant positive coefficient was found, implying that socially responsible investments that are VC-raised have even higher net IRRs.

The second hypothesis, the effect of the size of ESG and non-ESG funds, has been examined. There is a significant difference in average fund size between the two types, and size influences the net IRR. Therefore, size was first matched so the differences in fund size would not affect the coefficient of ethos. Size was also added to the regression to control for the effect size has on the net IRR. The results show that the fund size has a significant positive effect on the weighted net IRR.

Regarding the third hypothesis, a significant difference in average vintage year has been found. Therefore, the IRR has been weighted for the amount of funds in a specific year. The vintage year has a significant positive relation with the net IRR. Therefore, the weighted net IRR of the amount of funds has been used as a proxy to give a better estimation of the difference in created value of ESG funds compared to traditional funds. The weighted net IRR gives a

better estimation due to the equivalent vintage years for each fund. The regression has been run on the weighted proxy for size and vintage year.

To answer the main research question: “*What is the difference in return of ESG investments by private equity funds compared to traditional funds?*”, the results indicate a significant positive difference in net IRR of ESG funds. However, both funds still add value compared to their public equity benchmark. Based on the descriptive statistics, ESG funds outperform their public benchmark with a higher difference compared to regular funds. Currently, ESG funds show a lower total added value and lower MoM. ESG funds have a negative relation to the return multiples. However, the return multiples can still change over time, due to the change in the now expected unrealized returns that will be realized over time. Therefore, I agree with Yang et al. (2019) that it is too early to examine the exact difference in return between ESG funds and regular funds. Nonetheless, this dataset does strongly imply that ESG funds have a positive relation to firm value compared to traditional funds.



## 8. Limitations and Future Research

### 8.1 Limitations

The first problem is that the data used is self-reported data, and therefore potentially sensitive to biases (Ljungqvist & Richardson, 2003). This is a result of the fact that PE data is not publicly available. Secondly, the used data is, as mentioned earlier, limited. The total observations of ESG funds were low, and the time frame was limited and very young. Ljungqvist and Richardson (2003) explained that performance can only really be measured thirteen years after the fund's closing date. Funds that are not matured consist of a residual part and a distributed part. The residual part is unrealized, since it is an estimation of its net asset value (NAV), and therefore its future cash flows. However, the realized value might differ from the expected value, resulting in a noise and potentially a bias. Phalippou and Zollo (2005) argued that funds with a non-final performance should be dropped. Due to the young time frame of ESG funds, it was not possible to control for maturity in my dataset.

The third problem is the usage of the IRR as a proxy of return (Gottschalg & Phalippou, 2007). It assumes that cash profits have been reinvested at the IRR during the entire investment period. They find that in reality, investors are not reinvesting every time the cash is distributed. A possible solution for this would be using the modified IRR (M-IRR), which is similar to the IRR, but without assuming the reinvestments of the IRR. It defines a fixed rate of return for borrowing and investing. Gottschalg and Phalippou find that PE performance is overstated: PE funds have actually underperformed their public benchmark with an average of around 3% per year. Therefore, the estimation of the differences in the outperformance of their S&P 500 PME+ benchmark could be biased. In a later article, Phalippou (2008) wrote that the usage of IRR leads to distorted incentives for grouping of funds and timing of the cash flows. It also leads to an upward bias of the volatility estimates. Since VC is highly volatile, it results in a significant upward bias of the average performance.

### 8.2 Future Research

This research can be built upon with more data points, especially for ESG funds. In addition, the data should be controlled for matured funds. When there are more data points, the differences for each different sustainable factor, i.e. E, S, or G, could also be examined. A

regression of the difference in S&P 500 PME+ IRR benchmarks and the IRR of PE funds as a proxy of added value could also be measured if there are enough data points. Apart from more data points, an alternative for the net IRR could be examined, for example the M-IRR. In addition, more independent variables could be added to improve the explanatory power of the model. Finally, a further examination of how ESG funds might create value, for example by reducing risk, costs, or increasing performance, could be conducted.

## References

- Achleitner, A. -K., Braun, R., Engel, N., Figge, C., & Tappeneier, F. (2010). Value Creation Drivers in Private Equity Buyouts: Empirical Evidence from Europe. *The Journal of Private Equity*, 13(2), 17-17.
- Albers-Schoenberg, A. (2019). Measuring Private Equity Fund Performance. INSEAD. Retrieved from [https://www.insead.edu/sites/default/files/assets/dept/centres/gpei/docs/Measuring\\_PE\\_Fund-Performance-2019.pdf](https://www.insead.edu/sites/default/files/assets/dept/centres/gpei/docs/Measuring_PE_Fund-Performance-2019.pdf).
- Aupperle, K. E., Carrol, A. B., & Hatfield, J.D. (1985). An Empirical Examination of the Relationship between Corporate Social Responsibility and Profitability. *The Academy of Management Journal*, 28(2) 446-463.
- Baldwin, A. (2012). Private Equity and Agency Costs: An Economic Analysis. *Economic Affairs*, 32(3), 107-109.
- Baum, J. A. C., & Silverman, B. S. (2004). Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology startups. *Journal of Business Venturing*, 19(3), 411-436.
- Bernstein, S., Lerner, J., Sorensen, M., & Strömberg, P. (2017). Private Equity and Industry Performance. *Management Science*, 63(4), 1198-1213.
- Breuer, W., & Pinkwart, A. (2018). Venture capital and private equity finance as key determinants of economic development. *Journal of Business Economics*, 88(3-4), 319-324.
- Brooks, L. D., & Ferreira, E. J. (2008). Current and private investors' return and risk sharing with private equity offering announcements. *The Journal of Private Equity*, 11(3), 30-40.
- Brundtland Report (1987). Our Common Future: Report of the World Commission on Environment and Development. Retrieved from: <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>
- Chang, J. (2020). Private equity to drive performance. *ICIS Chemical Business*, 29(2), 26-27.

- Cheng, L. C. (2009). The Hazards of Using IRR to Measure Performance: The Case of Private Equity. *CFA Digest*, 39(2), 64-64.
- ClearBridge. (2017). *Making an Impact through Active Equity Ownership*. Retrieved from <https://www.clearbridge.com/environmental-social-governance/impact-2017/esg-in-practice.html>
- Cohn, J. B., Mills, L. F., & Towery, E. M. (2014). The evolution of capital structure and operating performance after leveraged buyouts: Evidence from U.S. corporate tax returns. *Journal of Financial Economics*, 111(2), 469-494.
- Cresst, R., Munari, F., & Malipiero, A. (2007). Playing to their strengths? Evidence that specialization in the private equity industry confers competitive advantage. *Journal of Corporate Finance*, 13(4), 647-669.
- Crifo, P., Forget, V., & Teyssier, S. (2015). The price of environmental, social and governance practice disclosure: An experiment with professional private equity investors. *Journal of Corporate Finance*, 30, 168-194.
- Cutlip & Faith. (2011). Relationship between carbon emissions and economic development: Case study of six countries. *Environment, Development and Sustainability*, 14, 433-453.
- Cunha, F. A. F., de Oliveria, E. M., Orsato, R. J., Klotzle, M. C., Oliveria, F. L. C., & Caiado, R. G. G. (2019). Can sustainable investments outperform traditional benchmarks? Evidence from global stock markets. *Business Strategy and the Environment*, 29(2), 682-697.
- Davis, P. J. (2018). Venture Capital vs Private Equity: Who's the King of Cash? The technology sector is more glamorous, but its returns aren't all that tangible. *Wall Street Journal*.
- Davis, S. J., Haltiwanger, J. C., Jarmin, R. S., Lerner, J. & Miranda, J. (2011). Private Equity, Jobs, and Productivity. *American Economic Review*, 104(12), 3956-3990.
- Diller, C., & Kaserer, C. (2004). European private equity funds: A cash flow based performance analysis. CEFS Working Paper Series.

- Eliwa, Y., Aboud, A., & Saleh, A. (2019). ESG practices and the cost of debt: Evidence from EU countries. *Critical Perspectives on Accounting*, <https://doi.org/10.1016/j.cpa.2019.102097>.
- Feldman, S. J., Soyoka, P. A., & Ameer, P.G. (1997). Does improving a firm's environmental management system and environmental performance result in a higher stock price? *The Journal of Investing*, 6(4), 87-97.
- Fernyhough, W., Sostheim, J., & Shite, A. (2018). Global PE & VC Fund Performance Report. PitchBook. Retrieved from: [https://www.theleadleft.com/wp-content/uploads/2019/03/PitchBook\\_Global\\_PE\\_VC\\_Fund\\_Performance\\_Report\\_as\\_of\\_2\\_Q\\_2018.pdf](https://www.theleadleft.com/wp-content/uploads/2019/03/PitchBook_Global_PE_VC_Fund_Performance_Report_as_of_2_Q_2018.pdf)
- Franzoni, F., Nowak, E., & Phalippou, L. (2012). Private Equity Performance and Liquidity Risk. *The Journal of Finance*, 67(6), 2341-2373.
- Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, 5, 4.
- Friedman, M. (1970). The Social responsibility of Business to Increase Its Profits. *The New York Times Magazine*.
- Galbreath, J. (2013). ESG in Focus: The Australian Evidence. *Journal of Business Ethics*, 118, 529-541.
- Gottschalg, O., & Phalippou, L. (2007). The Truth About Private Equity Performance. *Harvard Business Review*, 85(12), 17-20.
- Harris, R. S., Jenkinson, T., & Kaplan, S. N. (2015). How Do Private Equity Investments Perform Compared to Public Equity? *Darden Business School Working Paper*, n2597259.
- Henke, H. -M. (2016). The effect of social screening on bond mutual fund performance. *Journal of Banking & Finance*, 67, 69-84.
- Higson, C., & Stucke, R. (2012). The Performance of Private Equity. Retrieved from: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2009067](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2009067).

- Humphery, M. (2012). Private Equity Fund Size, Investment Size, and Value Creation. *Review of Finance*, 16(3), 799-835.
- Indahl, R., & Jacobsen, H. G. (2019). Using ESG to Create More Value with Less Risk. *Journal of Applied Corporate finance*, 31(2), 34-41.
- INSEAD. (2019). Measuring Private Equity Fund Performance. Retrieved from: [https://www.insead.edu/sites/default/files/assets/dept/centres/gpei/docs/Measuring\\_PE\\_Fund-Performance-2019.pdf](https://www.insead.edu/sites/default/files/assets/dept/centres/gpei/docs/Measuring_PE_Fund-Performance-2019.pdf)
- Jensen, M.C. (1986). Agency Costs of Free Cash Flow, Corporate Finance and Takeovers. *American Economic Review*, 76, 323-329.
- Kaplan, S. (1989). The effects of management buyouts on operating performance and value. *Journal of Financial Economics*, 24(2), 217-254.
- Kaplan, S. N., & Schoar, A. (2005). Private Equity Performance: Returns, Persistence, and Capital Flows. *The Journal of Finance*, 60(4), 1791-1823.
- Kaul, A., Nary, P., & Singh, H. (2018). Who does private equity buy? Evidence on the role of private equity from buyouts of divested businesses. *Strategic Management Journal*, 39(5), 1268-1298.
- Kiesel, F., & Lücke, F. (2019). ESG in credit ratings and the impact on financial markets. *Financial Markets, Institutions & Instruments*, 28(3), 263-290.
- Landi, G., & Sciarelli, M. (2019). Towards a more ethical market: the impact of ESG rating on corporate financial performance. *Social Responsibility Journal*, 15(1), 11-27.
- Litgerink, J. E., Martin, J. K., & boot, A. W. A. (2017). Zorgt private equity voor waardecreatie? *Maandblad voor Accountancy en Bedrijfseconomie*, 91(7/8), 236-243.
- Ljungqvist, A., & Richardson, M. (2003). The cash flow, return and risk characteristics of private equity. *NBER working paper series*, n9454.
- MacArthur, H., Bierly, C., Van Den Branden, J. -C., Steclik, I., Dessard, J., & Seemann, A. (2020). Investing with Impact: Today's ESG Mandate in Private Equity. Bain & Company.

Retrieved from <https://www.bain.com/insights/esg-investing-global-private-equity-report-2020/>

Mason, C. M., & Harrison R. T. (2002). Is it worth it? The rates of return from informal venture capital investments. *Journal of Business Venturing*, 7(3), 211-236.

Moon, J. J. (2006). Public vs. Private Equity. *Journal of Applied Corporate Finance*, 18(3), 76- 82.

Nidumolu, R., Prahalad, C.K. & Rangaswami, M. R. (2009). Why sustainability is now the key driver of innovation. *Harvard Business Review*, 7.

Orsato, R. (2009). Sustainable strategies: When does it pay to be green? INSEAD Business Press Series. Palgrave Macmillan, London.

Pereira, T. (2011). The transition to a sustainable society: a new social contract. *Environment, Development, and Sustainability*, 14(2), 273-281.

Phalippou, L. (2008). The hazards of Using IRR to Measure Performance: The Case of Private Equity. *CFA Digest*, 39(2), 64.

Phalippou, L., & Zollo, M. (2005). The Performance of Private Equity Funds. Retrieved from: <http://indexfunds.sk/wp-content/uploads/2012/02/ThePerformanceOfPrivateEquityFunds.pdf>

Polbennikov, S., Desclée, A., Dynkin, L., & Maitra, A. (2016). ESG Ratings and Performance of Corporate Bonds. *The Journal of Fixed Income*, 26(1), 21-41.

Preqin. (2015). Preqin Special Report: Public Market Equivalent (PME) Benchmarking. Retrieved from: <https://docs.preqin.com/reports/Preqin-Special-Report-PME-July-2015.pdf>

Preqin. (n.d.). ESG explained. Retrieved from: <https://go.preqin.com/hubfs/Product%20Marketing/ESG/ESG-Explained.pdf>

Puche, B., Braun, R., & Achleitner, A. K. (2015). International Evidence on Value Creation in Private Equity Transactions. *Journal of Applied Corporate Finance*, 27(4), 105-122.

- PwC & Waterman. (2010). *Responsible Investment: A guide for private equity and venture capital firms*, 1-12. London, UK: BVCA.
- PwC. (2016). *Are we nearly there yet? Private equity and the responsible investment journey*. Retrieved from <https://www.pwc.com/gx/en/sustainability/publications/assets/pe-survey-report.pdf>
- Sassen, R., Hinze, A., & Hardeck, I. (2016). Impact of ESG factors on firm risk in Europe. *Journal of Business Economics*, 86, 867-904.
- Schroders. (2017). ESG best practice: A look at how some of the world's largest asset owners approach sustainable investment. Retrieved from <https://www.schroders.com/en/syglobalassets/digital/insights/2018/sustainability/2017-11-esg-best-practice.pdf>
- Smith, A. J. (1990). Corporate ownership structure and performance: The case of management buyouts. *Journal of Financial Economics*, 27(1), 143-164.
- Spangenberg, J (2004). Reconciling sustainability and growth: criteria, indicators, policies. *Sustainable Development*, 12(2), 74-86.
- Stellner, C., Klein, c., & Zwergel, B. (2015). Corporate social responsibility and Eurozone corporate bonds: The moderating role of country sustainability. *Journal of Banking & Finance*, 59, 538-549.
- Stevens, P. (2020). Sustainable investing is set to surge in the wake of the coronavirus pandemic. CNBC. Retrieved from: <https://www.cnbc.com/2020/06/07/sustainable-investing-is-set-to-surge-in-the-wake-of-the-coronavirus-pandemic.html>
- Ullman, A. H. (1985). Data in search of a theory: A critical examination of the relationships among social performance, social disclosure, and economic performance of US firms. *The Academy of Management Review*, 10(3), 540-557.
- Verheyden, T., Eccles, R. G., & Feiner, A. (2016). ESG for All? The Impact of ESG Screening on Return, Risk, and Diversification. *Journal of Applied Corporate Finance*, 28(2), 47-55.
- Yang, K., Akhtar, U., Dessard, J., & Seemann, A. (2019). *Private Equity Investors Embrace Impact Investing*. Bain & Company. Retrieved from



[https://www.bain.com/contentassets/3ff71feadbfb4649bb4ae7c9a279226e/bain\\_brief\\_private\\_equity\\_investors\\_embrace\\_impact-investing.pdf](https://www.bain.com/contentassets/3ff71feadbfb4649bb4ae7c9a279226e/bain_brief_private_equity_investors_embrace_impact-investing.pdf)

# Appendix

## Appendix A

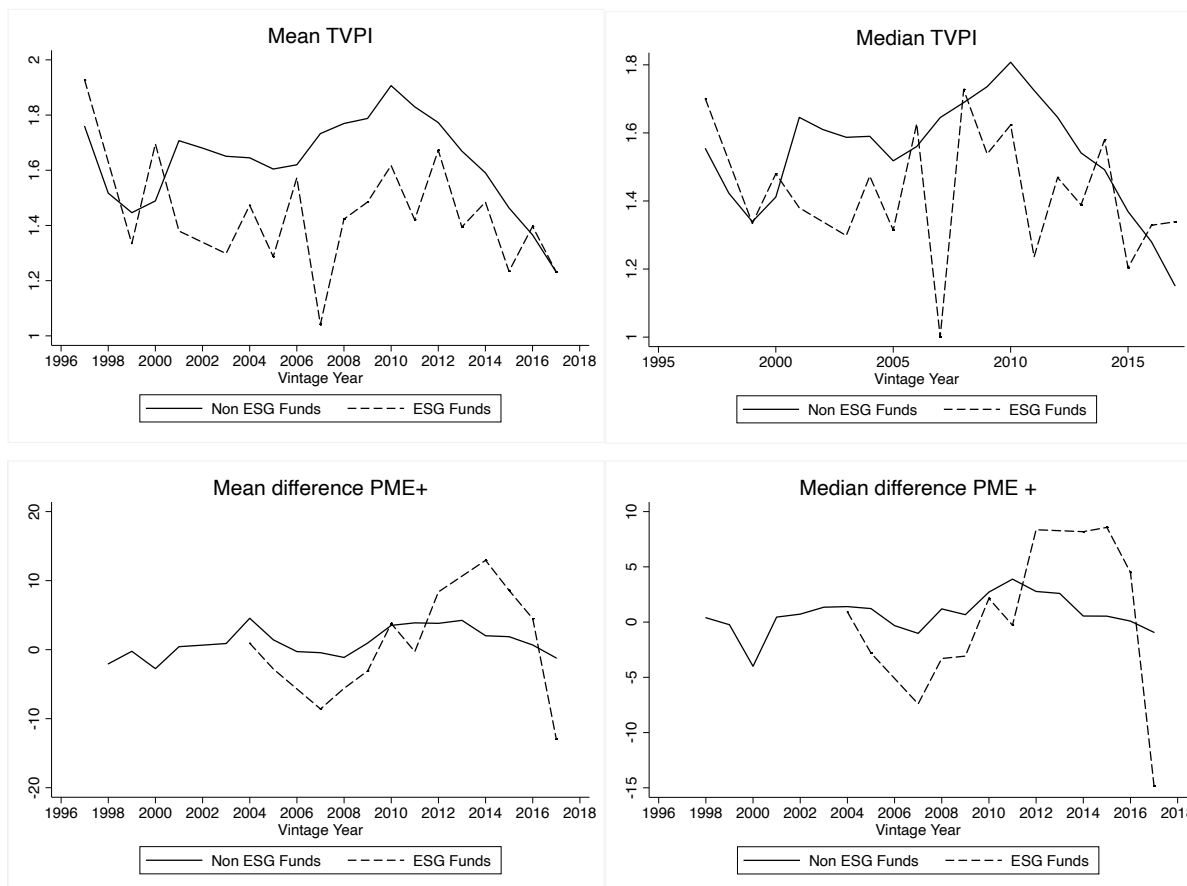


Figure 1. Mean and median of the measurements TVPI and the difference in the PME+ benchmark for ESG funds and non-ESG funds. The difference is calculated by subtracting the IRR PME+ benchmark from the net IRR of the fund.

Table 1. Sample Overview

Funds	No. of Funds	Net IRR				MoM				Fund Size		Vintage Year	
		Mean	Median	Min	Max	Mean	Median	Min	Max	Mean	Median	Mean	Median
Non ESG	3,864	14.2	11.7	-100	1013	1.7	1.5	0	30.8	276.1	202	2008	2008
ESG Funds	107	10.4	9.3	-88.2	64.3	1.4	1.4	0	3.5	217.5	137	2010	2010

Table 2. Characteristics of the two types of funds in percentages.

Variable (%)	Non ESG Funds	ESG Funds
Venture Capital	30.2	28.5

	Liquidated	28.5	16.8	
Geography	Africa	0.59	6.73	
	Asia	11.55	14.42	
	Australia	1.41	0	
	Europe	21.75	46.15	
	North America	63.61	30.77	
	South America	1.08	1.92	
	Undefined	81.70	67.27	
Industry	Artificial Intelligence	0.19	0	
	Clean Technology	4.42	15.45	
	Cloud Computing	0.17	0	
	E-Commerce	0.19	0.91	
	Infrastructure	1.14	1.82	
	Manufacturing	11.25	12.73	
	Diversified	0.95	1.82	
	Vintage Year	1997	2.99	2.73
		1998	3.78	0
1999		3.94	0.91	
2000		5.20	3.64	
2001		3.76	0.91	
2002		2.77	0	
2003		2.64	1.82	
2004		3.55	1.82	
2005		5.37	4.55	
2006		6.81	4.55	
2007		6.94	10.00	
2008		6.48	9.09	
2009		2.99	3.64	
2010		3.57	8.18	
2011		5.24	4.55	
2012	5.08	4.55		
2013	5.27	8.18		
2014	6.17	8.18		
	2015	6.01	8.18	

2016	6.55	5.45
2017	4.87	9.09

Table 3. Outperformance of the PME+ benchmark.

Funds	No. of Funds	PME+ with a benchmark funds	Outperformed (%)	Difference with PME+ benchmark							
				Overall				Outperformed			
				Mean	Median	Min	Max	Mean	Median	Min	Max
Non ESG Funds	903	51.4	0.78	0.13	-43.44	73.93	8.00	5.69	0.00	73.93	
ESG Funds	28	50.0	1.11	0.79	-21.94	41.72	8.34	4.97	0.66	41.72	

## Appendix B

Table 1. Correlogram of the variables used in the regression

	Weighted net IRR	Fund Size	D.Ethos	D.Class	D.Status	Geography	Industry	Vintage Year
Weighted net IRR	1.000							
Fund Size	-0.057	1.000						
D.Ethos	-0.024	-0.045	1.000					
D.Class	-0.029	-0.232	-0.035	1.000				
D.Status	-0.187	-0.133	-0.043	0.047	1.000			
Geography	-0.063	0.155	-0.083	0.017	0.001	1.000		
Industry	-0.014	0.066	0.028	-0.136	0.045	-0.027	1.000	
Vintage Year	0.358	0.025	0.060	-0.112	-0.465	-0.100	-0.040	1.000

Table 2. Pearson correlation

	Weighted net IRR	Fund Size	D.Ethos	D.Class	D.Status	Geography	Industry
Weighted net IRR	1.000						
Fund Size	-0.0611*	1.000					
D.Ethos	-0.025	-0.062*	1.000				
D.Class	-0.021	-0.316*	-0.012	1.000			
D.Status	-0.185*	-0.165*	-0.031*	0.063*	1.000		
Geography	-0.063*	0.131*	-0.080*	0.013	-0.004	1.000	
Industry	-0.015	0.061*	0.027	-0.116*	0.043*	-0.026	1.000

Vintage Year	0.359*	0.053*	0.052*	-0.109*	-0.634*	-0.087*	-0.039*
	0.000	0.000	0.000	0.000	0.000	0.000	0.008

Table 3. Variance Inflation Factor of the regression

Variable		Model 1	Model 2
	Fund Size	1.15	1.15
	Ethos	1.08	1.32
	Class	1..20	1.21
	Ethos ## Class	-	1.33
	Status	2.14	2.14
Geography	Asia	13.69	13.69
	Australia	2.97	2.97
	Europe	21.48	21.48
	North America	28.84	28.84
	South America	2.32	2.32
Industry	Artificial Intelligence	1.02	1.02
	Clean Technology	1.07	1.07
	Cloud Computing	1.01	1.01
	E-Commerce	1.03	1.03
	Infrastructure	1.02	1.02
	Manufacturing	1.01	1.01
	Diversified	1.07	1.07
Vintage Year	1998	2.07	2.07
	1999	2.11	2.11
	2000	2.44	2.44
	2001	2.12	2.12
	2002	1.79	1.79
	2003	1.78	1.78
	2004	2.09	2.09
	2005	2.67	2.67
2006	3.14	3.14	
	2007	3.28	3.28

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	2008	3.18	3.18
	2009	1.11	1.11
	2010	2.35	2.35
	2011	2.84	2.84
	2012	2.76	2.76
	2013	2.82	2.82
	2014	3.15	3.15
	2015	2.97	2.97
	2016	3.06	3.06
	2017	2.61	2.61
	Mean	3.62	3.62

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