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ESG in Venture Capital: An in depth look at the performance of sustainable VC investments.

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## **Abstract**

The topic of sustainability in finance has evolved from a niche approach to a broadly recognized investment focus. But even though the mass market is aware of conscious possibilities of investing still a lot of misconceptions surround the topic. Especially regarding the aspect of performance, the common assumption is that it lacks behind traditional investment vehicles. In the Venture Capital space limited research regarding the topic has been conducted. Therefore, this master thesis is focused on analyzing the factor of performance regarding sustainable startup investments in comparison to the average VC investment and further elaborating on the rationale behind it.

## **Keywords**

Sustainability, Venture Capital, Startups, ESG, Investment Performance, Entrepreneurial Finance

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## I. Introduction

Sustainability is playing an increasingly important role in nowadays society. With the undeniable climate change advancing politics, society and the economy are under pressure to react. Especially in the finance sector this pursuit of following sustainability driven investments historically was characterized by ethical motives and not directly linked to financial performance. The market for instruments that incorporate environmental, social, and governance (ESG) criteria in the investment decision used to be a niche segment and predominately requested by investors with a deep rooting within the sustainability sector. But over the recent years a clear change has been noticeable. Sustainability in all areas of finance has shifted from a side issue to a mainstream topic that can even be considered an investment trend in the current market.

The topic is not only receiving attention from the side of activists like Greta Thunberg and governmental institutions, but furthermore from some of the biggest players in the market. BlackRock, the world's largest asset manager, just recently called for the implementation of global standards to measure companies' efforts in sustainability replacing the prevalent, differentiating rating criteria (Mooney 2020). Furthermore, the asset manager obliged itself to comprehensively increase its exposure to ESG instruments through an extensive expansion of its portfolio.

*“Currently, every active investment team at BlackRock considers ESG factors in its investment process and has articulated how it integrates ESG in its investment processes. By the end of 2020, all active portfolios and advisory strategies will be fully ESG integrated – (...) and BlackRock as a whole – considers ESG risk with the same rigor that it analyzes traditional measures such as credit and liquidity risk.” (Fink 2020)*

Not only big players are entering the space of ESG investing to manifest a predominant position, but the general investor as well. BNP Paribas “ESG Global Survey 2019” shows that already 78 percent of all respondents confirmed that ESG is playing a growing role in their investing or is even becoming integral to their practice (BNP-Paribas 2019). The speed at which this field is growing can also be seen as in their 2017 survey 48 percent of asset owners were holding 25 percent or more of their investments in funds that incorporate ESG and only two years later already 75 percent of all asset owners were involved to such a significant extent in sustainable assets with a prediction of up to 92 percent in 2021 (BNP-Paribas 2019).

Taking a more specific look into the field of Venture Capital (VC) a similar development can be observed. A study by the European Investment Fund reveals that 73 percent of all VCs implement ESG considerations in their investment decision. What differentiates Venture Capital from other areas of finance is the evolution of practices. Even though professionals in the VC field deal with innovative technologies and business models on the daily their implementation of sustainable investment factors lacks behind the broader market. Most Venture Capitalists still follow the previous approach of negative screening. An investment opportunity will be reviewed regarding ESG criteria and if it does not meet these substantially, evaluated as less attractive opportunity or even discarded. The study by Botsari and Lang reveals that this practice is followed by 50 percent of all VCs instead of pursuing more comprehensive approaches like positive screening, active ownership, or a full integration (Botsari and Lang 2020). This is especially unexpected since more comprehensive approaches have shown to be more beneficial towards the performance of an asset.

Exceptions to the rule are dedicated impact funds. They go hand in hand with a trend that is favoring a more conscious approach to capitalism, thus focuses on ethical and social inclusion in addition to monetary gains. Impact VCs are following the same approach as they are combining both a value creation for society on a social, cultural, economic, or environmental

level, as well as realizing financial returns for their investors (Cetindamar and Ozkazanc-Pan 2017). These impact funds execute investments in the manner of a full integration as their objective is not limited to the financial side, but furthermore create a positive impact, which makes a full integration of ESG factors within the investment process a necessity, in contrary to negative screening that primarily acts as a filtering mechanism. This can go as far as intentionally accepting to forego expected financial returns in exchange for the prospect of impact. As the market for impact investments is steadily growing – estimated to reach a total size from \$400 billion to nearly \$1 trillion by 2020 across all classes – the influence of this field is going to have a crucial influence on the economy as well (O’Donohoe, et al. 2010).

But even with impact VCs the differences in motives and expectations are apparent. While general asset managers are already placing a strong emphasis on the performance of ESG investments regarding an improved long-term returns and decreased investment risk (BNP-Paribas 2019), Venture Capitalists still base their decision making towards sustainability on ethical or social responsibilities and the goal of encouraging change towards responsible business practices (Botsari and Lang 2020). More specifically investors are expecting assets with a high ESG ratings to have lower systematic risk, attract a positive risk premium and allow profits based on the underpricing of the market, hence linking sustainability factors directly to performance (Amel-Zadeh and Serafeim 2017).

This leads to the assumption that Venture Capitalists are still following the former notion that sustainability and performance are exclusive factors which negatively impact each other go hand in hand with inferior returns. As discussed, this belief has been widely falsified and in many asset classes implementing ESG criteria into investment decisions can be considered best practice nowadays. A possible reason for this seeming misconception could be the factor that Venture Capitalists primarily work with private companies. As a result, openly accessible data is limited and dedicated ESG rating agencies are not providing the information needed to

extensively evaluate individual investment opportunities. This gap comprised of missing key actors delivering sustainability insights should not be overlooked (Muñoz-Torres, et al. 2019). Hence, Venture Capitalists cannot rely on a preliminary ESG scoring, but rather have to determine the degree of sustainability of a startup based on the information provided and evaluated through their own methods. This could explain why most VCs rely on the approach of negative screening and the factor of performance is still a secondary driver in the decision-making process of a Venture Capitalist.

In addition to that the research landscape mostly focuses on pure impact VCs when examining the aspect of performance, which is why this thesis is taking a detailed look at the overall landscape of Venture Capital and making the attempt to evaluate how sustainable startup investments match up with the average growth company invested in. To accomplish this the current state of research regarding the returns of sustainable VC investments are being reviewed in more detail to gain deeper insights into the topic of performance, as it has already been examined in other areas of finance. Furthermore, a proprietary research is structured, conducted, analyzed, and thoroughly discussed in the latter part of this thesis.

## **II. Literature Review and Hypothesis Development**

Even though the field of ESG investments has been widely researched over the recent years, sufficient findings about the performance of sustainable Venture Capital investments are still scarce. Most studies either focus on impact VCs that have a dualistic approach to investing, combining both financial returns and social, cultural, economic, or environmental impact, or set their scope on a very specific area within the sustainable Venture Capital landscape. As a result, the broad spectrum of insights on different asset classes will be instrumental to gathering commonalities across multiple types of sustainable investments and derive theoretical concepts that can be applied to Venture Capital as an asset class. In addition to that the industry specific

findings within the VC industry can be used to complete the theoretical basis on which all further research is going to build upon.

The first topic to consider are the specific definitions of the terms of impact, responsibility, and sustainability in the context of investing. The strongest approach when focusing on achieving a positive effect on the environment and society is the concept of impact investing. The most common definition is offered by the Global Impact Investing Network (GIIN).

*“Investments made with the intention to generate positive, measurable social and environmental impact alongside a financial return.” (GIIN n.d.)*

This dualistic approach is rooted deep within the structure of an impact investor and positions them differently to a tradition investor that solely focusses on the realization of financial returns. Less strict with achieving measurable impact is the concept of responsible investing. There an investor is aware of the possible ESG benefits that can be realized with an investment and therefore actively screens opportunities and expels those who do not meet the criteria sufficiently by displaying ESG risk factors. Similar to responsible investing, the approach of sustainable investing considers ESG criteria, but shows a stronger opportunistic character. Sustainable investors identify investments based on ESG considerations that promise to increase value and hence yield competitive returns (Rockefeller n.d.). Within this thesis the focus lays on responsible and sustainable investing that is going to be joined under the term of “sustainable”, as the goal is to compare Venture Capital investments that show strong ESG characteristics to the average VC target, rather than adding the secondary benefits of impact into the equation, that are often difficult to measure and have been researched comprehensively. Looking at the performance of sustainability Friede, Busch and Bassen conducted an exhaustive review study on the relationship between ESG criteria and corporate financial performance (CFP) taking over 2000 empirical studies into account dating back to the 1970s. Their findings

show that approximately 90 percent of studies find a nonnegative relation between ESG criteria and CFP, with vote-count studies displaying a positive result in 47.9 percent of the cases and meta-analyses yielding positive findings 62.6 percent of the time with an average correlation level of 0.15. In addition to that this positive connection of ESG and CFP is supported by a stability over time – starting from the mid-1990s –, various approaches, regions, and asset classes (Friede, Busch and Bassen 2015). At the time of the study the prevalent notion across private and institutional was still, that the relation between ESG and CFP was neutral at its best. As already discussed, this opinion has been thoroughly challenged within a rather short period of five years (BNP-Paribas 2019). A more recent study from Morgan Stanley paints a very similar picture. Their analysis focuses on the performance of 11.000 mutual funds over a period of 14 years from 2004 to 2018. The two key findings to take away were that sustainable funds were in line with the performance of comparable traditional funds, while offering lower market risk shown by a 20 percent lower downside deviation (Morgan-Stanley 2019). This leads to the conclusion that – while following a traditional investment strategy that aims to achieve optimal financial returns – the inclusion or even focus on sustainable assets is not going to negatively influence the performance, but rather holds the potential to benefit the portfolio and overall risk minimization.

When narrowing the scope of sustainability to Venture Capital most studies are less comprehensive and focus on the subsector of impact VCs. Even though impact VCs follow a dualistic approach combining both social and financial objectives while investing, there are clear similarities to sustainable investing. A recent study has shown that impact funds underperform traditional VC funds by 4.7 percent ex post measured by their IRR, even after adjusting for various fund characteristics. To understand this shortcoming regarding performance it was further examined if there is a general acceptance towards lower returns and by that a high willingness to pay (WTP) for impact. The results revealed that an impact investor



is inclined to forego 2.5 to 3.7 percent in expected excess IRR for positive social, cultural, economic, or environmental effects of the investment. The measured WTP for impact is moreover amplified when an investor is confronted with political and / or regulatory pressure, while on the contrary laws that discourage the sacrifice of financial returns may lead to a lower WTP (Barber, Morse and Yasuda 2020). An equally recent study by Cole et al. investigated the performance of the International Finance Corporation, a member of the World Bank Group and one of the largest and longest-operating impact investors focusing on private-sector development in less developed countries. In contrast to the earlier discussed findings Cole et al. suggest that the portfolio of the International Finance Corporation outperformed the S&P 500 by 15 percent measured through the public market equivalent (PME) since its first activity in 1961. Similar returns to the IFC can be found in private equity funds active in advanced economies. An explanation for the disparity between the results of these two studies are offered by the authors pointing towards the varying definitions of an impact investor. Barber's, Morse's, and Yasuda's impact investor is characterized by a willingness to pay for the positive impact of an asset, while Cole et al. follow the understanding that investors can realize both competitive financial returns and address ESG related problems as their intent is the defining characteristic (Cole, et al. 2020).

Both studies on impact funds and the previous research about the broader market of ESG assets in combination lead to the conclusion that investing in sustainable assets offers a strong potential for above average performance. One deciding factor in the equation is the degree of mission drive towards impact. If the focus on realizing nonpecuniary benefits towards change is out-weighing financial objectives, an investor is going to have difficulties realizing (above) average returns in comparison to players primarily focusing on wealth generation – even including the positive effects of ESG assets. As this thesis aims at researching the performance of sustainable investments within the portfolio of a general Venture Capitalist the willingness

to pay for ESG criteria should not be significant. Hence, the sustainable VC investments are expected to perform as well or even outperform the rest of the portfolios. This leads to the null hypothesis  $H_0$  depicting the previous notion that including sustainable investments in a Venture Capital portfolio would have a negative effect on the returns showing a negative correlation between sustainable investments and the performance of said investments. On the contrary the alternate hypothesis  $H_1$  claims that including sustainable startup investments in a VC portfolio will show a relationship equal to zero or even positive regarding performance.

After reviewing the current state of research and the corresponding literature, the topic of performance in the context of Venture Capital investments should be further elaborated on. The most common performance measure in practice is the internal rate of return (IRR). It takes the time value of money into account by providing an average annualized percentage return on the investment (Storey 2016). To do so it sets the net present value (NPV) to zero and solves for the discount rate, which in this case is the IRR (Fernando 2020).

$$0 = NPV = \sum_{t=1}^T \frac{C_t}{(1 + IRR)^t} - C_0^1$$

In addition to the IRR the cash-on-cash multiple (CoC) is a common metric to compare investment opportunities without taking the aspect of time into consideration. It is frequently used by Venture Capitalists and Private Equities to represent performance as the CoC is easy to compute and understand (Permian n.d.). It is going to help to understand the overall development of value of an investment, act as a benchmark for the IRR, and further help filling in the gaps when determining the success of different investments.

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<sup>1</sup>  $C_0$  = total initial investment costs,  $C_t$  = net inflow of cash during the investment period t, IRR = internal rate of return, t = number of time periods

$$CoC = \frac{V_{exit}}{V_{PIC}} \int stake^2$$

Besides classical performance measures like the IRR and CoC, levels of performance can be observed in the funding a startup receives. As Venture Capital is linked to considerable investment risk and a majority of all growth companies already fail in their early stages (Erica 2017), a higher number of successful funding rounds, shorter time between individual rounds, and overall larger rounds and accumulated amount of funding can give insights into the performance of a startup (CB-Insights 2018).

### III. Data and Methods

The basis for all analyses in this thesis is the entirety of data from Crunchbase<sup>3</sup> as of the 19<sup>th</sup> of September 2019. The platform is specialized in compiling data regarding all types of growth companies, funding financials and investors active in the space.

*“Crunchbase is the leading platform for professionals to discover innovative companies, connect with the people behind them, and pursue new opportunities. Over 55 million professionals—including entrepreneurs, investors, market researchers, and salespeople—trust Crunchbase to inform their business decisions.” (Crunchbase 2020)*

At the time of the export the database contained around 800.000 individual organizations and information on more than 280.000 funding rounds. In addition to that data on around 100.000 acquisitions and 17.000 IPOs was incorporated in the analysis. The foundation for evaluating the Crunchbase data were the individual funding rounds. They provide insight on the companies that received funding, investors involved, type of funding round, date, and amount. In a further

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<sup>2</sup>  $V_{exit}$  = value at exit,  $V_{PIC}$  = value of paid in capital,  $\int stake$  = ownership stake at exit (Gaddy, Sivaram and O'Sullivan 2016)

<sup>3</sup> Crunchbase Inc.'s data is accessible through [www.crunchbase.com](http://www.crunchbase.com).

step the base of funding rounds was expanded with company specific information and data on possible exits through acquisitions and IPOs.

As to the nature of the data originating from a database and working on a large scale, the principles of extract, transform and load (ETL) had to be followed to avoid errors during the processing. Especially the step of transforming was crucial to cleanse the data according to the operational requirements, as the dataset was containing cells with missing information, duplicates, and had to be filtered and sorted to improve the quality for further analysis (Bansal 2015). The final sample were around 5.700 companies that fulfilled all requirements and could be utilized to measure the performance of sustainable VC investments.

Determining which companies within the sample could be considered sustainable investment opportunities posed to be a challenge as there are no dedicated ESG rating agencies that evaluate startups based on their ESG criteria. In addition to that not specifically impact investments were considered, which could have been distinguished by their dualistic structure regarding returns, but rather all targets that show strong ESG implications. Hence, a different approach had to be developed, which was applicable to the entire dataset. One essential characteristic Crunchbase is giving insights into is the sector that a company is active in. This was used as the fundament to determine if an organization can be considered a sustainable investment or not. Since the analysis is not focused on pure impact investments not only companies that directly operate in the field of sustainability should be considered, but in a broader sense all companies that are active in areas that show any sustainable implications. The literature on Venture Capital and startups is very scarce when it comes to assessing different industries and their sustainability, thus a broad overview of all sectors with respective ESG scoring cannot be found at all. As a result, an own method had to be designed.

One source of information regarding sustainable industries are the portfolios and corresponding investment theses of impact VC funds. The similarities in topics that were encountered within these funds<sup>4</sup> were matched with individual research on specific sectors which was available and resulted in the selection of four industry categories from the Crunchbase dataset. Sectors that have been assumed to show strong ESG implications<sup>5</sup> are education, health care, sustainability, and privacy and security. The direct effects of improved education can be quantified by the fact that each year of secondary schooling can increase wages up to 25 percent and especially in the field of technology education software and distance learning have the potential to greatly reduce costs while improving the quality of education (D.-Capital-Partners 2013). A similar picture can be seen in health care, as innovations in the field are improving society's general wellbeing through lowering costs, making medical services more accessible and lastly preventing long-term conditions like cancer or diabetes altogether (Lam and Tansey 2018). The implications of companies active in the field sustainability are quite straight forward as they are trying to improve the overall impact on the environment through renewable energy, sustainable production, research of innovative materials, etc. Lastly the topic of security and privacy has gained increased attention over the years as in nowadays society the internet and overall information technology sector plays a fundamental role and data privacy has become a human rights' issue directly impacting society (Maslin and Velarde 2019).

After compiling and cleansing the data and setting a sustainability classification, company specific calculations were made to provide results for the following analysis. The basis for all calculations were the individual amounts raised per round in US dollar (USD)<sup>6</sup>. To achieve comparability within the model the first assumption was set that a Venture Capitalist is only participating in the Series A investment as its first round and returns are measured by the last

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<sup>4</sup> (Nysnø n.d.), (BSC n.d.), (Norrskan n.d.), (BVG n.d.), (AnandaVC n.d.)

<sup>5</sup> (Peiró-Signes and Segarra-Oña 2013), (Tamimi and Sebastianelli 2017)

<sup>6</sup> USD used as common currency to compare investments across geographies and monetary zones.

recorded funding round or an event finalizing the funding process like an exit (IPO or acquisition) or the closure of the company. Before calculating returns the associated valuations of each company had to be computed taking the final valuations into account. With an IPO or acquisition the valuation is given by the market capitalization or the acquisition price, while with a closure the terminal value of the company is equal to zero, but when it comes to funding rounds the post-money valuation must be calculated from the invested amount and the received ownership stake (Majaski 2020).

As Venture Capital investments are conducted in the private market deal specific ownership stakes do not have to be publicized and predominantly are handled as confidential (Stirling 2016). This created the necessity to make the second assumption that all ownership stakes were standardized percentages with a median stake a Venture Capitalist acquires per round based on prevalent investment practices ( $\int stake_0$ ). An important factor that must be considered with investing in rounds is the effect of dilution, which is a decrease in ownership for existing shareholders that occurs when a company issues new shares within a funding round (Hower n.d.). Following up on the first assumption the initial ownership stake of Series A had to be adjusted to dilution according to the final round or exit recorded ( $\int stake$ ).

Round	Series A	Series B	Series C	Series D	Series E	Series F	Series G	Series H	Series I	Series J	Exit
$\int stake_0$	20.00%	16.00%	13.00%	12.00%	10.00%	9.00%	8.00%	6.00%	5.00%	5.00%	-
$\int stake$	-	17.24%	15.26%	13.62%	12.38%	11.36%	10.52%	9.92%	9.45%	9.00%	12.00%

Table 1: Overview of ownership stakes before and after dilution<sup>7</sup>

The table gives an overview of all individual funding rounds spanning from Series A – where a dilution has not occurred in the model yet – until the Series J where the initial VC’s 20 percent

<sup>7</sup> (Quintero 2019), (Finerva 2019), (Gaddy, Sivaram and O’Sullivan 2016), (Abdullah 2018), (Girardi 2016), (Schuster 2019)

stake has been diluted to 9 percent. As most startups will not raise ten funding rounds before making an exit the average amount of funding rounds of all companies that have been acquired or did an IPO further analyzed. The result shows an average of 3.39 funding rounds in exited companies, which positions a company between the Series D and E financing, leading to an ownership stake between 13.62 and 12.38 percent. This falls in line with the assumptions of Gaddy Sivaram and O’Sullivan that approximated the fractional ownership of a Series A investor at the time of an exit to be at twelve percent (Gaddy, Sivaram and O’Sullivan 2016).

Having all necessary data in place the actual computation of performance measures was possible. The first ratio to be calculated was the cash-on-cash multiple. In the dataset the value of the paid in capital ( $V_{PIC}$ ) was – under the previously discussed assumption that a Venture Capitalist only invests in the first round of financing – equal to the raised amount of capital in the Series A, which was uniformly considered as the first funding round. For determining the exit value ( $V_{exit}$ ) multiple sources had to be considered as either the last recorded funding round with its post money valuation, a status of closed<sup>8</sup>, the acquisition price or the market cap of an IPO define this variable. With both values in place only the ownership stake ( $\int stake$ ) – also accounting for dilution – had to be incorporated into the equation to receive the overall cash-on-cash multiple. The second defining performance measure to be computed was the internal rate of return. As the analysis is built upon a single investment and further down the lifecycle of the startup also on a single event to determine the value, just one negative cashflow and one positive cashflow are considered. This allows to adjust the IRR formula accordingly (Gaddy, Sivaram and O’Sullivan 2016):

$$IRR = \left( \frac{V_{exit} \int stake}{V_{PIC}} \right)^{1/t} - 1$$

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<sup>8</sup> The closed status corresponds with the termination of a company and equals the exit value to zero.

The approach of determining the values and stakes is identical to the computation of the CoC, but the variable of time must be incorporated as well. To receive the time between investment and exit (t) the difference between the respective dates in years had to be calculated. As with exit values the corresponding date is based on the Series A and the exit event, which can either be the date of the last funding round, IPO, acquisition, or termination. In addition to the two main performance metrics, measures regarding the number, frequency and volume of funding rounds were implemented into the analysis. Even though the analysis is focused on IRR and CoC supplementary information can help to form a more complete picture and strengthen all previous results. With the total funding and the number of funding rounds two metrics are already recorded within the dataset from Crunchbase. Furthermore, the time between funding rounds (TbR) and funding per round (FpR) were computed, following the idea that successful startups show a higher frequency of funding rounds and larger ticket sizes in the respective rounds.

With all data and metrics in place the approach for evaluating the information had to be determined. To measure the relation between sustainability and the defined performance metrics an ordinary least squares regression was chosen. When performing a linear regression one or multiple independent variables can be examined regarding their effect on a single dependent variable. In this analysis the independent variable of interest is the factor of sustainability and multiple dependent variables were researched independently regarding the effect of sustainability on them. To control for inference within the model a set of control variables was included in the analysis accounting for unbiased causal effect estimates. Both the years of the Series A investments were considered, as well as the country of origin of the invested company.<sup>9</sup>

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<sup>9</sup> The top ten countries were accounted for as control variables which show a sample size of at least 50 occurrences within the model covering over 90 percent of all observations recorded.



## **IV. Results**

To determine whether the sustainable character of an investment influences the predefined performance metrics multiple linear regressions were performed. The results were summarized in Appendix 2 offering an overview of the detailed findings that can be found in Appendix 3.

### **A. Results**

In total all regressions analyzed reached strong significance with p-values of 0.000 easily attaining the highest alpha level of one percent. Even with the inclusion of various control variables the standardized coefficient of determination ( $R^2$ ) falls between 12 percent at highest with the time between rounds and just around one percent with the total funding. Hence, only part of the variance within all models can be explained by the included factors and several outside influences are impacting the performance measures. Nonetheless the results of the regressions of each metric give valuable insights on how sustainability influences the performance of a Venture Capital investment.

#### ***Internal Rate of Return***

The first performance measure to test is the internal rate of return. Looking at the summary of the model the unstandardized beta coefficient (B) points towards a positive relationship between sustainability and the IRR, but the main problem with variable is the p-value. Even when choosing a more liberal alpha level of 0.1 the variable fails to reach significance as the p-value aggregates to 0.6275 and thus is 52.75 percent off, which makes any further examination of coefficients highly unreliable. Even when analyzing the dependent variable of the IRR separately by each individual sector significance cannot be achieved (Appendix 4).

#### ***Cash-on-Cash Multiple***

Looking at the second defining performance metric within the analysis – the cash-on-cash multiple – a different outcome of the linear regression can be observed. Analyzing the

unstandardized coefficients, the beta provides the expected change in the dependent variable based on the independent variable. In this case making an investment in a sustainable sector is associated with an increase of the CoC of 64.7 percent. This shows a clear positive relationship between the sustainable character of the respective investment and the cash-on-cash multiple accounting for nearly 20 percent of the mean (Appendix 1). On the contrary to the IRR the variable reaches significance with its p-value of 0.078 assuming an alpha level of ten percent. It should be noted that the use of this alpha level is less common than the levels of one and five percent, which are considered to account for strong statistical significance. When taking a more detailed look at the individual sectors only health care manages to lead to significant results, even reaching an alpha level of 0.05. This finding goes hand in hand with health care additionally showing the largest value for the unstandardized beta of 0.876 pointing towards an 87.6 percent higher cash-on-cash multiple in this sector than the average startup. Taking the results for both IRR and CoC into account the question arises how the two ratios calculated from the same inputs – with the exception of incorporating the factor of time – can display such different levels of significance. As the aspect of time is only incorporated in the IRR, which shows a much larger p-value, it could be assumed that time has a negative effect on the significance. To further clarify this issue a deeper analysis of the individual variables that are being used to calculate both metrics must be conducted.

Staying on the topic of significance, the dependent variable that shows the strongest statistically significant relationship with sustainability of all regressions is the ownership stake. With a p-value close to zero it easily meets the alpha level of one percent and displays a slightly negative relationship with a B of -0.005 linking the sustainable character of an investment to a less than one percent decrease in ownership stake. Lower ownership stakes point towards the occurrence of a higher number of funding rounds, which can be considered as a positive indicator for performance. As the change is relatively minute the explanatory power of this relation is also

limited. In addition to that the variable of  $V_{PIC}$  was regressed, showing a p-value of 0.293, which allows for no statistically significant relationship and hence no predictable capabilities of this factor. Lastly  $V_{exit}$  was studied as the remaining input variable of IRR and CoC. Comparable to the ownership stake the post money valuation both displays a highly significant relationship with the independent variable, as well as a positive influence of being in a sustainable sector. The unstandardized beta implicates a 34.2 million dollar higher  $V_{exit}$  than when not in a sustainable sector, equaling to 24 percent of the mean (Appendix 1). Combining the results from all three variables it can be assumed that with a stronger  $V_{PIC}$  the significance of both OLS regressions of the IRR and CoC could be improved, as the other variables persisted.

### ***Further Performance Measures***

Besides the two main metrics of IRR and CoC further performance measures were implemented into the dataset to provide more criteria to assess the hypothesis. As discussed in the literature review high failure rates are very common in the startup ecosystem, thus a larger number of successful funding rounds can be linked to a better performance of a company. When conducting a linear regression on how sustainability influences the number of funding rounds, the highest alpha level is easily met with a p-value of 0.000. In line with all previous regressions the unstandardized beta of 0.252 displays a positive influence on the number of funding rounds. On the other hand, the total funding shows similarly positive indications, but fails to reach significance. Hence the independent variable cannot be used to explain the dependent variable of total funding. This falls in line with  $V_{PIC}$  pointing towards less feasible results between funding related metrics and sustainability. Even with a non-significant input variable the outcome of founding per round is viable. The independent variable of sustainability shows a p-value of 0.031 and hence a highly significant relationship with the respective dependent variable. As to be expected, the estimated coefficient B accounts for nearly two million dollars more in a sustainable funding round over a traditional one, which accounts for around 15

percent of the mean (Appendix 1). Larger funding rounds are connected to a more successful fundraising process and altogether more attractive company. In contrast to the total funding which does not account for this detail, the FpR gives more accurate insights into the size of individual funding rounds and can be more clearly linked to performance.

Lastly the performance measure of time between rounds was considered. Surprisingly when regressing this measure, the independent variable of sustainability reaches the second highest level of significance of all regressions conducted, even though the factor of time in the equation was suspected to have a negative effect on significance. A more detailed look at the individual sectors further reveals that altogether this dependent variable displays the strongest statistically significant relation with sustainability across all industries, only having education fail to reach any valid alpha level (Appendix 4). On the contrary to all previous regressions, the sustainable character of an investment points towards a negative impact on the TbR with an unstandardized beta of 0.185 – accounting for 29 percent of the average (Appendix 1). Even though the numerator is positive, a longer time between rounds can be considered a negative performance indicator, as faster follow up rounds strongly increase the IRR and by that the value of the initial investment. Interestingly enough only the individual sector of sustainability realizes a negative B, making it the only sustainable industry that collects investments more frequently than the average observation (Appendix 8).

### ***Control Variables***

Control variables are crucial for identifying treatment effects, through that minimizing interference with the model and therefore improving the validity of a linear regression. At the same time, they pose to be difficult to interpret as even conclusive control variables often show correlations with further factors that have not been observed and as a result are not implemented in the model (Westreich and Greenland 2013). Thus, limited emphasis regarding the overall interpretation of this relationship should be attached to the control variables, but rather

insightful commonalities be highlighted. Two groups of control variables were included and should be considered separately. Firstly, within the group of years especially two years show a divergence. During the year 2000 as well as the year 2008 the models display strong implications with mostly negative unstandardized betas (Appendix 3). This can be led back to the difficult circumstances the financial markets had to face both in 2000 as a result of the bursting of the dot-com bubble and in 2008 because of the even more severe financial crisis (Block, De Vries and Sander 2010). Furthermore, a clear trend towards shorter intervals between funding rounds can be observed over the years displaying how quickly startups collect individual funding rounds nowadays.

The second group of control variables shows a less clear picture, since out of all included countries only one noticeably stands out. Across all dependent measures China displays the best unstandardized betas pointing towards a superior performance of VC investments in Chinese growth companies compared to the average startup. In addition to that this coherence is defined by a highly significant relationships reaching the alpha level of 0.01 in seven out of nine regressions, even outperforming the independent variable of sustainability (Appendix 3).

### ***Combined Analysis of Regressions***

After conducting 45 individual linear regressions the results of all models must be evaluated in an overarching analysis. The detailed look at each sustainable sector gives some further insights into how the results emerged. Overall, the results prove to be consistent across the majority of sectors and performance measures. The only clear exception seems to be investments into the topic of education. The first factor where education differs from the combined result is the significance of the relationship between the independent variable of sustainability and the researched metrics, as only a third of the regressions can be considered as statistically significant. Furthermore, the connection between investing into the sector of education and the performance of the respective investment suggests being a negative one across all recorded

betas (Appendix 5). On the contrary to the sector of education, the health care industry represents itself as the strongest indicator for the positive influence of a sustainable character to the performance of a VC investment. Especially when considering the cash-on-cash multiple health care both shows the largest standardized and unstandardized beta, as well as the highest significant relationship with sustainability, which can be connected to the overall best performance. The defining role of this sector had to be expected to a certain extent since health care investments were the largest sample within the conducted analysis (Appendix 6).

All together the combined analysis of all regressions helps to form a clearer picture of a positive relationship between the sustainable character and the performance of said investment. Incorporating a multitude of performance measures on different levels of the dataset let us further clarify this connection. Aside from all positive indications it should be noted that the standardized betas across all regression – amounting between 0.007 and 0.086 independent from its sign – display a rather small magnitude of how well the predictor variables contribute to explaining the actual outcome. This falls in line with the revised literature, especially the comprehensive review study by Friede, Busch and Bassen comparing the relationship between ESG and corporate financial performance. Their research points towards a nonnegative relation in 90 percent of the over 2000 studies and gives the indication that further benefits can be realized through sustainable investing (Friede, Busch and Bassen 2015).

The only exception from this widely positive relationship is the metric of time between rounds. A sustainable startup tends to take around two months longer to secure a follow-up funding round than the average growth company. This leads back to how quickly an investor can realize profits and hence implicates that sustainable investments are slower at yielding returns. Nevertheless, they seem to offset this drawback by realizing higher valuations and more funding rounds. Combining all previous results this lets us reject the null hypothesis that sustainable Venture Capital investments show inferior performance to the average VC investment. At the

same time, an investor must be careful with expecting over proportional performance of his sustainable assets as – even though the alternate hypothesis has been confirmed – the magnitude of the influence of sustainability is limited.

## **B. Discussion (including Limitations)**

Within this discussion two factors should be considered separately – the overall findings and the models themselves. When looking at the results of the analysis the factor of significance becomes apparent. Especially with monetary measures the independent variable within the linear regressions had problems reaching sufficient alpha levels which lead to viable results. Multiple factors come into play when significance is an issue, but as previously discussed especially the measure of  $V_{PIC}$  must be improved. Even though the Series A was defined as a general starting point for the analysis, the results evaluating sustainability were not sufficient. Only with the implementation of ownership stakes those funding specific metrics were improved, as it can be observed with the post money valuation of  $V_{exit}$ . This led to  $V_{PIC}$  being a weakness of the analysis, which is moreover connected to the model itself (Gaddy, Sivaram and O'Sullivan 2016). It can only be speculated if a further standardization of inputs would have solved this problem. Even though the relationship between the ownership stake and sustainability showed the highest significance the various assumptions that had been predefined to create sufficient consistency within the model should not be neglected. This had to be implemented to account for the varying number of funding rounds ranging from a minimum of one until a maximum of 19, which had to be represented in the ownership stakes including dilution as well.

The issue with monetary metrics is closely connected to the model itself and cannot solely be explained based on the conducted analysis. For ideal results, the Crunchbase database must have been more extensive and standardized in its recording of funding rounds, leading to a clearer structure within the dataset. The inconsistency of data becomes especially visible when

looking at the entirety of the dataset. The export of funding rounds contained around 33.000 Series A rounds, of which after the process of cleansing and standardizing the data only 5.700 could be considered, displaying a loss of information of over 80 percent – not accounting for additional Series A rounds that had not been reported to Crunchbase. The second characteristic of the models themselves to take a more detailed look at is the categorization of sustainable companies. As the scope of this thesis was not to look at pure impact investments, but rather at the entirety of Venture Capital investments that simultaneously show a sustainable character, the approach for identifying sustainability was to incorporate the sector a company is active in. This method was limited by the data source, similar to the funding information, as individual ESG ratings were not available, which would have strongly improved the quality of results. Out of the total of 5726 sample companies 1781 were identified as sustainable. Within these 1781 sustainable companies the sector of health care is overproportionally represented in the database with around 1100 organization. The remaining three sectors of security and privacy, education and sustainability collectively represent the residual 700 companies. This could lead to an emphasis of the analysis towards health care specific characteristics instead of detecting properties of general sustainable VC investments. To rule out this effect the individual analysis of all sustainable sectors had been added to allow for the comparison of the overall result with each sector.

Lastly the topic of control variables must not be neglected. Alike the funding information, the variable of timing of the Series A investment could be improved regarding its data quality. The sample span over a time of 25 years includes two major crises for the Venture Capital market. In a more controlled time frame without such strong outside influences the effect of sustainability on a VC investment could possibly lead to more precise results. On the contrary it could be argued that especially during times of distress for the financial markets sustainable VC investments might reveal their advantages. Besides the year, the control variable of



countries should be considered. It was chosen to incorporate the top ten countries that simultaneously show at least 50 occurrences to ensure validity of the relationship between the control and the dependent variable. The exclusion of the remainder of the countries could be argued to have led to less precise results, even though over 90 percent of all occurrences were displayed within that selection of the top ten countries.

### **C. Directions for Future Research**

As the current analysis is mostly limited by the data provided by Crunchbase a lot of room for additional research is given when incorporating more criteria. The challenge laying ahead is accessing and collecting the primarily private data and reaching a scale that is comparable in size to a database. With more precise information on both sides of Venture Capital – incorporating the startup and investors – interesting insights could be generated, and overall quality of results improved. Additional in-depth information about the human capital within a startup would open new possibilities of generating insights. Besides the enhancement of data, further research could focus on more variables regarding the success of an investment. Especially the factor of risk has been proven to be impacted by the sustainable character of an investment in other asset classes and could apply to the field of Venture Capital as well.

Another direction for future research is the incorporation of non-monetary implications of sustainable VC investments. Even though the scope of the analysis focused on a broader field of companies that had to fulfill a threshold of ESG criteria, the impact of these investments is not certain. It would be interesting to investigate if investments at the lower end of the sustainability spectrum still have a measurable positive impact, which would break with the current perception of impact investors and disprove some of the opinions in the industry that a negative approach to investment selection is mostly a tool of greenwashing. Therefore, the assets would not only be branded to appear as an impactful investment but would rather have a positive influence intrinsically (Starks, Venkat and Zhu 2017). Lastly a lack of research

regarding the topic of sustainability across different sectors was apparent during the development of this thesis. A comprehensive ESG ranking overseeing the majority of industries within the startup space would be a highly interesting topic. This would help to shine light on the topic of sustainability in the often untransparent startup ecosystem and could simultaneously be a valuable tool for Venture Capital investors to make more ESG responsible investments decisions.

## **V. Conclusion**

The focus of this thesis was to research the relationship between the sustainable character of a Venture Capital investment and the respective performance in comparison to the average VC investment. After conducting various OLS regressions the null hypothesis could be rejected and the expected positive influence of sustainability on performance was confirmed. This result was conclusive in five out of nine models with three additional regressions of performance measures showing positive implications but failing to reach significance. Only the metric of time between rounds pointed towards a slight negative relationship between sustainability and the performance of said VC investment. This slower fundraising process is assumed to be offset in the overall picture as sustainable startups collect larger funding rounds and furthermore retain higher valuations. Overall, the results fall in line with the reviewed literature that implied a non-negative relationship between sustainability and returns in various asset classes outside the Venture Capital space. Nevertheless, investors should be considered with anticipating intrinsic advantages of sustainable VC investments and by that over proportional performance as the discovered effects are limited. The results should rather encourage Venture Capitalists to further expand their exposure to sustainable targets and implement sustainability KPIs into their investment process. This might enable them to simultaneously realize nonpecuniary benefits towards impact without disregarding financial performance.

## VI. Appendix

### Appendix 1: Detailed description of data categories within the model.

	post_money_valuation	post_money_valuation2	raised_amount_usd	num_funding_rounds	total_funding_usd	valuation_price_usd
count	5726	5726	5726	5726	5726	171
mean	\$ 49,405,510	\$ 143,753,800	\$ 9,881,102	3.62	\$ 47,135,180	\$ 747,998,000
std	\$ 243,912,800	\$ 536,889,200	\$ 48,782,550	2.17	\$ 129,739,400	\$ 1,274,200,000
min	\$ 5,005	\$ -	\$ 1,001	1.00	\$ 15,000	\$ 11,899,580
25%	\$ 12,500,000	\$ 5,225,797	\$ 2,500,000	2.00	\$ 7,839,394	\$ 219,294,100
50%	\$ 25,000,000	\$ 40,847,470	\$ 5,000,000	3.00	\$ 19,790,890	\$ 388,454,400
75%	\$ 50,000,000	\$ 120,000,000	\$ 10,000,000	5.00	\$ 45,905,500	\$ 734,000,000
max	\$ 16,000,000,000	\$ 19,000,000,000	\$ 3,200,000,000	19.00	\$ 5,268,800,000	\$ 11,000,000,000

	acquisition_price_usd	ownership_stake	CoC	TbR	FpR
count	818	5726	5726	5726	5726
mean	\$ 362,982,300	0.17	3.60	0.63	\$ 12,794,900
std	\$ 1,182,970,000	0.03	12.86	1.12	\$ 31,363,690
min	\$ 10,250	0.11	0.00	-4.50	\$ 15,000
25%	\$ 30,900,000	0.15	0.25	0.00	\$ 2,918,880
50%	\$ 100,000,000	0.17	1.48	0.40	\$ 6,166,478
75%	\$ 275,000,000	0.20	3.14	0.89	\$ 12,826,560
max	\$ 19,000,000,000	0.20	376.80	15.00	\$ 1,099,545,000

### Appendix 2: Overview of OLS regression coefficients.

Dependent Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
IRR	0.039973	0.082372	0.006618	0.485272	0.627503354
CoC	0.646642835	0.367115	0.023275	1.761417	0.078221530
Ownership Stake	-5.13E-03	0.000769	-0.085657	-6.673448	2.73544E-11
Amount Raised / $V_{PIC}$	1488411.90	1416604.66	0.014125	1.050690	0.293445756
Post Money Valuation / $V_{exit}$	34249504.44	15379755.80	0.029533	2.226921	0.025991523
Funding per Round	1953934.24	903051.43	0.028842	2.163702	0.030528709
Number Funding Rounds	2.52E-01	0.061604	0.053883	4.093290	4.31183E-05
Total Funding	4250320.81	3769412.56	0.015167	1.127582	0.259544143
Time between Rounds	1.85E-01	0.030527	0.076554	6.055055	1.49346E-09

P-value > 0.1

P-value 0.05 - 0.1

P-value < 0.05













	Number of Funding Rounds					Total Funding					Time between Rounds				
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta			B	Std. Error	Beta			B	Std. Error	Beta		
(Constant)	3.518	0.125		28.226	0.000	3824008.324	7627897.538		5.013	0.000	0.523	0.062		8.471	0.000
sustainable	0.322	0.070	0.060	4.590	0.000	8180225.852	4288691.808	0.026	1.907	0.057	0.219	0.035	0.079	6.293	0.000
control_1995	-0.973	2.113	-0.006	-0.460	0.645	-37942781.175	129313863.108	-0.004	-0.293	0.769	1.683	1.047	0.020	1.607	0.108
control_1996	0.361	1.222	0.004	0.295	0.768	13168309.825	74811847.978	0.002	0.176	0.860	2.599	0.606	0.053	4.291	0.000
control_1997	-1.245	0.643	-0.025	-1.936	0.053	-30453852.945	39359854.575	-0.010	-0.774	0.439	3.251	0.319	0.127	10.198	0.000
control_1998	-0.483	0.481	-0.013	-1.003	0.316	12698850.304	29455854.823	0.006	0.431	0.666	1.376	0.239	0.073	5.768	0.000
control_1999	-1.448	0.244	-0.082	-5.948	0.000	23448015.747	14902903.441	0.022	1.573	0.116	1.160	0.121	0.128	9.615	0.000
control_2000	-1.633	0.178	-0.136	-9.176	0.000	-12543096.791	10890990.113	-0.017	-1.152	0.249	0.465	0.088	0.075	5.268	0.000
control_2001	-0.431	0.263	-0.022	-1.637	0.102	-10433215.277	16109141.334	-0.009	-0.648	0.517	1.041	0.130	0.105	7.983	0.000
control_2002	-0.298	0.265	-0.015	-1.121	0.262	-6538793.640	16238743.198	-0.006	-0.403	0.687	1.277	0.132	0.127	9.713	0.000
control_2003	-0.203	0.235	-0.012	-0.861	0.389	-1934335.176	14390361.819	-0.002	-0.134	0.893	0.917	0.117	0.105	7.867	0.000
control_2004	-0.363	0.216	-0.024	-1.683	0.093	-9980154.548	13193518.024	-0.011	-0.756	0.449	0.988	0.107	0.125	9.243	0.000
control_2005	-0.608	0.181	-0.049	-3.362	0.001	-13737194.907	11066216.721	-0.019	-1.241	0.215	0.637	0.090	0.100	7.107	0.000
control_2006	-0.617	0.162	-0.058	-3.818	0.000	-17643779.103	9888246.374	-0.028	-1.784	0.074	0.502	0.080	0.091	6.274	0.000
control_2007	-0.704	0.146	-0.077	-4.825	0.000	-15962308.574	8928835.011	-0.029	-1.788	0.074	0.382	0.072	0.081	5.282	0.000
control_2008	-0.872	0.149	-0.092	-5.845	0.000	-19146167.633	9131288.159	-0.034	-2.097	0.036	0.323	0.074	0.066	4.372	0.000
control_2009	-0.353	0.170	-0.031	-2.070	0.039	-393702.393	10425620.801	-0.001	-0.038	0.970	0.222	0.084	0.038	2.633	0.008
control_2010	-0.106	0.161	-0.010	-0.662	0.508	-7647005.336	9836202.383	-0.012	-0.777	0.437	0.284	0.080	0.052	3.570	0.000
control_2011	-0.059	0.151	-0.006	-0.393	0.695	939742.149	9265801.144	0.002	0.101	0.919	0.131	0.075	0.026	1.740	0.082
control_2012	0.125	0.152	0.013	0.827	0.408	103494.959	9275096.449	0.000	0.011	0.991	0.131	0.075	0.026	1.740	0.082
control_2013	-0.003	0.145	0.000	-0.020	0.984	-2959705.279	8882705.417	-0.005	-0.333	0.739	0.185	0.072	0.039	2.578	0.010
control_2014	0.019	0.132	0.002	0.145	0.884	-2246259.893	8064451.343	-0.005	-0.279	0.781	0.124	0.065	0.031	1.903	0.057
control_2015	0.003	0.128	0.000	0.021	0.983	7294496.236	7839037.500	0.016	0.931	0.352	0.016	0.063	0.004	0.250	0.803
control_2017	-0.137	0.129	-0.018	-1.067	0.286	-5941305.218	7878568.924	-0.013	-0.754	0.451	-0.166	0.064	-0.043	-2.605	0.009
control_2018	-0.285	0.141	-0.032	-2.013	0.044	-3448633.814	8655626.712	-0.007	-0.398	0.690	-0.397	0.070	-0.088	-5.667	0.000
control_2019	-0.337	0.222	-0.021	-1.515	0.130	-15256039.651	13615145.015	-0.016	-1.121	0.263	-0.778	0.110	-0.095	-7.060	0.000
control_USA	0.454	0.100	0.101	4.554	0.000	11087772.851	6105327.145	0.041	1.816	0.069	-0.206	0.049	-0.088	-4.168	0.000
control_CHN	-0.501	0.135	-0.063	-3.706	0.000	51163335.699	8276093.306	0.107	6.182	0.000	-0.009	0.067	-0.002	-0.141	0.888
control_GBR	0.746	0.152	0.078	4.913	0.000	5923904.535	9298607.497	0.010	0.637	0.524	-0.104	0.075	-0.021	-1.377	0.168
control_FRA	-0.187	0.198	-0.014	-0.945	0.345	-7929977.422	12115694.175	-0.010	-0.655	0.513	0.231	0.098	0.033	2.354	0.019
control_IND	0.478	0.202	0.034	2.365	0.018	10648432.398	12356356.763	0.013	0.862	0.389	0.193	0.100	0.027	1.930	0.054
control_ISR	0.123	0.211	0.008	0.581	0.561	4123096.062	12920458.453	0.005	0.319	0.750	0.016	0.105	0.002	0.152	0.879
control_DEU	0.333	0.213	0.022	1.563	0.118	13561444.267	13043267.268	0.015	1.040	0.299	-0.195	0.106	-0.025	-1.848	0.065
control_CAN	0.389	0.215	0.026	1.810	0.070	1191440.167	13150888.888	0.001	0.091	0.928	-0.149	0.106	-0.019	-1.396	0.163
control_CHE	0.284	0.303	0.013	0.938	0.348	-1199169.753	18544028.552	-0.001	-0.065	0.948	-0.242	0.150	-0.021	-1.614	0.107
control_SGP	0.468	0.316	0.020	1.484	0.138	-3853130.797	19314049.065	-0.003	-0.199	0.842	0.063	0.156	0.005	0.405	0.685



	Number of Funding Rounds					Total Funding					Time between Rounds				
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta			B	Std. Error	Beta			B	Std. Error	Beta		
(Constant)	3.573	0.124		28.704	0.000	39731512.248	7606334.631		5.223	0.000	0.551	0.062		8.918	0.000
sustainable	-0.153	0.133	-0.015	-1.146	0.252	-6879356.687	8136809.909	-0.011	-0.845	0.398	0.179	0.066	0.034	2.716	0.007
control_1995	-1.074	2.117	-0.007	-0.507	0.612	-40742100.813	129342956.132	-0.004	-0.315	0.753	1.635	1.050	0.019	1.557	0.119
control_1996	0.260	1.224	0.003	0.212	0.832	10368990.187	74823944.063	0.002	0.139	0.890	2.552	0.607	0.052	4.201	0.000
control_1997	-1.224	0.644	-0.025	-1.900	0.058	-30144743.608	39372411.099	-0.010	-0.766	0.444	3.286	0.320	0.129	10.281	0.000
control_1998	-0.549	0.482	-0.015	-1.139	0.255	11084131.462	29449410.430	0.005	0.376	0.707	1.325	0.239	0.070	5.541	0.000
control_1999	-1.522	0.244	-0.086	-6.242	0.000	21372070.014	14895544.175	0.020	1.435	0.151	1.131	0.121	0.125	9.355	0.000
control_2000	-1.702	0.178	-0.142	-9.578	0.000	-14376845.223	10860711.207	-0.020	-1.324	0.186	0.425	0.088	0.069	4.816	0.000
control_2001	-0.462	0.264	-0.024	-1.752	0.080	-11214364.690	16108071.488	-0.010	-0.696	0.486	1.021	0.131	0.102	7.803	0.000
control_2002	-0.321	0.266	-0.017	-1.207	0.227	-7223977.098	16242908.035	-0.006	-0.445	0.657	1.270	0.132	0.127	9.631	0.000
control_2003	-0.202	0.236	-0.012	-0.859	0.390	-1735954.844	14403287.522	-0.002	-0.121	0.904	0.898	0.117	0.103	7.682	0.000
control_2004	-0.386	0.216	-0.025	-1.786	0.074	-10616396.459	13194977.046	-0.012	-0.805	0.421	0.977	0.107	0.124	9.120	0.000
control_2005	-0.642	0.181	-0.052	-3.545	0.000	-14600759.831	11060025.007	-0.020	-1.320	0.187	0.614	0.090	0.096	6.842	0.000
control_2006	-0.652	0.162	-0.061	-4.032	0.000	-18617393.586	9884175.657	-0.029	-1.884	0.060	0.486	0.080	0.088	6.052	0.000
control_2007	-0.741	0.146	-0.081	-5.076	0.000	-17031257.804	8926308.419	-0.031	-1.908	0.056	0.367	0.072	0.078	5.065	0.000
control_2008	-0.906	0.149	-0.096	-6.068	0.000	-20092595.584	9127160.088	-0.035	-2.201	0.028	0.307	0.074	0.063	4.148	0.000
control_2009	-0.329	0.171	-0.029	-1.931	0.054	126278.717	10423929.103	0.000	0.012	0.990	0.245	0.085	0.041	2.892	0.004
control_2010	-0.117	0.161	-0.011	-0.726	0.468	-8036297.738	9844382.184	-0.013	-0.816	0.414	0.289	0.080	0.053	3.617	0.000
control_2011	-0.068	0.152	-0.007	-0.445	0.656	631568.696	9272311.370	0.001	0.068	0.946	0.135	0.075	0.027	1.790	0.073
control_2012	0.102	0.152	0.010	0.673	0.501	-594730.634	9279288.457	-0.001	-0.064	0.949	0.125	0.075	0.025	1.663	0.096
control_2013	-0.014	0.145	-0.002	-0.097	0.923	-3237507.999	8883696.718	-0.006	-0.364	0.716	0.177	0.072	0.038	2.459	0.014
control_2014	0.004	0.132	0.001	0.030	0.976	-2659962.173	8064819.589	-0.006	-0.330	0.742	0.117	0.065	0.029	1.782	0.075
control_2015	0.000	0.128	0.000	0.002	0.998	7190768.222	7841861.130	0.016	0.917	0.359	0.018	0.064	0.005	0.284	0.776
control_2017	-0.135	0.129	-0.018	-1.049	0.294	-5938059.704	7881484.092	-0.013	-0.753	0.451	-0.160	0.064	-0.041	-2.503	0.012
control_2018	-0.286	0.142	-0.033	-2.019	0.043	-3496905.434	8657917.325	-0.007	-0.404	0.686	-0.397	0.070	-0.088	-5.647	0.000
control_2019	-0.372	0.223	-0.023	-1.669	0.095	-16203078.403	13613299.703	-0.017	-1.190	0.234	-0.796	0.111	-0.097	-7.201	0.000
control_USA	0.501	0.100	0.111	5.025	0.000	12395588.565	6092144.763	0.046	2.035	0.042	-0.186	0.049	-0.080	-3.759	0.000
control_CHN	-0.499	0.135	-0.063	-3.684	0.000	51221966.591	8278194.232	0.107	6.188	0.000	-0.009	0.067	-0.002	-0.127	0.899
control_GBR	0.778	0.152	0.081	5.113	0.000	6764122.183	9294023.667	0.012	0.728	0.467	-0.087	0.075	-0.018	-1.154	0.249
control_FRA	-0.171	0.198	-0.012	-0.863	0.388	-7530814.199	12116902.078	-0.009	-0.622	0.534	0.242	0.098	0.034	2.462	0.014
control_IND	0.456	0.202	0.032	2.256	0.024	10074939.190	12357079.318	0.012	0.815	0.415	0.182	0.100	0.025	1.811	0.070
control_ISR	0.154	0.212	0.010	0.728	0.467	5208281.279	12944443.699	0.006	0.402	0.687	0.011	0.105	0.001	0.102	0.919
control_DEU	0.365	0.213	0.024	1.709	0.088	14405232.678	13041029.811	0.016	1.105	0.269	-0.177	0.106	-0.023	-1.675	0.094
control_CAN	0.430	0.215	0.028	2.001	0.045	2264684.460	13143261.550	0.002	0.172	0.863	-0.122	0.107	-0.016	-1.146	0.252
control_CHE	0.394	0.303	0.018	1.303	0.193	1726744.412	18500199.908	0.001	0.093	0.926	-0.179	0.150	-0.016	-1.194	0.233
control_SGP	0.457	0.316	0.019	1.445	0.148	-4025569.844	19320252.278	-0.003	-0.208	0.835	0.045	0.157	0.004	0.284	0.777



	Number of Funding Rounds					Total Funding					Time between Rounds				
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta			B	Std. Error	Beta			B	Std. Error	Beta		
(Constant)	3.563	0.124		28.648	0.000	39295532.486	7601471.133		5.169	0.000	0.559	0.062		9.057	0.000
sustainable	0.334	0.166	0.026	2.012	0.044	15225785.329	10152966.350	0.020	1.500	0.134	-0.176	0.082	-0.027	-2.135	0.033
control_1995	-1.056	2.116	-0.006	-0.499	0.618	-39916792.897	129324259.576	-0.004	-0.309	0.758	1.618	1.050	0.019	1.541	0.123
control_1996	0.278	1.224	0.003	0.227	0.821	11194298.103	74811672.343	0.002	0.150	0.881	2.535	0.608	0.052	4.172	0.000
control_1997	-1.266	0.645	-0.026	-1.964	0.050	-32064008.077	39395926.330	-0.011	-0.814	0.416	3.301	0.320	0.129	10.316	0.000
control_1998	-0.545	0.482	-0.015	-1.130	0.258	11277379.503	29445795.657	0.005	0.383	0.702	1.325	0.239	0.070	5.539	0.000
control_1999	-1.504	0.244	-0.085	-6.174	0.000	22181047.557	14883223.116	0.021	1.490	0.136	1.115	0.121	0.123	9.221	0.000
control_2000	-1.692	0.178	-0.141	-9.519	0.000	-13890916.239	10859398.639	-0.019	-1.279	0.201	0.417	0.088	0.067	4.723	0.000
control_2001	-0.460	0.264	-0.024	-1.744	0.081	-11115813.724	16106034.579	-0.010	-0.690	0.490	1.019	0.131	0.102	7.792	0.000
control_2002	-0.309	0.266	-0.016	-1.164	0.244	-6702081.351	16240145.015	-0.006	-0.413	0.680	1.261	0.132	0.126	9.560	0.000
control_2003	-0.212	0.235	-0.013	-0.902	0.367	-2185820.362	14391513.369	-0.002	-0.152	0.879	0.910	0.117	0.104	7.786	0.000
control_2004	-0.391	0.216	-0.026	-1.809	0.071	-10840289.429	13194423.954	-0.012	-0.822	0.411	0.978	0.107	0.124	9.124	0.000
control_2005	-0.646	0.181	-0.052	-3.569	0.000	-14792002.892	11059346.665	-0.020	-1.338	0.181	0.616	0.090	0.097	6.862	0.000
control_2006	-0.650	0.162	-0.061	-4.020	0.000	-18519587.493	9880768.330	-0.029	-1.874	0.061	0.482	0.080	0.088	6.006	0.000
control_2007	-0.750	0.146	-0.082	-5.133	0.000	-17422620.970	8930380.949	-0.032	-1.951	0.051	0.368	0.073	0.078	5.071	0.000
control_2008	-0.933	0.150	-0.098	-6.217	0.000	-21305007.558	9170485.491	-0.038	-2.323	0.020	0.319	0.074	0.065	4.281	0.000
control_2009	-0.336	0.171	-0.029	-1.972	0.049	-199917.022	10425846.032	0.000	-0.019	0.985	0.246	0.085	0.042	2.907	0.004
control_2010	-0.112	0.161	-0.011	-0.697	0.486	-7823714.175	9837373.774	-0.012	-0.795	0.426	0.282	0.080	0.052	3.535	0.000
control_2011	-0.070	0.152	-0.007	-0.459	0.646	535652.603	9269499.789	0.001	0.058	0.954	0.132	0.075	0.026	1.759	0.079
control_2012	0.107	0.152	0.011	0.705	0.481	-377572.045	9273298.326	-0.001	-0.041	0.968	0.119	0.075	0.024	1.582	0.114
control_2013	-0.015	0.145	-0.002	-0.102	0.919	-3270755.040	8882498.877	-0.006	-0.368	0.713	0.178	0.072	0.038	2.466	0.014
control_2014	0.003	0.132	0.000	0.019	0.984	-2726273.362	8063841.113	-0.006	-0.338	0.735	0.117	0.065	0.029	1.779	0.075
control_2015	0.003	0.128	0.000	0.020	0.984	7294223.319	7839994.655	0.016	0.930	0.352	0.016	0.064	0.004	0.244	0.807
control_2017	-0.135	0.129	-0.018	-1.050	0.294	-5943531.695	7879689.609	-0.013	-0.754	0.451	-0.162	0.064	-0.041	-2.527	0.012
control_2018	-0.284	0.142	-0.032	-2.007	0.045	-3414034.077	8656749.268	-0.006	-0.394	0.693	-0.398	0.070	-0.088	-5.666	0.000
control_2019	-0.366	0.223	-0.023	-1.645	0.100	-15961504.722	13610494.188	-0.017	-1.173	0.241	-0.801	0.111	-0.097	-7.245	0.000
control_USA	0.492	0.100	0.109	4.947	0.000	1206260.411	6082705.271	0.044	1.974	0.048	-0.177	0.049	-0.076	-3.590	0.000
control_CHN	-0.497	0.135	-0.062	-3.668	0.000	51324786.031	8277419.897	0.108	6.201	0.000	-0.010	0.067	-0.002	-0.142	0.887
control_GBR	0.770	0.152	0.080	5.065	0.000	6426392.309	9293098.754	0.011	0.692	0.489	-0.082	0.075	-0.016	-1.081	0.280
control_FRA	-0.168	0.198	-0.012	-0.850	0.395	-7410782.339	12115479.244	-0.009	-0.612	0.541	0.241	0.098	0.034	2.445	0.015
control_IND	0.465	0.202	0.033	2.300	0.021	10476687.148	12357021.201	0.012	0.848	0.397	0.176	0.100	0.024	1.753	0.080
control_ISR	0.129	0.211	0.009	0.610	0.542	4065531.119	12924214.045	0.005	0.315	0.753	0.033	0.105	0.004	0.318	0.751
control_DEU	0.363	0.213	0.024	1.701	0.089	14323038.961	13038850.662	0.016	1.098	0.272	-0.175	0.106	-0.023	-1.654	0.098
control_CAN	0.423	0.215	0.028	1.969	0.049	1947425.820	13142666.270	0.002	0.148	0.882	-0.118	0.107	-0.015	-1.105	0.269
control_CHE	0.390	0.303	0.017	1.288	0.198	1519318.956	18494671.992	0.001	0.082	0.935	-0.173	0.150	-0.015	-1.150	0.250
control_SGP	0.445	0.316	0.019	1.407	0.160	-4582922.857	19315966.241	-0.003	-0.237	0.812	0.055	0.157	0.005	0.350	0.727

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