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## **How the Sustainable International Agreements Influence the Green Start-Ups' Success: The Probability of Being Acquired**

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Master in management of services and technologies

Supervisor:

Giovanni Perrone

November 2023

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**BUSINESS  
SCHOOL**



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Department of Marketing, Strategy and Operations

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## RESUMO (PT)

Nos últimos anos, a sustentabilidade ambiental tornou-se uma questão importante e muita atenção tem sido focada no desenvolvimento sustentável, que foi definido como uma condição para o desenvolvimento capaz de "garantir a satisfação das necessidades da geração atual sem comprometer a capacidade das gerações futuras de realizar as suas" (Brundtland Report, Our Common Future). Isso leva as empresas a avaliar seus modelos de negócios com base em critérios de sustentabilidade. A conscientização para a adoção de práticas sustentáveis aumentou em vista dos acordos climáticos, particularmente o Acordo de Paris, que marcou um ponto de virada no cenário global. A aquisição de start-ups sustentáveis pode ser um proxy para o sucesso das startups. Esta tese pretende investigar o papel da sustentabilidade no contexto do arranque sustentável para aumentar o mercado de aquisição considerando mudanças regulatórias em tratados internacionais sobre sustentabilidade e considerando um conjunto de dados em painel de 3715 empresas extraídas da Crunchbase e fundadas entre 2010-2019. Os resultados sugerem que a sustentabilidade não influencia positiva ou negativamente a probabilidade de aquisição de uma startup. Consequentemente, optou-se por estudar detalhadamente os motivos que levaram à aquisição de startups sustentáveis dentro da amostra em exame. Além disso, os resultados mostram que a sustentabilidade é um fator secundário quando as empresas decidem adquirir. De fato, os empreendedores são movidos por outras motivações relacionadas à maximização do lucro, particularmente para melhorar sua eficiência no mercado usando novas tecnologias, expansão para mercados mais promissores ou consolidação de sua posição no mercado.

**Palavras chave:** acordos sustentáveis; empresas verdes em fase de arranque; sucesso das empresas em fase de arranque.

## **ABSTRACT (EN)**

In recent years, environmental sustainability has become an important issue and much attention has been focused on sustainable development, that was defined as a condition for development capable of "guaranteeing the satisfaction of the needs of the present generation without compromising the ability of future generations to realize their own" (Brundtland Report, Our Common Future). This leads companies to evaluate their business models based on sustainability criteria. Awareness to adopt sustainable practices has increased in view of climate agreements, particularly the Paris Agreement, has marked a turning point in the global landscape. Acquisition of sustainable start-ups could be a proxy for start-up success. This thesis wants to investigate the role of sustainability within the sustainable start-up acquisition market by considering regulatory changes on international treaties on sustainability and considering a panel dataset of 3715 companies extracted from Crunchbase and founded between 2010-2019. The results suggest that sustainability does not positively or negatively influence the likelihood of a start-up acquisition. Consequently, it was decided to study in detail the reasons that led to the acquisition of sustainable start-ups within the sample under examination. Downstream of the study, the results show that sustainability is a secondary factor when companies decide to acquire. In fact, entrepreneurs are driven by other motivations related to profit maximization, particularly to improve their efficiency in the market using new technologies, expansion into more promising markets, or consolidation of their position in the market.

**Keywords:** sustainable agreements; green start-ups; start-up's success.

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## GLOSSARY

BAT	Best Available Technologies
CDM	Clean Development Mechanism
COP	Conference of the Parties
CSR	Corporate Social Responsibility
CVCs	Corporate Venture Capital
ESG	Environmental, Social & Governance
GCF	Green Climate Fund
GDP	Gross Domestic Profit
GHG	Greenhouse Gas
HBH	Hydrocarbons and Hexachlorobenzene
IET	International Emission Trading
INDCs	Preliminary Nationally Determined Contributions
IPO	Initial Public Offering
JI	Joint Implementation
M&A	Merger and Acquisition
MDGs	Millennium Development Goals
MRV	Measurement, Reporting and Verification
NH <sub>3</sub>	Ammonia
Nox	Nitrogen Oxides
R&D	Research and Development
SDGs	Sustainable Development Goals
SO <sub>2</sub>	Sulfur Dioxide
TEC	Technology Executive Committee
UNCBD	United Nations Convention on Biological Biodiversity
UNCCD	United Nations Convention to Combact Desertification
UNFCCC	United Nations Framework Convention on Climate Change
VCs	Venture Capitalists
VOC	Volatile Organic Compounds

## INTRODUCTION

Environmental sustainability has become a rather important issue in recent years, crossing the current political, economic, and social debate, linked to the affirmation in the global consideration of the political class, society, and investors, or ESG (Environmental, Social & Governance) factors. In recent years, much attention has been focused on the need for sustainable development, that was defined as a condition for development capable of "guaranteeing the satisfaction of the needs of the present generation without compromising the ability of future generations to realize their own" (Brundtland Report, Our Common Future). Today, ESGs provide the legitimate policy framework on which governments, civil society and business can plan, measure, and communicate their contribution to sustainable development. This leads companies to evaluate their business models based on sustainability criteria (Horne et al., 2020).

However, in the literature the authors refer to the *environmental paradox*, in fact the evidence remains inconclusive on whether green initiatives are founded on a different set of core values such as making the world a better place or whether the goals of entrepreneurs are mainly rooted in maximizing profit (Demirel, 2019; De Lange & Valliere, 2019). According to Bocken (2015), sustainability can be a source of competitive advantage for the company, even if investing in sustainability is too risky due to high information asymmetry and regulatory uncertainty (Ghosh & Nanda, 2010). Venture capitalists (VCs) typically invest in riskier assets and financially support start-ups, hoping to close a profitable deal via merger and acquisition (M&A) or an initial public offering (IPO) (Bocken, 2015).

Over the years, awareness to adopt sustainable practices has increased in view of climate agreements, particularly the Paris Agreement, has marked a turning point in the global landscape. The determination to adopt new public policies encourages new companies to move toward sustainable commitments. Increased disclosure requirements are expected to force companies to change and include sustainability goals in their business (Barros, 2022). Previous studies of the market for sustainable startups have found that incumbents use investments in green startups for three strategic reasons: to show their stakeholders that they are committed to green sustainability (De Lange and Valliere, 2020), to increase their environmental and social performance (Battisti et al., 2022), and, to gain access to green startups' technological know-how (Hegeman and Sørheim, 2021). Acquisition of sustainable start-ups could be a proxy for start-up success. This thesis wants to investigate the role of sustainability within the sustainable start-up acquisition market by considering regulatory changes on international treaties on sustainability and considering a panel dataset of 3715 companies extracted from Crunchbase and founded between 2010-2019.



The results suggest that sustainability does not positively or negatively influence the likelihood of a start-up acquisition. Consequently, it was decided to study in detail the reasons that led to the acquisition of sustainable start-ups within the sample under examination. Downstream of the study, the results show that sustainability is a secondary factor when companies decide to acquire. In fact, entrepreneurs are driven by other motivations related to profit maximization, particularly to improve their efficiency in the market using new technologies, expansion into more promising markets, or consolidation of their position in the market.

The thesis will be structured as follows: the first chapter is dedicated to a literature review; the second chapter is on methodology, with a historical background on international climate agreements; the third chapter is on econometric analysis; in the fourth chapter, the five case studies of sustainable start-ups that were acquired are discussed; and finally, the last chapter discusses the study results, conclusions, and limitation of the study.

## **CHAPTER 1: LITERATURE REVIEW**

M&A activity changes the organizational structure of the company. Every M&A activity takes time to ensure operational and financial synergies. There are several reasons why entrepreneurs conduct M&A strategies. Moreover, buyers evaluate the company's stated growth potential through intellectual property rights (Cotei et al., 2018) to gain access to innovative technology and thus achieve higher competitive positioning. Companies often evaluate acquisitions to acquire new assets, to strengthen production capacity or to access new geographic markets (Niemczyk et al., 2022). Sustainability is also becoming increasingly important within the M&A market. For these reasons, the idea that one of the motivations for a merger and acquisition is likely to focus on the strategy of increasing sustainability performance (Barros et al., 2022).

The adaptation between environment and business strategy motivates acquisition behavior: environmental uncertainty affects companies' choices to acquire. Environmental factors influence the restructuring of the company's portfolio and the probability of acquisition (Halebian, 2009). According to Hockerts and Wüstenhagen (2010), sustainable companies can be important for the discovery and exploitation of economic opportunities. The interaction between incumbent companies and start-ups is key to exploring and exploiting green innovations due to their complementary challenges. Research shows that green start-ups are the agents of change for green innovation and CVCs are an important vehicle to help incumbents to adapt of green technologies, which consequently impacts the transformation of markets (Bendig et al., 2022).

The chapter proceeds as follows: a general description of the start-up life cycle, followed by a discussion of what a green start-up is and finally the antecedents about start-up acquisitions.

### **1.1 Start-up life cycle**

The life cycle of start-ups is a process that many new businesses go through in the market. The first step is the research and development (R&D) phase, in which the entrepreneur identifies a market opportunity. This phase is followed by the demonstration of the technology, which includes product ideation and prototyping. During this phase, investments tend to come from the entrepreneur's own capital, government or Angel Investor (Cumming et al., 2016; Hegeman&Sørheim, 2021; De Lange&Valliere, 2019). Investment markets during this phase are characterized by information asymmetries as investors do not have sufficient information to determine whether an investment can lead to future returns (De Lange & Valliere, 2019).

The stage between the development of the new technology and the commercialization of the product is the most critical and is called "Death Valley", from which many start-ups that commercialize a technology may never emerge. According to Cumming et al. (2016) "Death Valley" refers to the scarcity of funding in the technological development phase and the scarcity of funding to demonstrate the feasibility of a new technology for commercialization. Once this stage is overcome, the product is introduced into the market, and the associated risks concern: marketing and scaling up (De Lange & Valliere, 2019). During this phase, the start-up can attract the attention of venture capitalist (VC), succeeding through their knowledge networks, managing to reach investment banks (Hegeman&Sørheim, 2021). Indeed, Banks are interested in eventually taking a venture public or selling it through a merger and acquisition (M&A) transaction (De Lange&Valliere, 2019). These represent two successful exit (Know&Lee, 2018) and they are very different from each other: acquisitions are one-shot transactions involving individual buyers with strategic objectives to be extracted from an agreement, while IPOs are attractive capital raising initiatives for the wider investor community, which are often followed by subsequent secondary offerings (Ragozzino et al., 2016).

The figure below shows the start-up phases and investments received for each phase.

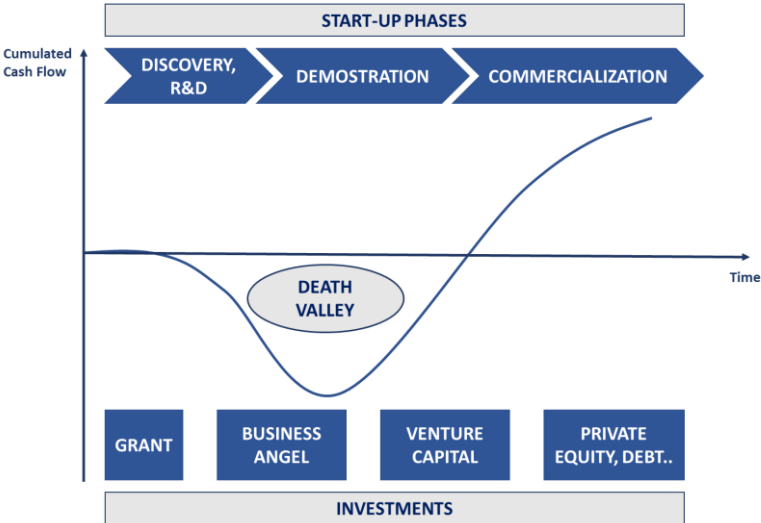


Figure 1.1 Start-up Phases and Investments

**1.2 Green Start-up**

Sustainable enterprises face the challenge of meeting institutional standards while demonstrating distinctiveness. These companies stand out for their inclination on the use of new, socially disruptive, and environmentally beneficial technologies, systems, and business models (De Lange&Valliere, 2019). Green innovation is essential for green transformation, and

that is known as green entrepreneurship: "*a mechanism through which entrepreneurship can meet the need for greener and more environmentally friendly business activities*" (Mrkajic et al., 2019).

Sustainable start-ups differ from conventional ones by their value-based approach and intention to initiate social and environmental change in society (Bocken, 2015). Today, large companies invest corporate venture capital (CVC) in small companies to remain competitive (Hegeman&Sørheim, 2021; Battisti et al., 2022). In fact, investing in green startups is a fruitful strategic option for incumbents who aim to simultaneously pursue environmental and economic goals. Incumbents have the resources to exploit these green innovations and establish them on the market, while start-ups typically explore innovative technologies (Hockerts&Wüstenhagen, 2010).

Investing in sustainable start-ups could represent a source of competitive advantage to compete in a market where both customers and investors are increasingly sensitive to environmental and social issues (Battisti et al., 2022). The number of green start-ups is growing rapidly, exploiting both economic and environmental benefits. Such initiatives have attracted the attention of both policymakers and VCs (Ghosh and Nanda, 2010). It is argued that corporate venture capital (CVC) allows incumbents to draw on valuable knowledge of green start-ups, thus being an important vehicle to increase their green production (Bendig et al., 2022).

On the other hand, sustainable companies can appear as a high-risk sector, especially when compared to other sectors such as IT or biotechnology (De Lange & Valliere, 2019; Bocken, 2015; Cumming et al., 2016). VCs, therefore, should be entrusted with the task of identifying businesses that have the potential to generate economic returns by creating positive environmental and social impacts (Bocken, 2015).

In addition, the *paradox of green entrepreneurship* is discussed, which is based on fact that the environmental well-being deriving from green startups is a public good and, therefore, not excludable. This property of non-excludability may push green entrepreneurs (along with their nascent breakthrough innovations) into liminal spaces, where additional costs render green entrepreneurs at a competitive disadvantage and, thus, limit their economic impact vis-à-vis non-green actors (Pacheco et al., 2010). In fact, the nature of the product or service advantages (clean air, clean water, carbon mitigation) does not exclude competing firms from the benefits that can be drawn, even if competing companies are not willing to pay for them (Cumming et al., 2016). According to the De Lange (2017), investors may choose to avoid sustainability-related business risk since they are unsure of value capture when working with entrepreneurs who have a goal other than profit.

Moreover, investors may be put off by several risk factors: greater information asymmetry at an early stage (Mrkajic et al., 2019), exposure to a market with uncertain government regulations (Demirel, 2017), longer payback times (Cumming et al., 2019) and lack of a scoreboard on the potential of green enterprises (Ghosh&Nanda, 2010). Therefore, within this fluctuating market, VC plays a key role in financing small start-ups; in fact, latter are usually companies at the beginning of their life cycle, little known and generally small. These characteristics increase the overall risks for potential investors, which require an adequate return on invested capital (Alakent et al., 2020).

### **1.3 Start-up Acquisition Antecedents**

The exit of a start-up refers to the strategy that the entrepreneur adopts to exit the company, with the aim of reaping a significant economic return. A review of the existing literature on what are the main reasons that drive entrepreneurs to pursue a start-up M&A strategy is discussed below.

Acquisition is an Open Innovation strategy, which allows companies to acquire knowledge beyond company boundaries (Battisti et al., 2022). Acquiring a start-up could be more profitable than acquiring other companies. Indeed, it is easier to absorb and integrate the organization of acquired start-ups. Furthermore, since a start-up is relatively smaller in size than incumbents, the acquisition of a start-up can mitigate the negative effects of failure caused by poor strategies, unexpected external business environments or overestimation of the purchase price (Know & Lee, 2020).

Most companies choose M&A to innovate and acquire the innovative ideas of emerging start-ups. The latter invest in new technologies and create innovative patents, increasing the probability of being acquired. In fact, intellectual property rights, such as patents, can be a signal for the quality of an innovative idea and the entrepreneurial commitment to develop that idea. Thus, patents can make the firm more attractive to the potential buyers (Cotei et al., 2018). The acquisition can also be motivated by the desire to reduce costs through economies of scale or rationalization of business activities (Ragozzino et al., 2016).

Venture capital investments can also have a significant influence on acquisitions. In fact, VCs invest in risky assets with the aim of finalizing a deal, through an exit through M&A or IPO (Bocken, 2015; Ragozzino et al., 2016; Cotei et al., 2018). According to De Lange & Valliere (2019), the gradual involvement of investors from the initial phase is considered a sign of legitimacy and quality for the company also in the later phases. Legitimacy is a central concept in institutional theory and is defined as "a generalized perception or assumption that the actions of an entity are desirable, proper and appropriate within some socially constructed system of norms, values, beliefs and definitions" (Suchman, 1995). VCs are necessary can confer

legitimacy but establishing legitimacy for sustainable start-ups difficult (De Lange & Valliere, 2019), due to their strict regulations and high information asymmetry. (Ghosh&Nanda, 2010).

Environmental uncertainty affects the acquisition decisions of companies, in fact environmental factors influence the restructuring of the company portfolio and the probability of acquisition (Haleblian, 2009). Recent findings by Hegeman and Sørheim (2021) indicate that incumbents are using corporate venture capital (CVC) as a strategic option to boost green innovation production. This learning effect has benefits, as large companies can significantly increase the adoption of green technologies, thereby maximizing the overall impact on the economy and society (Bending et al., 2022). Startups, on the other hand, gain access to financial resources to scale eco-innovations. Thus, the iteration between incumbents and start-ups is critical to achieving sustainable goals. Incumbents are increasingly engaged in M&A and corporate investments to absorb high-tech knowledge from start-ups born green to go green (Demirel, 2019). Therefore, born green start-ups are the essential change agents for green innovation and therefore valuable knowledge providers for incumbents who want to explore sustainability (Bending et al., 2022).

In addition, many buyers have expressed interest in the potential profits of sustainability, and acquisitions have given them the opportunity to align with cleaner technologies and reach new market segments. An important factor is the increased reputation associated with acquiring green technologies and thus achieving sustainable goals, which help buyers enter new markets (Vastola&Russo, 2020).

In the literature, there is still an open debate on the paradox of green entrepreneurship, or are the need to pursue sustainable goals based on the desire to make the world a better place or are the motivations mainly rooted in maximizing profit? (Demirel, 2019). According to Carrol (2015) Corporate Social Responsibility (CSR) has never been pure altruism; in fact, companies engage in CSR because they search greater benefits for them and for their company. In the field of M&A, Vastola and Russo (2020) distinguish between two types of buyers:

1. Buyers who perceive sustainability as a must-do, including social and environmental issues in their decision. They have been driven by strong value motivations or coercive government demands.
2. Buyers who perceive sustainability as a gradual improvement for the company have opted for M&A because they are interested in reputational gains.

#### **1.4 Literature Gap**

The literature analysis shows that the authors do not consider how international climate agreements, and so the environmental pillar of sustainability, can influence the probability of acquiring a start-up. The aim of this thesis is to cover this gap. In this regard, the next chapter will cover the most important and significant steps of climate negotiations, conferences, and agreements. The analysis and results of these meetings will be used to determine variables related to international climate events, matching macroeconomic shocks regarding environmental sustainability within the start-up market between 2010 and 2022. Environmental sustainability is expected to have an influence on the likelihood of acquisition of sustainable start-up.

**CHAPTER 2: RESEARCH DESIGN**

An ad hoc database was built using Crunchbase, an online platform that holds commercial information from private and public start-ups (Know&Lee, 2018). Crunchbase has been used in several previous studies for similar types of analysis and it has been demonstrated to be accurate (De Lange & Valliere, 2019), offering a dataset of companies at various stages of development and including information about investors, such as the name of the investors involved or other information such as the number of investments received, the headquarter location, number of employees and other data.

**2.1 Data collection**

Extracting data from Crunchbase was time-consuming, given the constraint of being able to extract only a thousand observations at a time. For this reason, the data collection was carried out in collaboration with other students, in order to mitigate the individual effort in manipulating such a large load of information. Following the extraction, a sample of 590.014 companies was collected, considering a time frame whose foundation date is between 2010-2019. The data collection took place considering collecting the start-ups by sector, for a total of 47 sectors and their respective subsectors. For example, as can be seen from the following table, the "Sustainability" sector includes the other sub-categories:

<b>Sustainability Sub-Industries - Crunchbase</b>	
Biofuel	Natural Resources
Biomass Energy	Organic
Clean Energy	Pollution Control
Cleantech	Recycling
Energy Efficiency	Renewable Energy
Environmental Engineering	Solar
Green Building	Waste Management
Green Consumer Goods	Water Purification
Greentech	Wind Energy

*Table 2.1 Sub-categories of industry "Sustainability"*

**2.2 Sample selection**

Within the database of 590.014 companies, some of them included venture capitalists (VCs), incubators, accelerator programs and unicorns. This feature of the company is shown in the "Investor Type" column. To avoid including this type of company within the analysis, it was decided to build a binary variable called "Investor Type" that takes value 1 if the start-up does not belong to one of the categories of investors previously listed, 0 otherwise.



Finally, it was possible to select the sample, discarding all start-ups that had a value of 0 in the "Investor Type" column. At the end of this operation, 5.177 start-ups were deleted.

Since the goal is to analyze the impact of sustainability on the probability of an exit through acquisition, it was necessary to define a criterion to identify the sustainable start-ups of the sample. It was decided to consider sustainable all start-ups that presented as "Industry" on Crunchbase, the macro-category "Sustainability" which means pertaining to at least one of its subcategories, listed in table 2.1. Therefore, a binary variable "Sustainability" was created. It has a value of 1 if the start-up turns out to be sustainable, 0 otherwise. Obtaining 14,241 sustainable start-ups, or 2% of the total sample.

### 2.3 Random Sample and Panel Data Building

The next step was to perform a representative random sampling of the original sample. It was initially made up of 4019 start-ups, of which 95 were sustainable. Following the sampling, a panel dataset was built reporting year by year the related information previously extracted from Crunchbase for each company. In fact, with the panel data it was possible to observe different start-ups in a period ranging from 2010 to 2022.

Downstream of the creation of the panel data, companies in "Closed" status for which there was no information on the closing date, and which did not present any investment round were eliminated. The final panel presents 3715 start-ups, of which 92 are sustainable. Managing to keep the sustainability report unchanged, as shown in the following graph:

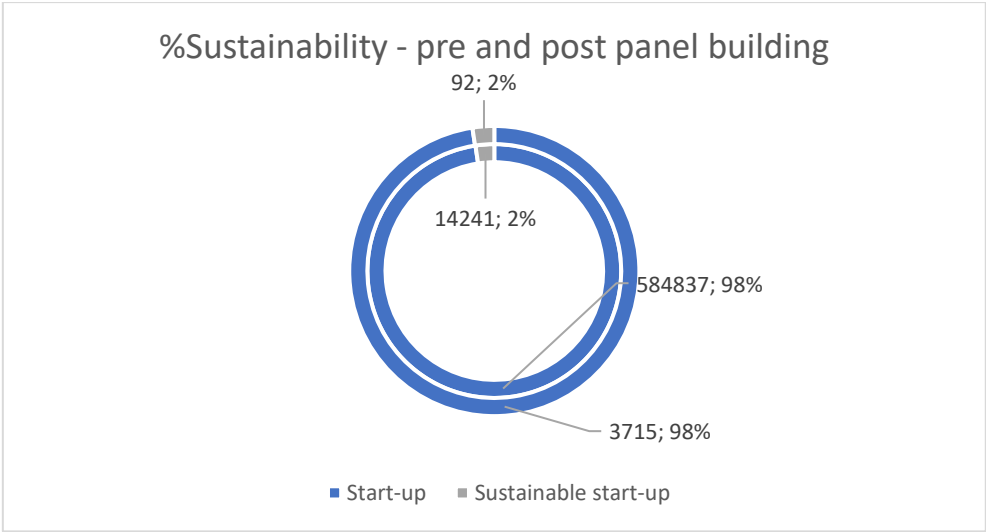


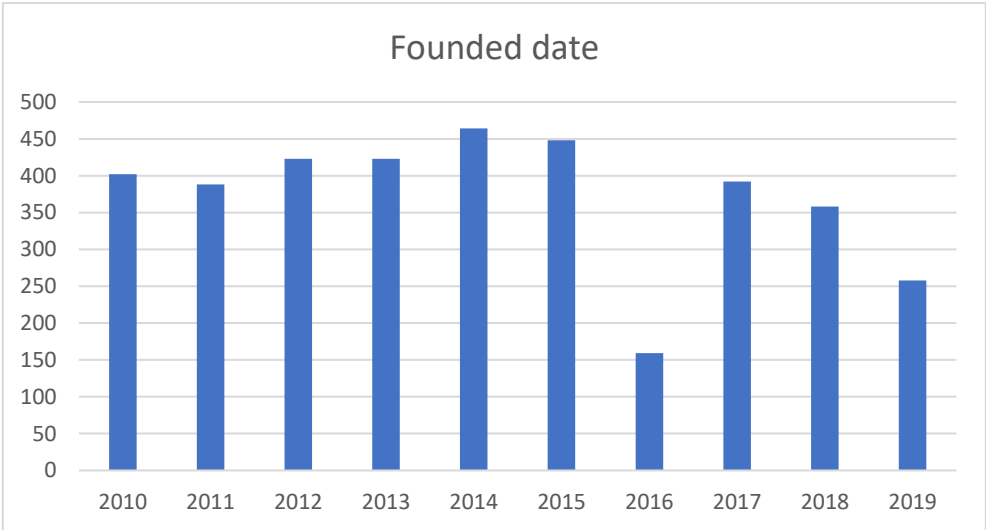
Figure 2.1 Sustainable start-up pre and post panel building

Finally, for companies that had a foundation and closure date, the rows relating to the years in which they did not exist have been deleted. For companies whose closing date was unknown but had received investments, the rows relating to the years following the last investment have been deleted. For these reasons, the final *panel is "unbalanced"*.

**2.4 Sample description**

In this section, a description of the main characteristics of the panel data used for the subsequent analysis will be provided.

The companies in the dataset were founded in a period between 2010 and 2019, and the trend of their foundation date can be seen in the following graph. There was a peak in 2014, with a value of 464 companies founded in that year. While in 2016 there was a sharp decline in the number of start-ups founded during the period taken as a reference.



*Figure 2.2 Number of start-ups founded between 2010-2019*

Most of the start-ups in the sample are located in North America, therefore in the United States and Canada which hold 43%. In Europe there are 31% of the total, followed by Asia with 18%. The rest is located between Oceania, Africa, and South/Central America.

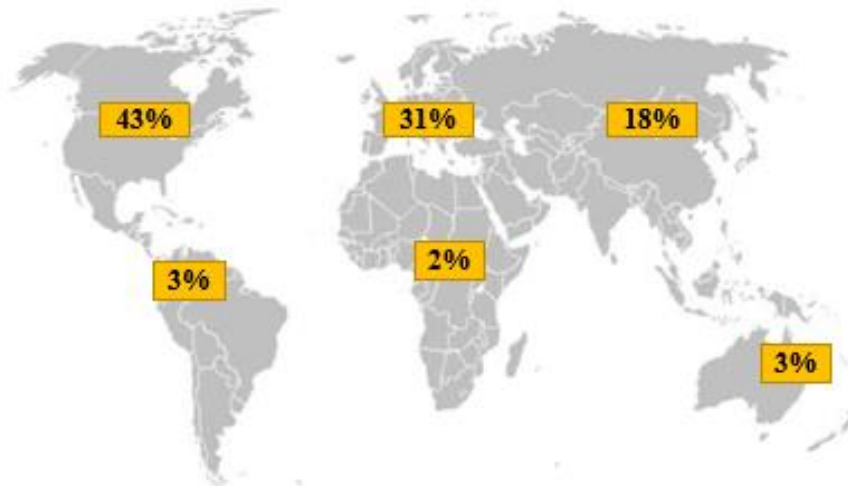


Figure 2.3 Start-up headquarter location.

Finally, figure 2.4 shows the types of funding received by start-ups in the sample. 68% of start-ups received funding early in their lifecycle. In fact, 43% are in the Seed Round, only 5% Grant and 18% Early-Stage Venture. Only 3% is represented by Late-Stage Round investments, while 12% is represented by Venture Round investments. Corporate Round holds only 1%, while 12% is related to other investments, such as crowdfunding campaigns.

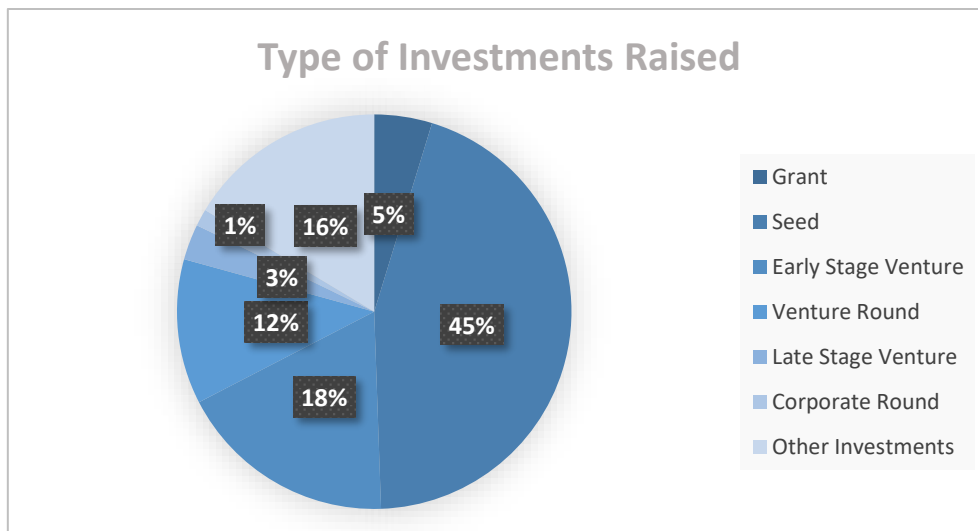


Figure 2.4 Type of Investments Raised

Analyzing the outputs for M&A and IPO, in the sample there are a total of 47 exits via IPO and 179 through M&A. Having the focus on M&A, the following chart shows the M&A trend during

the period taken as a reference. It peaked in 2020 and then collapsed, possibly due to the pandemic effect.

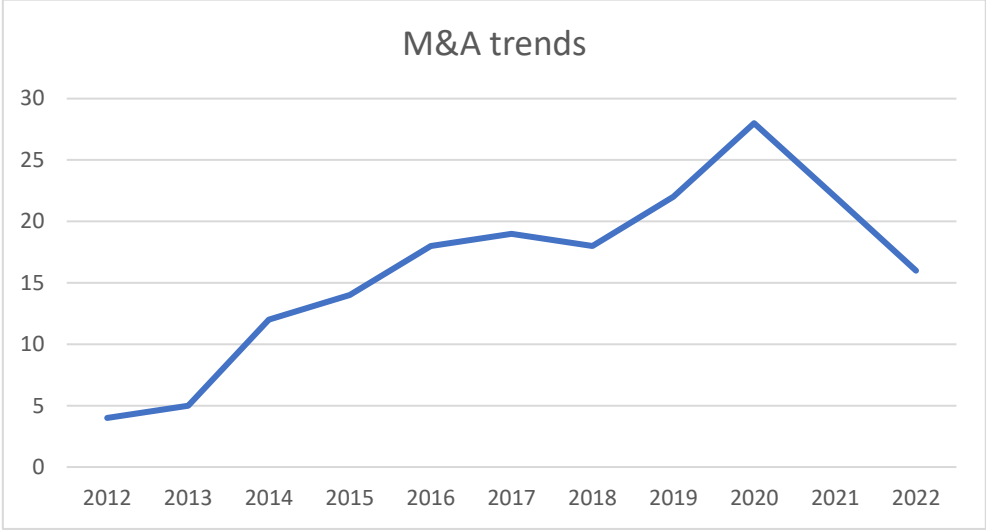


Figure 2.5 M&A Trends

Since the study investigates the impact of sustainability on the likelihood of acquiring a start-up. The main characteristics of sustainable start-ups will be illustrated by means of graphs below:

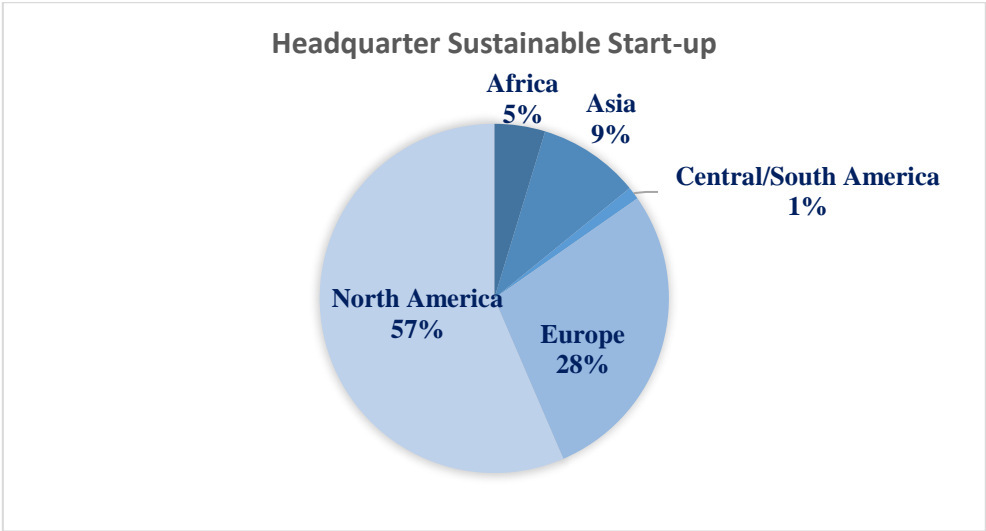


Figure 2.6 Headquarter Sustainable Start-ups

The location of the start-up headquarters reflects the characteristics of the sample in which both sustainable and non-sustainable start-ups are present. Most sustainable start-ups are located in North America (57%) and Europe (28%).

As for the investments received, most of the investments are concentrated in the initial phase of the launch of the start-up, in line with the literature. In fact, sustainability is still considered a risk for investors, as this market is characterized by strong information asymmetries (Demirel, 2019). The literature shows that most risk investments are concentrated in the initial part so that the start-up can overcome the "valley of death" (Hegeman & Sørheim, 2021).

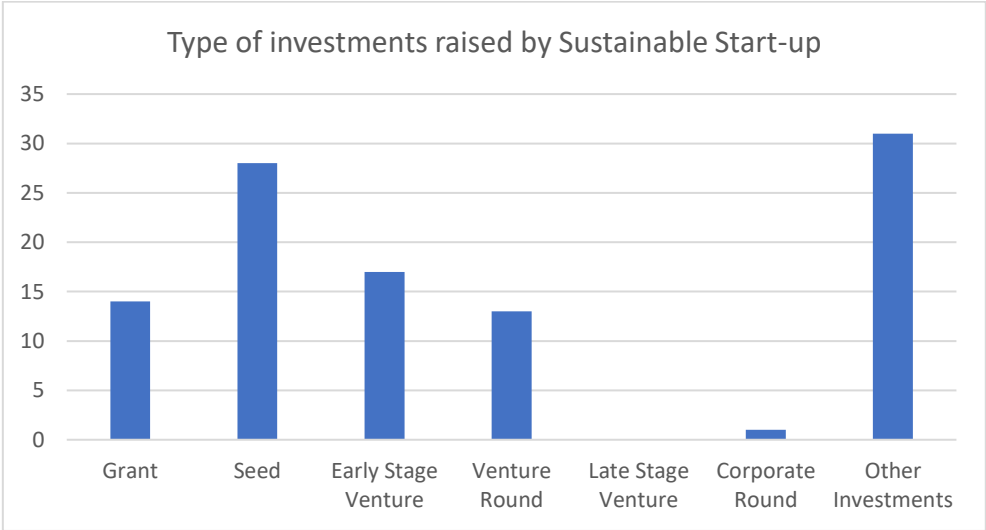
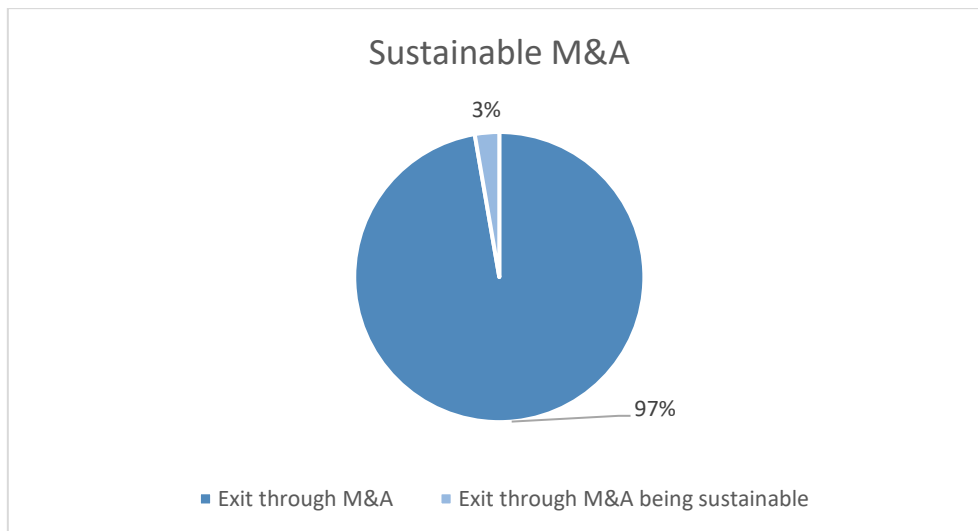


Figure 2.7 Type of Investments raised by Sustainable Start-ups

The sample is composed by 179 start-ups have made an exit via M&A, and of these only 5 are sustainable, that represents only 3% of M&A.



*Figure 2.8 Sustainable M&A*

## 2.5 Dependent Variable

Entrepreneurs can keep their start-ups or decide to participate in M&A activities, which involves merging with another company or selling their start-up to other companies (Know, 2020). Entrepreneurs see exit via M&A as a type of successful exit, it is a way to consolidate their business or company: in fact, established companies typically pay high premiums to acquire high-potential startups and these translate into great rewards for startup founders (Cotei et al., 2019). In this study, the aim is to investigate how international agreements and therefore sustainability can influence the probability of acquisition of a start-up, so the M&A variable will be the dependent variable. It has been designed as a binary variable that takes value 1 if the start-up was acquired between 2010 and 2022, value 0 otherwise (De Lange & Valliere, 2019).

## 2.6 Independent Variable

Since the focus of the study is on sustainability, the independent variable was constructed from Crunchbase's classification of "Sustainability" categories as described in paragraph 3.2. This variable is a binary variable that takes value 1 if the start-up is sustainable, 0 otherwise (De Lange & Valliere, 2019; Mrkajic et al., 2019).

## 2.7 Control Variables

The control variables were chosen starting from the literature. To these macroeconomic control variables were added (discussed in 2.8 paragraph).

It was decided to consider the location of the start-up's headquarters. Seven dummy variables have been created Africa, Asia, Central/South America, Europe, Oceania, US and Canada that assume value 1 if the start-up is located respectively in Africa, Asia, Central/South America, Europe, Oceania, *US and Canada*, 0 otherwise (Battisti et al., 2022). From the database extracted from Crunchbase, it was possible to find information on the revenue of each start-up (in millions of dollars). It was therefore decided to model the *Estimated Revenue Range* variable (De Lange&Valiere, 2019) as a categorical variable of 8 levels ranging from 1 to 8. Specifically: 1→ Less than 1M; 2 →1M to 10M; 3→ 10M to 50M; 4→ 50M to 100M; 5 → 100M to 500M; 6→ 500M to 1B; 7 →1B to 10B; 8 → Plus than 10B. As suggested by De Lange & Valiere (2019) it was decided to consider the age of the start-up, calculating considering the date of foundation, the *Age* variable was created, defined in a range from 1 to 13.

The *Size* variable was created, which considers the size of the start-up measured by the number of employees. *Size* is a categorical variable, created as follows: 1 – 10 → 1; 11 -50 → 2; 51 -100 → 3; 101 – 250→ 4; 251 – 500 → 5; 501 – 1000 → 6; 1001 – 5000 → 7; 5001 – 10000 → 8; Plus than10001→ 9 (De Lange&Valliere, 2019; Battisti et al., 2022).

The *Patents Granted* variable was considered as a count variable that defines the number of patents held by the start-up. This variable was included in the study because the number of patents can influence the likelihood of a start-up being acquired (De Lange&Valiere, 2019; Battisti, 2022; Cotei et al., 2018).

The count *Number of Founders* variable has been included. This is important because the larger the entrepreneurial team, the more likely the start-up is to receive funding (Mrkajic et al., 2019). Additional control variables were included to account for actions that investors reflect on the lifecycle effects of a start-up. The *Rounds* variable was included in the study, which counts the number of investments rounds that the start-up received. *Number of Investors*, which is a count variable defined in the range 0-8, *Lead Investors*, which represents the number of main investors, also counted defined in a range 0-36, and finally *Money Raised* have been entered as control variables, which is a continuous variable. The latter has been transformed using the logarithm to limit dispersion and is defined in the range 0 to 21,126.

In addition, six dummy variables have been created: *Grant*, *Seed*, *Early-Stage Venture*, *Venture Round*, *Late-Stage Venture*, *Other Investment* to indicate the type of funding received by start-ups, which assume value 1 if the start-up received that type of investment in a given year, 0 otherwise (Hegeman&Sørheim, 2021).

## 2.8 International Climate Agreements Variable

To investigate the macroeconomic effects of international climate agreements on the probability of acquiring a start-up, more than twenty years of negotiations have been retraced that have allowed to construct macroeconomic control variables.

### 2.8.1 International Climate Agreements

At the end of the seventies the environmental and climate issue began to take on more and more importance to ensure its own space within international political issues.

In 1979, the *World Climate Conference* in Geneva, the first international conference on climate change was held. The objective of this conference was to take stock of the global climate situation and its evolution over time. Under the convention, eight different protocols were developed:

- *EMEP Protocol (1984)*: this is an instrument for sharing the costs of a monitoring program and the assessment of European air pollution in the light of agreements on reducing emissions.
- *Helsinki Protocol (1985)*: relating to the reduction of sulfide emissions or their transboundary fluxes by at least 30% compared to 1980 levels;
- *Sofia Protocol (1988)*: this is a protocol relating to the fight against emissions of nitrogen oxides (NO<sub>x</sub>) or their transboundary fluxes: a first stage provides for the freezing of NO<sub>x</sub> emissions or their transboundary fluxes at 1987; a second phase involves applying an effects-based approach to further reduce emissions of nitrogenous compounds, including ammonia (NH<sub>3</sub>), and volatile organic compounds (VOCs).
- *Geneva Protocol (1991)*: this is a protocol for monitoring and controlling Volatile Organic Compounds (VOC) emissions or their transboundary fluxes, responsible for the formation of tropospheric ozone and the contracting parties must opt for one of the three emissions reduction objectives, to be achieved by 1999:
  - 30% reduction in VOCs, using a year between 1984 and 1990 as a baseline;
  - 30% reduction of VOC emissions within the tropospheric ozone management area specified in Annex I of the Protocol and ensuring that total national emissions do not exceed 1988 levels; or
  - or if emissions in 1988 did not exceed certain specified levels, contracting parties may opt for stabilization at that emission level.
- *Oslo Protocol (1994)*: this protocol builds on the Helsinki Protocol (1985) and sets sulfide emission limits until 2010. Parties are required to adopt various measures, which include:
  - increase energy efficiency;



- use renewable energies;
- reduce the sulfur content in fuels; And
- apply the best available control technologies (BAT).
- *Aarhus Protocol (1998) based on limitation of heavy metals*, in particular: cadmium, lead and mercury. The objective of the protocol is the reduction of emissions from industrial sources, waste combustion and incineration processes, establishing limit values and suggesting better technical solutions, such as for example the use of mercury-free processes.
- *Aarhus Protocol (1998) on persistent organic pollutants*: the goal was to eliminate any discharges, emissions and losses of these pollutants, prohibiting the production and use of some products, while for others, the elimination was scheduled for a later stage. It includes provisions for the treatment of waste from prohibited products and requires contracting parties to reduce their emissions of dioxins, furans, polycyclic aromatic hydrocarbons and hexachlorobenzene (HCB) below their 1990 levels.
- *Gothenburg Protocol (1999)*: this is a protocol for the reduction of acidification, eutrophication, and tropospheric ozone.
  - Sets national emission limits from 2010 to 2020 for 4 pollutants: sulfur dioxide (SO<sub>2</sub>), NO<sub>x</sub>, VOC and NH<sub>3</sub>.
  - Sets strict limit values for specific emission sources (e.g., combustion plants, electricity generation, dry cleaning, cars and trucks)
  - Require that BAT be used to keep emissions low.

One of the most important conferences on the international scene was the *Earth Summit* held in Rio de Janeiro in 1992, and led to the establishment of the following United Nations Conventions:

1. United Nations Convention to Combat Desertification (UNCCD), with the aim of combating desertification.
2. United Nations Convention on Biological Biodiversity (UNCBD), with the aim of protecting species in their natural habitats and rehabilitating endangered ones.
3. United Nations Framework Convention on Climate Change (UNFCCC), with the aim of combating climate change by establishing a mechanism for allocating financial resources based on countries' commitment to reducing greenhouse gas (GHG) emissions [10].

The Convention provides for financial assistance by the Parties with the greatest resources to the less endowed and most vulnerable. Developed country Parties shall provide financial resources to assist developing country Parties in implementing the Convention. To facilitate this, the Convention established a *Financial Mechanism* to provide funds to developing countries that are party to it.

States Parties to the UNFCCC are called Parties, which meet annually in the Conference of the Parties (COP) to discuss the most appropriate actions and instruments to reduce the effects of climate change. The Parties do not all have the same obligations, in fact the countries present in the *Annex I* (UNFCCC website) of the UNFCCC are assigned the leadership role in combating climate change, in terms of reducing greenhouse gas emissions and specific obligations for individual countries, while all other countries are required to make less specific commitments and often on a voluntary basis.

Within the framework of global policies, an adequate response to climate change is based on:

1. *Mitigation*: which consists in limiting the concentration of greenhouse gases in the atmosphere through the reduction of emissions and an increase in carbon concentrations (UNFCCC website).
2. *Adaptation*: which considers all those measures to limit the impact of climate change on human life and ecosystems (UNFCCC website).

At the origins of the negotiation process, the main intent was to limit climate change based on mitigation, as can already be seen from the text of the Convention. The first concrete targets were reached some years later, during COP3 I Kyoto (1997). In Kyoto, the countries sign the *Kyoto Protocol*, a voluntary treaty, which came into force only in 2005, after ratification by Russia. In fact, for the treaty to enter into force, it was necessary that it be ratified by at least 55 nations, and that these nations together accounted for no less than 55% of global greenhouse gas emissions. The Kyoto Protocol represents the first international agreement on sustainability, committing industrialized economies to reduce greenhouse gas emissions into the atmosphere *by at least 5% compared to the levels recorded in 1990, during the five-year period 2008-2012*.

This could be achieved in two different ways: through the adoption of national measures, such as mitigation measures that led to the reduction of emissions, or by using flexible mechanisms, i.e., instruments that allow emissions to be reduced through projects involving other countries. The mechanisms are as follows (UNFCCC website):

1. *Joint Implementation (JI)*: consists in carrying out projects to reduce and/or increase the absorption of greenhouse gas emissions carried out in other developed countries.
2. *Clean Development Mechanism (CDM)*: consists in carrying out projects that lead to the reduction of GHG and contribute to sustainable development, carried out in developing countries.
3. *International Emission Trading (IET)*: consists of the possibility of selling (or buying) credits exceeding (or missing) compared to the national target of the nation. It is also called the "carbon market".

The Kyoto Protocol (1997) states that developed countries undertake to provide financial resources to developing countries, as well as the transfer of new technologies, to proceed with the fulfillment of policies aimed at achieving their mitigation objectives. It involves the use of *MRV (Measurement, Reporting and Verification)* for the development of GHG measurement, communication, and verification frameworks (UNFCCC website).

During the following years, the Parties met periodically and promoted various documents. A symbolic event was the *Millennium Summit*, held in New York in September 2000. During this event, the Millennium Development Goals (MDGs) were adopted:

1. Eradicate extreme poverty and hunger;
2. Achieve universal primary education;
3. Promote gender equality and women's empowerment;
4. Reduce infant mortality;
5. Improve maternal health;
6. Fight HIV/AIDS, malaria and other diseases;
7. Ensure environmental sustainability;
8. Create a global partnership for development.

Several years passed before a new conference had international relevance, below are the milestones that formed the basis for the conclusion of the *Paris Agreement*.

During the COP13 in Bali in 2007, the four pillars on which to build the new international agreement were identified, alongside the principles of mitigation and adaptation (on which the Kyoto Protocol is based), also the issues of finance and development and technology transfer. During this event, the *Bali Action Plan* was established, with which governments have taken a shared and targeted action to undertake mitigation actions for the reduction of emissions, supported by the implementation of new technologies and new financing. After two years, a crucial event in the negotiation process was held in Copenhagen (COP15), where a non-

binding agreement was signed between the parties expressing the political intention to limit carbon emissions, responding to climate change both in the short and long term.

This was followed by COP16 in Cancun, where the countries signed the Cancun Agreement which includes:

1. The *Green Climate Fund (GCF)* is the largest global fund created specifically to provide financial assistance by supporting projects, programs, policies, and other activities for developing countries.
2. The *Technology Mechanism*, i.e., an Executive Committee (TEC) responsible for the development and dissemination of new technologies for mitigation and adaptation by strengthening technological cooperation between the Parties.
3. An *Adaptation Plan*, which allows Parties to implement national medium and long-term adaptation plans to develop and undertake targeted actions.

It was clear that an agreement had to be found that would bind all countries, but the approach used to implement the objectives of the Kyoto Protocol had to be reviewed, since it would no longer be possible to adopt the mechanisms according to which industrialized countries had to facilitate developing countries, since global conditions were changing.

The turning point came during COP17 in Durban (2011) with the introduction of the "Durban platform", thanks to which governments had to commit to a global plan that aimed to stabilize greenhouse gas concentrations in the atmosphere at a level that prevented dangerous interference with the climate system and at the same time preserve the right to sustainable development (UNFCCC website). This conference has made the Green Climate Fund operational.

The following year, during COP 18, the *Doha Amendment* was adopted, whereby it was decided to create a second commitment period for the Kyoto Protocol, in which Annex I countries committed to an *emissions reduction target of at least 18% below 1990 levels* (and no longer 5%), *to be achieved during the period 2013-2020*. For the first time, an additional greenhouse gas is considered: Nitrogen Trifluoride (NF<sub>3</sub>), which is in addition to the GHGs discussed in Annex A of the Kyoto Protocol. The Doha amendment did not enter into force until 2020, with ratification by 144 countries.

During COP19 in Warsaw, governments agreed on the *Loss and Damage Mechanism*, created specifically to address the loss and damage associated with the impacts of climate change, including extreme events and slow-onset events, in developing countries particularly vulnerable to the adverse effects of climate change. In addition, governments have agreed to use a platform that provides methodological and financial guidelines for reducing emissions

caused by deforestation and forest degradation, known as "*Warsaw Framework for REDD-plus*".

Subsequently, in 2015, the *Paris Agreement* was signed, which entered into force on November 4, 2016, upon reaching the necessary ratification thresholds by the countries. Countries commit to reducing greenhouse gas emissions according to their level of ambition, in full compliance with the principle of common responsibility but differentiated according to the respective capacities of the States through the definition, on a national basis, of the INDCs, or the Preliminary Nationally Determined Contributions. The poorest countries are given a certain margin of discretion to achieve the objectives set, while the industrialized countries are invited to respect the commitments made.

The Paris Agreement is a milestone in the history of international climate treaties, representing the *first legally binding agreement*. It defines the obligations for the Parties that have ratified it: the provisions supported by the terms indicating their clear obligatory nature are binding. The agreement contains mandatory requirements ("shall"), voluntary requirements ("should") and encouragement ("may"). The objectives of the NDCs do not present, however, a formulation that formally binds countries to achieve the objectives that each nation imposes to respect, or in the event of non-compliance with the NDCs there is no trigger for a punitive or sanctioning compliance mechanism, but the agreement provides for a committee to facilitate compliance that will establish a dialogue with the country if necessary (UNFCCC website). Today, the 193 countries that have ratified the Paris Agreement account for 94.3% of global greenhouse gas emissions.



Figure 2.9 Signatory countries to the Paris Agreement (UNFCCC website)

From a financial point of view, the agreement provides that developed countries must, in a binding manner, offer economic support to developing countries, both for mitigation and adaptation actions. It includes a more balanced framework than the Kyoto Protocol in terms of actions to progressively reduce global greenhouse gas emissions. It has three main long-term objectives (UNFCCC website):

1. *Mitigation*: "keeping the increase in temperatures below 2°C above pre-industrial levels by making efforts to limit this increase below 1.5°C";
2. *Adaptation*: "increased ability to adapt to the adverse impacts of climate change, greater promotion of resilience and development with low greenhouse gas emissions, so as not to threaten food production";
3. *Finance*: "make financial flows consistent with a scenario towards low-greenhouse gas emissions and climate-resilient development".

During the same year, the 2030 Agenda was presented, which represents a major action program for a total of 169 sub-objectives, which cover all dimensions of human life and the planet, and which must be achieved by all countries of the world by 2030. It defines 17 primary goals, covering four five main spheres (5P): People, Planet, Partnership, Peace and Prosperity. The *Sustainable Development Goals* (SDGs) cover all dimensions of sustainability and are summarized in the figure below (UNFCCC website; United Nation website):



Figure 2.10 SDG's Agenda 2030

Considering the poor results of the Bonn COP in 2017, the next step that brought remarkable results for the actualization of the Paris Agreement was the implementation of the *Katowice Climate Package* drawn up during COP24. This document includes a set of decisions covering all elements of the Paris Agreement.

During COP26 in Glasgow (2021), the Parties drafted the *Glasgow Climate Pact*, which includes a series of joint decisions to reduce greenhouse gas emissions. The main objective of this agreement is to *reduce CO2 emissions by 45% compared to 2010*, with the aim of reaching *net-zero emissions around the middle of the century* and accelerating efforts to gradually limit the use of coal and related subsidies to fossil fuels. For the first time in the history of international agreements, the use of coal is explicitly mentioned, which is the major contributor to climate change. During this COP the Reporting Format was established with the aim of tracking the progress towards decarbonization of the Parties, using appropriate reporting tables.

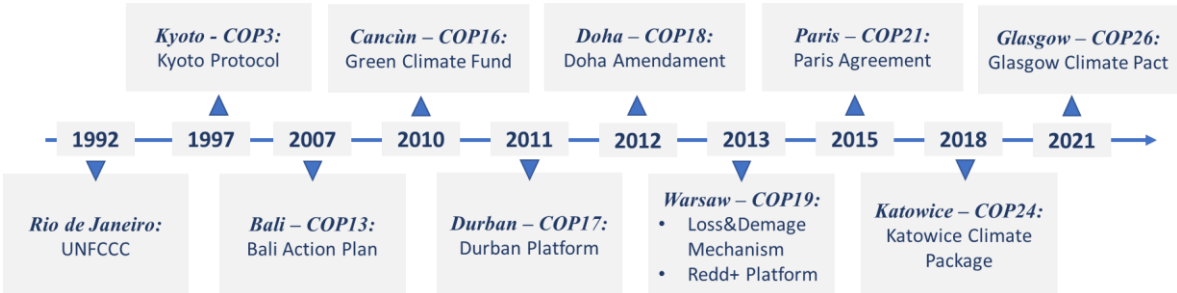


Figure 2.11 Timeline Climate Agreements over years

**2.8.2 Selection of International Climate Agreements Variable**

Following the analysis of international climate agreements, it was decided to take as a reference for the study in question the following events, which are thought to have caused a significant shock within sustainable start-up market between 2010 and 2022: the establishment of the Green Climate Fund defined during COP16 in Cancun (2010), the Doha amendment (2012), the establishment of the REDD+ Framework and the Loss & Damage Mechanism during COP19 in Warsaw (2013), the Paris Agreement (2015) and the revision of the financial mechanism.

These macroeconomic variables are ordinal variables, which take on a different value from the previous one and increased by one whenever some aspect of the agreement changes. Especially:

1. the *Green Climate Fund* variable assumes a value of 1 starting from 2011, the year in which this fund was launched for the first time, value 2 starting from 2013, the year in which it was expanded.
2. the *variable Doha Amendment* assumes value 1 from 2012, when it was created and value 2 from 2020, when it came into force.
3. the *REDD+* variable assumes a value of 1 starting from 2013, the year in which it was established, and 2 in 2015, the year in which it underwent a change.
4. the *variable Mechanism of Loss & Damage* assumes value 1 in 2013, the year in which it was established, a value of 2 in 2014 and 3 in 2019, years in which it has changed.
5. the *variable Paris Agreement* assumes a value of 1 starting from the year 2015, i.e., the year in which the countries signed the agreement.
6. the variable *Review of Financial Mechanism*, assumes value 1 in 2012, when the fifth review of the financial mechanism was made, and values gradually increasing every two years. In fact, the UNFCCC has decided to review this mechanism every two years.

To these variables, two other macroeconomic variables have been added that consider the countries participating in the COPs. For each COP analyzed, the number of signatory countries of the agreement/convention was collected from the UNFCCC website and through the World Bank website the percentage of the countries' GDP compared to world GDP in the year of the COP was calculated, obtaining the following two variables: number of countries present at the COP (*No\_Countries*) and percentage of GDP of the countries present at the COP (*%GDP\_COP*). Regarding the year 2020, due to the Covid19 pandemic, the annual COP was not held, so there are no data regarding it. Instead, the GDP of the countries participating in the Shelm-el-Sheik COP (2022) could not be calculated due to lack of data within the World Bank website.

The results of this study are listed in the following table:

<i>COP</i>	<i>YEAR</i>	<i>No Countries</i>	<i>%GDP_COP</i>
<i>Cancun (COP16)</i>	2010	191	0.986
<i>Durban (COP17)</i>	2011	193	0.986
<i>Doha (COP18)</i>	2012	190	0.963
<i>Warsaw (COP19)</i>	2013	188	0.983
<i>Lima (COP20)</i>	2014	186	0.987
<i>Paris (COP21)</i>	2015	195	0.978
<i>Marrakesh (COP22)</i>	2016	193	0.982
<i>Bonn (COP23)</i>	2017	175	0.975
<i>Katowice (COP24)</i>	2018	192	0.981



<i>Madrid (COP25)</i>	2019	195	0.982
<i>Online COP</i>	2020	-	-
<i>Glasgow (COP27)</i>	2021	192	0.978
<i>Sharm-el-Sheikh (COP28)</i>	2022	195	-

Table 2.2 Summary of No of Parties and %PIL of Parties during COP

Table 2.3 summarizes all the variables considered for the study.

VARIABLE	VARIABLE NAME	TYPE	DESCRIPTION	REFERENCES
DEPENDENT VARIABLE	<i>M&amp;A</i>	Binary	1 if the start-up was acquired, 0 otherwise	<i>De Lange, 2019</i>
INDEPENDENT VARIABLE	<i>Sustainability</i>	Binary	1 if the start-up is sustainable, 0 otherwise	<i>De Lange, 2019</i>
CONTROL VARIABLE	<i>Africa</i>	Dummy	1 if the start-up is located in Africa, 0 otherwise	<i>De Lange, 2017</i>
CONTROL VARIABLE	<i>Asia</i>	Dummy	1 if the start-up is located in Asia, 0 otherwise	<i>De Lange, 2017</i>
CONTROL VARIABLE	<i>Central/South America</i>	Dummy	1 if the start-up is located in Central/South America, 0 otherwise	<i>De Lange, 2017</i>
CONTROL VARIABLE	<i>Europe</i>	Dummy	1 if the start-up is located in Europe, 0 otherwise	<i>De Lange, 2017; Battisti, 2022</i>
CONTROL VARIABLE	<i>Oceania</i>	Dummy	1 if the start-up is located in Oceania, 0 otherwise	<i>De Lange, 2017</i>
CONTROL VARIABLE	<i>Canada</i>	Dummy	1 if the start-up is located in Canada, 0 otherwise	<i>De Lange, 2017</i>
CONTROL VARIABLE	<i>US</i>	Dummy	1 if the start-up is located in US, 0 otherwise	<i>De Lange, 2017; Battisti, 2022</i>
CONTROL VARIABLE	<i>Revenue_Range</i>	Categorical	1 if less than 1M 2 if 1M to 10M 3 if 10M to 50M 4 if 50M to 100M 5 if 100M to 500M 6 if 500M to 1B 7 if 1B to 10B 8 if 10B+	
CONTROL VARIABLE	<i>Age</i>	Count	Defined in a range from 1 to 13	<i>De Lange, 2019</i>
CONTROL VARIABLE	<i>No of Founders</i>	Count	Defined in a range from 1 to 7	<i>Mrkajic et Al, 2019</i>

CONTROL VARIABLE	<i>Size</i>	Count	1 if 1-10 2 if 11-50 3 if 51-100 4 if 101-250 5 if 251-500 6 if 501-1000 7 if 1001-5000 8 if 5001-10000 9 if 10001+	<i>De Lange&amp;Valiere, 2019; Battisti et Al, 2022; Cotei et Al., 2018</i>
CONTROL VARIABLE	<i>Rounds</i>	Count	Defined in a range from 0 to 8	<i>De Lange, 2019</i>
CONTROL VARIABLE	<i>No_Lead_Investors</i>	Count	Defined in a range from 0 to 8	<i>De Lange, 2017</i>
CONTROL VARIABLE	<i>No_Investors</i>	Count	Defined in a range from 0 to 36	<i>De Lange, 2019</i>
CONTROL VARIABLE	<i>IPO</i>	Binary	1 if the IPO is reached, 0 otherwise	<i>De Lange, 2019</i>
CONTROL VARIABLE	<i>Grant</i>	Dummy	1 if an investment during Grant Stage is received 0 otherwise	---
CONTROL VARIABLE	<i>Seed</i>	Dummy	1 if an investment during Seed Stage is received 0 otherwise	---
CONTROL VARIABLE	<i>Early_Venture_Stage</i>	Dummy	1 if an investment during Early Stage is received 0 otherwise	---
CONTROL VARIABLE	<i>Venture_Round</i>	Dummy	1 if an investment during Venture Stage is received 0 otherwise	---
CONTROL VARIABLE	<i>Late_Venture_Stage</i>	Dummy	1 if an investment during Late Stage is received 0 otherwise	---
CONTROL VARIABLE	<i>Corporate_Round</i>	Dummy	1 if an investment during Corporate Round Stage is received 0 otherwise	<i>Hegeman&amp;Sørheim, 2021</i>
CONTROL VARIABLE	<i>Other_Investments</i>	Dummy	1 if other investments are received 0 otherwise	---
CONTROL VARIABLE	<i>Green_Climate_Fund</i>	Ordinal	Defined in a range from 0 to 2	---
CONTROL VARIABLE	<i>Doha_Amendment</i>	Ordinal	Defined in a range from 0 to 2	---
CONTROL VARIABLE	<i>Redd+_Framework</i>	Ordinal	Defined in a range from 0 to 2	---
CONTROL VARIABLE	<i>Loss&amp;Damage_Mechanism</i>	Ordinal	Defined in a range from 0 to 3	---
CONTROL VARIABLE	<i>Review_Financial_Mechanism</i>	Ordinal	Defined in a range from 0 to 4	---
CONTROL VARIABLE	<i>Paris_Agreement</i>	Ordinal	Defined in a range from 0 to 1	---
CONTROL VARIABLE	<i>No_PartiesCOP</i>	Count	Defined in a range from 175 to 195	---

CONTROL VARIABLE	<i>%GDP_COP</i>	Count	Defined in a range from 0,983 to 0.987	---
CONTROL VARIABLE	<i>Covid19</i>	Ordinal	Defined in a range from 0 to 1	---
CONTROL VARIABLE	<i>Money_Raised (ln)</i>	Continuous	Defined in a range from 0 to 21.126	<i>De Lange, 2019</i>
CONTROL VARIABLE	<i>Patents (ln)</i>	Count	Defined in a range from 0 to 6524	<i>Mrkajic et Al., 2019; Cotei et Al., 2018</i>

*Table 2.3 Variables Summary*

## CHAPTER 3: ANALYSIS

This chapter focuses on the results obtained through analysis. To analyze the selected sample, it was decided to use the STATA multi-purpose statistical package, which is ideal for exploring, summarizing, and analyzing datasets. STATA is one of the most widely used tools in social science research and business schools. The descriptive statistics of variables are given in the first paragraph of this chapter (3.1), while the correlation analysis between variables is shown in the second section (3.2), finally, the third section (3.3) concludes with econometric analysis and a discussion of the main findings.

### 3.1 Descriptive statistics

Descriptive statistics of the previously defined variables are necessary to interpret the data of the selected sample. Table 3.1 presents descriptive statistics, showing the mean, standard deviation, number of observations, minimum and maximum:

Descriptive Statistics					
Variable	Obs	Mean	Std. Dev.	Min	Max
<i>M&amp;A</i>	31774	0.006	0.075	0	1
<i>Sustainability</i>	31774	0.025	0.158	0	1
<i>Africa</i>	30076	0.017	0.128	0	1
<i>Asia</i>	30076	0.18	0.384	0	1
<i>Cental/South America</i>	30076	0.034	0.18	0	1
<i>Europe</i>	30076	0.314	0.464	0	1
<i>Oceania</i>	30076	0.028	0.164	0	1
<i>Canada</i>	30076	0.428	0.495	0	1
<i>US</i>	30076	0.393	0.488	0	1
<i>Revenue_Range</i>	16153	1.693	0.851	1	8
<i>Age</i>	31774	5.301	3.155	1	13
<i>No of Founders</i>	12083	1.639	0.942	1	7
<i>Size</i>	28600	1.791	1.155	1	9
<i>Rounds</i>	31774	0.065	0.297	0	8
<i>No_Lead_Investors</i>	31325	0.028	0.214	0	8
<i>No_Investors</i>	31324	0.108	0.824	0	36
<i>IPO</i>	31774	0.001	0.038	0	1
<i>Grant</i>	31774	0.003	0.05	0	1
<i>Seed</i>	31774	0.024	0.153	0	1
<i>Early_Venture_Stage</i>	31774	0.01	0.098	0	1
<i>Venture_Round</i>	31774	0.006	0.08	0	1
<i>Late_Venture_Stage</i>	31774	0.002	0.04	0	1

<i>Corporate_Round</i>	31774	0.001	0.027	0	1
<i>Other_Investments</i>	31774	0.009	0.093	0	1
<i>Green_Climate_Fund</i>	31774	1.912	0.325	0	2
<i>Doha_Amendment</i>	31774	1.298	0.533	0	2
<i>Redd+_Framework</i>	31774	1.733	0.589	0	2
<i>Loss&amp;Damage_Mechanism</i>	31774	2.103	0.967	0	3
<i>Review_Financial_Mechanism</i>	31774	3.214	1.2	0	4
<i>Paris_Agreement</i>	31774	0.809	0.393	0	1
<i>No_PartiesCOP</i>	28212	190.569	5.966	175	195
<i>%GDP_COP</i>	24658	0.979	0.005	0.963	0.987
<i>Covid19</i>	31774	0.336	0.472	0	1
<i>Money_Raised (ln)</i>	31290	0.567	2.802	0	21.13
<i>Patents (ln)</i>	31774	0.066	0.389	0	6.524

*Table 3.1 Descriptive Statistics*

The dependent variable *M&A*, indicates whether a start-up has been acquired or not, being a binary variable can only take values 0 and 1 and has an average of 0.006 and a standard deviation of 0.075. The average is low, as the outputs for M&A are 179 in total, and being a panel data, the exit value is reported only in the year in which the company has made an exit through M&A.

Moreover, regarding the control variables, it was decided to transform into logarithmic form those variables that had a variance of at least one order of magnitude higher than the average, since they were dispersed. As the table 3.1 shows, the *Patent and Money Raised* variables have been transformed.

### **3.2 Correlation Analysis**

In order to evaluate the relationships between the variables and exclude the variables that were related to each other, a correlation analysis was performed. The table below shows the correlation coefficients between the variables in the study:

**Pairwise correlations**

<b>Variables</b>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
<i>(1) Sustainability</i>	1																
<i>(2) Africa</i>	0.041	1															
<i>(3) Asia</i>	-0.04	-0.061	1														
<i>(4) Cental/South America</i>	-0.025	-0.024	-0.087	1													
<i>(5) Europe</i>	-0.016	-0.088	-0.317	-0.126	1												
<i>(6) Oceania</i>	-0.027	-0.022	-0.079	-0.031	-0.114	1											
<i>(7) Canada</i>	0.054	-0.113	-0.405	-0.162	-0.586	-0.146	1										
<i>(8) US</i>	0.036	-0.105	-0.377	-0.15	-0.544	-0.125	0.926	1									
<i>(9) Revenue_Range</i>	0.095	0.002	0.132	0.041	-0.157	0.044	0.047	0.036	1								
<i>(10) Age</i>	0.008	-0.014	-0.019	0.003	0.002	0.001	0.015	0.02	0.023	1							
<i>(11) No of Founders</i>	0.043	-0.048	-0.032	0.052	0.056	-0.037	-0.016	0.006	0.104	-0.031	1						
<i>(12) Size</i>	0.044	0.012	0.165	0.05	-0.144	0.04	-0.021	-0.039	0.544	0.038	0.146	1					
<i>(13) Rounds</i>	0.056	-0.003	0.012	-0.01	-0.027	-0.017	0.027	0.025	0.085	-0.107	0.172	0.082	1				
<i>(14) No_Lead_Investors</i>	0.039	0.007	0.022	-0.012	-0.018	-0.013	0.007	0.009	0.106	-0.034	0.15	0.111	0.688	1			
<i>(15) No_Investors</i>	0.034	-0.004	0.011	-0.012	-0.025	-0.017	0.025	0.028	0.111	-0.05	0.171	0.109	0.699	0.642	1		
<i>(16) IPO</i>	0.02	-0.005	0.031	-0.007	-0.011	0.015	-0.014	-0.017	0.03	-0.007	0.015	0.041	0.008	0.011	0.011	1	
<i>(17) M&amp;A</i>	0.001	-0.01	0.001	-0.007	-0.011	-0.002	0.015	0.015	0.025	0.016	0.04	0.03	-0.001	-0.004	-0.004	-0.003	1

<b>Variables</b>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
<i>(18) Grant</i>	0.047	0.003	-0.021	-0.002	0.006	0.003	0.009	0.007	-0.008	-0.009	0.035	-0.008	0.19	0.197	0.067	-0.002	-0.004
<i>(19) Seed</i>	0.011	-0.006	0.012	-0.006	-0.014	-0.011	0.012	0.009	-0.007	-0.129	0.098	-0.002	0.559	0.261	0.355	-0.001	0.002
<i>(20) Early_Venture_Stage</i>	0.019	-0.003	0.036	-0.01	-0.028	-0.015	0.008	0.013	0.068	-0.025	0.106	0.094	0.367	0.413	0.398	0.005	0.001
<i>(21) Venture_Round</i>	0.02	-0.004	0	-0.011	-0.011	0.006	0.013	0.013	0.034	-0.011	0.037	0.027	0.297	0.185	0.144	-0.003	-0.001
<i>(22) Late_Venture_Stage</i>	-0.006	-0.005	0.021	-0.008	-0.021	-0.007	0.009	0.012	0.054	0.012	0.06	0.087	0.151	0.227	0.238	0.019	-0.003
<i>(23) Corporate_Round</i>	0.003	-0.004	0.024	-0.005	-0.006	-0.005	-0.008	-0.008	0.016	0.001	0.023	0.018	0.11	0.138	0.055	0.029	-0.002
<i>(24) Other_Investments</i>	0.051	0.017	-0.02	0.003	-0.01	-0.008	0.022	0.015	0.058	-0.03	0.052	0.038	0.422	0.233	0.228	0.014	0.006
<i>(25) Green_Climate_Fund</i>	-0.004	0.007	0.016	0	0.001	0.004	-0.017	-0.019	-0.013	0.321	0.032	-0.02	0.011	0.019	0.011	0	0.014
<i>(26) Doha_Amendment</i>	-0.002	0.014	0.015	-0.001	0.003	-0.001	-0.018	-0.021	-0.018	0.585	0.012	-0.025	0.035	0.009	-0.003	-0.014	0.01
<i>(27) Redd+_Framework</i>	-0.007	0.009	0.026	-0.003	0.001	0.005	-0.023	-0.028	-0.019	0.457	0.027	-0.029	0.001	0.027	0.009	-0.001	0.015
<i>(28) Loss&amp;Damage_Mechanism</i>	-0.004	0.015	0.024	-0.003	0.003	0.001	-0.025	-0.03	-0.023	0.619	0.017	-0.035	-0.023	0.023	0.001	-0.009	0.012
<i>(29) Review_Financial_Mechanism</i>	-0.006	0.013	0.026	-0.005	0.002	0.002	-0.024	-0.03	-0.023	0.556	0.019	-0.035	-0.014	0.028	0.003	-0.004	0.014
<i>(30) Paris_Agreement</i>	-0.007	0.009	0.026	-0.005	0.001	0.004	-0.023	-0.028	-0.02	0.462	0.019	-0.03	-0.008	0.027	0.008	0	0.013
<i>(31) No_PartiesCOP</i>	0.001	0.006	0.003	0.003	0.001	-0.002	-0.005	-0.006	-0.005	0.199	-0.001	-0.01	0.016	0.003	0.001	-0.007	-0.003
<i>(32) %PIL_COP</i>	0.002	-0.004	0.001	0.004	0	0	-0.001	-0.003	0.005	-0.039	0.005	0.002	0.01	-0.003	-0.003	0.004	-0.003
<i>(33) Covid19</i>	-0.001	0.012	0.013	0	0.003	-0.002	-0.015	-0.019	-0.016	0.561	0.004	-0.023	0.043	0.004	-0.007	-0.017	0.005
<i>(34) Money_Raised (ln)</i>	0.053	-0.009	0.015	-0.016	-0.033	-0.015	0.033	0.034	0.092	-0.088	0.173	0.102	0.9	0.698	0.69	0.016	0.002
<i>(35) Patents (ln)</i>	0.057	-0.023	-0.012	-0.029	-0.026	0.004	0.048	0.052	0.117	0.006	0.085	0.154	0.15	0.157	0.152	0.006	0.031

<b>Variables</b>	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)
<i>(17) M&amp;A</i>																		
<i>(18) Grant</i>	1																	
<i>(19) Seed</i>	-0.008	1																
<i>(20) Early_Venture_Stage</i>	-0.005	-0.016	1															
<i>(21) Venture_Round</i>	-0.004	-0.013	-0.008	1														
<i>(22) Late_Venture_Stage</i>	-0.002	-0.006	-0.004	-0.003	1													
<i>(23) Corporate_Round</i>	-0.001	-0.004	-0.003	-0.002	-0.001	1												
<i>(24) Other_Investments</i>	-0.005	-0.015	-0.009	-0.008	-0.004	-0.003	1											
<i>(25) Green_Climate_Fund</i>	0.012	-0.009	0.016	0.008	0.001	0.007	0.004	1										
<i>(26) Doha_Amendment</i>	0.001	-0.053	-0.011	-0.004	0.003	0	-0.007	0.442	1									
<i>(27) Redd+_Framework</i>	0.009	-0.032	0.015	0.009	0.01	0.011	-0.001	0.798	0.493	1								
<i>(28) Loss&amp;Demage_Mechanism</i>	0.004	-0.054	-0.002	0.003	0.013	0.011	-0.001	0.59	0.738	0.783	1							
<i>(29) Review_Financial_Mechanism</i>	0.005	-0.05	0.008	0.007	0.015	0.014	0.001	0.63	0.601	0.851	0.905	1						
<i>(30) Paris_Agreement</i>	0.006	-0.041	0.012	0.007	0.013	0.01	-0.002	0.558	0.451	0.932	0.754	0.84	1					
<i>(31) No_PartiesCOP</i>	-0.009	-0.01	-0.009	-0.009	0.002	0.004	-0.003	-0.027	0.223	0.104	0.223	-0.016	0.176	1				
<i>(32) %GDP_COP</i>	-0.002	0.019	0.004	0.004	-0.004	0.006	-0.001	0.199	-0.272	0.04	0.103	-0.061	-0.158	0.228	1			
<i>(33) CovidI9</i>	-0.003	-0.056	-0.018	-0.006	0.002	-0.003	-0.01	0.193	0.936	0.322	0.66	0.466	0.346	0.285	-0.154	1		
<i>(34) Money_Raised (ln)</i>	0.205	0.584	0.488	0.334	0.22	0.114	0.363	0.016	-0.031	0.004	-0.022	-0.012	-0.004	-0.015	0.01	-0.04	1	
<i>(35) Patents (ln)</i>	0.057	0.031	0.122	0.068	0.128	0.046	0.063	0.004	-0.004	0	-0.006	-0.004	-0.002	-0.004	0	-0.007	0.194	1

*Table 3.2 Correlation Analysis*



Following the correlation analysis, 17 variables were chosen to be included in the study. *Rounds* was included rather than *No\_Lead\_Investor*, *No\_Investor* and *Money\_Raised* variables since they were correlated. As regards the macroeconomic variables on the treaties, those considered to be most important were included in the study, since some of these had high correlations. Next are the macroeconomic variables included in the study and the reasons for them:

- the *Paris\_Agreement* because it represented the first legally binding treaty in the international panorama of climate agreements and therefore for the purpose of the study it can be useful to understand how this can influence the probability of exit of a start-up through M&A.
- the *Doha\_Amandament* because this marked a second commitment period for the Kyoto Protocol, committing developed countries to reduce GHG emissions by at least 18% compared to 1990 and no more than just 5%.
- *Green\_Climate\_Fund* because it is the largest global fund to provide financial assistance to contrast and mitigate climate change.

### 3.3 Econometric analysis

This section shows the results of the econometric analysis. Since the dependent variable is a dichotomous *M&A* variable then the analysis will be performed using a logit model. It was necessary to observe the dependent variable at time  $t+2$  to evaluate the effect of the independent variable *Sustainability* in later years in order to investigate how international climate treaties can influence the success of a green start-up and in particular the likelihood of being acquired. Logit regression allows to estimate the probability that an event will occur or not, predicting a binary dependent result from a set of independent variables. Since this thesis aims to investigate the impact of sustainability on the likelihood of a start-up being acquired, this type of regression is used. To avoid multicollinearity problems in the regression model, the Inflation of Variance (VIF) factors test was performed. In addition, the *Hausman test* was followed, to test whether to perform a regression with fixed or random effects. Since the result was that the  $p\text{-value} > 0.05$ : a logit regression with random effects was used.

Following the statistical controls, a *logit regression with random effects* was performed, which led to the results shown in tables below:

MODEL 1							
F2.ma	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
<i>Europe</i>	.666	.348	1.91	.056	-.016	1.348	*
<i>US</i>	.97	.303	3.20	.001	.376	1.565	***
<i>Age</i>	.095	.054	1.75	.081	-.012	.201	*
<i>Size</i>	.236	.085	2.77	.006	.069	.404	***
<i>No of founders</i>	.274	.095	2.90	.004	.089	.46	***
<i>Rounds</i>	-.777	1.091	-0.71	.477	-2.916	1.362	
<i>Patents (ln)</i>	.505	.778	0.65	.516	-1.02	2.03	
<i>Seed</i>	-.598	.365	-1.64	.101	-1.313	.117	
<i>EarlyStageVenture</i>	-49.783	34.946	-1.42	.154	-118.276	18.71	
<i>Venture_Round</i>	-.584	.542	-1.08	.282	-1.647	.479	
<i>LateStageVenture</i>	-.835	.721	-1.16	.247	-2.248	.578	
<i>OtherInvestments</i>	.345	.629	0.55	.583	-.887	1.577	
<i>GreenClimateFund</i>	-.412	1.142	-0.36	.718	-2.65	1.826	
<i>Doha_Amendment</i>	-.841	.85	-0.99	.322	-2.508	.825	
<i>Paris_Agreement</i>	.445	.273	1.63	.103	-.09	.981	
<i>%GDP_Parties</i>	.094	.13	0.72	.471	-.161	.348	
Constant	42.529	33.925	1.25	.21	-23.964	109.021	
Mean dependent var		0.013	SD dependent var			0.111	
Number of obs		7113	Chi-square			47.322	
Prob > chi2		0.000	Akaike crit. (AIC)			948.444	

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

Table 3.3 Econometric Analysis - Only Control Variables

*Model 1* studies the impact of control variables on dependent variable. It shows that start-ups based in the United States and Europe have a positive impact on probability of being acquiring; in fact, both variables are significant. In particular, the variables *US* ( $\beta = 0.970$ ; S.E. = 0.303;  $p < 0.01$ ) and *Europe* ( $\beta = 0.666$ ; S.E. = 0.348;  $p < 0.05$ ). This is aligned with the existing literature, according to which acquisition activities have a long tradition, especially in Europe and the United States (Barros et al., 2022; Battisti et al., 2022).

The variables related to start-up characteristics are also significant: the variable *Age* ( $\beta = 0.0948$ ; S.E. = 0.054;  $p < 0.1$ ) has a positive impact on the probability of acquisition of a start-up; the size of the company, described by the variable *Size* ( $\beta = 0.236$ ; S.E. = 0.085;  $p < 0.1$ ) have a significant and positive impact on the probability that a start-up chooses an output through acquisition. It's an important result as indicators of the progress of the firms (De Lange & Valliere, 2019). Similarly, the *Number of Founders* ( $\beta = 0.274$ ; S.E. = 0.095;  $p < 0.1$ ) has a significant and positive impact on the dependent variable.

Since the Round and Paris Agreement control variables are not significant with a p-value close to one in the first model and significant in the second: the probability of acquisition of a start-up can depend on the number of rounds of investments received, in fact this could increase the legitimacy of the company (De Lange, 2019) and thus could have a higher probability of exit through acquisition (Bocken, 2015). The variable *Rounds* have a significant positive impact ( $\beta = 0.491$ ; S.E. = 0.27;  $p < 0.1$ ) in the second model. As regards the Paris Agreement variable,

which is significant with a negative impact in the second model ( $\beta = -0.619$ ; S.E. = 0.366;  $p < 0.1$ ), it is likely that a binding treaty may have raised more concerns within the start-up market up, possibly linked to a general transformation towards the sustainable transaction caused by pressure from governments and international climate policies.

MODEL 2							
F2.ma	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
<i>Sustainability</i>	-1.163	.728	-1.60	.11	-2.589	.264	
<i>Europe</i>	.701	.349	2.01	.045	.017	1.385	**
<i>US</i>	1.032	.305	3.39	.001	.434	1.629	***
<i>Age</i>	.101	.054	1.85	.065	-.006	.208	*
<i>Size</i>	.245	.085	2.89	.004	.079	.412	***
<i>No of founders</i>	.286	.095	3.01	.003	.1	.472	***
<i>Rounds</i>	.491	.27	1.82	.069	-.038	1.021	*
<i>Patents (ln)</i>	.095	.13	0.74	.462	-.159	.349	
<i>Seed</i>	-.624	.54	-1.16	.247	-1.682	.433	
<i>EarlyStageVenture</i>	-.898	.712	-1.26	.207	-2.294	.498	
<i>Venture_Round</i>	.329	.627	0.52	.6	-.899	1.557	
<i>LateStageVenture</i>	-.557	1.146	-0.49	.627	-2.804	1.69	
<i>OtherInvestments</i>	-.845	.846	-1.00	.318	-2.504	.813	
<i>GreenClimateFund</i>	-.793	1.091	-0.73	.468	-2.932	1.346	
<i>Doha_Amendment</i>	.503	.778	0.65	.518	-1.023	2.029	
<i>Paris_Agreement</i>	-.619	.366	-1.69	.09	-1.335	.097	*
<i>%GDP_Parties</i>	-50.318	34.957	-1.44	.15	-118.832	18.197	
<i>Constant</i>	43.014	33.935	1.27	.205	-23.497	109.525	
Mean dependent var		0.013	SD dependent var			0.111	
Number of obs		7113	Chi-square			50.627	
Prob > chi2		0.000	Akaike crit. (AIC)			946.776	

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

Table 3.4 Econometric Analysis - Impact of Sustainability

Model 2 includes the independent variable *Sustainability*. This is not significant on the probability of acquisition of a start-up since  $p\text{-value} > 0.1$  ( $\beta = -1.163$ ; S.E. = 0.728;  $p > 0.1$ ). Therefore, the probability of a start-up being acquired does not depend on sustainability. As a result, the probability of a startup being acquired does not change whether it is sustainable or not.

**CHAPTER 4: SUSTAINABLE M&A CASE STUDIES**

The analysis carried out shows that sustainability has no influence on the probability of acquisition of a start-up, which means that the sustainability of a company is not a relevant factor on the probability of being acquired. Since at the beginning of the study it was expected that sustainability would influence the probability that a start-up would be acquired, it was decided to analyze in more detail the start-ups of the sample considered, in order to investigate the motivations behind the acquisition of these sustainable start-ups.

Of the 3715 start-ups analyzed, only 179 of these were acquired, and only 5 of them were found to be sustainable. Therefore, it turns out that only 2.8% of acquired start-ups are sustainable. Subsequently, five case studies of sustainable start-ups acquired between 2010-2022 present in the sample studied are analyzed.

ACQUIRED START-UP		M&A		
NAME	Core Business	Acquired in	Acquired by	Company Acquiring Core Business
<b>GELI</b>	Energy Storage, Software, Sustainability	2020	<b>Q Cells</b>	Electronics, Solar, Energy
<b>MODERN RESOURCES</b>	Biomass Energy, Energy, Oil & Gas	2020	<b>Tourmaline</b>	Energy, Energy efficiency, Oil & Gas.
<b>UTOPUS INSIGHT</b>	Analytical, Energy, Energy Efficiency, Renewable Energy	2018	<b>Vestas</b>	Energy, Environmental Engineering, Renewable Energy
<b>WATER INTEGRATED TREATMENT SYSTEM</b>	Environmental Consulting, Transport, Waste Management, Water	2021	<b>Circon Enviromental</b>	Biofuel, Fuel, Oil & Gas, Recycling, Renewable Energy, Waste Management, Water Purification.
<b>WHOLESHORE</b>	E-commerce, Internet, Market, Organic Food, Sustainability.	2016	<b>Direct Eats</b>	E-commerce, Food, Online portals.

*Table 4.1 Main business of the acquired start-ups and buyers*

**4.1 Geli acquired by Q Cells**

Geli, acronym for Growing Energy Labs Inc, is a start-up based in San Francisco, California (USA). It provides software and business solutions to design, automate, and manage energy storage systems. The company has devised an end-to-end software platform that simplifies the energy storage development process.

South Korean provider of solar and energy storage products Q Cells has signed an agreement to acquire Geli in 2020. This transaction marks Q Cells' first acquisition of an energy storage

solutions company and its entry into the U.S. commercial and industrial distributed energy (C&I) market.

The company intends to use Geli's artificial intelligence technology to help design, automate and manage its digital energy storage solutions. Through this, it hopes to develop integrated energy solutions in packages consisting of hardware and software functionalities for solar and storage projects. The combination of the two companies strengthens competitiveness in the global distributed energy market, helping to provide smarter and cleaner energy solutions (Power Technology, 2018).

#### **4.2 Modern Resources acquired by Turmaline**

Modern Resources is an oil and gas energy company headquartered in Calgary, Canada. Tourmaline is a company also based in Canada and operates in sectors such as exploration and intermediate production of oil and natural gas. Turmaline purchased Modern Resources in 2020 for \$144M with the intent of leveraging the potential of this low-carbon company. These efficiently managed activities have enabled Tormaline to have an increase in cash flow in 2020 (Cision, 2020)

#### **4.3 Utopus Insights acquired by Vestas**

Utopus Insights operates as an energy analysis provider and is in Valhalla, New York (USA). It was acquired by Vestas for \$100M in 2018. Vestas is the only global energy company dedicated exclusively to wind energy based in Denmark and operates in the fields of energy, environmental engineering and renewable energy.

The acquisition enables Vestas to seize digital opportunities and expand its service offering. In fact, Utopus Insights integrates innovative digital data solutions in analytics, energy engineering and software development that can help Vestas offer customers greater predictability, greater renewable energy production, more efficient operations, and better integration with energy grids. With this purchase, Vestas seeks to seize the opportunity offered by this ongoing transformation to deliver faster, smarter, and more holistic solutions. Vestas' strategic goal is to accelerate the transition to a fully decarbonized energy sector in the most efficient and cost-effective way possible (GlobeNewswire, 2018).

#### **4.4 Water Integrated Treatment System acquired by Circon Environmental**

Water Integrated Treatment System is a company specialized in the treatment of non-hazardous liquid waste treatable for disposal in sanitary sewers. It was acquired by Circon Enviromental in 2021. The latter is in Texas (USA), deals with finding sustainable and innovative solutions for waste management.

The acquisition of Water Integrated Treatment Systems (“WITS”) is part of an acquisition cycle by the Texas-based company with the aim of further enhancing its centralized waste treatment capabilities. This acquisition allows Circon Environmental to expand into the Great Lakes geographic region in order to better serve its customers and provide a higher level of sustainable services with quantifiable metrics (Cision, 2016).

#### **4.5 Wholshare acquired by Direct Eats**

Wholshare is a start-up that deals with online sales in the sustainable and organic food market based in San Francisco, California (USA). It was acquired by Direct Eats in 2016. This further advances Direct Eats' position as a leading leader, engine, and prominent hub in the ecommerce arena for organic, natural and specialty food products. In addition, this will bring together a large audience of natural and organic food buyers actively engaged in Direct Eats. In fact, Wholshare represented for Direct Eat a competitor in the direct-to-consumer online market for the natural and organic food space.

#### **4.6 Case Study Results**

Based on the analysis carried out, it emerges that companies that have decided to acquire a sustainable start-up, present sustainability in their core business, in fact they operate in similar sectors. Thus, based on the study it can be concluded that the probability of acquisition increases if it operates in the same sector as the acquiring company.

On the other hand, sustainability appears as a secondary aspect. When evaluating an acquisition, sustainability is of marginal importance, in fact the start-ups that have acquired have done so for other reasons:

- Q Cells acquired Geli to integrate innovative digital technology into its business and to expand into the US market;
- Tourmaline acquired Modern Resources with the aim of improving its technologies and efficiency in the market;
- Vestas acquired Utopus Insights to leverage its innovative technologies;
- Circon Environmental has acquired Water Integrated Treatment System to expand geographically in the Great Lakes region and take advantage of innovative technologies;
- Finally, Direct Eats has decided to acquire Wholshare with the intention of increasing its consumer base, to hold the leading role in the US food e-commerce market by reducing competition.

<b>M&amp;A Motivation</b>	<i>Geografical Expansion</i>	<i>Innovative Tech</i>	<i>Competition Reduction</i>	<i>Sustanability</i>
<i>Q Cells</i>	<b>X</b>	<b>X</b>		<b>X</b>
<i>Tourmaline</i>			<b>X</b>	<b>X</b>
<i>Vestas</i>		<b>X</b>		<b>X</b>
<i>Circon Enviromental</i>	<b>X</b>	<b>X</b>		
<i>Direct Eats</i>	<b>X</b>		<b>X</b>	

*Table 4.2 Reasons to acquire start-ups.*

## **CHAPTER 5: DISCUSSION AND CONCLUSION**

Sustainability has become a mainstream for companies all over the world. Climate change is changing the world of finance, placing sustainability at the center of the investment approach to favor the energy transition envisaged by international climate agreements. Corporate social responsibility (CSR) emphasizes the notion of responsibility, while ESG factors emphasize long-term growth, driving change for the society. As reported in the "Our world today" section of the 2030 Agenda, climate change is one of the greatest challenges of our time today and its negative impact compromises the ability of States to implement sustainable development. At the same time, it emphasizes the concept of sustainability as a great opportunity for changing.

In this study, how sustainability and international climate agreements can influence the success of green start-ups was analyzed. This study aims to make an empirical contribution to the scientific literature by including the main international climate agreements in the analysis.

It was carried out by starting with the creation of a data panel including 3715 start-ups founded between 2010 and 2019. As a result of the analysis performed, it can be concluded that the probability of a startup being acquired is not affected by whether it is oriented toward sustainable initiatives or not. Therefore, the results show that the probability of acquisition does not depend on the sustainability factor.

Indeed, as can be deduced from the cases study analysis, sustainability appears as a secondary factor when companies decide to acquire green start-ups. The attention of entrepreneurs is focused on other factors such as the expansion in different geographical areas, the reduction of competitiveness or the acquisition of innovative technologies. Therefore, their focus is more on the economic return they can have by choosing to acquire sustainable start-ups and not linked to the pursuit of sustainable goals. Moreover, it can be concluded that the probability of acquisition increases if sustainable start-up operates in the same sector as the acquiring company.

Previous studies have shown that the link between sustainability and mergers and acquisitions could be explained by a reputational effect and that increased disclosure will force companies to change and include sustainability goals in their business (Barros et al., 2022). Sustainable start-ups can find opportunities in sustainable business model innovation, new technologies and new forms of financing, on the other hand VCs can help demonstrate the success of sustainable business models but will also need to be patient in their return expectations (Bocken, 2015).



Indeed, sustainable initiatives can set high risks and companies may not be able to offer high returns to cover these risks (De Lange & Valliere, 2019). At the same time, these companies are preparing for a transition to sustainability in which they expect to be rewarded for the green value created (Hegeman&Sørheim, 2021). Within this economic context, entrepreneurs must be able to recognize the potential of sustainability and integrate it into their business considering that the results of M&A strategies are not evident in the short term, but these require time to ensure operational and financial synergies (Barros et al., 2022).

Green entrepreneurship is still in its beginning stages, and entrepreneurs are not yet ready to face the challenges of sustainability. Consistent with the study of Ghosh and Nanda (2010), the results of this thesis show the market for sustainable acquisitions is still too uncertain mainly due to excessively strict regulations. This implies that there is less opportunity for exit via sustainable M&A, also due to the lack of a proven framework for assessing sustainable companies.

### **5.1 Limitation**

The limitations of this study mainly focus on the sample construction. It is made up of 3715 start-ups, of which only 2% can be considered sustainable according to the previously defined criteria. Furthermore, there are 179 acquisitions, of which only 5 are sustainable, in fact some control variables were often omitted from the study due to lack of observations. For example, the Grant variable relating to investments was excluded from the study. In addition, some variables such as the estimated revenue of the start-up, was not taken into consideration as it greatly reduced the number of observations, due to lack of collected data. The sample was limited to data extracted from Crunchbase only.

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