

POLITECNICO DI TORINO

Department of Management and Production Engineering

MSC in management and Engineering

Academic year 2022

Master thesis

The effect of Greenwashing on Market Value



Relatore

Prof. Anna D'Ambrosio

Candidato

Giorgio Baruffaldi

Acknowledgements

I would like to express my sincere thanks to my family for having given me the opportunity to pursue this academic path at Politecnico di Torino, for always having been there for me despite the miles between us and, above all, for being my role models everyday both on a personal and professional level.

I am moreover grateful for the fantastic people this university has allowed me to meet without whom this journey would not have been the same.

Finally, I would like to thank my thesis professor Anna D'Ambrosio for all the valuable advice and guidance she has given me during this last academic year, and especially during the preparation of my Master Thesis.

Abstract

The thesis focuses on discovering the effect the Greenwashing has on the Market Value. It is noteworthy that there are companies which effectively care about the environment and other firms which seem to be interested but do not effectively make any activities to reduce the environmental pollution. This last concept is called Greenwashing.

First, the research focused on finding a way to classify the firm as a Greenwashing activity pursuant and, secondly, how the Greenwashing can affect the Market Value of the firms. Indeed, the main topic in this paper is to understand if pursuing Greenwashing activities creates more Market Value.

Index

1. Introduction
2. Theoretical knowledge about Greenwashing
 - 2.1 Definition of Greenwashing
 - 2.2 Corporate monitor responsibility monitor
 - 2.3 Variables
3. Assessment of the risk of Greenwashing
 - 3.1 Profile assessment of the company
 - 3.2 Strategy assessment of the company
 - 3.3 Final range assessment
4. Empirical application
 - 4.1 Market value computation
 - 4.2 Null hypothesis analysis
5. Results
 - 5.1 Linear regression
 - 5.2 Multivariate regression
 - 5.3 Conclusion
 - 5.4 Companies' groups
6. Bibliography

Index table

Table 1. Companies

Table 2. Values 2

Table 3. Values 3

Table 4. Values 4

Table 5. Values 5

Table 6. Values 6

Table 7. Values 7

Table 8. Values 8

Table 9. Values 9

Table 10. Values 10

Table 11. Values 11

Table 12. Values 12

Table 13. Values 13

Table 14. Values 14

Table 15. Values 15

Index Figure

Figure 1. Greenwashing corporate model (Torelli, Balluchi, Lazzini)

Figure 2. Drivers of greenwashing (Lyon and Montgomery)

Figure 3. Thoughts of people

Figure 4. Distrust of people

Figure 5. Corporate social responsibility

Figure 6. Information disclosure (CSR monitor paper)

Figure 7. Setting targets (CSR monitor paper)

Figure 8. Reduction of emission (CSR monitor paper)

Figure 9. Climate contribution and offsetting (CSR monitor paper)

Figure 10. Amazon vs Walmart

Figure 11. Amazon evaluation

Figure 12. CSRM website

Figure 13. CSRM points

Figure 14. Amazon

Figure 15. Environment variable

Figure 16. Values of variables

Figure 17. Level of pollution 2

Figure 18. Comparison 1

Figure 19. Comparison 2

Figure 20. Analytical part comparison

Figure 21. MW vs GW

Figure 22. GT and EPS (MV paper)

Figure 23. EPS pie chart

Figure 24. GT/NP percentage

Figure 25. GT/NP_R&D

Figure 26. GW categories

Figure 27. lnMV and GW

Figure 28. lnMV and lnEPS

Figure 29. Box plot lnMV and GW

Figure 30. lnMV and GW_EPS

Figure 31. lnMV and lnrev

Figure 32. ln MV and ln RD

Figure 33. lnMV and lnGTNP_RD

Figure 34. lnMV and GW, lnEPS, lnGTNP_RD

Figure 35. lnMV and GW, GW_EPS, lnrev

Figure 36. lnMV GW lnEPS lnGTNP_RD

Figure 37. lnMV GW lnEPS lnGTNP_RD lnrev

Figure 38. lnMV GW lnGTNP_RD i.sector

1. Introduction

The thesis is aimed to understand the effect of the Greenwashing on the Market value of the firms. The focus is on evaluating if the firms considered which have been implementing Greenwashing policies in their strategies achieved higher Market values.

One of the pillar papers on which this thesis is based is "*Green technologies and firms' market value: a micro-econometric analysis of European firms*" (Colombelli, 2021) which estimated the effect of green technologies on the Market value. The paper demonstrated any possible effects of the variable "Green Technologies" on the Market values of more than 4000 firms.

As fundamental for the analysis, the paper "*Corporate Climate Responsibility Monitor 2022*" (Thomas Day, 2022) shows the methodology to evaluate from an environmental point of view the firms. This paper is a publication by the entity "Corporate Climate Responsibility Monitor" which has the objective to make analysis on Corporation's behavior on green, economic, and social aspects. Its data analysis helped the study of the thesis to rely on specific and precise quantitative analysis.

In the end, the paper "*The Means and End of Greenwash*" (Thomas P. Lyon, 2015) explains which are the main drivers of Greenwashing and focuses on the definition of it. This helped in understanding why the thesis is focused on Greenwashing and why it is so discussed today.

As the earth is showing its negative effect provoked by human beings, the thesis is aimed to understand why and if it is more convenient to apply Greenwashing activities.

This research is based on these three pillars as literature. Anyway, the articles and the papers analyzed stopped at evaluating the effects of the Green Technologies on the Market values (Colombelli, 2021). Hence the focus will be on going beyond the results already found and thanks to the methodological approach and the data of the Corporate Climate Responsibility Monitor and the definitions of Greenwashing explained (Thomas P. Lyon, 2015), it has been possible to study the effects of Greenwashing on the Market value.

2. Theoretical knowledge about Greenwashing

The first chapter focuses on tracking the historical data and the analysis already verified and evaluated. In the following papers are cited the information found which are at the base of this thesis are in the following paper:

- a) The Means and End of Greenwash (Lyon, 2015): this paper introduces term of Greenwashing. The authors deeply analyzed the drivers, the positive and the negative effects and the phenomena.
- b) The Corporate responsibility monitor (Thomas Day, 2022): this paper found many indicators and measures of assessment to classify the firms. Indeed, this entity releases reports every year in which it shows the level of compliance of the firms with the environmental and social responsibilities
- c) Corporate net zero pledges - the bad and Ugly (Jack Arnold, 2021): this paper found many questions to focus on to evaluate Greenwashing activities. The answers are given on a set of tests and analysis the authors have concluded. During the analytical part, these questions have been transformed into variables and contribute to the analysis.

Moreover, these three papers helped to generate the variables for the analytical part of this thesis.

Before starting to introduce the arguments of the thesis, all the data related to the values and variables have been found on the following databases:

- a) ORBIS database – Bureau Van DIJK
- b) Website of OECD and Espacenet

Specifically, the database “ORBIS” has been used to find values for the calculation of the Market Value (Colombelli, 2021).

To gather information on patents and the IPC(s) of such listed firms, the analysis followed the process indicated (Colombelli, 2021). Indeed, it has been used the OECD website to find IPC codes were used to label patent applications as “environmental” according to two alternative international classifications of GTs: “IPC Green Inventory” and the OECD “EnvTech.”

The data has been enriched with “Espacenet”. This is a website where it is possible to find the data about the patents of the firms. As it is explained in the following chapters, the calculation about finding the Green Technologies patents over the Portfolio of the firms needs reliable data about firms.

2.1 Definition of Greenwashing

Greenwashing was mentioned by the biologist activist Jay Westervelt (Pearson, 2010) for the first time. Many studies focused on this term, an important paper to be considered is “The Means and End of Greenwash. Organization and Environment” (Lyon and Montgomery, 2015). Recently, Greenwashing has become an important argument at the academic research level.

While the Oxford Dictionary defines Greenwashing as “disinformation disseminated by an organization to present an environmentally responsible public image,” Lyon and Montgomery consider Greenwashing “the act of misleading consumers regarding the environmental practices of a company or the environmental benefits of a product or service.”

Hence, why do we need to be interested in greenwashing?

“After greenwashing: Symbolic corporate environmentalism and society” Bowen(2014), expressed on Greenwashing four assumptions:

1. greenwashing is only about information disclosure
2. greenwashing is deliberate
3. companies primarily initiate greenwashing
4. greenwashing is beneficial to firms and costly to society.

Thanks to “Greenwashing and Environmental Communication: Effects on Stakeholders’ Perceptions”(Riccardo Torelli, Federica Balluchi, Arianna Lazzini) there are four main levels of Greenwashing acted by firms:

- The corporate level
- Strategic level
- Dark level
- Product level

Corporate-level greenwashing focuses on misleading environmental communication (i.e., the company name, vision, corporate certification)

Strategic level greenwashing concerns a misleading environmental communication (i.e., corporate medium-long-term goals, strategic plan for improvement, and targeted technologies).

Dark level greenwashing is aimed at finalizing to hidden illegal activities (i.e., criminal and/or mafia collusion, corruption)

Product level greenwashing concerns the communication towards some specific features of a product (i.e., targeted advertising, packaging).



Figure 1. Greenwashing corporate model (Torelli, Balluchi, Lazzini)

Furthermore, we need to analyze what are the drivers of Greenwashing.

Delmas and Burbano (2011) in “The drivers of greenwashing. *California Management Review*” studied a wide range of drivers of greenwash, grouping them into two levels: external, individual. External drivers of greenwashing include pressures from both nonmarket actors, such as consumers and investors.

Lyon and Montgomery (2013) write about an internal driver: social media on Greenwashing. They posit that social media will help to rein in Greenwashing generally. The authors supported this framework finding that the role of social media communication for Fortune 500 firms with higher CSR ratings adopt Twitter earlier, develop online followers faster, receive stronger social media responses to their tweets, and are more likely to be retweeted respect to the average. These are interesting results in the paper of Lyon and Montgomery of 2013. The figure below shows aspects and data about the drivers of Greenwashing. The authors wanted to summarize where to take the main information about the topic.

Drivers of greenwash	Relevant academic research
External/environmental	
Lax regulatory environment	Delmas and Burbano (2011)
Weak political pressure	Delmas and Montes-Sancho (2010)
Threat of regulation	Kim and Lyon (2011)
Weak pressure from environmental groups	Kim and Lyon (2011); Marquis and Toffel (2013)
Weak relationships with government agencies	Delmas and Montes-Sancho (2010)
Weak connection to industry trade groups	Delmas and Montes-Sancho (2010)
Weak connections to global economic system	Marquis and Toffel (2013)
Internal/organizational	
Low visibility	Delmas and Montes-Sancho (2010)
Large size	Kim and Lyon (2011)
Being “relatively” green	Marquis and Toffel (2013)
Growing firms	Kim and Lyon (2014)
Firms in a service industry	Ramus and Montiel (2005)

Figure 2. Drivers of greenwashing (Lyon and Montgomery)

In particular, “Lax regulatory environment” described by Delmas and Burbano (2011) explains the little incentive for firms to ensure that organizational characteristics such as incentive structures and ethical climate are aligned to minimize greenwashing, or to put processes in place to improve effectiveness of intra-firm communication to decrease the likelihood that firms will Greenwashing.

Lyon and Montgomery (2015) mentioned about the possibilities of solving the problem of Greenwashing. Three specific mechanisms cited by the authors are:

- pressure from civil society including social media
- the use of ecolabels, created thanks to eco data
- government restrictions on deceptive marketing practices.

“The power of civil society to challenge Greenwashing is enhanced by the emergence of social media. Indeed, society can eliminate greenwashing through the information technology. Many studies cited by Lyon and Montgomery state that the asymmetry information between consumers and firms will decrease as time passes. This does allow any chances to the today’s variety of greenwashing in the future.

Labels are certifications by trusted third parties based on a set of characteristics. One type of label, however, is strongly dominant in the market. It is consumer facing, focused on a single issue, oriented to renewable resources (food, agriculture, or forest products), run by a nonprofit voluntary organization, does not use life-cycle analysis, is not focused on product-level processes and production methods” (Lyon and Montgomery 2015).

The main issue in using labels is competition: label competition can be rendered useless if consumers are uncertain which ecolabels are more stringent than others.

Lyon and Montgomery (2015) are ones who warn against making unqualified environmental claims and offer detailed guidance regarding what constitutes deceptive communications. Although developing ideas against the Greenwashing, the authors do not concentrate on the positive aspects about Greenwashing. This will be focus of the thesis.

Since Lyon and Montgomery (2015) highlight the need for further research aimed at a broader inquiry of the taxonomy of the greenwashing phenomenon, in this paper we analyze the market value the firms can create through this symbolic communication action in its varieties and the ways the firms are able to interpret the Corporate Climate responsibility Monitor rules.

The target of greenwashing actions is divided into two subgroups:

- a) Consumers
- b) Investors

“The model focuses on investors as the drivers of corporate greening, tracing the interacting effects of a firm’s green reputation, the quality of a firm’s internal organizational information system, and the ability of activists to punish firms for greenwashing. All firms prefer to greenwash if there is no punishment for doing so, but if investors decide to go in one direction not investing other than noting a real activism in green technologies, then firms will diverge in their greenwashing strategies. Obviously, Firms with strong green reputations reduce their green communications, while those with brown reputations fully disclose their performance; those with middling reputations continue to take the risk of greenwashing”. This was cited in the masterpiece “Greenwash vs. brown wash: Exaggeration and undue modesty in corporate sustainability disclosure, *Organization Science*” (Kim and Lyon, 2014). In the same paper, the authors advanced a theory of “brownwash” in which firms understate their environmental activities when financial performance deteriorates, so that investors do not think they are wasting money on unnecessary green initiatives.

Looking at internal drivers of greenwash, competition is the key both in greenwashing and in brown washing. As Lyon and Montgomery explain, when the profit levels are low the regulations are not strictly enough, firms try to cheat. This last comment coming out from the study of Kim and Lyon (2014) are again the pillar of this research. Connecting the value given to shareholders and stakeholders through initiatives about Greenwashing is the center of the “STATA” analysis, of which it is better talked in the last chapter.

In “Greenwashing in new millennium”(2009) Nancy Furlow states that there has been a rapid rise in products touting environmental claims. Today attracting the consumers and the investors through environmental aspects bond to the product is essential. In attracting a green audience, companies often use claims that sound environmentally friendly, but are vague, and at times may be false. This phenomenon is called “Greenwashing.”

As explained below in the analysis, Greenwashing is the dissemination of false or incomplete information by an organization to present an environmentally responsible public image. Web site and social media help anyone who want post advertisements misleading. Obviously, consumers are concerned about the topic and raise questions about these environmental claims.

Anyway, the paper explained how it is not easy for a company to be “green” and how it can be criticized as it tries to overtake green actions. The cost and the investments to do could be very high and strictly government policies are never easy to treat. “The most cited examples are Ford Motor Company’s It Is Not Easy Being Green campaign for the hybrid Escape SUV. While touting itself as being environmentally friendly, Ford's cars were considered the worst carbon emitters and had the worst fuel efficiency trend of any major automaker according to Union of Concerned Scientists (Friedman & Mackenzie, 2004). Since its early and much-criticized entry into the hybrid market, Ford has backed away from promoting itself as the green car choice,” reported the Journal. Indeed, companies which are the most lauded for its awareness are also the ones most denounced”, (Nancy Furlow, 2009).

Why do consumers are confused?

The multitude of vague and misleading environmental claims lead consumers to ask for corporate honesty. The concern over greenwashing has also a double effect:

- 1) Losing credibility for companies which do not look green for real
- 2) True companies in doing green strategies lose their competitiveness.

In addition, overuse of the “green” may become meaningless to the consumer.

Furthermore, the complexity in understanding the scientific knowledge bond to the product and its relationship in being green is often high and subject to change, thereby making it difficult for the public to comprehend. In addition, comparisons made between products are frequently limited to a single environmental benefit, making the claim incomplete and misleading. There are not handy instruments for consumers to understand what an environmental product really means.

Consumers’ skepticism attempts companies which try to catch higher market value being environmentally friendly. There will be fewer rewards and therefore less motivation for companies to make environmentally helpful products, as consumers will “discount” all environmental marketing claims.

The following graph represents the customers that think that companies should spread in a better way the environmental policies. The customers are divided on nationalities. For example, 80% of customers in Spain believe that companies should publish their environmental policies.

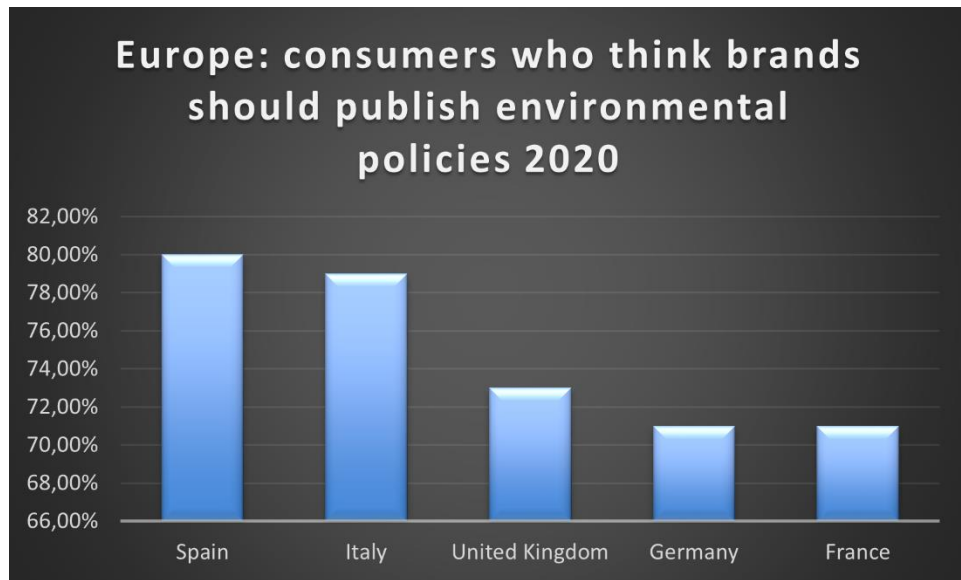


Figure 3.Thoughts of people

The following graph shows how people distrust the sustainability claims of the companies. in 2014, 48% of respondents distrust the claims about the sustainability issued by the companies.

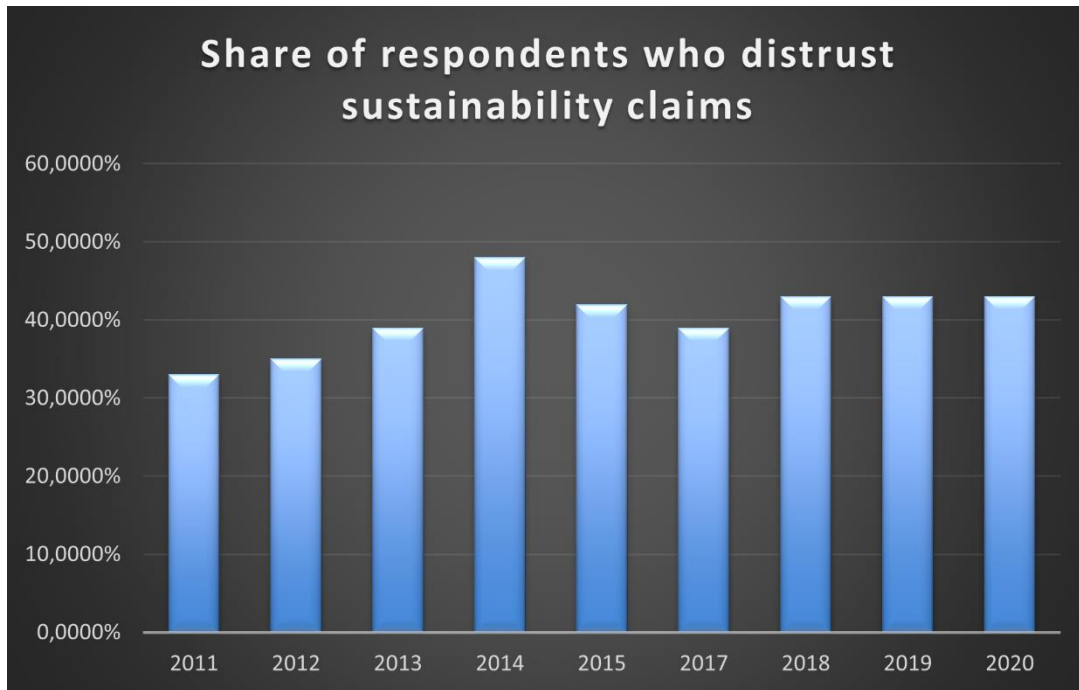


Figure 4. Distrust of people

Alle the data has been taken from the resource “Statista” available thanks to the Polytechnic di Torino.

2.1 Corporate monitor responsibility monitor (CSRM)

Why are we interested in talking about the entity “Corporate Responsibility Monitor”?

This entity has the aim of assessing the firms based on their actions towards the Social and environmental policies. It also analyzes the governance and the value created for the shareholders from the level respecting these policies.

The objectives of the Corporate Climate Responsibility Monitor (Thomas Day, 2022) are:

- Identify and highlight good practice approaches that can be replicated by other companies, recognizing that companies are experimenting to work out what is constructive and credible practice
- Reveal the extent to which major companies’ climate leadership claims have integrity and transparency
- Scrutinize the credibility of companies’ plans for offsetting their emissions through carbon dioxide removals, emission reduction credits and making growing trees all around the world.

These objectives are explained document “Corporate Social Responsibility” written by Thomas Day, Silke Mooldijk, Sybrig Smit, Eduardo Posada, Frederic Hans, Harry Fearnough, Aki Kachi, Carsten Warnecke, Takeshi Kuramochi, Niklas Höhne (2022). Thomas Day is considered by the report as the main author.

The Corporate Climate Responsibility Monitor highlighted four key points to assess firms:

1. Tracking and disclosure of emissions
2. Setting specific and substantiated targets
3. Reducing own emissions
4. Climate contributions and offsetting

First, the key role is played by the “Paris Agreement”, the Paris Climate Accords adopted in 2015, is the center of the clear scientific evidence that climate is changing. One of the keyrings is to reach a state of net-zero global CO₂ emissions by around. This agreement creates the need of a new mindset and evaluation standard for companies: The Corporate Climate Responsibility Monitor (CSRM). This entity is aimed evaluates the transparency and integrity of companies’ climate strategies and actions.

Corporate climate action is key to closing the emissions gap to a 1.5°C pathway. In a short space of time consumer's and shareholder's expectations have become a major driver for enhanced corporate climate action. Companies are responding. To facilitate this important bottom-up pressure mechanism, it is essential that the credibility of companies' strategies is transparent and can be understood by their target audiences. For these reasons it really important to make a really good impression on the reports published by the CSRM annually or monthly.

Briefly it is noteworthy to analyze the context in which firms apply the principles of greenwashing and why they do it. The first thing to describe are the corporate actions in this arena which are often referred to as Environmental, Social and Governance (ESG), or Corporate Social Responsibility (CSR).

"ESG refers to how corporations and investors integrate environmental, social and governance concerns into their business models. CSR traditionally has referred to corporations' activities about being more socially responsible, to being a better corporate citizen", (Stuart L. Gillan, Andrew Koch, Laura T. Starks, 2018). The main objectives of corporations are: ensuring good corporate citizenship, maintaining strong corporate governance, reporting on corporate performance, and behaving ethically in a general. Corporations can also extend sustainability practices by developing a business model that is socially, environmentally, and financially. The new model of CSR is not anymore limited to solely making profits and complying with legislation and law. Corporations are now more challenged to meet values and interests' shareholders as well as consumers, employees, communities, government, the environment, and other stakeholders.

At the base of strategic plan of many companies there is the triple bottom line of economic, social, and environmental performance. Creating shared value is also an integral part of the contemporary CSR. This implies that integrating corporate sustainability into corporate strategy is more than a responsibility; corporations are recognizing the necessity for being socially, environmentally, and financially sustainable to be able to survive over time even if it is not explicitly defined in their business ethics or code of conduct.

In this paper we analyze the environmental part of the triple bottom cited above. Indeed, we focus on understanding how and if firms respect the environmental rules.

The figure below shows an example of Triple bottom line.



Figure 5. Corporate social responsibility

The paper on CSR monitor (Thomas Day, 2022) explains that it is key for companies to be transparent about their GHG emission footprints and their trajectories. Greenhouse gas emissions (GHG) from human activities strengthen the greenhouse effect, causing climate change. Most is carbon dioxide from burning fossil fuels: coal, oil, and natural gas. Anyway, these also ways to create energy, and of energy companies really need if they want to produce. A complete and transparent overview of a company’s emissions footprint is crucial to understand a company’s scope of influence, to grasp relevance of its climate-related targets, and to determine whether emission reduction measures are appropriate and comprehensive.

Sometimes, annual reports of the companies disclose detailed information on their GHG emissions, covering the full spectrum of climate impacts associated with the activities of the company. However, their level of disclosure is very low.

Thomas Day (2022) there are three scopes to achieve by firms: Complete and transparent disclosure covers all direct emissions (scope 1), indirect energy-use emissions (scope 2) and other upstream and downstream indirect emissions (scope 3). The latter includes business travel emissions, emissions from procured products and services, investments, waste, upstream and downstream transport and distribution and emissions from product use.

TRACKING AND DISCLOSURE OF EMISSIONS	CORPORATE CLIMATE LEADERS EXHIBITING GOOD PRACTICE...
<p>ASSESSED FOR THE FOLLOWING EMISSION SCOPES INDIVIDUALLY:</p> <ul style="list-style-type: none"> • Scope 1 • Scope 2 • Scope 3 upstream • Scope 3 downstream 	<ul style="list-style-type: none"> ✓ Annually disclose their emissions ✓ Disclose emissions in a clear and understandable format ✓ Ensure complete and consistent reporting of GHG emissions in public documentation ✓ Provide a breakdown of emission sources ✓ Present historical data for the same emission sources ✓ Present activity data and emission intensities ✓ Disclose non-GHG climate forcers if relevant ✓ Disclose scope 2 emissions using both the market-based and location-based accounting method, using the accounting approach that returns the higher emission value for aggregated emissions. ✓ Integrate the emissions from subsidiaries into the respective emission scopes.

Figure 6. Information disclosure (CSR monitor paper)

Moreover, firms set targets and objectives to respect in short, medium, or long term. They set strategies to respect the policies directed by the central government. Below there are many environmental objectives(Thomas Day, 2022):

- Some companies opt for specific GHG emission reduction targets, but most major companies are moving towards “net zero” pledges.
- Some companies’ headline pledges are long-term visions for 2040 or 2050, while others focus on shorter-term commitments for 2025 or 2030. Limiting global temperature increase to 1.5°C requires the rapid decarbonization of all sectors, to reach a state of net-zero global CO2 emissions by around 2050.
- Some companies focus on emission intensity targets or targets associated with decarbonization indicators, such as renewable energy targets.

Below it is possible to find actions which are suggested by the Corporate Social Responsibility Monitor to achieve objectives they settled.

SETTING SPECIFIC AND SUBSTANTIATED TARGETS	CORPORATE CLIMATE LEADERS DEMONSTRATING GOOD PRACTICE...
COVERAGE OF EMISSION SOURCES	<ul style="list-style-type: none"> ✓ Clearly communicate the scope and year of their target. ✓ Cover all scope 1, 2 and 3 emissions (including upstream and downstream scope 3 emissions), as well as non-GHG climate forcers where relevant.
EMISSION REDUCTIONS IN THE HEADLINE PLEDGE	<ul style="list-style-type: none"> ✓ Set a specific emission reduction target that is independent from neutralisation claims as their main headline pledge. ✓ Commit to emission reductions of at least 90% below 2019 levels, if their headline pledge is a net-zero target, to ensure that the terminology is not misleading. ✓ Set an emission reduction target that is aligned with 1.5°C compatible trajectories or benchmarks for the sector.
SUBSTANTIATION THROUGH INTERIM TARGETS	<ul style="list-style-type: none"> ✓ Set interim targets that are aligned with the long-term vision in terms of depth and scope, with the first target on a timescale that requires immediate action and accountability (maximum 5 years). ✓ Chart a trajectory that is aligned with 1.5°C compatible trajectories or benchmarks for the sector. ✓ Prominently provide details on interim targets alongside headline pledges.

Figure 7. Setting targets (CSR monitor paper)

Furthermore, there are key point in emissions for the firms. The electricity represents a key role for all firms. There are many of them who try to take the direction of renewable electricity generation and procurement. Companies reduce electricity-related emissions in diverse ways. How a company goes about sourcing renewable electricity makes a significant difference in the actual emission impact and the credibility of renewable electricity consumption claims.

From the figure below it is possible to notice how the Corporate Social Responsibility Monitor try to advice good practice to make firms achieving the reduction of emissions.

REDUCING EMISSIONS	CORPORATE CLIMATE LEADERS EXHIBITING GOOD PRACTICE...
EMISSION REDUCTION MEASURES	<ul style="list-style-type: none"> ✓ Publish detailed information on the planned emission reduction measures for all relevant emission sources throughout the value chain. ✓ Outline the expected emission reductions resulting from the implementation of those measures
RENEWABLE ELECTRICITY PROCUREMENT	<ul style="list-style-type: none"> ✓ Adopt existing reduction measures and scale up demonstrated flagship projects to mainstream those projects across the organisation. ✓ Invest in research and development of new technological solutions, where necessary. ✓ Set out a clear plan to phase out all carbon-intensive infrastructure and products. ✓ Pursue the highest quality renewable electricity procurement option that is feasible for the company ✓ Use the most accurate and transparent accounting method, which reflects emissions from electricity consumed (location-based accounting), rather than the emissions from the electricity bought (market-based accounting).

Figure 8. Reduction of emission (CSR monitor paper)

In the end, many firms believe that taking responsibility for unabated emissions means making climate contributions to support climate change mitigation beyond the company’s value chain without making a neutralization claim, while for others it means offsetting and claiming to neutralize their emissions through carbon dioxide removals or emission reduction offset credits.

Climate contributions is defined as the financial support provided by a company to support climate change action beyond the company’s own value chain, without claiming to neutralize its own emissions. A company can claim to contribute to climate change mitigation activities, without claiming ownership of the emission reduction outcomes and without subtracting associated reductions from their own GHG inventory or net-zero target. Anyway, CSRM shows in its methodology to evaluate firms (Thomas Day, 2022) how mitigation of reduction of emissions can be interpreted in many ways. There are corporations which follow strictly the rules and the policies of Government trying to reach lower emission, but there are also firms which offset the emission. In the next paragraph, it is better explained what “Offset” really means.

Anyway, climate contributions without neutralization claims can provide a transparent, constructive, and ambitious approach to take responsibility for unabated emissions.

Companies make an offsetting claim when they assert that unabated GHG emissions within their value chain are “offset” through carbon dioxide removals or emission reduction activities outside of their value chain. The practice of offsetting has been afflicted by controversy and contention due to significant uncertainties in the real impact of offset credit use as well as the suitability of carbon dioxide removals for neutralizing emissions.

In the figure below it is possible to notice that CSR Monitor advice good practices to firms to offsetting and get climate contribution.

CLIMATE CONTRIBUTIONS AND OFFSETTING	CORPORATE CLIMATE LEADERS EXHIBITING GOOD PRACTICE...
CLIMATE CONTRIBUTIONS	<ul style="list-style-type: none"> ✓ Provide support to projects for climate change mitigation beyond their value chains. ✓ Derive the volume of finance from an internal carbon price across all emissions at a price level commensurate with keeping global temperature rise below 1.5°C above pre-industrialised levels. ✓ Disclose full details on the volume of finance, the project recipients, and the expected impact. ✓ Claim only to make a contribution, without claiming ownership of the reductions for the neutralisation of emissions.
OFFSETTING CLAIMS Offsetting claims today	<ul style="list-style-type: none"> ✓ Transparently disclose whether or not the company offsets any of its emissions. If making offsetting claims: ✓ Procure only high-quality credits that lead to an additional climate impact that is accurately measured and guarantees permanence, among other environmental integrity considerations. ✓ Disclose full details on all offsetting activities including the volumes of offset credits, the details of the projects supported, the credit vintages and credit prices paid. ✓ Prominently present transparent disclaimers on the dependence on offsets and the inherent uncertainties that this entails alongside neutrality claims. ✓ Avoid misleading consumers through offsetting claims for only selected emission sources, divisions, or products.

Figure 9. Climate contribution and offsetting (CSR monitor paper)

Anyway, it is important to remember the slightly difference between firms who set too ambitious strategies, but they are unsuccessful and firms who apply the principles of greenwashing. Therefore, there are separated these kinds of firms into two groups. This analysis focusses more on the firms who try follow the street of greenwashing.

2.3 Variables

This article published by the Columbia university center (Jack Arnold, 2021) underlines the new policy derived from the Paris agreement in 2015. As mentioned above, the study focuses on finding many questions to evaluate the firms on green activities . the most important are reported below:

- a) Does the company have short- and medium-term targets?
- b) Are the targets based on absolute emissions or on emissions intensity?
- c) Does the company's net-zero target include scope 3 GHG emissions?

Many questions, to which the author gave an answer based on empirical results, helped to understand the variables to use in the analysis of the firms regarding the Greenwashing activities.

The following paragraph explains the variables that have been used in the Greenwashing model evaluation of the firms. The variables considered have both be discovered thanks to CSRM report (Thomas Day, 2022) and to "Columbia Center on sustainable investment" article (Jack Arnold, 2021).

Each paragraph described if the variable comes from a question, and this is a sign of the paper published by Jack Arnold. Otherwise, if the paragraph is deeply detailed, the variable has been found by Thomas Day.

Through a long and deep screening of the variables:

- *Absolute emissions*

Are the targets established by companies on environmental aspects based on absolute emissions or on emissions intensity?

An absolute target consists of a set number of metric tons of emissions, usually expressed in CO₂-equivalent (CO₂e) to account for CO₂ as well as GHG. Often this number is indicated as a percentage of emissions relative to a selected base year. For example, a cement company analyzed set a 2030 goal to reduce its GHG emissions by 28% relative to its selected base year of 2007.

Intensity-based targets measure metric tons of CO₂e per unit of production. Another cement company pledged to reduce its emissions intensity to below 520 kg CO₂e per metric ton of output by 2030.

Accordingly, absolute targets are preferable: a company that sets and achieves an absolute emissions target will shrink its carbon footprint, even if its production increases.

- *Transparency*
The Corporate Climate Responsibility Monitor assesses the transparency and integrity of companies' climate pledges. Transparency ratings refer to the extent to which a company publicly discloses the information necessary to fully understand the integrity of that company's approaches towards the various elements of corporate climate responsibility.
- *Scope 1*
Scope 1 emissions are direct emissions from owned or controlled sources.
- *Scope 2*
Scope 2 emissions are indirect emissions from the generation of purchased energy (see also location-based method and market-based method).
- *Scope 3 Upstream*
Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions. Upstream emissions are indirect GHG emissions related to purchased or acquired goods and services.
- *Scope 3 Downstream*
Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions. Downstream emissions are indirect GHG emissions related to sold goods and services
- *Reduction of CO2 in recent years*
This variable is aimed to verify if the company has tried to reduce its CO2 emissions in the recent three years. The data has been verified on the resource offered by Polytechnic di Torino "Statista"
- *Sanction or accuse of greenwashing*
This variable is aimed to verify if the company has been accused of Greenwashing in the recent ten years. Accusations or sanctions have been discovered through articles found on the net.
- *Offset actions in the past*
This variable is aimed at verifying if companies make an offsetting claim when they assert that unabated GHG emissions within their value chain are "neutralized", "netted-out", or "offset" through carbon dioxide removals or emission reduction activities outside of their value chain
- The number of "Green" words in the Sustainability Report of the companies:
The "Green" words are:
 - a. Green (investments, technologies)
 - b. ESG
 - c. Environment
 - d. Sustainability

This means that for each report it has been calculated the numbers of the words found in the report.

- *Short - and medium - term strategy on green activities*
This variable represents the availability of a short-term target or a medium - term target on the company report or reported by the CSRM report 2022.
- *Explanation of Net – zero pledges*
This variable explains the level of the Net – Zero pledges of the company. This means how the company can go in details of the disclosure for the Net – zero emissions target.
- *Explanation of contribution to lower the temperature of about 1.5 degree*
This variable explains the level of details a company can achieve in describing the achievement of 1.5-degree objective.
- *Offset actions*
This variable explains if the companies plan to have any offset actions target in their strategies in the future. This variable will be considered in a negative way because it has a negative role with respect to all the other variables. Companies make an offsetting claim when they assert that unabated GHG emissions within their value chain are “neutralized”, “netted-out”, or “offset” through carbon dioxide removals or emission reduction activities outside of their value chain.
- *GT/NP*
This variable represents the fraction of the Greenwashing patents emitted by the company over the 2020 and 2021. Indeed, GT stands for Greenwashing patents issued and NP is the total number of patents the company has emitted in the 2020 and 2021. The maximum number is 250 patents.

3. Assessment of the risk of Greenwashing

The chapter 3 of the thesis is the first to explain the core process of the thesis. Before understanding the effect of the Greenwashing on the Market Value, the earth is developing a method to understand why a firm can be classified as at risk of Greenwashing. Indeed, this part will be divided in two:

- 1) Finding the methodology to “accuse” the firms of Greenwashing
- 2) Classifying the firm as a Greenwashing activity pursuant

From the analysis of the papers cited above, firms can easily understand the stringent rules on respecting the environment. But do they respect them? As mentioned through the papers analyzed (Thomas Day, 2022), (Jack Arnold, 2021) and to the variables and data found the thesis focused on finding the level of risk of Greenwashing for each firm. The risk of Greenwashing will be found both for the actual profile and situation of the firms and for the strategy they have set for the future.

The Greenwashing is defined as a binary variable which can be enhanced to 1, hence the firm will be considered at risk of Greenwashing, or it can be 0, and so the firm will be not accused of Greenwashing. Indeed, the examination has the scope to verify that when the variable of Greenwashing is enhanced whether the market value is higher with respect to the firms which do not have the variable of Greenwashing enhanced.

The analysis has been made on fifty firms. Since the key model of this analysis is to compare companies in the same sector as it will be explained below, we divide the 50 firms into groups.

Furthermore, during the following steps of the thesis it is provided a clear example of the analysis between the two firms leader in the Good Distribution sector: Amazon and Walmart.



Figure 10. Amazon vs Walmart

To evaluate the firms in a more detailed way, the key focus reference has been the Corporate Social Responsibility Monitor (CSRМ)(Thomas Day, 2022). As described above, this entity makes in depth studies on companies using different methodologies and variables, contributing to give a benchmark on their activities. For this thesis, it has been considered two different sources of the CSRМ’s research:

1. The website

In the section named “Analytics” CSRМ analyzes many companies through variables as: “Integrity Assurance,” “Environment,” “Stakeholder Engagement” and “Governance”.

After having valued these variables, the website published reports score which explains the quality of Corporate Social actions of the company. The report score is also evaluated with the median score of the primary industry in which the company operates. This allows to view the position of the company with respect to its competitors on the themes analyzed. The website looks like in the picture below.

Report Element	Company Score	All Companies Median Score	Primary Industry Median Score
Integrity Assurance	66.67%	0.00%	50.00 %
Environment	81.63%	36.92%	35.71 %
Philanthropy & Community Involvement	40.00%	53.33%	60.00 %
Stakeholder Engagement	75.00%	32.14%	35.71 %
Supply-Chain Management	100.00%	29.41%	47.06 %
Labor Relations	98.04%	41.18%	50.98 %
Governance	80.00%	30.00%	40.00 %
Anti-corruption	83.33%	16.67%	33.33 %
Human Rights	94.12%	29.41%	47.06 %
Codes of Conduct	37.88%	19.70%	24.62 %
Executive Message	54.55%	50.00%	54.55 %
Report Score	73.56	32.81	42.65

Figure 11. Amazon evaluation

2. Reports

In the section “Reports & Publications,” CSRM releases many reports which evaluates the companies more deeply. One of this report represented the start of this thesis: CSR Monitor report 2022.

Moreover, 25 firms of the total have been analyzed deeply by the report. This allows the analysis to avoid looking for other information about the companies inside their Sustainability reports or Annual reports.

The last twenty-five firms have been chosen to enrich the analysis of the groups in which we divide the firms richer in terms of data and precision. This topic will be analyzed in the following sections.

This is probably the most interesting part of the thesis. It has been developed a model to evaluate if the company can be classified as Greenwashing activities. Indeed, before evaluating which is the impact of the Greenwashing on the company's market value, it must be verified if the company is making Greenwashing activities.

As mentioned above, the model is divided in two parts. The first which evaluates the historical data about the respect of the environmental policies until the end of 2021, Profile assessment, and a second part which focuses on the evaluation of the future of the firm (strategy assessment).

a) Profile assessment

It analyzes the level of pollution of the firm based on historical data. These data have been taken by the resources of the Polytechnic di Torino, by the reports issued by CSRM and reports issued directly by the company. The model has the aim to give a final score in a range of 0 and 1 to the variable "Level of pollution". This score is obtained through an assessment of the firm made on ten variables. Each of these variables have a weight which will be explained in the "Variables" section of the thesis. Indeed, the final score will be the sum of the weight given to the variables. After that, it will be classified in a range of pollution which will allow to compare the companies in an objective way. Also, this process will be explained below.

a) Strategy assessment

It analyzes the level of risk of Greenwashing of the firm based on the more recent reports of the companies. The final aim of this part is to give a score to the variable "Risk of Greenwashing" between 0 and 1. The assessment of the strategy of the firm has been made on six variables. Each of these variables have a value and contribute to give a final score to the Strategy assessment. Indeed, the final score will be the sum of the weight given to the variables. Thanks to this score, it will be possible to classify in a range of Risk of Greenwashing, which will allow to compare the companies in an objective way. Also, this process will be explained below.

Once both the Profile assessment and the Strategy assessment will be computed and the respective final variable "Level of pollution" and "Risk of Greenwashing" will be enhanced, the company will be identified as Greenwashing activities pursuant by the combination of the two total points achieved by the variables. The ranges through which the Greenwashing variable has been set to 1 or to zero. This interval between 0 and 1 is divided into four groups of 0,25 points each. Anyway, this process will be explained below

Before entering in the details of the model, it is important to explain the choice of the companies analyzed and compared. Starting from the fact that the market value has already many variables for which it can be bigger for a firm and lower for another firm. Anyway, the first action overtaken was to restrict the analysis. Therefore, companies have been grouped together following the sector explained below . This allows to eliminate comparing market value of companies which could be not comparable, instead.

However, the groups of the fifty companies are in the following page :

ID	Companies	ID	Companies
1	Walmart	3	General Motors
1	Amazon	3	Hitachi
1	Carrefour	3	Toshiba
1	IKEA	3	Fujitsu
1	UPS	3	Saint Gobain
1	FedEx	3	CRH
1	Deutsche Post DHL	3	Cemex
1	C.H. Robinson	3	Johnson Controls
1	Vodafone	3	JBS
1	Deutsche Telekom	3	Tyson Foods
1	TIM	3	Smithfield
1	AT&T	4	Enel
1	Nestlé	4	Maersk
1	Unilever	4	E. ON
1	General Mills	4	Eni
1	Procter and Gamble	4	Chevron
1	CVS Health		
1	Novartis		
1	GlaxoSmithKline		
1	Pfizer		
1	Johnson & Johnson		
1	Accenture		
2	Apple		
2	Sony		
2	Samsung		
2	Dell		
2	HP		
2	Xerox		
2	Google		
2	Microsoft		
2	Adobe		
3	BMW-Group		
3	Volkswagen		
3	Stellantis		

Table 1. Companies

The groups of firms have been done looking at the industry of the companies. The four industries of the companies found are:

1. Services: which can be IT services, Health services, Distribution services
2. Discretionary goods
3. Industrial services
4. Energetic industry

These four groups have been found analyzing the core business of the companies reported in their annual report.

The “Services sector” has been created to group the companies for which core business consist in of the provision of the services “IT”, “Healthcare”, “Distribution”.

The “Discretionary good” sector groups all the firms which provide the final product that is not essential for consumers.

The “Industrial services” groups all the firms which involves human activities to create essential goods

The “Energetic sector” groups all the firms which produce energy and sells energy.

After having introduced the scope of the chapter 3 and the companies which are analyzed, it is possible to proceed to the details of the analysis.

As it was explained above the model has been divided into two parts:

- a) Profile assessment of the company
- b) Strategy assessment of the company

After this computation, the two variables will be connected in the last variable : Greenwashing. To do that, the focus is on associating the final values found for each variable. Summing all the points found, it is possible to figure one final value. This will indicate if the Greenwashing is enhanced. This final procedure has taken the name of “Final range assessment”.

3.1 Profile assessment of the company

The Profile assessment of the company is based on the total points which can be achieved by the sum of all the weights of the variables. The total points are the value of the variable “Level of pollution”. The latter variable can achieve a maximum value of 1 and a minimum value of zero.

The variables considered have been divided between the ones for which the CSRM provide a clear explanation and the ones describes “Columbia Center on sustainable investment” article. The first were analyzed through an objective criterion since they were deeply explained by the CSRM. That is why, as it will be possible to see, why they receive higher weights. Meanwhile the

other variables considered were not clearly explained in the CSRM report. Consequently, they were analyzed in a subjective way. That is why, as it will be possible to see, why they receive lower weights.

The variables which contribute to the final score are assigned to weights and described below.

I. Subjective criteria variables

It has been used on variables for which it was not possible to observe how the Corporate Social Responsibility Monitor gave its values.

The weight has been given based on “Columbia Center on sustainable investment” article and on a common sense. The values assigned were very little to leave bigger weight to objective criteria variables. Below it is shown how which variables have been considered under this criterion and which were the values associated:

Variables	Values
Absolute emissions	0,05
Reduction of CO2 in recent years	0,1
Sanction or accuse of Greenwashing in the past	-0,05
Offset actions or strategies in the past	-0,05
Total CO2 emissions issued in 2020 or 2021	TBV – see Special cases section

Table 2. Values 2

As it is possible to see from the Figure above, the “Absolute emission” variable and “Reduction of CO2” in recent years variable has positive value. This is because they contribute in a positive way to the “Greenwashing score” of the company. Indeed, Absolute emissions has a positive weight because this way of emissions disclosure is much deeper and better with respect to emissions intensity (the differences are explained above).

While the Sanction or accuse of Greenwashing in the past variable and the Offset actions or strategies in the past variable has a negative weight on the total points for the Profile assessment of the company. Since the aim is obtaining the total points as possible, both having taken sanctions and having made offset actions in past has a negative impact.

The “Total CO2 emissions issued in 2020 or 2021” variable point will be explained in the Special cases section.

II. Objective criteria variables

It has been used on variables for which it has been found an obvious way of description.

The objective criteria evaluation is divided in two parts connected each other:

1. The “Environment” variable
 2. The colors used in the CSR report 2022
-
1. The Corporate Social Responsibility Monitor released an explanation to reveal how they evaluate the variable “Environment” in the CSR website. As it is possible to see from the Figure below, there are levels on the left side which represents the level of disclosure of the company about environmental policy, rules, and actions of the company. On the right side, it is explained the description of each level It revealed the values given through the level of details and of disclosure a firm were able to have.

Level	Criteria Description
0	Report does not discuss activities toward reducing/mitigating the environmental impacts of the company’s business in a meaningful way.
1	Report provides minimal depth of information on the scope of coverage of the company’s activities toward reducing/mitigating the environmental impacts of the company’s business. Discussion categorized as incomplete and vague.
2	Report provides fair depth of information on the scope of coverage of the company’s activities toward reducing/mitigating the environmental impacts of the company’s business, including measurable results. Discussion categorized as reasonably comprehensive and detailed.
3	Report provides good depth of information on the scope of coverage of the company’s activities toward reducing/mitigating the environmental impacts of the company’s business, including measurable results and comparisons of outcomes at a company or industry level. Discussion categorized as comprehensive and detailed.

4	Report provides excellent depth of information on the scope of coverage of the company's activities toward reducing/mitigating the environmental impacts of the company's business, including measurable results and comparisons of outcomes at the company or industry level. Discussion categorized as comprehensive and detailed and is noted for reaching an exceptional level of disclosure.
---	---

Table 3. Values3

The following graph makes clearer the level of details for each level. Indeed, every numerical level has its own level assigned. The levels of details have been given in subjective way based on the description criteria. Indeed, the lower level is assigned to the lower criteria description. The lower criteria description is labeled as "Low" level of details.

On the website of CSRM, under the section "Analytics," after having clicked on a company, it is possible to see the values given to the different variables CSRM has used to evaluate the Total score of the company. Of the thesis interest is the value of the Environment variable which has been given based the criteria explained above. This value is used as point of reference to compare the Profile assessment of the company. Indeed, it allows to compare the company considered both the industry in which it operates and with its competitors.

However, the latest value was not available for all the fifty companies. Indeed, it has been made an arithmetical average between the latest three values found available. In fact, the top right corner, as shown in picture below, it is possible to change the year of evaluation for the company.

PSA Group (Peugeot)

CSR-S Monitor Edition: 2019 2016 2014

HQ Location: France
 Region: Western Europe
 Primary Industry: Manufacturing-33
 Primary NAICS code: 336111
 Secondary NAICS codes: 334413

Rank: 1
 Score: 73.56
 Industry Rank: 1

Report Element	Company Score	All Companies Median Score	Primary Industry Median Score
Integrity Assurance	66.67%	0.00%	50.00 %
Environment	81.63%	36.92%	35.71 %
Philanthropy & Community Involvement	40.00%	53.33%	60.00 %
Stakeholder Engagement	75.00%	32.14%	35.71 %

Figure 12. CSRM website

2. To understand more deeply the analysis of the CSRM website, the thesis focused on the CSRM report 2022. In the report, the variables considered for each company have been analyzed through colors. The colors are aimed to evaluate the impact value of the variable considered. The colors used are red, yellow, and green.
- The red color is used to describe the variable considered in the worst way.
 - The yellow color represents in a moderate way.
 - The green color is used to describe the variable in the best way.

An example of the method used by CSRM is shown in the figure below:

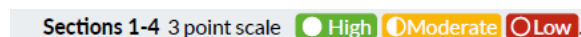


Figure 13. CSRM points

The variables evaluated with colors by the CSRM are the following:

- Transparency
- Scope 1
- Scope 2
- Scope 3 Upstream
- Scope 3 downstream

In the report issued by the CSRM in the 2022, each of these variables belong to a precise color. To understand better the process used by the CSRM: if Transparency

has been accomplished to a green color it means that the level of disclosure of green activities expressed by the company considered is high. The following picture make the process used in the CSRM clearer.

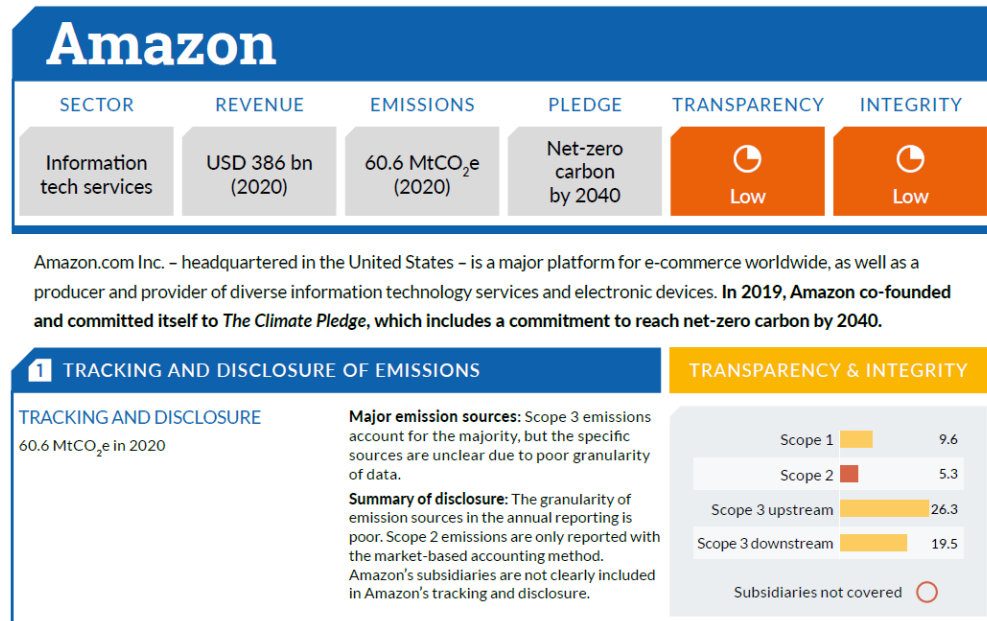


Figure 14. Amazon

Anyway, the adjective “high,” as well as green, is too vague to be used in a quantitative model. It does not have a particular value. Therefore, it was needed to associate the green, the red and the yellow color to a numerical value. To have standard numerical value for the three colors it has been used an association. Since the CSRM report 2022 use the colors to evaluate the level of disclosure of the company and the CSRM website use the level of disclosure to evaluate the companies, the two methodologies have been associated together. The assorted colors are associated to different Level of details, the ones shown in the graph above:

- Red is associated to “Low” and “Medium – Low” level of details
- Yellow is associated to “Medium” and “Medium – High” level of details
- Green is associated to “High” level of details

Once we have analyzed both the Website of CSRM's criteria to evaluate the firms on the variable "Environment" in point "1" (as shown in the CSRM website figure), it is possible first to connect the color to the level and then the color to a value. Indeed, more the level of detail is low, it means that the value assigned is low. A lower value means a lower contribution to the "Environment" variable value.

This passage is important to check if the CSRM report methodology is connected to the CSRM website.

For the other companies, which have not been evaluated by the CSRM, the colors were given in a subjective way. Anyway, the point of reference taken was the values given to the "Environment" variable. Therefore, it has been excluded a an entirely subjective evaluation process.

Since both the CSRM report 2022 and the "Analytics" section of CSRM classify the companies, it has been searched a connection between the methodologies. In fact, it has been studied that "Environment" could have been associated to variables used in the report: Transparency, Scope 1, Scope 2, Scope 3 Upstream and Scope 3 downstream. The following scheme shows a hierarchical association made in the methodology used.

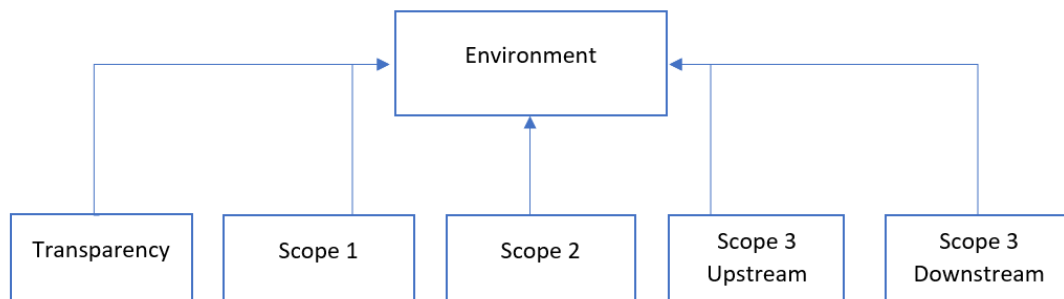


Figure 15. Environment variable

The aim is having the same comparative values for the variable "Environment" and for the "Level of pollution" which correspond to the sum of all the variables mentioned above. For example, if Amazon has the Environment value = 100 and Walmart has the Environment value = 200, then also the sum of values associated to each variable (Transparency, Scope 1...) must be higher for Walmart with respect to Amazon. In this way, we have a clear verification that the model is based on scientific data, and it confirmed by a national entity which analyzing social responsibility activities as a core business.

The following Figure shows how the colors has been assigned to the level explained by the CSRM

Level	Color	Value
Lev 0	Red	0,02
Lev 1	Red	0,02
Lev 2	Yellow	0,12
Lev 3	Yellow	0,12
Lev 4	Green	0,17

Table 4. Values 4

Finally, the colors are associated to levels. The levels are associated to values with respect to the values given to variable “Environment,” as it will be explained below. Therefore, the colors receive a value based on the level they are associated to. The variables Transparency, Scope 1, Scope 2, Scope 3 Upstream and Scope 3 downstream will be given:

- 1) A color
- 2) A level
- 3) A value

In the graph below it is shown the different weights associated to the variables considered. The graph is needed just to make clearer the values assigned in the Figure above. It is important to notice how the variables which have been analyzed by the CSRM have greater values, while the variables used without a précised method have lower values.

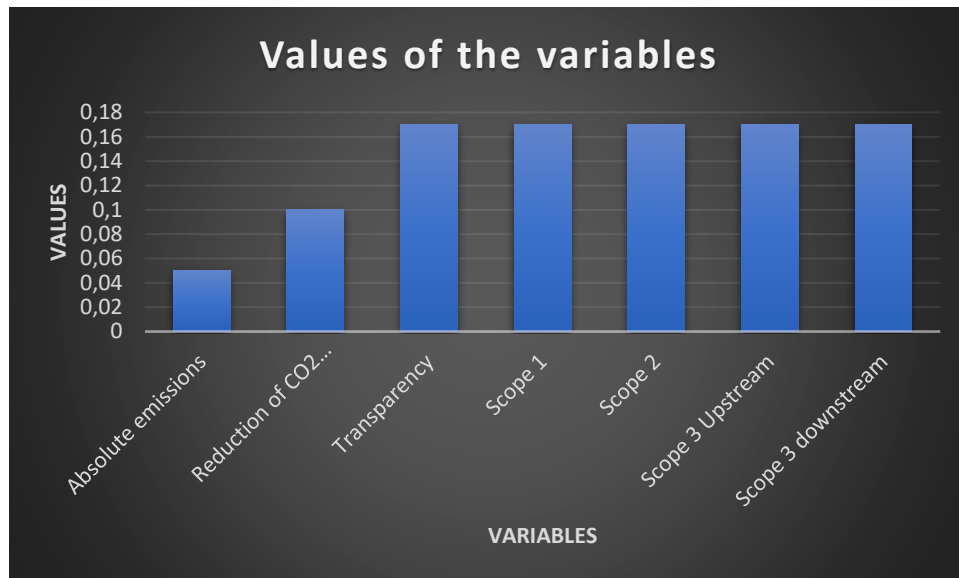


Figure 16. Values of variables

An objective evaluation was possible for 25 companies, the ones assessed also in the CSR report.

Once it has been analyzed how to give the weights to the variables, both in subjective and objective way, it is possible to proceed to the conclusion of the Profile assessment part. In the end, it is interest of the thesis finding the total points for each company assigned to the variable “Level of pollution,” summing all the variables considered. This will give an idea of the pollution of the firm.

As the values of the final variable can achieve a maximum value of 1 and a minimum value of 0, there will be a way to compare a firm with the others in the same sector. Anyway, the value given is just a number. Therefore, it was needed to divide the values from 0 to 1 into four ranges. Each range represents a zone in which the firm is labeled as:

- High pollutant
- Medium – High pollutant
- Medium – Low pollutant
- Low – pollutant

The following Figure shows how the division works.

Level of pollution	Range
High polluting firm	0 – 0,25
Medium – High polluting firm	0,26 – 0,5
Medium - low polluting firm	0,51 – 0,75
Low polluting firm	0,76 - 1

Table 5. Values 5

The model is structured in a way the lower it is the total point of the “Level of pollution” of the firm, more it is level of pollution of the firm. This division of the companies in ranges is used in the last methodology to indicate if the firm pursues the Greenwashing activities.

In the following graph it is possible to see how the values between 0 and 1 have equally split into four ranges. This has been done to have data disperse all along the categories and to enrich the data.

3.2 Strategy assessment of the company

This part is aimed at evaluating the company under the point of view of its strategy described in its Sustainability Report, Annual report or CRSM report. Each company will have the “Risk of Greenwashing” variable given by the sum of values of variables for which it is analyzed. The higher will be the total points of the final variable, the higher will be the risk of Greenwashing for the company.

However, it is important to notice that there has been assigned values to variables. The weights have been assigned to variables following the path explained for the Profile assessment.

Indeed, for the following variables:

1. Short - and medium - term strategy on green activities
2. Explanation of Net – zero pledges
3. Explanation of contribution to lower the temperature of about 1.5 degree

the weights assignment method is the one based on the level of CSRM used also for the Profile assessment.

It is possible to notice how the different level of CSRM were assigned the level of details explained by the Report of the company.

For the variable “Short – term strategy” and “Medium - term strategy” on green activities, the level of description reported in the Report of the company is assigned to a level of CSRM. Then, each level has been assigned subjectively to a numerical value. From the explanation of the CSRM about the level of classification for the “Environment” variable one can understand that the lower level corresponds to exceptionally low detailed description of the variable considered. Hence, the level 0 and 1 has been assigned to “No interim target”. Consequently, since the company the more has higher “Risk of Greenwashing” the worse it will be classified in terms of greenwashing activities, “No interim target” has the higher value. Following this logic, in the Figure below all the other levels are described.

The numerical value has been given in a subjective way and following the same rules used for the “Environment” variable in the profile assessment part.

Description	Level	Values
No interim target	Lev 0 – 1	0,2
One step	Lev 2 – 3	0,1
At least two steps	Lev 4	0,05

Table 6. Values 6

For the variable “Explanation of Net – zero pledges”, the level of description reported in the Report of the company is assigned to a CSRM level. Then, each level has been assigned subjectively to a numerical value.

Level	Values
Lev 0 – 1	0,2
Lev 2 – 3	0,1
Lev 4	0,05

Table 7. Values 7

For the variable “Explanation of contribution to lower the temperature of about 1.5 degree”, the level of description reported in the Report of the company is assigned to a level of CSRM. Then, each level has been assigned subjectively to a numerical value.

Level	Values
Lev 0 – 1	0,2
Lev 2 – 3	0,1
Lev 4	0,05

Table 8. Values 8

The variable “Offset actions” is valued in a subjective way due to missing data and information. The variable has been evaluated based both on the CSRM report 2022 and on the information found on the Sustainability section of the annual report of the firms. As it was explained above, this variable has been considered as a negative impact on the total points assigned to “Risk of Greenwashing” since the reduction of the emissions come from offsetting actions and not from operative actions applied to the value of the companies. In fact, the company is making offsetting is given a higher value to the variable. This is a negative impact because the higher is the total point in the Strategy assessment part, the higher is the risk of Greenwashing. As it is possible to see from the Figure below the values given to the different variable description are lower with respect to the ones analyzed by the CSRM. In the CSRM report, the variable “Offsetting” has as description:

- Yes
- No
- Unclear

For the others twenty-five companies which have not been analyzed by the CSRM, it has been possible to find the offsetting information in the Sustainability report of each company. As it shown in the table below, the value given to the variable “Offsetting” is negative. Indeed, ad the CSRM report studied, a good practice to get high Environment value is to “Avoid the misleading claims, and procure only high-quality credits that lead to an additional climate impact”. The CSRM report analyzes the “Offsetting” variable through the level of Transparency and Integrity. More the companies are suspected of Offsetting, more the values of the Transparency and Integrity is low. Therefore, the values assigned to the description of the variable in the Figure below are the same:

Variable	Description	Value
Offsetting	Yes	0,15
	No	0
	Unclear	0,05

Table 9. Values 9

The last variable considered is “GP/NP”(Greenwashing over the total number of patents). This variable has a value that has been computed considering the ratio between the Green Technologies’ patents and the total number of the patents issued in 2020 and 2021. After the computation of the value, the comparison between the companies of the same sector has been made on a ranking method. Therefore, the higher ratio value, meaning that the company has more green technologies patents, receives less points with respect to the lower value. The following Figure shows an example.

Ranking	Values
1	0,025
2	0,05
3	0,1
4	0,15

Table 10. values 10

Anyway, the data reported in the Figure above are just an example of values assigned to the position of the companies in the ranking. The other groups of firms might have different number of firms in the group and so different values associated. This is because the maximum value that the “Risk of Greenwashing” variable can achieve is one and the minimum value is 0.

Once the variables used have been explained, it has been applied the process to give values to the variables.

In the end, each company has received the total score assigned to the variable “Risk of Greenwashing.” However, each value of the companies must be interpreted. Indeed, it has been divided the numerical range between 0 and 1 into four ranges. The ranges are described in the following Figure.

Risk of Greenwashing	Ranges
Low	0 – 0,25
Medium - Low	0,26 – 0,5
Medium - High	0,51 – 0,75
High	0,76 - 1

Table 11. Values 11

In the following graph it is possible to see how the values between 0 and 1 have equally split into four ranges. This has been done to have data disperse all along the categories and to enrich the data.

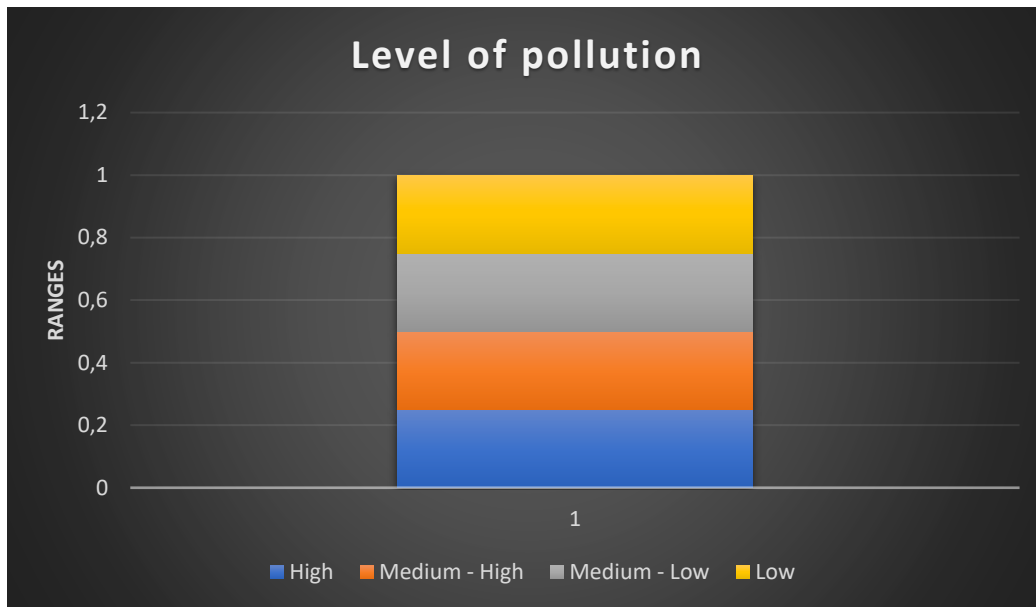


Figure 17. Level of pollution 2

The values associated to each company belong to one of the ranges showed above. This explains if the company can be categorized as Low - Risk of Greenwashing or High - Risk of Greenwashing, meaning the level of risk a firm can incur in its strategies.

3.3 Final range assessment

Finally, after having assigned a label of pollution, “Level of pollution” and a label for the risk of Greenwashing, “Risk of Greenwashing” to each company, the results have been associated. The combination, shown in the following Figure, leads to have the expected result of the binary variable Greenwashing (GW). Indeed, when the variable GW is set to 1, it means that the company can be potentially identified as a Greenwashing activity pursuant. The opposite effect will be verified when the variable is set to 0.

For example, a high “Level of pollution” and a high “Risk of Greenwashing” shows that the binary “Greenwashing” variable enhanced to one.

Risk / Pollution	High	Medium - High	Medium - Low	Low
High	1	1	1	0
Medium – High	1	1	0	0
Medium – Low	1	0	0	0
Low	0	0	0	0

Table 12. Values 12

Example of model application: Amazon vs Walmart

Amazon and Walmart are the main competitor in good distribution in US market. Hence, they have been analyzed and compared together.

Following the steps of the model, one can start with the evaluation of the variables of the Profile assessment part. Both the companies have been evaluated by the CSRM report 2022. CSRM found out that:

- Absolute emission

While the annual report of Walmart shows a clear representation of the reduction of CO₂ and GHG by percentage, amazon has not detailed enough this part. Therefore, the “Absolute emissions” variable for Walmart is set to 1 and it achieves the value as describe in Figure. For amazon, the variable is set to 0.

- Reduction of CO₂ in recent years

The variable is verified for Walmart but not for Amazon. The decision of the setting to 1 or 0 has been based on the resource “Statista” available to the Polytechnic di Torino. Hence, Walmart will achieve the higher value.

- Sanction or accuse of Greenwashing in the past

This variable is one for Walmart and 0 for Amazon. This is because in the historic data used and mentioned by CSRM report it has been found accuses of Greenwashing for Walmart but not for Amazon. This demonstrates the enhancement of the binary variable.

Therefore, to each company are assigned the values given in the Figure below.

- Offset actions or strategies in the past

This variable has been found, both on the CSRM report and on their annual report, to zero for both companies.

Therefore, to each company are assigned the values given in the Figure.

- Total CO₂ emissions issued in 2020 and 2021

This variable is valued following the ranking method. Hence, Amazon (sixty-one million metric tons) will have lower absolute value with respect to Walmart (203 million metric tons).

Therefore, to each company are assigned the values given in the Figure.

- Transparency

This variable follows the technique of the colors assigned by CSRM in the report 2022. Amazon is assigned to the red color, while Walmart is assigned to the green color. Therefore, to each company are assigned the values given in the Figure.

- Scope 1

This variable follows the technique of the colors assigned by CSRM in the report 2022. Amazon is assigned to the yellow color, while Walmart is assigned to the green color. Therefore, to each company are assigned the values given in the Figure below.

- Scope 2
This variable follows the technique of the colors assigned by CSRM in the report 2022. Amazon is assigned to the red color, while Walmart is assigned to the red color. Therefore, to each company are assigned the values given in the Figure.
- Scope 3 Upstream
This variable follows the technique of the colors assigned by CSRM in the report 2022. Amazon is assigned to the yellow color, while Walmart is assigned to the red color. Therefore, to each company are assigned the values given in the Figure.
- Scope 3 Downstream
This variable follows the technique of the colors assigned by CSRM in the report 2022. Amazon is assigned to the red color, while Walmart is assigned to the yellow color. Therefore, to each company are assigned the values given in the Figure.

Variables	Amazon	Walmart
Absolute emissions	0	0,05
Reduction of CO2 in recent years	0	0,1
Sanction or accuse of Greenwashing in the past	0	-0,05
Offset actions or strategies in the past	0	0
Total CO2 emissions issued in 2020 or 2021	-0,05	-0,1
Transparency	0,02	0,17
Scope 1	0,12	0,17
Scope 2	0,02	0,02
Scope 3 Upstream	0,12	0,02
Scope 3 downstream	0,12	0,02
Level of pollution of the firm	0,35	0,4

Table 13. Values 13

The following graph shows a resume of the values given to the variables which composed the final variables of the Profile assessment.

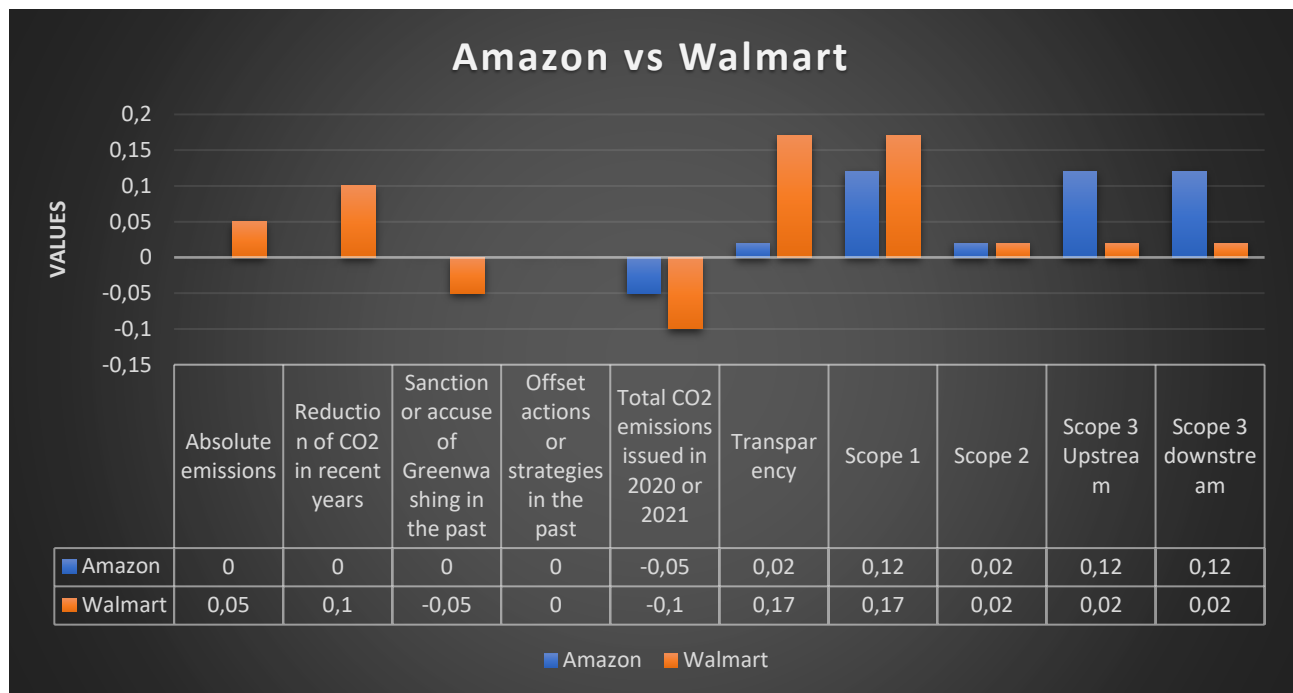


Figure 18. Comparison 1

While in the graph below it is possible to see the difference in the final variable “Level of pollution” for both companies. It is possible to notice that both the companies will be classified the “Medium polluting area” because their values are within the range 0,26 – 0,5.

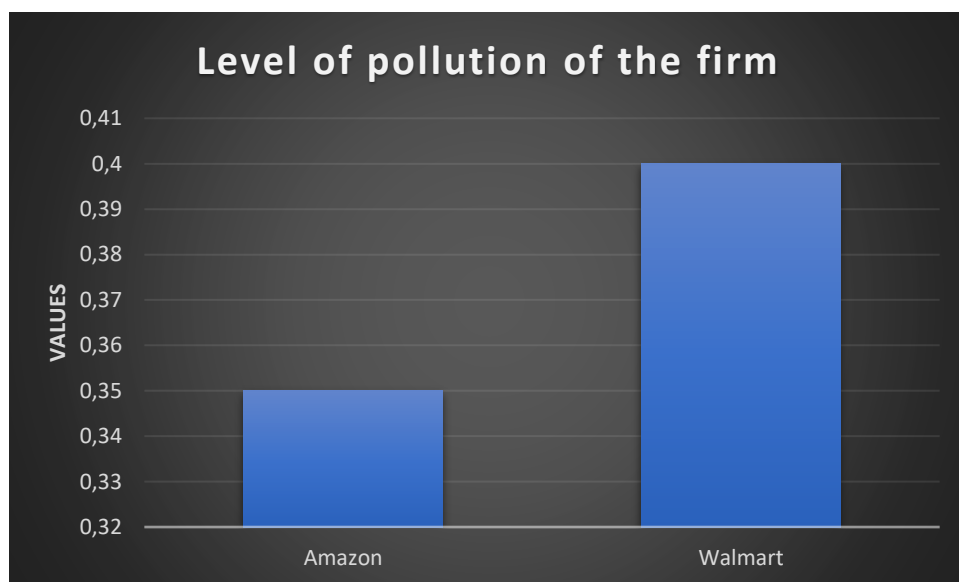


Figure 19. Comparison 2

Now the thesis can proceed in analyzing the companies under the point of view of their strategies about environmental actions in the future. The information is taken by both CSRM report 2022, Annual report and Sustainability report.

The strategy assessment is based on the following variables:

- Short - and medium - term strategy on green activities
This variable follows the algorithm described by the CSRM in the section “Analytics” of their website. It explains how Amazon has a worse description than Walmart in the resources found above. In fact, Walmart has described the objective with two intermedium – targets.
- Explanation of Net – zero pledges
This variable follows the algorithm described by the CSRM in the section “Analytics” of their website. It explains how Amazon has a worse description than Walmart in the resources found above. In fact, Walmart has described the objective with two intermedium – targets.
- Explanation of contribution to lower the temperature of about 1.5 degree
This variable follows the algorithm described by the CSRM in the section “Analytics” of their website. It explains how Amazon has the same level of description as Walmart in the resources found above
- Offset actions in the future
This variable is explained in the CSRM report 2022. In the report it is described if the company has offsetting action in the future strategies. Hence, the “Unclear” level of description for both companies has been assigned a value
- GP/NP
This variable shows that amazon has issued more patents relative to green activities during the 2020 or 2021.

Variables	Amazon	Walmart
Short - and medium - term strategy on green activities	0,2 – Lv1	0,05 – Lv4
Explanation of Net – zero pledges	0,2 – Lv1	0,05 – Lv1
Explanation of contribution to lower the temperature of about 1.5 degree	0,05 – Lv4	0,05 – Lv4
Number of “green” words in the Sustainability/Annual report	0,1 - (316)	0,05 - (370)
Offset actions in the future	Unclear – 0,05	Unclear – 0,05
GP/NP	0,025(first place)	0,05(second place)
Risk of Greenwashing	0,775	0,45

Table 15. Values 15

The following graph shows a resume of the values given to the variables which composed the final variables of the Strategy assessment.



Figure 29. Comparison 3

While in the graph below it is possible to see the difference in the final variable “Risk of Greenwashing” for both companies. It is possible to notice that Amazon will be classified as a “High risk of Greenwashing” while Walmart will be classified as a “Medium – Low risk of Greenwashing.”

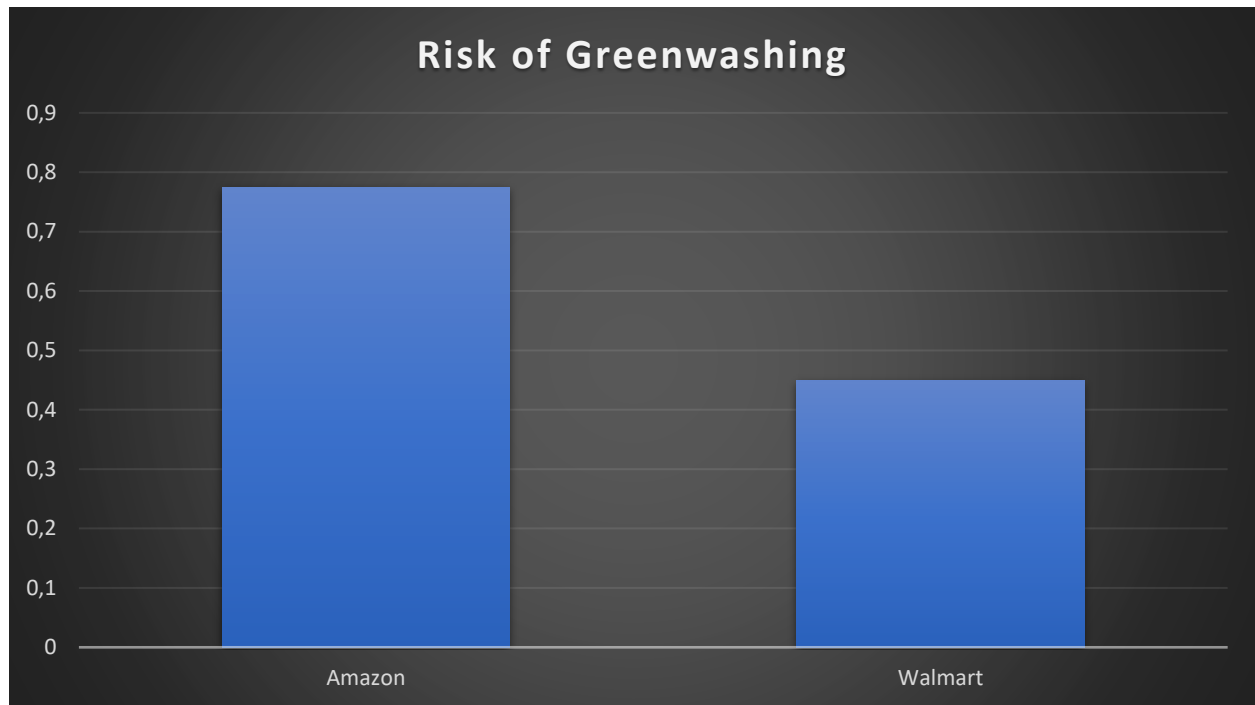


Figure 30. Comparison 4

Now, the thesis can proceed performing the final assessment of Greenwashing. In this part the variable “Greenwashing” will be enhanced with the value of 1 or 0.

4. Empirical application

The chapter 4 has the aim of following the calculation of the Market Value Colombelli (2021). Indeed, after having classified the firms with as a Greenwashing activities pursuant, the thesis focuses on finding the value of the Market to correlate the two variable together. After that, it will be illustrated how it has been structured the method to analyze each firm under the point of view of environmental sustainability. To develop this second part of the methodology there have been used the following papers.

4.1 Market Value Computation

In the paper “Green technologies and firms’ market value: a micro-econometric analysis of \$pean firms” written by Alessandra Colombelli, Claudia Ghisetti and Francesco Quatraro, the market value is described through the theory of Tobin’s q. Griliches in (1981) ‘Market value, R&D, and patents,’ Economics Letters wrote about this measure as a way evaluate intangible capital that enables firms to generate technological knowledge. The theory assumes that financial markets assign value to the bundle of a firm’s assets, which is equal to the present discounted value of its future cash flows. In other words, if knowledge stock is expected to contribute positively to the future net cash flows of a firm, then the size of this stock should be reflected in the observed MV of the firm. In the formula explained below given by the book “Corporate finance” written by Berk and DeMarzo, the replacement cost represents how much a unit of capital costs to be replaced.

$$Tobin\ Q = \frac{Market\ value}{Replacement\ cost} \quad (1)$$

The professors also try to explain the concept of knowledge in the paper. Most empirical investigations have used firms’ patent applications to derive an approximation of their knowledge stock. However, from the theoretical viewpoint, patents seem to be well suited to appreciate how financial markets evaluate a firm’s knowledge assets. Several studies have in fact stressed that patents, by approximating a firm’s R&D competences, provide signals to external investors that mitigate information asymmetries on financial markets and derive probabilities for the success of R&D-active firms (2020, Green technologies and firms’ market value: a micro-econometric analysis of \$pean firms).

In the paper, it has been demonstrated that financial markets positively evaluate a firm’s knowledge assets, which pursue green technology strategies. Stringent policies in fact induce polluting firms to improve their environmental performances by eco-innovating. The researchers use another equation with respect to the one illustrated by Berk and DeMarzo to evaluate the market value:

$$MV = b(A + \mu GT + \mu_2 NO_{GT})^\sigma \quad (2)$$

Professors indicate V as the market value of the firm I, b is the replacement cost of the total assets, μ is the price of acquiring new knowledge of capital, GT is the inclusion of green technologies as I in investment in their strategies and NO_GT is the opposite.

As it will be explained in the last chapter, it is noteworthy to notice how the colleagues referred to the logarithm expression.

$$\log(q_i) = \log\left(\frac{V_i}{A_i}\right) = \log b + \log\left(1 + \gamma_1 \frac{GT_i}{A_i} + \gamma_2 \frac{NO_{GT_i}}{A_i}\right) \quad (3)$$

where $\log(q)$ is the log of Tobin's q index, and the intercept can be interpreted as an estimate of the logarithmic average of Tobin's q for each year.

Following this approach, the analysis on "Stata", a software that will be used to analyze the data, the variables which contain high values have been transformed into logarithm form.

$$\ln(q_i) = \alpha + \beta GW_i + \gamma X_i + \varepsilon \quad (4)$$

The equation above has a central role for the analysis of this thesis. The factor $\ln(q_i)$ is referred to the $\ln(MV)$, GW_i represents the Greenwashing variable as it is explained in chapter 1 and X represents all the other control variables which has been introduced in the analysis. The term " i " represents the firms considered.

This equation has been interpreted to develop computations in the thesis.

- a) A represents "the Fixed tangible assets" of a firm. This data has been taken by the resource of Polytechnic di Torino "Orbis," as the professor Colombelli suggested. Being more précised, it corresponds to the value "Immobilizazioni materiali."
- b) GT represents the number of Patents on green technologies which a company has in the year 2020 or 2021. However, this is not a simple number to explain. It is the Market Value of a firm which represented by the portion of green patents. Indeed, the calculation behind this variable is the following:

$$GT = \left(\frac{GT}{NP} \right) * R\&D \quad (5)$$

$R\&D$ corresponds to Research and Development variable of the firm
 NP is the total number of patents issued in 2020 and/or 2021

" $R\&D$ " is variable that has been evaluated thanks to the "Orbis" resource offered by the Polytechnic di Torino. It corresponds to the numerical value of "Immobili immateriali" found for each firm. This numerical value gives an idea of how much a company invest in Research and Development in a year.

The ratio GT/NP represents the percentage of a company of investments in patents which are near to green technologies. Multiplying the " $R\&D$ " variable times the ratio explained, it is possible to obtain the value which shows the total amount of green activities as part of the total Market Value, given the method described by the professor Colombelli.

- c) $NOGT$ represents the number of Patents not on green technologies which a company has in the year 2020 or 2021. However, this is not a simple number to explain. It is the Market Value of a firm which represented by the portion of green patents. Indeed, the calculation behind this variable is the following:

$$NOGT = \left(\frac{NOGT}{NP} \right) * R\&D \quad (6)$$

$R\&D$ corresponds to Research and Development variable of the firm
 NP is the total number of patents issued in 2020 and/or 2021

The ratio NOGT/NP represents the percentage of a company of investments in patents which are not near to green technologies. Multiplying the “R&D” variable times the ratio explained, it is possible to obtain the value which shows the total amount of activities as part of the total Market Value, given the method described by the professor Colombelli. This ratio corresponds to the number given by:

$$\frac{NOGT}{NP} = 1 - \left(\frac{GT}{NP}\right) \quad (7)$$

The book value of intangible assets is taken by firms’ balance sheets on the “Orbis” resource. It includes goodwill, patents, copyrights, trademarks, and other expenses such as organizational and capitalized advertising cost.

Afterwards, they introduce the environmental effect through two institutions which evaluate the patents of the firms: the World Intellectual Property Organization (WIPO) “IPC Green Inventory” and the OECD “EnvTech.” The one that has been mostly used is WIPO.

The World Intellectual Property Organization (WIPO) was created to promote and protect intellectual property (IP) across the world by cooperating with countries as well as international organizations. WIPO's activities include hosting forums to discuss and shape international IP rules and policies, providing global services that register and protect IP in different countries. The IPC codes and the OECD data were used to label patent applications as “environmental.”

The important passage which has been used in this thesis is the fact that patents assigned to Environmental impact have a précised code given by the WIPO entity.

The Figure which shows the IPC (Intellectual Property Classification) codes with its relative topic will be presented as external pdf file at the end of the thesis.

Now, since every patent issued by the company is assigned to a specific IPC code, it has been easy to see if the two codes were associated. The IPC code for each company has been taken by the Espacenet website. Espacenet is a free online service for searching patents and patent applications. The example of comparison between Amazon and Walmart will show this computation.

This part of the thesis has the aim of computing the Market Value of the firms to compare them using also the “Greenwashing” variable. In this part it has been developed the process of calculation described by professor Colombelli based on the following variables:

- Tangible assets
This variable is represented by the voice called “Immobilizzazioni materiali” on the resource “Orbis” offered by the Polytechnic di Torino
- R&D: intangible assets

This variable is represented by the voice called “Immobilizzazioni immateriali” on the resource “Orbis” offered by the Polytechnic di Torino

- Number of patents considered (in 2020 or 2021)
This variable is the sum of all the patents issued by the firm during the year 2020 or 2021. However, it required to notice that maximum number available was 250 due to software limitations.
- Patents on green technologies (GT)
As already explained, this the variable which consider all the patents regarding the green technologies’ patents issued by the firm
- Patents not on green technologies (NO_GT)
- As already explained, this the variable which consider all the patents not regarding the green technologies’ patents issued by the firm
- GT/NP
This variable represents the ratio between the green technologies’ patents and the total number of patents issued by the firm in 2020 or in 2021.
- (GT/NP) *R&D
This variable is the amount of the market value committed to the green activities.
- (NO_GT/NP) *R&D
This variable is the amount of the market value committed to the not green activities.
- MV
This is the variable which calculates the market value of the firm in the way as described by the professor Colombelli.

To explain in the best way the analytical part of the analysis, this thesis tried to compare Amazon and Walmart with all the variables cited above. Indeed, the following Figure shows the comparison in terms of values given by the “Orbis” resource.

	Fixed Tangible assets (mln \$)	R&D (mln \$)	NP (mln \$)	GT (mln \$)	NO_GT (mln \$)	(GT/NP) *R&D (mln \$)	(NO_GT/NP) *R&D (mln \$)	MV (mln \$)
Amazon	216,363	20,478	32	6	26	3,839625	16,638375	236,841
Walmart	112,624	29,014	36	3	33	2,417833333	26,59616667	141,638

Table 16. Values 16

The following graph shows the differences on the variables evaluated between the two firms.

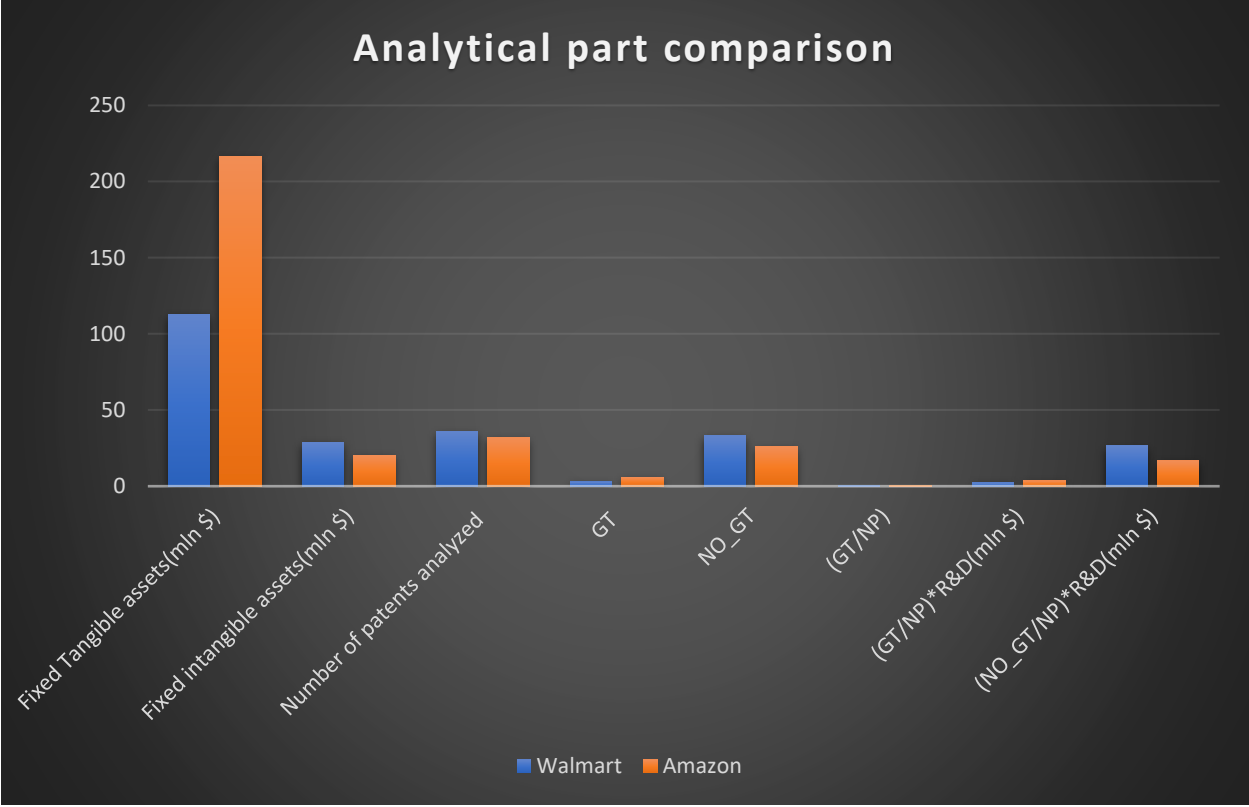


Figure 20. Analytical part comparison

The following graph compares Walmart and Amazon under the point of view of the relationships between the Market value and the Greenwashing variable.

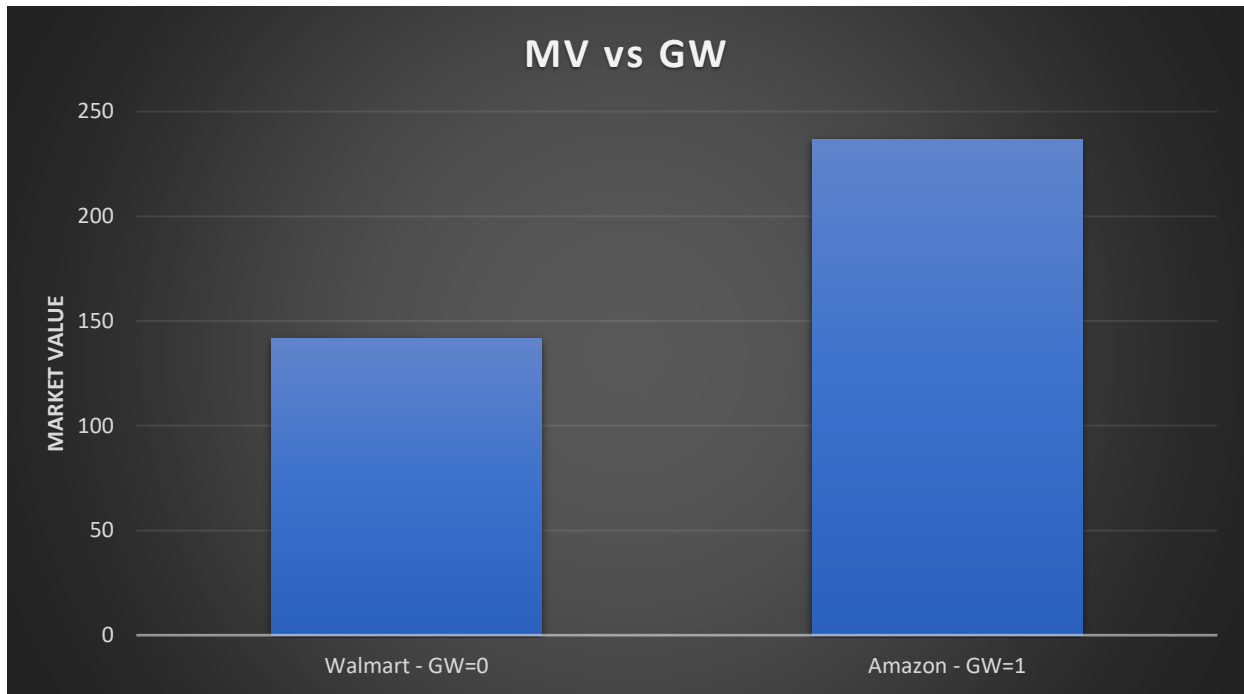


Figure 21. MW vs GW

4.2 Null Hypothesis analysis

This chapter focuses on finding the effect of the Greenwashing on the Market Value. Firms can set strategies based on eco-innovation and focus on Green Technologies can effectively create market value. However, firms can question themselves: Greenwashing creates value? Do we need to achieve green technologies objectives to get a competitive advantage? (Lyon, 2015).

Hence, the aim of this part of the thesis is to understand if the firms respect the Corporate responsibilities, they have settled by international rules to protect the environment.

As it is shown in the figure above, the thesis focuses on finding if the Market Value is higher when the corporate responsibilities are respected or, on the contrary, the Market Value is higher when the corporate responsibilities are not respected.

The data analysis using the software “Stata”. This helped to concentrate more on the null hypothesis of the thesis which is:

- H0: Greenwashing does not create more Market Value

Indeed, it is very important to understand that the software focused on an excel file which will be connected at the end of the thesis. In this final file, there have been reported all the data about each firm. The data reported are described by the variables cited above.

This section has been organized in describing the additional variables relevant for the analysis with respect to the ones cited in the chapter above, an excursus over the EPS variable, descriptive analysis, and the linear regression analysis

Again, the main reference in the analysis on Stata over the Market Value has been the scientific paper written by Colombelli (2021).

Before introducing the experiment with data, it is important to focus on some general concepts about “Linear regression models” since it will be used in this thesis. In econometrics, Ordinary Least Squares (OLS) method is used to estimate the parameters of a linear regression model. For the validity of OLS estimates, there are assumptions made while running linear regression models.

- The linear regression model is “linear in parameters.”
- There is a random sampling of observations.
- The conditional mean should be zero.
- There is no multi-collinearity (or perfect collinearity).
- There is homoscedasticity and no autocorrelation
- Error terms should be normally distributed.

These assumptions are extremely important because violation of any of these assumptions would make OLS estimates unreliable and incorrect. Specifically, a violation would result in incorrect signs of OLS estimates, or the variance of OLS estimates would be unreliable, leading to confidence intervals that are too wide or too narrow.

4.2.1 Additional variables

First, the thesis focuses on understanding in depth the variables used. Indeed, the variables considered as “critical” for the Market Value were analyzed through a common set of commands. This has been done to anticipate the linear regression analysis which will be used to understand better the influence of them on the Market Value.

The Scope of introducing many variables which may affect the Market Value, other than the Greenwashing (GW), is isolate or understand better how much the GW is able to make the Market Value varying. Some of the variables have been already described above the “Variables section”

The following variables:

EPS: environmental policy stringency. This indicator shows the level of the policies about green activities a country has. Indeed, in the final excel it is possible to see that the firms have different level of EPS. This depends on the Headquarter base. More it is higher, more the firm will be under control by the State of reference. This indicator (Colombelli, 2021) has been introduced because it might affect the Market Value.

The growth in environmental regulatory stringency both directly (EPS is positive and significant) and indirectly affects market evaluation of the firms through the effect of the policy on GTs (interaction GT/R&D*EPS is positive and significant). The OECD environmental policy stringency (EPS) indicator was used to control for the role of EPS across the considered Countries. This is a composite indicator that bridges market-based environmental policies (taxes, trading schemes, feed-in tariffs, and deposit refund measures) and nonmarket-based ones (Standards and R&D subsidies). It ranges from 0 to 6 and it reports the stringency of existing environmental policies, where the stringency values depend on the explicit or implicit price of the produced environmental damage, in the field of air and climate policies. Its appropriateness and quality have been confirmed by its high correlation with alternative policy indicators, such as the World Economic Forum’s Executive Opinion Survey on the perception of EPS or the CLIMI Climate Laws, Institutions, and Measures Index produced by EBRD. The indicator focuses on the upstream sectors, namely energy and transport. In contrast GT/R&D alone, not mediated by the policy, no longer influences market returns. This evidence strongly supports our arguments according to which (i) the market positively evaluates the capability of the firm to generate “greener” technologies; (ii) this effect is stronger in contexts characterized by growing regulatory stringency, and (iii) more importantly, the more regulatory stringency

increases the stronger the MV returns of GTs. Results, provide further support to the moderating role exerted by policy stringency on the impact of GTs on the market evaluation: the interaction between GT/R&D and EPS_above is indeed positive and significant whereas the interaction with EPS_below (the median value) is not significant. In other terms, it is only for firms located in contexts with growing stringent environmental policies that the market would positively value GTs developed by firms.

We provide a visual representation of the moderating effect of EPS on GTs returns on the MV of the firm in the figure below. We visualize the marginal effects of GT/R&D on the Tobin's q at three distinct levels in the regulatory stringency variable: the minimum, the median, and the maximum. Visually it emerges clearly that the higher the EPS growth, the stronger the market evaluation of GTs.

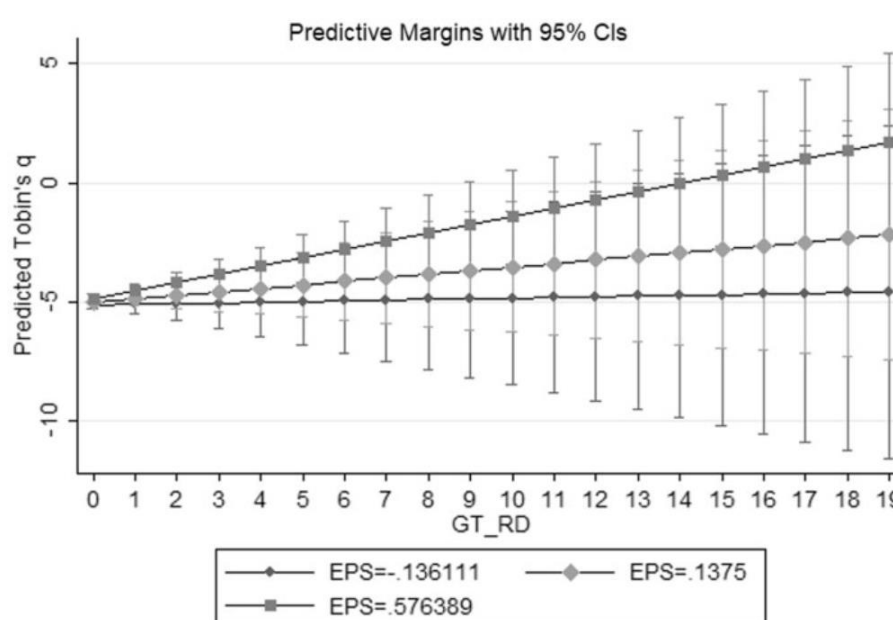


Figure 22. GT and EPS (MV paper)

Size: Revenues. This variable is needed to understand how much the revenues are important for the creation of the Market Value (Colombelli, 2021)

GW_EPS: this variable is explained as the multiplication of the Greenwashing and the EPS. This idea come from the paper of the professor Colombelli, who has multiplied the green technologies and the EPS to see if there were any connected affection of these two variables on the Market Value. Below it is represented a further details description on the EPS variables and its role.

Anyway, the variables "MV", "EPS_GTNP_RD", "EPS", "REV", "RD", "GTNP_RD", "GW_EPS have been transformed into "ln" to understand better the results of the regression analysis.

4.2.2 Statistical description

As explained in the introduction, prior to focus on the affection of the variables on the Market Value, the thesis must concentrate on understanding the behavior of the variables mentioned in the chapters above.

All of them have been analyzed through a set of commands, which will be also described in the “Do file” attached at the end:

- Describe
- Summarize
- Tabulate
- Table
- Tabstat

The variables for which all these commands have used are: GT, EPS, GTNP, GW, GTNP_RD, Revenues, GW_EPS

All the data about the descriptive analysis will be attached at the end of the thesis, it has been reported below just some important graphs about the descriptive analysis.

The first is the EPS pie chart:

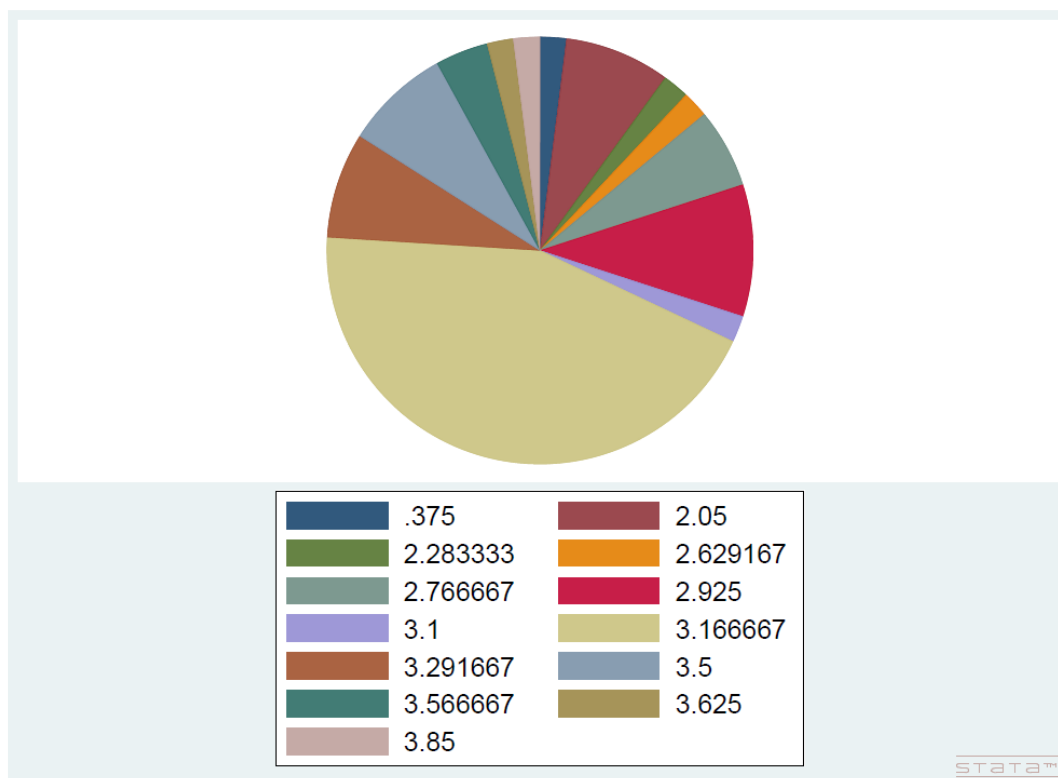


Figure 23. EPS pie chart

Each slice of the pie chart represents a different country because of the output analysis issued by OECD. The Organization for Economic Co-operation and Development issued on its website the environmental stringency policy for each country. On the same website it is possible to find the calculation done to find the final number per country. Once obtained the number it was easy to determine the Headquarter of each firm and to associate each one to the final EPS.

Another important graph is the one about Green technologies (Colombelli, 2021). Below on the x axis it is possible to see the different levels of the green technologies over the total number of patents emitted by the firm. On the y axis the graph shows the percentage number of firms which has a certain value of GT/NP.

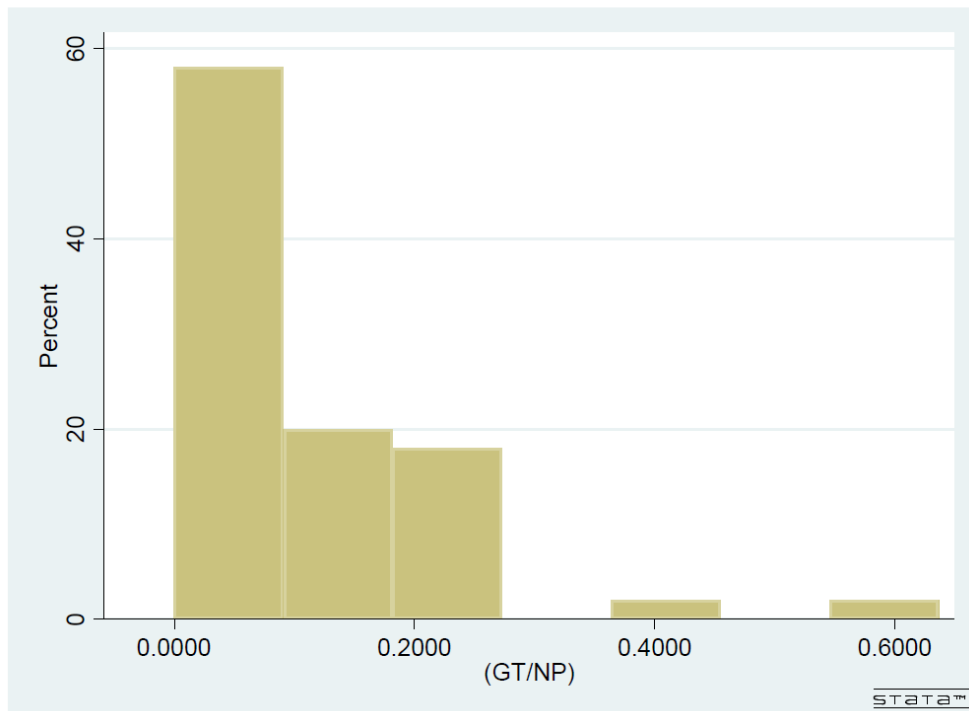


Figure 24. GT/NP percentage

As the results show, more than 50% of the firm has a low level of GT/NP, meaning that many firms invest not so much on green technologies over its total portfolio.

In the next graph it is possible to see the value of the R&D dedicated to the green technologies by the firms. The results show how more than 90% of the firms has value between 0 and 5000 mln dollar.

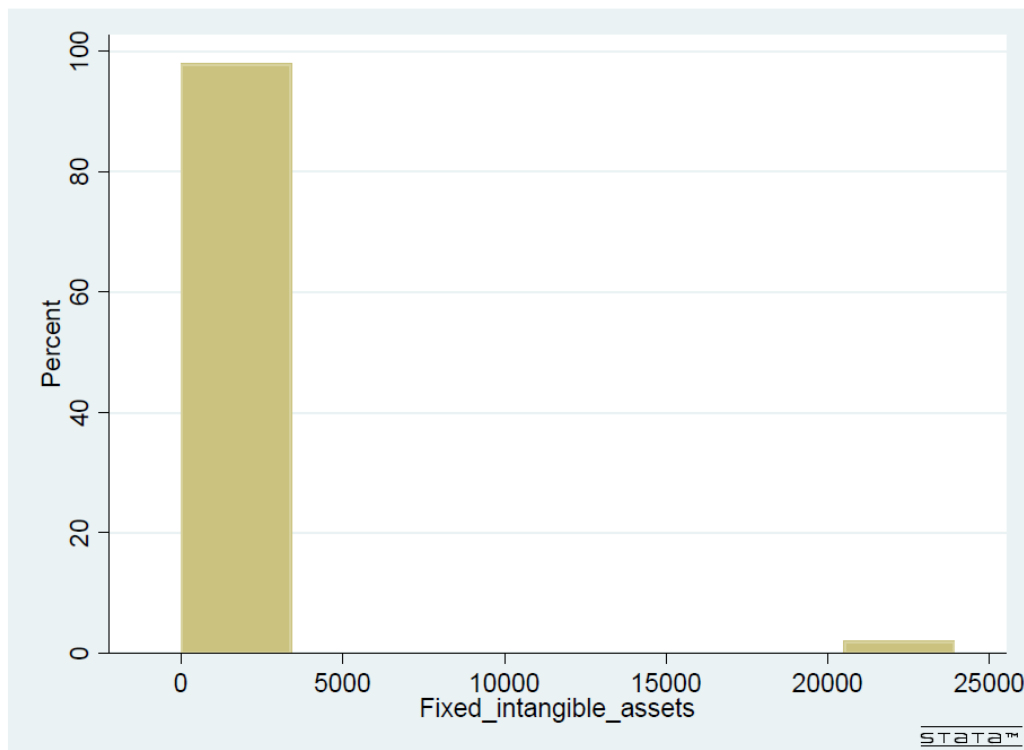


Figure 25. GT/NP_R&D

The next graph shows the distribution of the variable Greenwashing (GW) over the total firms. The pie chart is divided in the firms which has GW equal to zero or equal to one. It is possible to see that almost 75% of the firm analyzed has not been categorized with GW = 1 by the methodology explained in chapter above.

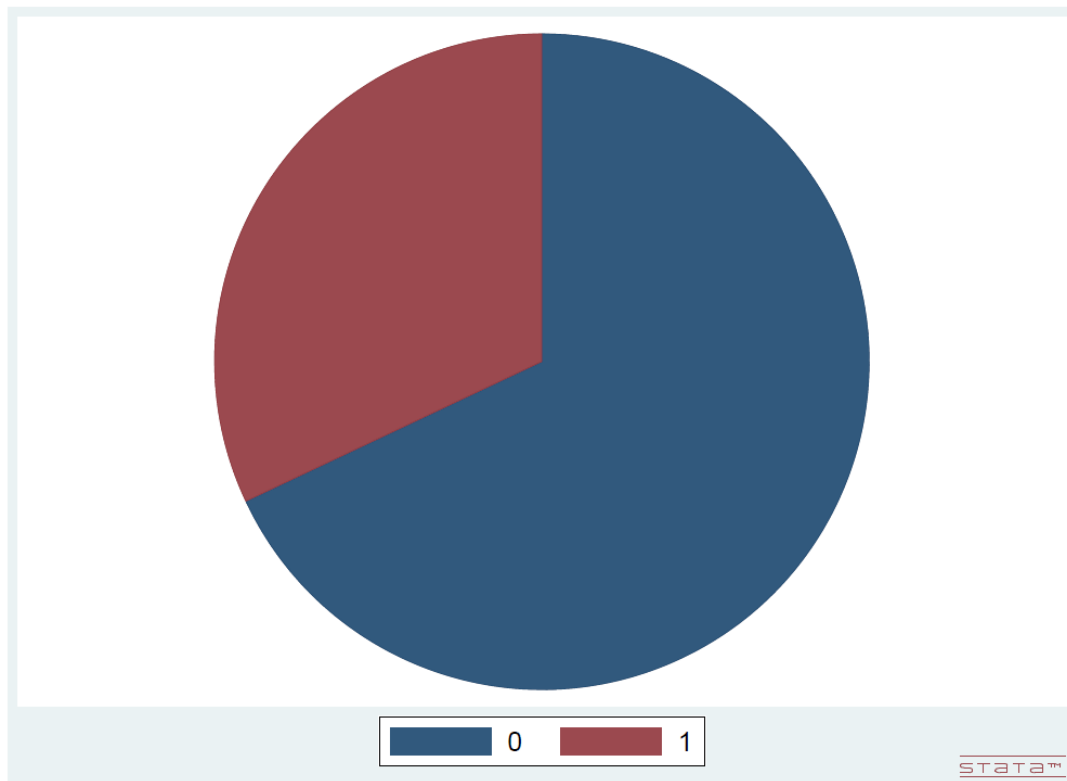


Figure 26. GW categories

5. Results

The last chapter of the thesis is focused on the effect of the Greenwashing (GW) on the Market Value (MV).

To find the results the analytical software “Stata” has been used. Both the linear regression and the multivariate regression has a primary role.

The variables used in this part of thesis have been described in the chapter 1.

Furthermore, the variables have transformed into the “ln” form. This allows to understand in a clear way the results derived from Stata. Indeed, in the following table it is easier to capture the effect of the regressors on the dependent variable.

5.1 Linear regression

In the following graph there are shown the first results given by the regression of the lnMV by GW and by lnEPS. As it possible to notice none of them has a significative influence on the lnMV. This means that it is not possible to neglect the null Hypothesis. In the end, in this model it is not possible to state that the effect of Greenwashing is of influence for the Market Value.

The same can be concluded for the lnEPS. Indeed, the lnEPS is not significative on the MV in this model.

. regress lnMV GW						
Source	SS	df	MS	Number of obs	=	50
Model	5.27013108	1	5.27013108	F(1, 48)	=	2.71
Residual	93.3209173	48	1.94418578	Prob > F	=	0.1062
				R-squared	=	0.0535
				Adj R-squared	=	0.0337
Total	98.5910484	49	2.01206221	Root MSE	=	1.3943
lnMV	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GW	.6959792	.4227216	1.65	0.106	- .1539595	1.545918
_cons	3.905636	.2391274	16.33	0.000	3.424838	4.386434

Figure 27. lnMV and GW

. regress lnMV lnEPS

Source	SS	df	MS	Number of obs	=	50
Model	.040995235	1	.040995235	F(1, 48)	=	0.02
Residual	98.5500532	48	2.05312611	Prob > F	=	0.8882
				R-squared	=	0.0004
				Adj R-squared	=	-0.0204
Total	98.5910484	49	2.01206221	Root MSE	=	1.4329

lnMV	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lnEPS	-.0876727	.6204484	-0.14	0.888	-1.335168	1.159822
_cons	4.222244	.6946919	6.08	0.000	2.825473	5.619016

Figure 28. lnMV and lnEPS

Below it is possible to see a box plot graph which shows how the GW affects the MV. The boxes have not separated one another, this confirms that we cannot neglect the null hypothesis.

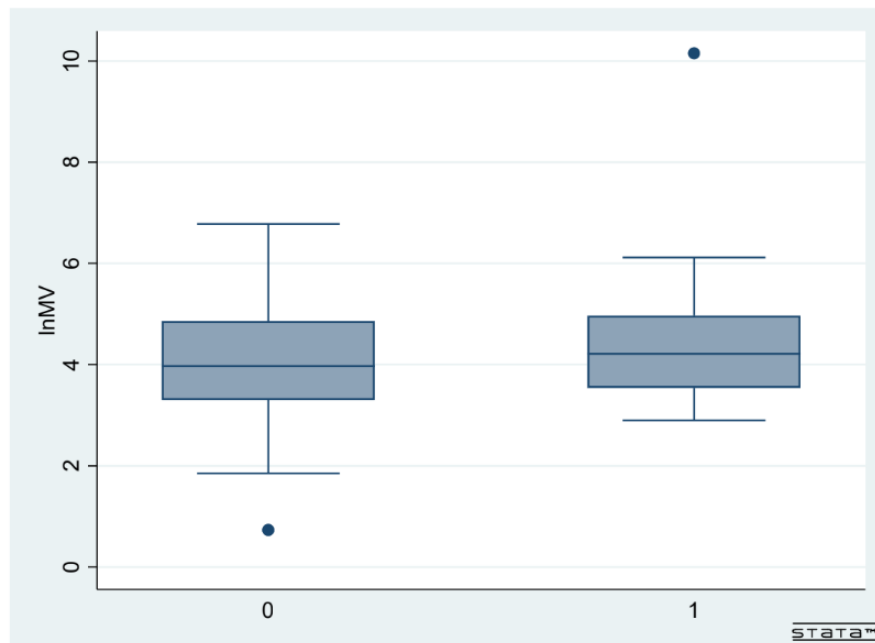


Figure 29. Box plot lnMV and GW

In the following graph there is shown the first results given by the regression of the $\ln MV$ by $\ln GW_EPS$, where the GW is the absolute value while EPS has the \ln of the value. The last variable is the interaction between $\ln EPS$ and GW .

. reg $\ln MV$ GW $\ln EPS$ $c.\ln EPS \# GW$						
Source	SS	df	MS	Number of obs	=	50
Model	5.41414636	3	1.80471545	F(3, 46)	=	0.89
Residual	93.1769021	46	2.02558483	Prob > F	=	0.4530
				R-squared	=	0.0549
				Adj R-squared	=	-0.0067
Total	98.5910484	49	2.01206221	Root MSE	=	1.4232
$\ln MV$	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GW	1.372848	3.689135	0.37	0.712	-6.052995	8.798692
$\ln EPS$.1762559	2.322375	0.08	0.940	-4.498442	4.850954
$GW \# c.\ln EPS$						
1	-.5004217	2.646078	-0.19	0.851	-5.8267	4.825856
_cons	3.658588	3.26429	1.12	0.268	-2.912087	10.22926

Figure 30. $\ln MV$ and GW_EPS

In the following graph there is shown the first results given by the regression of the lnMV by lnrev . As it is possible to notice the variable lnrev has a significative influence on the lnMV in this model.

. regress lnMV lnrev

Source	SS	df	MS	Number of obs	=	50
Model	11.7560645	1	11.7560645	F(1, 48)	=	6.50
Residual	86.8349839	48	1.80906216	Prob > F	=	0.0140
				R-squared	=	0.1192
				Adj R-squared	=	0.1009
Total	98.5910484	49	2.01206221	Root MSE	=	1.345

lnMV	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lnrev	.4741998	.1860189	2.55	0.014	.1001837	.848216
_cons	-1.137663	2.074488	-0.55	0.586	-5.308701	3.033376

Figure 31. lnMV and lnrev

In the following graph there is shown the result given by the regression of the lnMV by lnRD . As it possible to notice the variable lnRD is significative on the lnMV in this model. This means that the delta of lnRD of 1% makes varying the lnMV of 0,6341777 %.

. regress lnMV lnRD

Source	SS	df	MS	Number of obs	=	49
Model	53.4050827	1	53.4050827	F(1, 47)	=	55.61
Residual	45.1339249	47	.960296275	Prob > F	=	0.0000
				R-squared	=	0.5420
				Adj R-squared	=	0.5322
Total	98.5390076	48	2.05289599	Root MSE	=	.97995

lnMV	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lnRD	.6341777	.0850398	7.46	0.000	.4630997	.8052558
_cons	2.179329	.2970299	7.34	0.000	1.581782	2.776876

Figure 32. lnMV and ln RD

In the following graph there is shown the result given by the regression of the lnMV by lnGTNP_RD . As it possible to notice the variable lnGTNP_RD is significative for the lnMV in this model. This means that the delta of lnGTNP_RD of 1% makes varying the lnMV of 0,5927251%.

. regress lnMV lnGTNP_RD						
Source	SS	df	MS	Number of obs	=	34
Model	39.4581013	1	39.4581013	F(1, 32)	=	32.76
Residual	38.540679	32	1.20439622	Prob > F	=	0.0000
				R-squared	=	0.5059
				Adj R-squared	=	0.4904
Total	77.9987803	33	2.3635994	Root MSE	=	1.0974
lnMV	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lnGTNP_RD	.5927251	.1035547	5.72	0.000	.381791	.8036592
_cons	3.704377	.2076548	17.84	0.000	3.281398	4.127356

Figure 33. lnMV and lnGTNP_RD

In the following graph there is shown the result given by the regression of the lnMV by GW, lnEPS, lnGTNP_RD and the interaction between lnGTNP_RD and lnEPS. As it possible to notice the variable lnEPS_GTNP_RD is significative for the lnMV in this model. This means that the delta of lnEPS_GTNP_RD of 1% makes varying the lnMV of 0,5795775%.

. reg lnMV GW lnEPS lnGTNP_RD c.lnEPS#c.lnGTNP_RD lnrev i.Sector						
Source	SS	df	MS	Number of obs	=	50
Model	54.8728949	8	6.85911187	F(8, 41)	=	6.43
Residual	43.7181535	41	1.06629643	Prob > F	=	0.0000
				R-squared	=	0.5566
				Adj R-squared	=	0.4700
Total	98.5910484	49	2.01206221	Root MSE	=	1.0326

lnMV	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GW	.3432584	.3376577	1.02	0.315	-.3386552	1.025172
lnEPS	.6626088	.9568349	0.69	0.493	-1.269758	2.594976
lnGTNP_RD	2.375024	.9128005	2.60	0.013	.5315865	4.218462
c.lnEPS#c.lnGTNP_RD	-1.511965	.7324461	-2.06	0.045	-2.99117	-.0327598
lnrev	.3939365	.1625979	2.42	0.020	.0655634	.7223095
Sector						
2	.2770699	.4440492	0.62	0.536	-.6197057	1.173846
3	-.7016869	.3674932	-1.91	0.063	-1.443855	.0404807
4	-.0517183	.5117	-0.10	0.920	-1.085117	.9816807
_cons	-1.45526	2.334071	-0.62	0.536	-6.169011	3.258492

Figure 34. lnMV and GW, lnEPS, lnGTNP_RD

5.2 Multivariate regression

In the following graph there is shown the result given by the regression of the lnMV by GW, lnEPS and lnrev. As it is possible to notice the variable GW has not a significative influence on the lnMV in this model. This means that we cannot neglect the null hypothesis and so it is possible to state that the Greenwashing does not significantly affect the Market value in this model.

. regress lnMV GW lnEPS lnrev

Source	SS	df	MS	Number of obs	=	50
Model	14.8499996	3	4.94999988	F(3, 46)	=	2.72
Residual	83.7410488	46	1.82045758	Prob > F	=	0.0553
				R-squared	=	0.1506
				Adj R-squared	=	0.0952
Total	98.5910484	49	2.01206221	Root MSE	=	1.3492

lnMV	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GW	.5465629	.4240055	1.29	0.204	-.3069159	1.400042
lnEPS	.0467617	.5974459	0.08	0.938	-1.155834	1.249358
lnrev	.432939	.1894418	2.29	0.027	.0516125	.8142656
_cons	-.9044399	2.164832	-0.42	0.678	-5.262021	3.453141

Figure 35. lnMV and GW, GW_EPS, lnrev

In the following graph there is shown the result given by the regression of the lnMV by GW, lnEPS, lnGTNP_RD. As it possible to notice the variable GW has not a significative influence on the lnMV in this model. This means that we cannot neglect the null hypothesis and so it is possible to state that the Greenwashing does not significantly affect the Market value in this model. Anyway, we can notice that , lnGTNP_RD has a significance influence for the lnMV.

. regress lnMV GW lnEPS lnGTNP_RD

Source	SS	df	MS	Number of obs	=	34
Model	40.0942119	3	13.3647373	F(3, 30)	=	10.58
Residual	37.9045684	30	1.26348561	Prob > F	=	0.0001
				R-squared	=	0.5140
				Adj R-squared	=	0.4654
Total	77.9987803	33	2.3635994	Root MSE	=	1.124

lnMV	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GW	.2960389	.4191622	0.71	0.485	-.5600044	1.152082
lnEPS	.1137542	.5168963	0.22	0.827	-.9418888	1.169397
lnGTNP_RD	.5795775	.1076772	5.38	0.000	.3596712	.7994838
_cons	3.491283	.6241098	5.59	0.000	2.216681	4.765885

Figure 36.lnMV GW lnEPS lnGTNP_RD

In the following graph there is shown the result given by the regression of the lnMV by GW, lnEPS, lnGTNP_RD, lnrev and the interaction between lnEPS and GW. As it possible to notice the variable GW has not a significative influence on the lnMV in this model. This means that we cannot neglect the null hypothesis and so it is possible to state that the Greenwashing does not significantly affect the Market value in this model. Anyway, we can notice that EPS_lnGTNP_RD has a significance influence for the lnMV.

. reg lnMV GW lnEPS lnGTNP_RD c.lnEPS#c.GW lnrev i.Sector						
Source	SS	df	MS	Number of obs	=	50
Model	50.3703362	8	6.29629202	F(8, 41)	=	5.35
Residual	48.2207122	41	1.17611493	Prob > F	=	0.0001
				R-squared	=	0.5109
				Adj R-squared	=	0.4155
Total	98.5910484	49	2.01206221	Root MSE	=	1.0845
lnMV	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GW	-.1160036	2.843797	-0.04	0.968	-5.859168	5.62716
lnEPS	-.6271452	1.806356	-0.35	0.730	-4.275156	3.020865
lnGTNP_RD	.5055949	.1230996	4.11	0.000	.2569902	.7541997
c.lnEPS#c.GW	.3821446	2.04314	0.19	0.853	-3.74406	4.508349
lnrev	.2910141	.1625578	1.79	0.081	-.037278	.6193062
Sector						
2	.4153598	.465463	0.89	0.377	-.5246617	1.355381
3	-.7470952	.3853348	-1.94	0.059	-1.525295	.0311041
4	.034234	.5379285	0.06	0.950	-1.052135	1.120603
_cons	1.261262	2.996151	0.42	0.676	-4.789589	7.312112

Figure 37. lnMV GW lnEPS lnGTNP_RD lnrev

In the following graph there is shown the result given by the regression of the lnMV by GW, lnGTNP_RD, lnrev. As it is possible to notice the variable GW has not a significative influence on the lnMV. This means that we cannot neglect the null hypothesis and so it is not possible to state that the Greenwashing significantly affects the Market value in this model. In this model it has been added the Sector variable.

. reg lnMV GW lnGTNP_RD lnrev i.Sector						
Source	SS	df	MS	Number of obs	=	50
Model	50.1584677	6	8.35974462	F(6, 43)	=	7.42
Residual	48.4325807	43	1.12633909	Prob > F	=	0.0000
				R-squared	=	0.5088
				Adj R-squared	=	0.4402
Total	98.5910484	49	2.01206221	Root MSE	=	1.0613
lnMV	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GW	.4346057	.3403414	1.28	0.208	-.2517581	1.120969
lnGTNP_RD	.5105788	.1199104	4.26	0.000	.2687565	.752401
lnrev	.2859887	.1585484	1.80	0.078	-.0337546	.605732
Sector						
2	.4103962	.4516947	0.91	0.369	-.500533	1.321325
3	-.7192479	.3707188	-1.94	0.059	-1.466874	.0283779
4	.0235524	.5244699	0.04	0.964	-1.034142	1.081247
_cons	.4290641	1.768938	0.24	0.810	-3.138339	3.996468

Figure 38. lnMV GW lnGTNP_RD ii.sector

5.3 Conclusion

This paper analyzed the relationship between Greenwashing the MV of firms. The central topic is that the strategic intent of the firms based on Greenwashing does not influence the market evaluation of the firm.

Similarly, to the papers which were used as pillar for this thesis (Colombelli, 2021), the core research questions about the effects of green inventions and stringent regulatory frameworks on the stock mixed with the Greenwashing activities does not create more market evaluation of firms.

To investigate the relationship between the generation of environmental patents and firms' MV, we have estimated MV equations that covered the period from 2019 to 2021.

The finding has the honor to be one of the only studies about connecting the variables cited above. Although many studies have described the Greenwashing as a term, the difficulties stand in connecting it to firms and MV.

The second research is that in model where Greenwashing is considered together with the environmental policies has not affected the Market Value.

Moreover, we accounted for the quality of the knowledge stock by considering the number of citations (forward citations) to standard and to GTs, and about the GW.

Lastly, a deeper investigation of annual report of companies and further analysis can lead to find more and more data about the firms. Increasing the data and the number of the firms analyzed could be useful to individuate more established results.

6. Bibliography

Paper or article published

1. *Corporate Climate Responsibility Monitor 2022* - Thomas Day, Silke Mooldijk, Sybrig Smit, Eduardo Posada, Frederic Hans, Harry Fearnough, Aki Kachi, Carsten Warnecke, Takeshi Kuramochi, Niklas Höhne
2. *Green technologies and firms' market value: a micro-econometric analysis of European firms* - Alessandra Colombelli, Claudia Ghisetti, and Francesco Quatraro - 2021
3. *Firms and Social Responsibility: A Review of ESG and CSR Research in Corporate Finance* - Stuart L. Gillan, Andrew Koch, Laura T. Starks
4. *ESG and financial performance: aggregated evidence from more than 2000 empirical studies* - Gunnar Friede, Timo Busch & Alexander Bassen
5. *Morningstar ESG Commitment Level Methodology* – Morning Star
6. *Greenwashing in the New Millennium* - Nancy E. Furlow, Marymount University
7. *Greenwashing and Environmental Communication: Effects on Stakeholders' Perceptions* - Riccardo Torelli, Federica Balluchi, Arianna Lazzini
8. *The Means and End of Greenwash* - Thomas P. Lyon and A. Wren Montgomery
9. *How stringent are environmental policies?* – OECD
10. *How corporate social responsibility can be integrated into corporate sustainability: a theoretical review of their relationships* - The International Journal of Sustainable Development and World Ecology (2018)
11. *Corporate net zero pledges: the bad and Ugly* – Columbia university center - Jack Arnold and Perrine Toledano – 2021
12. *The Drivers of Greenwashing* – Delmas, Burbano – 2015
13. *Greenwashing in new millennium* - Nancy Furlow - 2009

Website

14. <https://www.oecd.org/economy/greeneco/how-stringent-are-environmental-policies.htm> - OECD

Companies Annual Report/Sustainability Report/websites

15. Walmart - <https://corporate.walmart.com/purpose/sustainability>
16. Amazon - <https://sustainability.aboutamazon.com/pdfBuilderDownload?name=amazon-sustainability-2020-report>
17. Carrefour - <https://www.carrefour.com/sites/default/files/2021-06/Carrefour%20-%20Sustainability-Linked%20Bond%20Framework%20%281%29.pdf>
18. IKEA - <https://gbl-sc9u2-prd-cdn.azureedge.net/-/media/aboutikea/newsroom/publications/documents/ikea-sustainability-report-fy21.pdf?rev=6d09c40ec452441091b10d9212718192>
19. UPS - <https://about.ups.com/sg/en/social-impact/diversity-equity-and-inclusion/2020-ups-corporate-sustainability-report.html>
20. FedEx - https://www.fedex.com/content/dam/fedex/us-united-states/sustainability/gcrs/FedEx_2021_ESG_Report.pdf
21. Deutsche Post DHL - <https://www.dpdhl.com/content/dam/dpdhl/en/media-center/investors/documents/presentations/2021/DPDHL-ESG-Presentation-2021.pdf>
22. C.H. Robinson - https://www.chrobinson.com/en-us/-/media/chrobinson/documents/ch_robinson_2020_sustainability_report.pdf
23. BMW-Group - https://corporate.walmart.com/media-library/document/2020-environmental-social-and-governance-report/_proxyDocument?id=0000017a-85af-d7dc-ad7a-bfaf6cd70000
24. Volkswagen - <https://www.volkswagenag.com/en/sustainability/reporting-and-esg-performance/sustainability-report.html>
25. Stellantis - https://www.stellantis.com/content/dam/stellantis-corporate/sustainability/csr-disclosure/stellantis/2021/Stellantis_2021_CSR_Report.pdf
26. General Motors - https://www.gmsustainability.com/_pdf/resources-and-downloads/GM_2021_SR_Supplement.pdf
27. Vodafone - https://www.vodafone.com/content/dam/vodcom/sustainability/pdfs/2010-11_vodafone_sustainability_report.pdf
28. Deutsche Telekom - <https://www.telekom.com/en/corporate-responsibility/social-commitment/cr-report>
29. TIM - <https://www.gruppotim.it/content/dam/gt/sostenibilit%C3%A0/doc-bilanci/Bilancio-di-Sostenibilita-2021.pdf>

30. AT&T - <https://about.att.com/ecms/dam/csr/2019/library/corporate-responsibility/2019-2020-Summary.pdf>
31. Nestlé - <https://www.nestle.com/sites/default/files/2022-03/creating-shared-value-sustainability-report-2021-en.pdf>
32. Unilever - https://www.responsibilityreports.com/HostedData/ResponsibilityReports/PDF/LSE_ULVR_2017.pdfhttps://www.responsibilityreports.com/HostedData/ResponsibilityReports/PDF/LSE_ULVR_2017.pdf
33. Enel - https://globalresponsibility.generalmills.com/2020/images/General_Mills-Global_Responsibility_2020.pdf
34. Procter and Gamble - https://downloads.ctfassets.net/oggad6svuzkv/6c8spc91y3m5xLRvGfU4Al/630a468e13377bf4892ad72d8a59e315/PG_CTAP.pdf
35. Apple - <https://investor.apple.com/esg/default.aspx>
36. Sony - https://www.sony.com/en/SonyInfo/csr_report/https://www.sony.com/en/SonyInfo/csr/library/reports/SustainabilityReport2021_E.pdf
37. Samsung - <https://www.climateaction.org/news/samsung-unveils-2025-sustainability-commitments-for-tangible-climate-action>
38. Dell - <file:///C:/Users/gbaruffaldi/Downloads/dell-fy19-csr-report.pdf>
39. Enel - <https://www.eni.com/assets/documents/ita/sostenibilita/2020/Eni-for-2020-Performance-di-sostenibilita.pdf>
40. Maersk - <file:///C:/Users/gbaruffaldi/Downloads/APMM%20Sustainability%20Report%202020%20A3.pdf>
41. E. ON - <https://renewablesnow.com/news/eon-issues-eur-15bn-of-green-bonds-778265/>
42. Eni - <https://www.eni.com/it-IT/low-carbon/come-ridurre-emissioni-co2.html>
43. Chevron - <https://www.chevron.com/-/media/shared-media/documents/chevron-sustainability-report-2020.pdf>
44. CVS Health - https://www.google.com/search?q=no+health+reduction+emissions&rlz=1C1GCEA_pfT994IT994&sxsrf=APq-WBvdBGjKhzeyuiQqA9wl-dr-9hx3TA:1650306717741&source=Inms&tbm=isch&sa=X&ved=2ahUKEwjEpLnN573AhXI_rslHQ5CsoQ_AUoA3oECAEQBQ&biw=1280&bih=609&dpr=1.5#imgsrc=uApK_7seL4ZnbM
45. Novartis - <https://www.environmental-finance.com/content/news/novartis-issues-first-sustainability-linked-bond-with-social-targets.html>
46. GlaxoSmithKline - <https://www.gsk.com/en-gb/responsibility/environmental-sustainability/>

47. Pfizer - https://www.pfizer.com/sites/default/files/investors/financial_reports/annual_reports/2021/files/Pfizer_ESG_Report.pdf
48. Johnson & Johnson - <https://www.jnj.com/environmental-sustainability/climate-and-energy-action>
49. Saint Gobain - <https://www.saint-gobain.com/en/future-sustainability>
50. Cemex - <https://www.cemex.com/-/2020-sustainability-reports>
51. Johnson and Control - <https://www.johnsoncontrols.com/2021sustainability>
52. Hitachi - https://www.hitachi.com/sustainability/download/pdf/en_sustainability2021.pdf
53. Toshiba - <https://www.global.toshiba/ww/sustainability/corporate/report.html>
54. Fujitsu - <https://www.fujitsu.com/global/documents/about/resources/reports/sustainabilityreport/2021-report/fujitsudatabook2021e.pdf>
55. Xerox - https://www.xerox.com/downloads/usa/en/x/Xerox_CSR_Report.pdf
56. HP - <https://h20195.www2.hp.com/v2/GetDocument.aspx?docname=c07539064>
57. Accenture - <https://www.accenture.com/us-en/about/responsible-business/environment>
58. JBS - <https://jbs.com.br/wp-content/uploads/2021/12/-sustainability-in-report-jbs-2020.pdf>
59. Tyson Food - https://www.tysonsustainability.com/downloads/Tyson_2020_Sustainability_Report.pdf
60. Smithfield - <https://www.smithfieldfoods.com/getmedia/1fc9b578-4dff-4104-9706-ba0fbbc44f47/2020-Sustainability-Impact-Report.pdf>
61. https://downloads.ctfassets.net/oggad6svuzkv/6c8spc91y3m5xLRvGfU4Al/630a468e13377bf4892ad72d8a59e315/PG_CTAP.pdf
62. Microsoft - <https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RE4RwfV>
63. Adobe - https://www.adobe.com/content/dam/cc/en/corporate-responsibility/pdfs/Adobe_CDP_Climate_Change_Questionnaire_2021.pdf