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Does Good ESG Guarantee Better Financial Performance? Sustainable Finance Evolution, Challenges and Investment Perspectives – a Quantitative Analysis of the Electric Mobility Sector

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Index

Introduction

"In too many cases, the financial sector has strayed from its original, noble purpose. And too often, it has worked hard to serve itself rather than serve people and the economy at large." (Christine Lagarde, ECB's President - 2019)

This sentence, pronounced by Christine Lagarde in 2019 during a speech in London, reflects the poor image recently often associated to the financial sector, detached from any value. Indeed, finance is perceived as a sector that only focuses on performance and return. Only a couple of years ago it was therefore difficult to imagine that banks, asset managers and financial institutions would all aim to include Environmental, Social and Governance (ESG) criteria in their investment strategies.

Environmental, Social and Governance (ESG) is a broad concept that has attracted an increased attention during the last years, with an unprecedent growth in 2020, a particular year that has shaped industries worldwide and that has allowed people and companies to take a moment to reflect about some important themes, such as the environment and climate issues. The financial sector has undergone a profound change in structural terms, with investments directed towards sustainable assets to improve the negative reputation that has been attributed to this sector for years. The electric mobility sector, as a prime example, has gone under a strong evolution that has brought the sector itself to a completely new level, attracting the attention of international investors. Habits of people around the world have changed in the last years and 2020 has probably had a role in accelerating all those changing processes that have been in a "working process" status for years. Shifting to renewable resources and clean energy has become the central point of most of the regulations around the world, with ambitious government objectives concerning the sustainability issue.

It is especially on the investment side that the question of sustainability has gained notoriety, with investors perceiving socially responsible investments as a way to better manage risk, to make a positive impact on the society and to attain more sustainable long-term returns. In fact, the financial crises that have crossed the past decades and company controversies have shown how harmful it can be to focus on the short term, highlighting at the same time the importance of screening companies based on their governance and environmental and social practices. A strong push towards sustainable investments comes from the regulators, such as in the European Union, where it has recently emerged a strong interest towards the

development of the integration of ESG issues into the investment decision-making process and companies' practices, alongside with market and financial risks.

Climate and environment have always been crucial themes for the human evolution, but they were left out of global discussions until some years ago. Eventually, we have realized that the world we are living in needs an increased attention in order to preserve it for the next generations.

CEOs from every angle of the planet have started reviewing company values to adapt them to the new challenges that the world is facing. Being a socially responsible company has become a basic requirement when operating globally, and everybody can play a role in making the world a better place.

The attention around the broad topic of "*sustainability*" is growing at an exponential pace. The durable negligence of resources is being perceived by the society as a threat to the economic, cultural and social world. This awareness is spreading like never before and there are some who are more than others interested in this shift in people's preferences: preoccupations and curiosity around the ESG concept have captured the attention of an increasing number of fund managers and high-profile investors, who are trying to make the best out of it. Some traditional companies are finding out that their business models have not been able to keep up with the times, delivering lower returns than more dynamic and socially involved companies, who have been able to design their models in a way that makes the company both competitive and attractive for capitals, receiving positive grades on the ESG side. These ESG ratings are becoming key assets for companies, with numerous studies pointing towards the fact that good ESG generates superior performance.

In this paper, we will go through simultaneous analyses of sectors related to the sustainability issue and the ESG ratings, trying to find interactions between profitability and sustainability, and showing how these elements influence each other. I will analyze if and how integrating ESG issues can help a company lower the cost of capital, reach higher profits, reduce risks and how a company can use this status to gain consensus and make a positive impact. The starting point of the analysis will be the electric mobility sector, being the one more often associated to the ESG topic. The analysis will move towards related sectors, automotive, energy, materials and utilities, indagating how ESG ratings are assigned and how they affect company's performance.

The central research question of the paper is “Does good ESG guarantee better financial performance?”. Together with this central one, other related questions will be addressed in the paper to enlarge the focus of the research.

In the first chapter, the sustainable finance topic has been described and analysed. Sustainable investments are becoming more and more appealing, and they have gained enough notoriety to be the game changer of this era. The first chapter recalls the Environmental, Social and Governance (ESG) phenomenon: characteristics, sustainable principles and standards, regulations and issues have been deeply explored at this stage. Furthermore, different investment strategies, such as the Sustainable and Responsible Investment (SRI) and the impact investing are addressed, with a focus also on the ESG metrics that help define which companies are compliant and in which measure. In order to give a better taste of which metrics are usually used in evaluating the ESG issues management level, different examples have been proposed, with a focus on a specific rating methodology that will be also included as part of the analysis in the last chapter.

The second chapter builds on the concepts of sustainability and investment opportunities to present the characteristics and the advantages of the integration of ESG issues in a portfolio, providing concrete examples from the financial world based on benchmark analysis and data coming from affirmed asset managers. Furthermore, the chapter enlarges the spectrum of the analysis illustrating the differences and the impacts of the integration of ESG investments in equity and fixed income portfolios. Remaining in the fixed income environment, the green bonds topic is widely discussed, with key figures and elements that help understand the importance of a phenomenon that has gained a renewed attention in the sustainable finance world.

The chapter has also drawn the attention on the advantages and drawbacks that can arise from different screening processes when it comes to pick the right companies to build a sustainable portfolio. It is not always the financial return that motivates investors to choose a company over another, because the ethical component plays its part: this element has been taken into consideration while explaining the investment decision-making process that brings to certain choices.

Finally, to give a wide and complete view of the phenomenon, the chapter tries to go through all the possible risks that it is possible to encounter when dealing with ESG investments: data reliability, incomplete standardization process, inhomogeneous data and greenwashing practices are all under the spotlight.

The third chapter aims to look at sustainability from another angle, in particular the electric vehicle sector, a sector that is often referred to as the pioneer of sustainability, and that has become a vast trend especially in the last years. The sector has accounted for a discrete part of revenues of the overall automotive sector in recent times and it is expected to grow a lot in next years, in terms of sales, investments and technological growth. The chapter begins with an outlook of the market, presenting characteristics, evolution and trends. Furthermore, the regional differences are addressed, with a focus on the local market features and the different regulations adopted worldwide. A lot of differences arise between Europe, United States and China, with markets being slightly different between each other, and national laws and governments' supports making the difference in the adoption of electric vehicles. Another element that has an important role in shaping the characteristics of this sector is the supply chain, that has been studied for its peculiarities, contradictions and the environmental impact. The chapter also covers the investment opportunities in the electric mobility sector, trying to give an answer to the question "Is Electric Mobility a good and sustainable investment opportunity?", whose answer has been carefully and thoughtfully addressed.

The fourth and last chapter is an applied one, with data analysis carried mainly through a regression analysis methodology that aims to demonstrate if there exists a bond between ESG ratings and the financial performance of companies, also assessing the strength of this bond. This part of the paper covers the numerical part of what represented in the previous chapters, trying to reply to a number of questions that arise when talking about sustainability and that allow to enlarge the focus of the research question. In order to carry the analysis, companies have been picked from sectors who have a direct or indirect relationship with the ESG topic and the electric mobility sector. Furthermore, a predictive analysis has been conducted to try to assess the possible future evolution of ESG ratings.
Results coming from the different analyses are interesting, allowing to widen the discussion about the relations between ESG issues and financial performance, leaving room to further broaden the discussion and extend the analysis.

Literature Review

"Does it pay to be green?" A question that institutions, researchers and managers around the world have been trying to answer for a long time, not always coming up the same result. Several academic papers have also aimed to provide explanations and analysis on the reaction of stakeholders to environmental and social related issues.

The 1996 study conducted by Hart and Ahuja[1] is focused on the relation between emissions reduction and company performance, providing an analysis of the main factors who play a determining role trying to answer the previously mentioned question. In 1975 a new program to control emission has been introduced by 3M Company, the "Pollution Prevention Pays" (3P), who has been a model that adopted worldwide has been able in 20 years to reduce the waste and pollution of a significant amount. The importance of this project is related especially to the fact that companies and countries around the world have seen for the first time the beneficial effect of reduced emissions and the strict relationship between business and environment.[1] The prevention of the emissions has been the key to success of this project. The McKinsey book "Valuation: Measuring and Managing the Value of Companies"[2] also refers to this important example, mentioning the ability of the company in recognizing an opportunity that has allowed 3M to save costs for around 2,2 billion of dollars.

Studies on ESG gravitate also around other aspects, such as its integration through different investment styles. L.Kaiser[3], in its 2018 article "ESG Integration: Value, Growth and Momentum" provides results about the impact of ESG integration on corporate financial performance, also considering the active investment style. The study analyzes if different styles make a real difference in terms of risks and results, also showing the increased attention for sustainability integration that the corporate and the investment management industry is paying nowadays. The findings of the study demonstrate a consistent reduction

1 Hart, S. L. and G. Ahuja (1996). Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance. Business Strategy and the Environment 5 (1), 30–37.

2 Koller, Tim, Marc H. Goedhart, David Wessels, and Thomas E. Copeland. 2020. Valuation: measuring and managing the value of companies. Hoboken, N.J.: John Wiley & Sons.

3 Kaiser, L. (2018). ESG integration: value, growth and momentum. Journal Of Asset Management, 21(1), 32-51. doi: 10.1057/s41260-019-00148-y

of the risk in the portfolio when ESG criteria are taken into account, supporting the theory that ESG integration serves also as a risk mitigator element.

Other interesting findings are related to the impact of ESG news on firms' market value: a 2017 study conducted by Capelle-Blancard and Petit[4] shows how, on average, the market value of firms who are facing negative events decreases of around 0,1%. To conduct the study, 33.000 ESG news have been analysed, covering 100 listed companies over the period 2002-2010. Recent history provides examples of how bad corporate social responsibility, together with negative events and consequent harsh media comments, can harmfully affect the image and value of the company. This leaves room for action by the managers, who have gained knowledge over time about the effects of controversies on the stock price and who are now called to assess and disclose the environmental and social impacts their companies can have.

During the years, numerous studies have entirely focused on how negative social and governance practices can impact companies' market value. These include Karpoff et. Al. (2005)[5], on environmental violations, Capele-Blancard and Laguna (2010)[6], on industrial accidents that have caused economic damages, and Chaney and Philipich (2002)[7], on corporate fraud. However, these studies have mainly focused on been extreme events, not taking into consideration less dramatic and ordinary events. Flammer (2013)[8] has conducted this kind of analysis, with a sample of 273 events (some eco-friendly and some eco-harmful) extracted from the Wall Street Journal over the period 1980-2009. The study finds that announcements of eco-harmful corporate behavior normally led to negative returns (around -0,65%) and that eco-friendly corporate initiatives generate, instead, a positive return (+0,84%). This study confirms that more ordinary events can affect company's performance

4 Capelle-Blancard, G., & Petit, A. (2017). Every Little Helps? ESG News and Stock Market Reaction. Journal Of Business Ethics, 157(2), 543-565. doi: 10.1007/s10551-017-3667-3

[5] Karpoff, J., Lott, Jr., J., & Wehrly, E. (2005). The Reputational Penalties for Environmental Violations: Empirical Evidence. The Journal Of Law And Economics, 48(2), 653-675. doi: 10.1086/430806

[6] Capelle-Blancard, G., & Laguna, M. (2010). How does the stock market respond to chemical disasters?. Journal Of Environmental Economics And Management, 59(2), 192-205. doi: 10.1016/j.jeem.2009.11.002

[7] Chaney, P., & Philipich, K. (2002). Shredded Reputation: The Cost of Audit Failure. Journal Of Accounting Research, 40(4), 1221-1245. doi: 10.1111/1475-679x.00087

[8] Flammer, C., 2013. Corporate Social Responsibility and Shareholder Reaction: The Environmental Awareness of Investors. Academy of Management Journal, 56(3), pp.758-781.

as well as more important and dramatic events and that stronger environmental performance helps the company to be less penalized in the case of an eco-harmful event.
However, things can be even worse if the collapse in returns generate a consequent fall in stock price. Krueger (2015)[9] investigated this subject, confirming that negative news is followed by a stock drop. Overall, therefore, environmental events in which the company is involved have repercussions on both the company's performance and its stock price, thus indicating that every company must be aware of the risks it runs when pursuing projects that could damage the environment and at the same time the company's image. Furthermore, El Ghoul et al. (2011)[10] find that firms that enjoy a high level of corporate social responsibility must bear a lower cost of equity, while companies in sin sectors are subject to higher cost of capital.

Hart and Ahuja (1996)[1] highlight the fact that in the '90s environmental initiatives have been considered as a way towards a higher profitability. Emission reduction, achieved through control and prevention practices, requires up-front investments, that would normally be recovered thanks to a better utilization of the inputs and less waste production, that leads to a reduction of the firm's compliance and the liability costs.[1] On the other side, however, when a firm has committed to a "zero pollution" policy and is closer to this goal, it becomes highly technological and capital-intensive, a reason that might discourage the company to further pursue this policy. In fact, the marginal costs of reducing emissions would not exceed the marginal benefits, in cases where the company has already made huge investments, implemented new practices and properly trained the staff.
Trying to reply to the question "Does it pay to be green?", Hart and Ahuja's study[1], has analysed the company through performance indicators, such as ROA, ROE and ROS. The result is that it definitely pays to be green. In fact, reducing emissions guarantees a higher ROS and ROA already in the first year after the implementation of the pollution control system and the new practices, while it takes two years to have a positive effect on the ROE. What should be underlined is that "being green" has been seen as a new competitive way to foster competition and to be more profitable already in the '80s and the '90s, when the industrial development tended to overshadow the importance of sensitive topics such as

[9] Krüger, P., 2015. Corporate goodness and shareholder wealth. Journal of Financial Economics, 115(2), pp.304-329.

[10] El Ghoul, S., Guedhami, O., Kwok, C. C., Mishra, D. R., 2011. Does corporate social responsibility affect the cost of capital? Journal of Banking and Finance 35 (9), 2388– 2406.

climate and environment. The study also provides evidence that companies with a good environmental profile have a better liability exposure, general reputation and a higher market value.

This is true especially looking at the capitalization of companies who put a lot of attention in environment and social issues: those companies, in fact, have seen their value increasing dramatically during the last year, together with the solidification of its financial structure and public image.

Furthermore, sustainable investing has also proved to be a means to protect a portfolio in times of downward economic cycles: Nofsinger and Varma (2014)[11] study the performance of socially responsible mutual funds over the business cycle and find that more sustainable and social-aware funds tend to outperform during market crises.

Investors are becoming more interested in company's ESG performance and the amount of investments in this sense is considerably increasing: the Global Sustainable Investment Review report of 2018 shows that ESG investments now top 30 trillion dollars, with an increase around 68% since 2014, reaching 10 times the value of 2004.[12]

One of the sectors mostly perceived as a pioneer of the transition to a carbon-free world is the electric mobility. In fact, in recent years, this sector has been increasingly well received by the public, thanks to the considerable development it has undergone and the great achievements of companies such as Tesla, which have disrupted the concept of mobility.

Electric mobility has crossed a critical threshold and is benefiting from various developments: some technological, both within and outside the automotive sector, and some developments in the social context of car mobility.[13]

Dijik, Orsato and Kemp (2013)[13] in their work have observed the transition period of the EV vehicles from an innovative introduction to a slow affirmation of a new standard of transportation. They have concentrated the attention around the concept of co-evolution of the multiple developments that have characterized the sector, being able to identify "transition pathways" of the phenomenon. After the early appearance and decline in the late

[11] Nofsinger, J., Varma, A., 2014. Socially responsible funds and market crises. Journal of Banking and Finance 48 (C), 180–193.

[12] Global Sustainable Investment Review 2018, Global Sustainable Investment Alliance, 2018, www.gsi-alliance.org

[13] Dijk, M., Orsato, R. and Kemp, R., 2013. The emergence of an electric mobility trajectory. Energy Policy, 52, pp.135-145.

19th and early 20th century, interest in battery electric vehicles (BEVs) has re-emerged in the 1960s and 1970s in the USA, mainly due to the negative effects of air pollution and rising oil prices. In fact, the 1965 Clean Air Act triggered several research institutes and firms to develop electric cars, but the results were not satisfying in terms of both technological performance and price compared to gasoline powered vehicles.[13] At the end of the 1970s, less than 4000 BEVs had been sold worldwide. A very small number compared with the traditional mobility. After a period of little activity, public interest on BEVs come up once again in the second half of the 1980s and the early 1990s, bringing hope to environmentalists that BEVs would finally become a mass market reality. This was mainly due to the new regulatory push done by American State of California and to the environmental policies and programs promoted that were starting to circulate weakly in Europe. Moreover, the analysis of Dijik, Orsato and Kemp[13] has also shown how the market in Europe has grown after the initial momentum. In Europe, interest in BEV technology had its main origins in engineering schools.

In the 2005 book "Experimenting for Sustainable Transport", Hoogma et al[14] have highlighted that ecological-conscious students and technicians in small enterprises were able to move from developing solar vehicles to the artisanal manufacturing of lightweight BEVs. After being showcased to the public, coinciding with the developments in California, these vehicles motivated politicians to promote their mass production and commercialization. This led to the support of R&D programs in several Western European countries, involving incentives and tax reductions for such vehicles. The EV revolution was starting to move its first steps. In the 1990s, few small companies outside the car industry were dominating BEV-developments. Hoogma et al (2002)[14] have studied the European demonstration experiments in the electric vehicles in Germany, Switzerland and Norway, among others. However, more positive results were achieved in the large-scale pilot and demonstration project for lightweight electric vehicles (LEVs) between 1995 and 2001.

Although the efforts of regulators to make BEVs a commercial success, the demonstrations around the world did not seem to appeal consumers, discouraging carmakers to invest on them.

[14] Hoogma, R., Kemp, R., Schot, J., & Truffer, B. (2005). Experimenting for sustainable transport the approach of strategic niche management. London: Spon.

Yarime et al (2008)[15] found out that probably the main reason for that was the limited technological progress achieved during the 1990s, especially on the battery side. In fact, due to the technological constraints, batteries were too costly to offer a BEV that would have been competitive in the marketplace. So, by the early 2000s, due to the poor results in building a new mobility standard, commercial production of electric vehicles had stopped.

Dijik (2011)[16] identified that also consumer preference was a crucial point in the electric vehicle's success in the late 1990s. In fact, they were not satisfied with both functionality and price of BEVs.

However, by 2000, there was only one negative attribute, the limited range of the cars. Another aspect that was undermining the production and diffusion of BEVs was the lobbying effort by the auto industry to loosen up regulations to still be the dominant players of the mobility market. Although there were electric vehicle associations in Europe, US and Asia, public support for BEVs was not strong enough to counterbalance the industry lobbying. Hybrid vehicles started making their appearance in this environment where traditional carmakers were challenging the birth of BEVs.

After 2005, though, there has been a shift in perception, with most car manufacturers investing considerable resources in R&D, showing a positive momentum for electric mobility. The consequences of the Hurricane Katrina in 2005 raised the awareness of the public opinion on the negative effects of climate change, and Al Gore's "Inconvenient Truth" documentary of May 2006 raised global awareness. These events influenced policymakers to develop regulatory frameworks and market instruments to curb carbon emissions.[17] From 2005 onwards, concerns about climate change motivated governments worldwide to demand car industry to decrease vehicles' emissions even more than before.

Until 2020 a lot of policy aiming at carbon free states have been following each other.

The European Commission has stimulated the development of alternative powertrain technologies through R&D programs. Accomplishing the 2020 "Commitment" will require the integration of additional clean power from renewable resources into the EU system.

[15] Yarime, M., Shiroyama, H., Kuroki, Y., 2008. The strategies of the Japanese auto industry in developing hybrid and fuel cell vehicles. In: Mytelka, L.K., Boile, G. (Eds.), Making Choices about Hydrogen: Transport Issues for Developing Countries. UNU Press and Ottawa: IDRC Press, Tokyo.

[16] Dijk, M. (2011). Technological frames of car engines. Technology in Society - TECHNOL SOC. 33. 165-180.

[17] Orsato, R.J., 2009. Sustainability Strategies. Pelgrave MacMillan and Fontainebleau: INSEAD Business Press., Basingstoke (UK).

Policies and programs in the largest economies of the world provided signals and incentives for carmakers to invest increasing amounts of money in R&D and acquisitions, to build competences in EV technologies. Magnusson and Berggrn (2001)[18] have identified the tendency of collaborations between automakers and battery producers to strengthen competencies, allowing the participants of the collaborations to share R&D costs and risks.
In the years, the potential demand for EVs has represented a huge growth potential for existing business or new entrants in the battery manufacturing industry. Battery technology and costs are crucial for market success of EVs, but also the infrastructure for recharging has been one of the main issues for the success in the sector.[19] So, after 2005, national and local governments decided to get more involved in the provision of recharging infrastructures.
EVs also help to reduce carbon emissions. Even when the eventual carbon credits that result from the shift from ICEs to EVs are almost insignificant, fleet operators can expect to collect benefits in terms of reputation from the decarbonization strategies.[17]
Furthermore, thanks to the diffusion of mobility providers of car sharing, EVs have proved to be attractive for the purpose because of the reduced operating costs, which can compensate for the higher purchase prices. The global feeling of the market is a positive tendency towards the electric mobility adoption.
BEVs have gone through cycles of hype and disillusionment and were unable to break out their small niche. The effects of relevant developments are examined for three configurations of vehicles: battery electric vehicles, hybrid electric and fuel cell vehicles. The reasons for looking at different configurations is that they compete and reinforce each other in certain ways, since the electric drive technology is common to them all. Advances in electric drive will help them to compete against more fuel-efficient ICEV.

For Dijik, Orsato and Kemp[13] the future of the electric mobility depends on developments in infrastructure, developments in mobility, developments in global car manufacturing regime, developments in energy prices, and developments in the electricity sector. And, eventually, all of this is strictly and inevitably connected with policy measures.

[18] Magnusson, T., Berggren, C., 2001. Environmental innovation in auto development – managing technological uncertainty within strict time limits. International Journal of Vehicle Design 26 (2/3), 101-115.

[19] Yarime, M., 2009. Public coordination for escaping from technological lock-in: its possibilities and limits in replacing diesel vehicles with compressed natural gas vehicles in Tokyo. Journal of Cleaner Production 17 (14), 1281-1288.

E-mobility success, however, will also rely on changes in mobility patterns and affordability. High purchase price has been a burden for this kind of vehicles, whereas car-sharing has eliminated the purchase prices, reducing the costs of car ownerships.

Zhou (2011)[20] has conducted an analysis on the emerging countries, showing in his study that this part of the world is going through a significant growth in the sales of automobiles. China's market is also growing in importance and Chinese competitors are entering the market. The electrification of vehicles has been explicitly encouraged in China through close collaboration between industry, academia, and government.[20] Influenced strongly by government policies for promoting electric vehicles, the Chinese industry has focused on the latest types of electric vehicles and associated batteries for its knowledge development activities. The attention on electric propulsion stimulates attention to light-weight vehicles, as lower weight increases the electric range of BEVs vehicles. This is important as the steel body is a cornerstone to the foundations of the mass production.[21]

Further analysis from Dijik, Orsato and Kemp[13] has brought the attention on the fact that electric vehicles may become the link between the energy sector and the transportation sector. BEVs could, in fact, help utilities to reduce system inefficiencies and fluctuation that are part of the grid today. The conclusive analysis has led to the future perspectives of the EVs. In the specific, the electric configurations are expected to benefit from: higher oil prices compared to electricity prices, better and more efficient charging systems, new business propositions, such as a new profitable BEVs market segment, ambitious and inevitable climate policies, diffusion of renewable energies, better systems of intermodality (combining different modes of transport in a seamless travel experience) and the cultural acceptance of electric mobility and car sharing. Altogether, these developments suggest that a pathway of electrification of cars is visibly underway.

However, the literature offers four main reasons why EVs failed to reach mass markets before 2005, including the state of the technology and its business case, in particular regarding battery technology, the resistance of incumbents, especially car manufacturers[22],

[20] Zhou, L., 2011. The Strategies for Entering the Next Generation Automotive Market in China: Frontiers of Local Innovations. Nikkei BP, Tokyo.

[21] Nieuwenhuis, P., Wells, P., 2007. The all-steel body as a cornerstone to the foundations of the mass production car industry. Industrial and Corporate Change 16 (2), 183-211.

[22] Kester J., Sovacool B.K., Noel L., de Rubens G.Z., 2020. Between hope, hype, and hell: Electric mobility and the interplay of fear and desire in sustainability transitions. Environmental Innovation and Societal

the competing promises from alternative technologies like fuel cell vehicles and biofuels in alternating hope and hype cycles[13], and because of consumer preference for cars that deviated less from their current models.[16]

A reflection on the last 10 years of EV development and deployment in comparison to the earlier waves of electric mobility in the 1970s and 1990s offers three core reasons why EVs are on their way to mass market deployment since 2005.[23] First, technological development in its broadest sense (e.g. including supply chain management, ICT developments, etc.) and especially developments in Li-ion battery technology, as well as business experience with consumer batteries, made it possible to foresee a future business case that is slowly becoming reality.[24] Subsequently, the advent of new market players like Tesla and the bold decisions of traditional automotive companies like Nissan, to move to EV environment, shifted the narrative around EVs from traditional vehicles, like the Buddy and EV1, that have become must-have vehicles. This applies to consumers but also to other car companies who took heart from the Tesla Roadster (showcasing the use of Li-ion battery technology in cars) as well as the Toyota Prius (for jumpstarting hybrid engine technologies) and the affordable Nissan Leaf (for showing that it is possible to build a reasonably priced EV offer). Third element that are pushing toward mass marketing of EV is that this took place in conjunction with developments in renewable energy resources, like household solar panels, and generally a much broader and shared acceptance of climate change and local pollution as security threats as opposed to the 1990s, especially by companies and governments, both local and national. Tesla is the most important example in this picture, because the company claims to use clean energy from renewable resources in an integrated and complete way, generating an interconnected and functional grid.

From a security perspective, the issue of climate change in the 1990s lacked the international recognition by governments, companies and individuals that it has gained since. Ultimately, an argument can be made that the security claims of climate change, fuel dependency and local pollution were accepted by some, but not by enough for the extraordinary interventions

Transitions. Retrieved 12 May 2021, from: https://www.sciencedirect.com/science/article/pii/S2210422420300307

[23] IEA (2018), World Energy Outlook 2018, IEA, Paris. Retrieved 5 April 2021, from: https://www.iea.org/reports/world-energy-outlook-2018

[24] Bohnsack, R., Pinkse, J., & Kolk, A. (2014). Business models for sustainable technologies: Exploring business model evolution in the case of electric vehicles. Research Policy, 43(2), 284-300. doi: 10.1016/j.respol.2013.10.014

to keep the EV momentum going and overcome the technological and economic challenges that remained. In contrast, the third wave of EVs came at a time of increasingly broad international recognition of climate change, increasing urban concerns and experience with smog, and a renewed attention to oil dependency. In other words, it came at a time of a broader, but not complete, acceptance of these issues and the need to act on them.[13]

A recent research paper from Rietnmann and Lieven[25] has investigated how policy measures have been a driving factor of the development and the spread of the electric mobility in 20 countries around the world. Positive drivers of the spread have been government incentives, traffic regulations and investments in charging infrastructures. Over the last years, the government support to the adoption of the electric mobility has grown consistently, but in the most part of the countries analysed in the study the affirmation of EVs over traditional vehicles is still yet to come. However, the results of the study report that high levels of governmental incentives have been the main element in promoting this "new mobility", a tangible effect visible especially if we compare the country with the highest participation of the government and the country with the lowest one. In fact, a comparison between China, who has gone through years of high expenditures in infrastructures and high levels of policy measures, and Brazil, who instead has experimented a weaker expansion in this sense, shows that in China the electric mobility is way more diffused than in the Brazilian counterparty. The strength of this support is confirmed also by another country, Norway, where thanks to the accommodating policy of the government, the EV market share has rose to about 40% in 2017.[25] The study also presents the differences and the interactions between the kind of aids that have been mentioned before: the monetary aid and the infrastructure investment. The main difference resides in the fact that financial incentives have to be paid every time on each EV acquisition and normally they only benefit the single buyer, while investment on chargers sum op over time, giving the possibility to all EV users to make a time-honoured use. *Figure n.1* represents this situation, showing on the left side a non-interaction situation between financial aid and charging station in the countries up for analysis, with the result that the EV market has a lower share than the scenario on the right, where the interaction is computed and taken into consideration.[25] However, there is still an "chicken-and-egg dilemma" in the EV adoption and the impact of all the policies adopted by the different countries: in fact, with a lower EV penetration, few countries are willing to invest in

[25] Rietmann, N., & Lieven, T. (2019). How policy measures succeeded to promote electric mobility – Worldwide review and outlook. Journal Of Cleaner Production, 206, 66-75. doi: 10.1016/j.jclepro.2018.09.121

infrastructure. Solving this problem paves the way to allow the financial aid to reinforce the investments and vice versa, allowing the countries to better exploit their possibilities and to expand the EVs adoption.

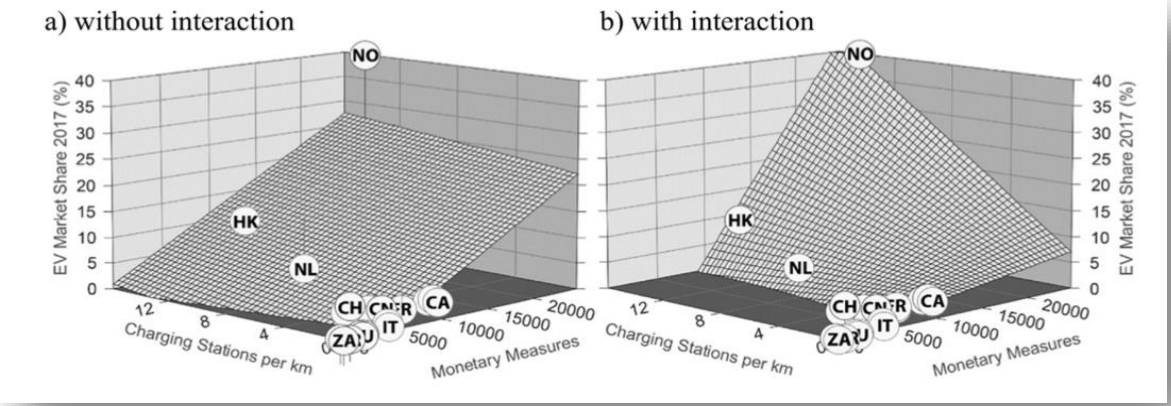

Figure n.1

Source: Rietmann, N., & Lieven, T. (2019)

However, the factors who are leading to an increased attention and sensibility towards the electric mobility are various and all of them play an important role: in fact, the research conducted by Rietmann and Lieven[25] has also taken into consideration the importance of the climate targets and the policies and project related to them. Among the others, the European Union has put some pressure on its member states in order to reduce the CO2 emissions, especially the ones caused by vehicles, by 2021. The Paris Agreement provides quite stringent measures to limit global warming and to reach the greenhouse emissions goals. Evidence also shows that in countries who must comply with these limits the electric mobility tends to spread faster, while in countries such as Brazil, who do not have such strict regulations, the EVs' adoption is usually slower, being sometimes the result of institutional or lobbying obstacles. Furthermore, the various factors who have an impact on EVS diffusion can also include the cultural differences between counties and between customers and the willingness to adopt such a big innovation, a choice that can be sometimes characterized by an anxiety feeling. In fact, what has to be taken in consideration is that the emotional aspect of customers also matters in the spread of the electric mobility and the same holds for their sensibility to themes concerning the climate change and the environment.

Numerous researches have analysed the impact of ESG integration on company's financial indicators, providing mixed results. Friede, Busch and Bassen (2015)[26] have summarized around 2.200 studies on this topic that go back until the 1970s. The result of their research is that around half of the observations show a positive relationship between ESG and firm valuation, one fourth shows a neutral relationship and only one tenth of the studies find a negative one. However, the studies have a lack of homogeneity: in fact, they are based on different approaches and hypotheses and analyse different data coming from companies in different parts of the world. A study that tries to address the same issue, while concentrating on a single sector, is the 2019's study of Almeyda and Darmansyah[27]. The data has been collected by the G7 countries in a period of five years, between 2014 and 2018, focusing on the real-estate sector, being this one the more aligned, for the authors, with the long-term ESG goals. The results of this study indicate that it is there is a statistically significant positive relationship between performance measures (ROA and ROC) and ESG values, while the relationship between ESG and stock price and P/E ratio is not a significant one. The study also asserts that there are many agencies and sources of ESG information and that each agency has a different type of assessment method, with information that can be difficult to be distinguished and interpreted. Some standard frameworks and rules on ESG reporting have been recently implemented and this is an important element that help in pursuing further analysis. However, Almeyda and Darmansyah also state that those differences in what is being measured and how tends to differ between industries and firms, contributing to the lack of homogeneity.

Another study (Velve, 2017)[28] also finds evidence of a positive relationship between ESG issues and ROA, while denying a positive relationship between market-based financial performance and ESG scores. The study covers a selection of companies listed on the German Prime Standard (DAX30, TecDAX, MDAX) for the years 2010-2014, for a total of 412 observations. Furthermore, governance appears to have the strongest impact on ROA

[26] Friede, G., Busch, T. & Bassen, A. (2015), "ESG and Financial Performance: Aggregated Evidence from More Than 2000 Empirical Studies", *Journal of Sustainable Finance & Investment*, 5 (4), pp. 210-233.

[27] Almeyda, R. & Darmansyah, A. (2019), "The Influence of Environmental, Social, and Governance (ESG) Disclosure on Firm Financial Performance", *IPTEK Journal of Proceedings Series*, 5, pp. 278-290.

[28] Velte, P. (2017), "Does ESG Performance Have an Impact on Financial Performance? Evidence from Germany", *Journal of Global Responsibility*, 80 (2), pp. 169-178.

compared to the environmental and social issues. In terms of sectors, a study comprising more than 200 Australian companies has shown that different industries tend to perform in a different way in terms of ESG scores.[29]

A further study (Ciciretti, Dalò & Dam, 2019)[30] that collects data from North America, South America, Europe, Asia, Japan and Africa showed that lower ESG scores are associated with higher expected returns. Here, the negative ESG premium could be generated by higher risk associated to low ESG scores or it could also signal a preference for investments in firms with higher ESG scores. Behavioural finance can explain why investors tend sometimes to look for "greener" companies even if the return on investment could be lower.

[29] Balatbat, M., Siew, R. Y. J. & Carmichael, D. G. (2012), "ESG Scores and its Influence on Firm Performance: Australian Evidence", *Australian School of Business School of Accounting*, 2, pp. 1-32.

[30] Ciciretti, R., Dalò, A. & Dam, L. (2019), "The Contributions of Betas versus Characteristics to the ESG Premium", CEIS Working Paper No. 413, Tor Vergata University, CEIS.

CHAPTER 1: Sustainable Finance and Environmental, Social and Governance (ESG) investing: main concepts and issues

1.1 Sustainable Finance outlook, goals and regulations

1.1.1 Sustainable Finance

"Sustainable finance generally refers to the process of taking due account of ***environmental, social and governance (ESG) considerations*** *when making investment decisions in the financial sector, leading to increased longer-term investments into sustainable economic activities and projects"* is the definition of the concept of sustainable finance provided by the European Commission.[31] The importance of this process resides in the fact that it has a central role in providing the capital necessary to reach the objectives under the **European Green Deal** and the climate and sustainability goals defined by the European Union.

Sustainable finance is having a stronger role in Europe because the EU is supporting a concrete and strong transition to a low-carbon, more resource-efficient and less environmentally impactful economy, building a financial system able to help reaching this goal.

The first concrete milestone of this transition has been adopting of the UN 2020 agenda and Sustainable Development Goals and the Paris Climate Agreement in 2015, international agreements that include the commitment to common goals, reduction of CO2 emissions and aligning businesses and finance towards low-carbon and sustainable development. Furthermore, the Commission introduced the European Green Deal in 2019, a plan aiming at making the EU's economy sustainable and making Europe the first climate-neutral continent by 2050. The Green Deal has been supported economically by the Commission that in 2020 has defined an investment plan of 1 trillion euros that will be invested accordingly to the Green Deal's objectives.

However, the Commission recognizes the limitations of the public sector, at the same time as designating the financial sector as the primary way to reach the European goals.

[31] Overview of sustainable finance. (2021). Retrieved 23 March 2021, from https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/overview-sustainable-finance_en

The Commission is working to implement the **EU Action Plan for Financing Sustainable Growth**, that has been first launched in May 2018, also relying on the aid of the private capital market: to reach this scope, the EU launched, together with authorities from other countries worldwide, the international platform on sustainable finance (IPSF). The objective of the platform is to help mobilizing the private capital towards sustainable investments, strengthen cooperation and coordination between entities and seize investment opportunities. The plan is characterized by three parties:

1) A proposal to establish an EU taxonomy related to sustainable investments.
2) A proposal for improving disclosure regulation on the integration of ESG issues into the investment process.
3) A proposal to create new benchmarks that take into consideration low-carbon and positive carbon impact.[32]

"By shifting the horizon away from the short term and contributing to a more sustainable economic trajectory, the financial sector can become a powerful force acting in our collective best interest" affirms Christine Lagarde at the launch of the COP 26 Private Finance Agenda, the 27th of February 2020. The ECB chief, on several occasions, has pointed out that the financial sector is the key player for the development of a more sustainable and egalitarian community. Between 2009-2019, in fact, sustainable finance has been able to move capital in the direction of the EU goals. Confirming that, Ahlström and Monciardini's 2021 research[32] that focuses on the dynamics and limitations of the EU regulatory approach to sustainable finance, shows that more than half of global asset owners are currently implementing or evaluating ESG in their investment strategy. This trend is also due to the adoption of the Sustainable Finance Disclosure Regulation (SFDR), which is analysed in greater detail later in the paper.

Investors have now, more than ever, the power to make a difference and to contribute to the success of the sustainable challenge. This is especially true for institutional investors, who have been invested by the role of "universal owners" and that play a key role in driving the transition towards the establishment of a sustainable economic model.[32]

The hypothesis raised in the article is that the largest institutional investors have highly diversified, long-term portfolios that can be a representation of the capital markets and their investment return depends inevitably on the financial sustainability of the whole economy.

[32] Ahlström, H., & Monciardini, D. (2021). The Regulatory Dynamics of Sustainable Finance: Paradoxical Success and Limitations of EU Reforms. *Journal Of Business Ethics*. doi: 10.1007/s10551-021-04763-x

On the other side, however, the financialization of the world economy has often been seen as the main cause of the social and environmental problems. Particular attention has been raised around this topic during and after the 2007-2008 financial crisis, an event that has contributed to foster reflections about the role of finance in the society. Finance is perceived as part of the social and environmental problems the world is now facing at the same time as the solution to them.

The article also analyses the institutional logics behind the financial system. The terms "institutional logics" stand for the organising principles, such as its values, norms, characteristics and practices, of an institutional order.[32] Sustainable finance brings elements, such as environmental and social objectives, in the investment's world, making them a vital part and an essential characteristic that institutional logics have to consider.

The financial logic, however, could also be a constraint to the development of SRI funds. This is also confirmed by a study from Yan et al. (2019)[33] which indicates that finance can be a source of constraint as well as a provider of resources to SRI funding. So, if the prevalence of finance is growing within a society, the level of sustainable funds should increase as well, until a peak would be reached, with the funding eventually finishing lower than the financial prevalence. Yan et al. (2019)[33] indicate three different scenarios, with the financial logic having either a low, moderate or strong prevalence.

If the financial logic has a low prevalence, investors are more open to integrate SRI practices but, at the same time, the financial system is weak, with few resources to allocate, making allocating resources to sustainable scopes more difficult. Instead, when the financial logic is highly prevalent, in the market there are enough resources to finance SRI initiatives, but financial organizations tend to be mainly oriented towards profit maximization. Finally, when the prevalence of the financial logic is moderate, there are more possibilities to make the resources deviate from only profit maximization goals to pursue sustainable objectives.

When it comes to sustainable finance, the various actors in this field tend to approach the phenomenon in different ways, that translates in their different investment strategies: thematic investment, impact investment, exclusionary and positive screening.

Ahlström and Monciardini (2021)[32] individuate three different phases in the transformation of sustainable finance scenario in the European Union from a niche market to a fundamental

[33] Yan, S., Ferraro, F., & Almandoz, J. (2019). The rise of socially responsible investment funds: The paradoxical role of the financial logic. *Administrative Science Quarterly, 64*(2), 466–501.

part of the financial system. Phase I (2009-2012) is the conflictual one, characterized by the weakening of the financial logic in society due to the financial crisis and the emergence of a small community of SRI hybrid funds opposed to the financialization of the economy offering a sustainable alternative. No policy was in place about sustainable finance during the first phase, with profit maximization being itself the end goal and the market's regulator. Resistance to reforms based on non-financial reasons tended to be obstructed by a harsh financial logic and the lack of understanding of the SRI phenomenon.

The financial crisis has, therefore, accelerated the first shift from the voluntary to the legislative character of the EU regulation. Phase II (2012-2017) has been depicted as the complementary one, with an expansion of SRI organizations into larger financial players and organizations, generating a boost in EU sustainable finance reforms that, however, due to the regained social legitimacy of finance, have been shaped mainly around climate issues and green finance. During this period, there has been a first significative alignment between financial and civil society. 2015 represents a milestone in sustainable finance with the approval of the Paris Climate Agreement, which paved the way to make financial capitals, and especially private ones, flowing into projects aiming at climate change mitigation.

Phase III (2017-2019), the last, is again a conflictual phase between finance and sustainability logics, with sustainability indicated as a financial opportunity in contrast with finance as a means for social transformation, and the adoption of the EU Action Plan. Conflicts have also been raised around the Paris Agreement, that aims to cut CO2 emissions, focusing mostly on climate rather than environmental and social general issues. These conflicts have been solved by the introduction, dated March 2019, of a sustainable finance taxonomy, voted by the European Parliament, that would cover social issues, human rights and the economic activities that significantly harm the environment.

Sustainability provisions in financial regulations have been missing for years, until recently, due to the growing importance of sustainable finance, that has shifted from a peripheral issue to a core element in the financial sector. The global financial crisis has played an important role in showing to the world the weaknesses of the financial system while at the same time planting the seed for sustainable finance as an alternative to the financialization of the economy. Ahlström and Monciardini[32] find that the adoption of a European regulation for sustainable finance has a key role for the development of this phenomenon, but the effects could be limited (such as the case of restricting the field of action to solely the climate challenge), and could even promote further financialization.

Policymakers should, in fact, consider how finance would act without proper regulatory constraint, to what extend it is possible to increase the reach of sustainable finance, and measure the socio-economic impact of the newly introduced sustainable policies.

1.1.2 Sustainable Development Goals (SDGs)

Sustainable Development Goals date back to decades of work by the UN and countries around the world. However, it is with the adoption of the 2030 Agenda for Sustainable Development by the United Nation Member States in 2015 that SDGs have become a crucial point in countries' goals list. SDGs are 17 and they represent an urgent call for action by any country, aiming at ending poverty and hunger, developing strategies that could improve health, education, reduce inequality and foster economic growth, and tackle the climate change and environmental issues. The Division for Sustainable Development Goals (DSDG) of the UN provides concrete support to the realization of the SDGs.
The Agenda for Sustainable Development recognizes the importance of the environmental, social and governmental thematic, claiming that climate change is a central topic and that it is necessary to accelerate the reduction of greenhouse gas emission and to adopt a concrete policy and joint action, highlighting that social and economic developments depends on sustainable management of natural resources. In order to reach the SDGs, United Nations propose that Governments, private sector, civil society and organizations work together to mobilize financial resources and human capital. Another element underlined by the Agenda for Sustainable Development is that it is important to respect each country's policy and regulation and the means through which sustainable policies are implemented, while being coherent with the international rules and commitments.

A recent study[34] on the role of sustainable finance in countries belonging to the OECD, demonstrates that all the Scandinavian countries and the Netherlands are ranked in the top of the ranking. The research takes into consideration fifteen Sustainable Development Goals, analyzing 23 EU countries belonging to the OECD for 2016. The findings indicate that the more sustainable is the financial model, the better are the results of countries in achieving SDGs. This can be explained by the fact that if the public system is sustainable, it is possible to realize an equalization of income and the adoption of a social policy that provides to all citizens the access to basic goods and services. Reaching the SGDs is a challenge that

requires the involvement of multiple actors and actions, such as the integration of a fiscal policy with sustainable benchmarks and ratings and ESG risk management practices.

Scandinavian countries show a "sustainable finance model 3.0", meaning that they have the highest possible level of sustainable finance, integrating well the most part of the Sustainable Development Goals. In these countries, the financial system is well developed, a lot of different financial instruments are available to investors, and public and private financing are integrated, coherent and balanced with each other.

Concerning the "sustainable finance model 2.0", instead, it is characterized by a developed environmental tax system, but key Sustainable Development Goals related to climate change have not been effectively implemented, an element proved also by some countries within this model that produce the highest source of GHG emissions in Europe.

The "sustainable finance model 1.0" is the conventional finance model that applies in the countries most affected by the global financial crisis, whose economies are mainly based on traditional fuels and that are just beginning the journey to replace those fuels with renewable energy sources. The financial market is not well developed and not able to meet the expectations of sustainable finance, while the most part of the funding comes from public financing.

The study[34] also demonstrates that, between all the Scandinavian countries, Sweden is the leader in sustainable financing, with its financial institutions being among the first in the world for green bond issuance. In fact, according to the Climate Bond Initiative, Sweden is the sixth largest issuer of green bonds, while Norway, Finland and Denmark are in the Top 20, with increasing rates of issuance. Furthermore, Ziolo, Zak and Cheba[34] indicate that, in particular, Denmark, Sweden and Finland are on 3 top ranking positions when it comes to the achievement of the Sustainable Financial Goals. Together with Finland, these countries have scored strongly in social and economic issues, while can still improve on the low carbon side.

What delivers the highest results in financing and fostering the sustainable development is the combination of the public and private financial systems, providing the necessary capitals to realize projects and to comply with the SDGs and the various regulations. Therefore, the

[34] Ziolo, M. ., Bak, I. ., & Cheba, K. . (2021). The role of sustainable finance in achieving Sustainable Development Goals: does it work?. *Technological and Economic Development of Economy*, *27*(1), 45-70. Retrieved 2 February 2021: https://doi.org/10.3846/tede.2020.13863

study[34] indicates that the parallel development and cooperation between public and private financial systems should be incentivized and supported by the government.
Ziolo, Bak and Cheba[34] indicate also that the public financial system is able to support the implementation of the social pillar among the sustainable development challenges, but it struggles in meeting the requirements for the environmental one, for which capitals are coming especially from the financial market. However, the government could contribute to support the financial system through proper legal regulations. This could be done also by considering integrating financial policy with sustainable development policy, unifying monitoring indicators and defining common goals for the two spheres. Also, another element that could help the evolution of sustainable finance is the government's introduction of a standard reporting system, that could help monitoring the impact of public and market financial systems on the application of the Sustainable Development Goals.

The Agenda for Sustainable Development recognizes the importance of the environmental, social and governmental thematic, claiming that climate change is a central topic and that it is necessary to accelerate the reduction of greenhouse gas emission and to adopt a concrete policy and joint action, highlighting that social and economic developments depends on sustainable management of natural resources. In order to reach the SDGs, United Nations propose that Governments, private sector, civil society and organizations work together to mobilize financial resources and human capital. Another element underlined by the Agenda for Sustainable Development is that it is important to respect each country's policy and regulation and the means through which sustainable policies are implemented, while being coherent with the international rules and commitments.

1.1.3 Sustainable Finance Disclosure Regulation (SFDR)

The Sustainable Finance Disclosure Regulation (SFDR), as part of the European Commission's Action Plan on financing sustainable growth of March 2018, aims to provide greater transparency on the degree of sustainability of the financial products offered by asset managers, while also channelling capitals towards sustainable investments.
Asset managers were required to assess their products and to indicate if funds are sustainable and at which level of sustainability they aim. Furthermore, it is necessary to provide information about the integration of sustainability risks in the investment decision-making

process and on how remuneration policies are consistent with the integration of sustainability risks.[35]

Investment prospectus needs to be updated accordingly and investors can so be aware of how their investments contribute to sustainable goals. If there is no disclosure, asset managers need to explain why the disclosure is missing.

The EU taxonomy requirements have also been drawn to help to achieve this purpose by requiring those financial products to disclose to what extent they invest in environmentally sustainable economic activities.

The regulation has set 10 March 2021 as a deadline for providing the required information and it is addressed to European credit institutions and investment firms, alternative investment funds and UCITs, insurance-based investment products and all the pension products.[35]

Precontractual information and periodic reports are key elements within this new regulation, that aims at providing un unprecedent level of transparency. This information will be mandatory starting from 10 March 2021 and the specific requirements are better specified in the Regulatory Technical Standards (RTS). Furthermore, financial market participants have to disclose how Principal Adverse Impacts (PAI), effects of investment decisions and advice that result in negative effects on sustainability factors, on environmental and social matters resulting from an investment decision are considered on a "comply or explain" basis from 10 March 2021.

On 2 February 2021, a draft Regulatory Technical Standards (RTS) has been published to further specify the ESG data required to meet the transparency requirements of the SFDR regulation. The draft also specifies the details of pre-contractual and periodic disclosures for financial products that integrate ESG issues that must be published from 1 January 2022.

1.2 Definition of the ESG concept

ESG issues are capturing the attention of an increasing number of investors around the world. The term "Environmental, Social and Governance" (ESG) is attributed to The Global Compact Leaders Summit of 2004, where nearly 500 leaders, including CEOs, executives, government officials and UN agencies, have discussed the concept of global corporate

[35] Sustainable Finance Disclosure Regulation (SFDR) – regulation memo. (2021). Retrieved 5 April 2021, from https://securities.bnpparibas.com/insights/sustainable-finance-disclosure.html

citizenship and the central role that governments and companies could play in safeguarding the world. Participants were asked to commit to embrace and apply a set of fundamental values in the fields of environmental sustainability, human rights, labour standards and anti-corruption practices, and to engage with the other partners to concretely realize the Global Compact principles and the goals of the United Nations. The final aim of the Summit was to assure that the principles would have been integrated into the business strategies and the operations by the companies' executives, at the same time as developing a sustainable program and promoting a responsible governance worldwide. Between the others, one of the most important elements that has characterized this Summit has been the engagement of twenty major financial companies to begin integrating social, environmental and governance issues into their investment decision-making process. This represents a milestone and a first step towards what has been later developed by institutional organisations and that has led to an increased attention to sustainable practices and corporate social responsibility. Furthermore, the participants agreed that the governments should create favourable conditions for the development and the application of the Global Compact principles and the adoption of reliable systems of measurement and monitoring.

The voluntary and universal nature of the ten principles has been the differentiating element from the rest of codes of conduct who are developed and applied by each specific firm and who often lack global credibility. The Summit has also helped in properly addressing the question of corporate responsibility, who was starting to have a large impact on the reputation of the companies, eventually impacting their value and the stock price. The attention has been raised also around two key elements currently under the spotlight, of a committed effort towards sustainable business practices, that are the measurement and the transparency of the integration of these practices, believed to affect the credibility and the adoption of the principles.[36]

ESG investing is not a kind of investment related to a separate asset class or strategy, and the approach is usually different for each investor. In fact, investors have to establish their goals and they also have to consider the potential outcomes of the approach they want to adopt, taking into consideration risks and costs.[37]

[36] The Global Compact Leaders Summit 2004 – Final Report, United Nations Global Compact

[37] Grim, D. and Berkowitz, D., 2018. ESG, SRI, and Impact Investing: A Primer for Decision-Making. *Vanguard Research.*

ESG integration, SRI, PRI principles, Green Bonds, Impact Investing: the vast array of terms used in this area generates some sort of investor confusion. A global definition for each of these terms can hardly be found. Still, it is necessary to try to shed light on these issues. One way to do that is to start from the ones provided by the Global Sustainable Investment Alliance (GSIA), a collaboration of the seven largest sustainable investment membership organizations globally, with the aim of deepening the impact and visibility of sustainable investment organizations.

ESG investing is defined as an investment-related activity that accounts for some type of environmental, social, or governance consideration. The ESG integration is the systematic inclusion of financially material ESG information into the investment analysis and, differently from the SRI principle, does not preclude investment in objectionable industries. A recent Vanguard study[37] proposes a list of potential ESG issues *(Figure n.2).*

Environmental	Air emissions and air quality	Fossil fuels	Occupational health and safety
	Biodiversity protection	Hazardous materials use	Renewable energy sources
	Community health, safety, and security	Land contamination	Waste generation
	Energy conservation	Natural resource preservation	Water use and conservation
Social	Adequate housing	Consumer privacy	Opioids
	Abortion providers	Employment of minorities and women	Religious values
	Adult entertainment	Human rights standards	Tobacco
	Alcohol	Income inequality	Union relationships
	Animal testing	Manufacturers of birth control products	Weapons
	Casinos and gambling equipment	Obesity	Workforce exploitation
Governance	Antitrust violations	Consumer fraud	Political contributions
	Auditor independence	Disclosure of material risks	Reporting transparency
	Board independence and elections	Executive compensation	Short-term focus
	Board diversity	Oversight of strategy	Voting rights

Figure n.2

Source: Climate Bonds Initiative, 2020

Considering that ESG investing is a dynamic process which is enriched with new elements over time, the list is still growing, and the spectrum of issues can be wider than the one proposed by Vanguard.

1.3 Sustainable and Responsible Investment (SRI) and Impact Investing

Integrating sustainability criteria (ESG criteria) in investment decision and analysis is called socially responsible investment (SRI). Hill[48] indicates that the most common distinction between ESG and SRI is that SRI factors are characterized by a screen out of some companies, while ESG investing provides guidelines on which companies and sectors to include in a portfolio while going through an investment decision-making process.[37] This "screen out" process is usually called negative screening, that is characterized by the exclusion of companies that do not comply with defined environmental and social criteria, representing a first step towards a sustainable investment.

However, a general concern has been expressed about the fact that an exclusionary strategy could lead to building a portfolio that underperforms market benchmarks. An interesting case is the one of the so-called "sin stocks": shares in companies who operate in industries representing human vices, such as the tobacco, alcohol, gambling, weapons and adult entertainment. What brings to questioning these stocks is not only related to moral issues, but also to a financial risk exposure that could come from a potential unfavourable regulatory framework and uncertainty in the sectors.

A recent research study of the University of Queensland[41] reveals that SRI performance is the main topic in the SRI literature, showing a general greater attention towards financial return generated through sustainable practices. A reason of concern around this topic is the trade-off between return and social and environmental responsibility: the limited number of assets that pass the screening and become part of the portfolio could in fact be a threat for financial return. The study also investigates the possibility to create a portfolio that respects SRI criteria at the same time with generating the desired financial return for investors, asserting that integrating sustainability criteria has no significant impact on portfolio return, both in negative and positive terms. This means that the study does not find a correlation between the return of the SRI portfolio and the return of more conventional portfolios.

However, the study also focuses on analysing investors who are less concerned about less or negative performance, but who put more importance into the SRI value.

Through their research, Viviers and Eccles (2012)[38] define SRI practices as increasingly concentrated on the screening process and on the shareholder activism, indicating that institutional investors are becoming more concerned about these issues. The recent study "Can Sustainable Investing save the world?"[39] analyses and distinguishes three impact mechanisms: shareholder engagement, capital allocation, and indirect impacts, suggesting that investors who looks for impact should follow a shareholder engagement, screening out non sustainable companies and allocating resources to the ones who are within the SRI criteria and that suffer from limiting external financing conditions. Also, the study highlights the fact that different SRI criteria used in the screening process can have different impacts on the financial performance of the portfolios built following this strategy. Furthermore, the attention is shifted towards the fact that ESG metrics are fundamental as an enabling factor of the SRI market. The introduction of these metric is key for the acceleration of the growth of emerging SRI markets. More than that, since ESG rating agencies started to gain popularity, the number of SRI portfolios has grown sharply.

Widyawati[41] argues that SRI is both a financial innovation that has originated from the ethical concerns that fluctuate around the corporate behaviour, that has not always been able to respond to environmental and social concerns. Corporate scandals around the world have contributed to orientate the public attention towards the undeniable responsibility that companies, CEOs and governments have in relation to our planet. An interesting investigation from the shows that there is a paradigm problem when discussing about the SRI topic: in fact, it exists a mismatch between the short-term view of financial markets, who need to see companies boost profits, and long-term view of ESG, that takes time in order to be properly realized. Furthermore, the author indicates that the establishment of ESG metrics has been one of the main factors in the development of the SRI phenomenon.[41] Kölbel, Heeb, Paetzold and Busch[39] find that many investors are willing to invest into SRI portfolios for altruistic motives and to make a positive impact, with banks and asset managers who are building more and more on the ESG concept to offer them a variety of

[38] Viviers, S., & Eccles, N. S. (2012). 35 years of socially responsible investing (SRI) research—General trends over time. South African Journal of Business Management, 43(4), 1–16.

[39] Kölbel, J., Heeb, F., Paetzold, F. and Busch, T., 2020. Can Sustainable Investing Save the World? Reviewing the Mechanisms of Investor Impact. *Organization & Environment*, 33(4), pp.554-574.

products in which they can invest. In fact, investors usually do not have a direct impact on social and governmental issues, but they can influence the companies they invest in and this companies subsequentially have an impact on those issues. So, it is possible to make a difference between the investor impact, that is the change that the investor activities have on companies, and company impact, which in turn is the tangible change in social and environmental issues due to company activities. However, it does not exist a common standard or a specific metric to assess the result of an investor impact, and this leads to only few investors being capable to analyse their contribution in environmental and social activities. The authors[39] continue their analysis identifying three fundamental mechanisms behind the investor impact: shareholder engagement, capital allocation and indirect impacts. Shareholder engagement is a key element in fostering companies to ameliorate they practices, as well as capital allocation, who also generates competitivity between firms to have access to more favourable financing conditions.

Indirect impacts can be exercised through some practices such as stigmatization, endorsement, benchmarking and demonstration.

For what concern stigmatization, investors can decide to exclude some companies from their portfolio, generating a probable drawback for the company in terms of capital costs and reputation. Investors can also decide to fully endorse companies who are perceived to be sustainable, helping to increase the visibility and the reputation of the company, with a general positive financial impact. ESG rating agencies develop standards and benchmarks that help companies to assess their ESG strategies. This could help companies to develop a better managerial system for their ESG issues and to comply with the sustainable requirement. Also, the presence of benchmark against pears can foster competition and constant amelioration of sustainable practices. Activities carried out by sustainable investors tend to affect companies' practices, but they can also have a wider impact if they are able to engage and encourage other investors to do the same. This represents the demonstration step, consisting in investors establishing a sort of social norm, pioneering investment projects and practices and directing financing towards sustainable projects.

1.4 Principles for Responsible Investment (PRI)

"Principles for Responsible Investment (PRI)" is an investor initiative in partnership with the UNEP Finance Initiative and the Global Compact. This initiative believes that environmental, social and governance issues can have an impact on portfolios, with differences that depend on sectors, countries, companies, asset classes and length of investment. PRI participants believe that, applying the principles they are committed to, they can align investors objectives with the ones of the society, fostering a rapid integration of ESG issues into investment decisions.

The six Principles are a voluntary and ambitious set of investment principles that offer possible actions for incorporating ESG theme into investment practice. In the specific, they are:

1) Incorporating ESG issues into investment analysis and decision-making process.
2) Being active owners and incorporating ESG issues into ownership policies and practices.
3) Seeking the appropriate disclosure on ESG issues by the entities in which the investments are made.
4) Promoting the acceptance and implementation of the principles within the investment industry.
5) Working together with the other signatories to enhance the effectiveness in implementing the Principles.
6) Reporting on the activities and progressing towards the implementation of the Principles.

The characterizing mission of PRI is that it will work to achieve an economically efficient and sustainable global financial system, because it is a necessity for long-term value creation. In order to do so, PRI aims to encourage adoption of the Principles and mutual work, by fostering values such as integrity, transparence and accountability, and incentivizing good governance, sustainable regulation and market practices.[40]

[40] Financial Performance of ESG Integration in US investing – PRI (2018). Retrieved 14 March 2021, from https://www.unpri.org/fixed-income/financial-performance-of-esg-integration-in-us-investing/2738.article

Organisations can become a signatory of PRI principles if they respect certain characteristics, provide accurate disclosure about ESG data and company's activities and fell under one of these three categories:

- **Asset owners,** representing holders of long-term retirement savings, insurance and other assets, mainly deposits, such as sovereign wealth funds, foundations, endowments and insurance pension funds. This one represents the principal category of signatory.
- **Investment managers** managing or controlling investment funds as a third-party, serving an institutional and/or retail market. If investment managers are still raising assets, rather than actively managing funds, they can sign a pre-emptive contract as provisional signatories.
- **Service providers,** firms that offer products or services to investment managers and/or asset owners who demonstrate a commitment to promote and develop services that support the implementation and the diffusion of the principles.

The Principles have to date been signed by more than 1200 signatories worldwide, with a lot of more companies who are starting the procedures to comply with PRIs and to integrate sustainability at the core of their investment process.
ESG integration is an important part of the new sustainable measures promoted worldwide and the process has to be done in a way that really shows the engagement of a company in making a tangible effort towards climate and social issues.
The next section describes an ESG integration process in the fixed income environment, while at the same time explaining why companies feel the need to integrate ESG and to promote "green" financial products.

1.5 The "divestment strategy dilemma"

Investors are all trying to apply profitable strategies, at the same time as contributing to the shift towards sustainable practices. SRI principles focus their attention on which companies to avoid, leaving investors and portfolio managers to make delicate choices, who could affect the performance return. There is not enough evidence that the adoption of a divestment

strategy will help accomplishing these aims, due to the challenges inherent to this kind of strategy.

A divestment strategy based on a negative screening of companies and assets carries some challenges, that could make the strategy itself ineffective. Companies could be difficult to be identified, because of the data inaccuracy or because some of a multi-business model, who comprises appropriate and inappropriate activities within the same company. Related to this, there is an "energy dilemma": businesses who are not believed to be environmental-friendly, like for example oil companies, could be automatically excluded from the investment process, while instead some of them are seriously committing to carbon-free projects. Also, removing these companies from the portfolio could lead to a loss in returns. Another challenge coming from a divesting strategy is the collateral damage in economic terms that the blamed company could face, whose effects could be passed on to consumers or employees, in the form of price increases or job losses for example.

Another polemic revolves around the fact that certain industries, even if they need to be removed from the portfolio, still operates in compliance with the law. An important example dates back to 2018 when, in response to the increased number of shootings between civilians in the USA, numerous financial institutions decided to stop financing gun manufacturers and retailers. Citigroup was the first bank to cut funds to those companies who were failing in meeting the requirements. Bank of America followed not long after.

However, this has not been positively perceived by the public, for which the banks have represented a threat for social and political issues. In fact, it is controversial if, in a society where the credit is fundamental to make the economy thrive, financial institutions should be the ones to referee on such delicate questions, a power that could have damaging effects on society as a whole.[48]

Divestment is not a simple process; it is long and delicate, and often not the best solution for achieving environmental and social objectives. Other strategies might guarantee better performance and results.

1.6 ESG Metrics

ESG metrics are helpful to shed the light on company practices and at the same time of addressing concerns while pursuing an investment decision-making process. Lack of transparency and lack of consistency are the main issues inherent ESG measurement. The lack of transparency arises because agencies who are involved in the rating process of ESG exposed companies do not disclose sufficient information about the data gathering and the methodologies they use. About this issue, more transparency would help make the analysis more homogeneous between different agencies and would help to make a progress on the second problem mentioned before, the lack of consistency. In fact, also due to different approaches in data gathering, rating agencies could assign different scores. Standardisation and transparency in the basic methodologies could be a solution to this problem. Furthermore, the lack of transparency also triggers for a difficult comparison between the rating agencies, because data and calculation processes between them could be different, leading to possible inaccurate outcomes. These issues have been empirically studied, through general analysis of aggregated ESG metrics, with results that show that ESG scores published by some major rating agencies do not converge. [41]

However, it is worth analysing an example of how the ESG risks and the consequent ratings are defined by a global ESG metrics provider.

1.6.1 Sustainalytics ESG Ratings Methodology

SRI principles are an important way for capital allocation to achieve sustainable goals. However, even if investors know that investing in ESG securities and projects is central for the application of SRI principles, there are two problems that emerge when evaluating the investments: a lack of understanding of ESG metrics and a lack of standards in the adoption and analysis of metrics. Investors, in fact, are confused by the absence of common standards and by the different approaches adopted by the various ESG rating agencies. Furthermore, a lot of data is available concerning the SRI performance, but the heterogeneity in SRI practices has not been fully explored yet.[41]

[41] Widyawati, L. (2019). A systematic literature review of socially responsible investment and environmental social governance metrics. *Business Strategy And The Environment*, *29*(2), 619-637. doi: 10.1002/bse.2393

Between the others, Sustainalytics, a Morningstar Company, is one of the biggest and most known and complete providers of ESG metrics and company analysis.

The company provides an updated guide that illustrates the research process, the methodology and the ESG risk rating assignment procedure in detail.[42]

Sustainalytics' work has a wide coverage, with a database composed by more than 12.000 companies, analyzing 20 material ESG issues through a two-dimensional materiality framework, and relying on more than 300 indicators and 1.300 datapoints. [43]

Sustainalitycs' research process is based on three pillars: annual review of subindustry exposure scores (carried also at the company level), indicator selection and indicator weights. The process starts collecting data via public disclosure and media, with a consequent analysis that is carried according to the indicator framework. Analysts then evaluate how the company is complying related to the set of pre-defined criteria and versus peers. Then, in a successive and dynamic process, all the events that impact the company are taken into consideration in the risk measurement procedure, in order to constantly update the ESG risk rating. A report can finally be drafted and sent to the company for a feedback that will help collect additional data useful to make the report more accurate. The last phase of the research process consists in diffusing the report to clients.

The aim of the report is to provide an accurate snapshot of the unmanaged ESG risks of a company. Ratings scale is 0-100, with higher scores indicating a high level of unmanaged risk, while lower scores standing for a higher percentage of risk being managed.

Sustainalytics splits then the companies into five risk categories: negligible, low, medium, high and severe.

The building blocks of the rating process are:

[42] ESG Risk Ratings, Methodology Abstract Version 2.1 - Sustainalytics (2021), Retrieved 28 February 2021, from https://connect.sustainalytics.com/esg-risk-ratings-methodology

[43] ESG Ratings and Research – Sustainalytics. (2021). Retrieved 28 February 2021, from https://www.sustainalytics.com/esg-data/#1530569060054-8b9ec33c-bfff

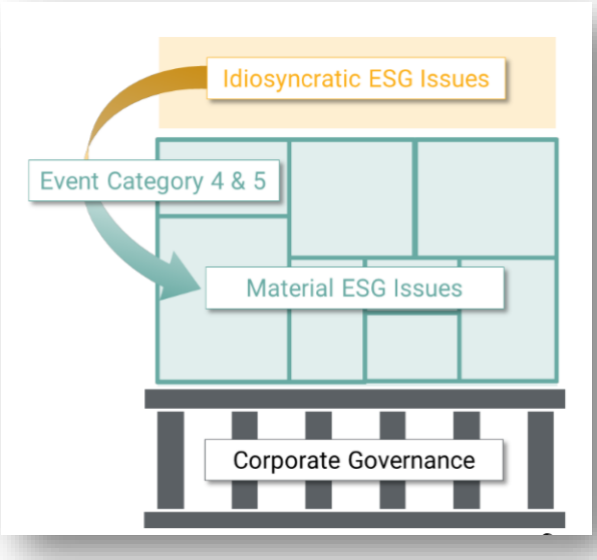

Figure n.3

Source: Sustainalytics, 2021

- **Corporate Governance**: it is the element at the base of the rating and represents Sustainalytics' conviction that poor governance is a material issue for the company. It is assessed through a six-pillar framework that is based on Board Quality and Shareholder Rights. This pillar is independent of the industry where the company operates. However, two kinds of adjustments are made: regional adjustments; adjustments related to the transposition of Event Category 4 or 5, which represent high risk, into material ESG issues.

- **Material ESG issues**: topic or set of topics that require similar management initiatives. For example, Human Capital is a ESG subject that includes a series of employee-related issues such as recruitment, diversity, labor conditions and development. Material ESG issues are defined at the subindustry level, with an annual review that helps to keep only the ones that matter to the company's business model.
- **Idiosyncratic Issues**: unexpected or unpredictable issues that are unrelated to the subindustry. Usually, these kinds of issues are event-related, such as an accounting or environmental scandal. They become material issues for the interested company if the event passes a threshold, that has been set at a Category 4 or 5 level.

Sustainalytics bases its risk ratings' approach to materiality on a two-rating dimension that is composed by Exposure and Management. Exposure represents to which extent a company is exposed to material ESG risks, while Management reflects how well a company is managing the exposure to those risks.

1.6.2 Sustainalytics Assessment of exposure to ESG issues

Concerning the first dimension, Exposure, a top-down assessment of subindustry exposure is necessary: the exposure of companies operating in the same subindustry is estimated. *Figure n.4* helps provide a snapshot of the exposure assessment process of the subindustry. The necessary data to build the exposure evaluation comes from company reporting, third-party research, track record of the events that have had an impact on companies during the period and reliable sources of external data (that provide for example information about company's emissions). Sustainalytics expertise allows the internal research team to work on these data in order to generate a first assessment of the exposure, that is then integrated with corporate data and materiality matrices based on the global standards for sustainability reporting (GRI).

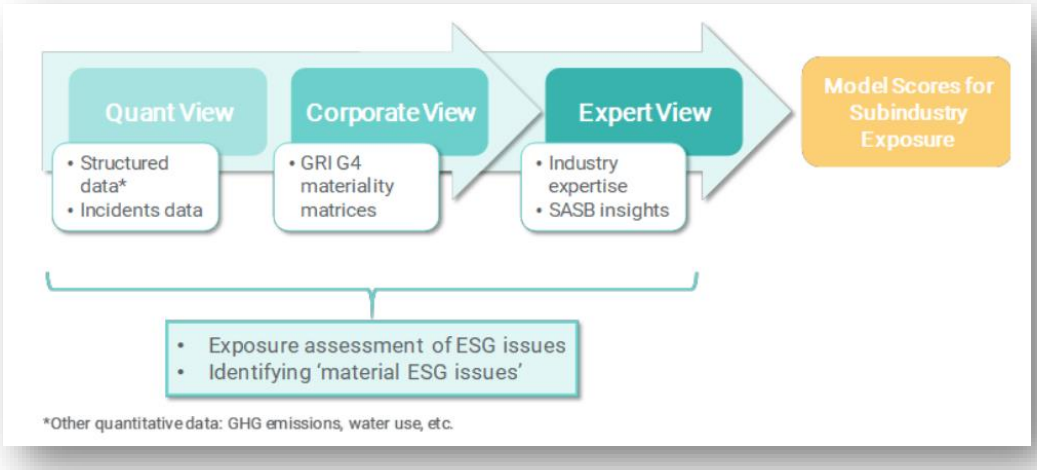

Figure n.4
Source: Sustainalytics, 2021

The outcome of this process is represented by the exposure assessment of ESG issues that comes under the form of model scores, and the identification of material ESG issues. Scores are updated every year and the set of material ESG issues can change overtime.

After the subindustry exposure has been defined, the process moves towards the definition of “betas”, that represent the degree of the deviation of a company’s exposure to material ESG issues from the subindustry average.

The beta for a company is calculated through a three-phase process which is based on main economic indicators related to the subindustry:

- Beta signals are indicators that allow to better define the risk profile of a company. They are divided into four areas: Product and Production; Financials, which assess the financial strength of the company; Meaningful events and their subsequent adjustments if they pass the defined threshold; Geographic, representing the country risk and local elements such as headquarters and revenues.
- Qualitative overlay, that can be applied by the analysts and that reflect additional factors not previously included in the model.
- Correction factor, representing a technical correction factor that assures an average beta of 1 at subindustry level.

However, they do exist material issues whose risk cannot be completely managed. Level of manageable risk goes from 30% to 100% and it is the level of risk that is considered to be manageable by the company.

The second dimension of the ESG Risk Ratings is Management, that consists of company actions and strategies towards managing the ESG risk exposure. The score assessment takes into consideration a lot of different qualitative and quantitative indicators such as policies, certifications, management systems and CO_2 emissions.

The final assessment of the ESG Risk Rating comes from a process that is substantially composed by six phases, whose essential elements previously analysed are combined together.

- The first step is the assessment of the subindustry’s exposure to material ESG issues.
- Subsequentially, analysts look at the management dimension, measuring how well the company is mitigating the previously defined exposure.
- Despite the effort that companies put into managing risk, some of this risk could still be considered as unmanageable, and this constitute an assessment necessary to proceed with the analysis, that will further investigate this risk and sum up with the others at the end of the process.
- For what concerns the manageable risk, instead, a company’s performance is reflected by its practices (ESG and non ESG), policies, projects and performance.

- An important phase of the process is the assessment of controversies in which the company is involved, because their effect can be detrimental to the company's rating in the way that they could rise the level of unmanaged risk.
- Finally, a company's overall **ESG Risk Rating** comes from the sum of the amount of each unmanaged risk for every material ESG issue.

In quantitative terms, company exposure is calculated by multiplying the issue beta by subindustry exposure. Furthermore, in order to compute the managed risk, it is first of all necessary to assess the manageable risk, that is the result of company exposure multiplied by the manageable risk factor. In fact, the managed risk comes from multiplying the manageable risk by the management score (expressed in percentage). The unmanaged risk if finally obtained subtracting the managed risk from the company exposure.
An important factor that contributes to increase the overall unmanaged risk level is the so-called "management gap", that represents the failure of the company to manage manageable material ESG risks and that, summed to the unmanageable risks, determines the unmanaged risk itself.
The sum of all the individual unmanaged risks makes up to the overall ESG Risk Rating score.[44]

ESG analysis and integration are critical elements of the whole ESG investing world and a deeper analysis will be presented in the next chapter, alongside with practical examples.

[44] ESG Risk Ratings, Methodology Abstract Version 2.1 - Sustainalytics (2021), Retrieved 28 February 2021, from https://connect.sustainalytics.com/esg-risk-ratings-methodology

CHAPTER 2: Integrating ESG analysis in Equity and Fixed Income portfolios and related risks

2.1 Integration of ESG screening in the portfolio

2.1.1 An ESG integration example: PIMCO GIS Global Bond ESG Fund

2.1.1.1 PIMCO and the "3E screening"

A recent study[45] from the University of Perugia and Fideuram Bank analyses the importance of sustainable investments in the financial market scenario, focusing on the impact that ESG screening and impact investing have on investor performance. Demand for investments that are able to provide a financial return that is in line with the desired environmental and social impact is growing at a very fast pace. The research study from Vannoni and Ciotti[45] focuses on a specific fund, PIMCO's GIS Global Bond ESG Funds (EUR Hedged), because it is one of the first funds in the world to integrate impact investing strategies in the investment decision process. The fund invests primarily in a diversified portfolio of investment grade bonds from around the world, on the basis of PIMCO's ESG exclusions, evaluation and engagement decisions.

In a book dedicated to ESG investing[48], John Hill analysis PIMCO practices and how the company is able to navigate the bonds' world, looking for issuers that provide best-in-class sustainable principles integration.

Pacific Investment Management Company LLC (PIMCO) is a subsidiary of Allianz SE, providing mutual funds and portfolio management and securities allocation services worldwide. The company manages around 1,7 trillion of dollars, focusing especially on fixed income products, including core bonds, structured credits, private credits, real assets and currencies. PIMCO is an interesting case of analysis because the company believes it is possible to achieve a satisfying financial return together with making a concrete positive impact. The company began to provide funds with a significant focus on ESG issues. The process on which the company relies to build portfolios that address ESG portfolios is based on the "3E screening":

[45] Vannoni, V., & Ciotti, E. (2020). Esg or Not Esg? A Benchmarking Analysis. *International Journal Of Business And Management*, *15*(8), 152. doi: 10.5539/ijbm.v15n8p152

- **Exclusion**: as the most part of companies applying an exclusionary approach as a first filter, PIMCO restrict investment in companies who are not considered sustainable, such as adult entertaining, tobacco and weapons, usually excluding those issuers with more than 10% of revenues deriving from these businesses. Instead, concerning government bonds, PIMCO excludes states and entities that have violated the Global Principles of the United Nations and that have internal controversies related to corruption and human right.[45]

- **Evaluation**: a second line of screening utilized by the company is a best-in-class ESG approach, that helps analysts to find companies with the best environmental and social practices and a strong and reliable corporate governance.

- **Engagement**: this step is a proof of the PIMCO's commitment to make a concrete step forward concerning the ESG subject. In fact, the company develops interactions with issuers in order to improve and develop their ESG practices.

2.1.1.2 ESG assessment process

In order to better integrate ESG issues into company practices, to support its sustainable growth and to provide ESG-focused funds for the investors, PIMCO has built a team that is fully dedicated to the ESG topic. Portfolio managers, in fact, can benefice from the help provided by this dedicated team in analysing companies, opportunities, capital structure, scores and while taking investment decisions.

The ESG assessment process of the companies in which there is an interest in investing involves a wide range of resources other than the analysis of the dedicated ESG team: in fact, the company also relies on third party data and more than 60 credit analysis. Concerning the ESG technology, the company has developed ESG proprietary tools:

-ESG analytics, it is a data warehouse that centralizes internal and external ESG data, providing the possibility to operate a reliable reporting and to help portfolio managers integrate ESG in their investment decision process.

-ESG Company Engagement Tool (COMET), an instrument that helps tracking the engagement and the progress of issuer companies.

-**ESG Business Involvement Screen (METRO)**, a tool that gathers detailed information on the involvement of issuers in non-sustainable activities such as weapons.
-**PIMCO Analyst Research and Recommendations (PARR)**, a system that deals with credit research views.

Furthermore, PIMCO's fixed income products can be split in four categories: corporates, sovereigns, mortgages and US municipals. PIMCO tends to adopt a different strategy for each category.
Concerning the corporate bond sector, the company analyzes the alignment of the ESG strategies implemented by the issuers with the bond's objective, focusing the attention on bonds that respect the UN Sustainable Development Goals, assessing the positive impact that an investment could have through the bond purchase phase. Red flags raise when controversies emerge around the concrete realization on the pre-defined positive impact.
In the sovereign debt market, PIMCO carries a deeper and more detailed risk analysis that aims to assess financial and ESG variables, assigning scores to sovereign bonds according to ESG factors, such as climate transition risk measures, impact on the cost of capital for governments in vulnerable countries, measures of air pollution and usage of natural resources. In addition to the ESG issues, PIMCO focuses also on International Sanctions and each of the four macro-areas has its own weight, summing up to the overall score.
In the mortgage market, instead, PIMCO adopts its own ESG scoring model that allows first to separate mortgage-backed securities (MBS) and non-agency MBS, providing a score that is based on four objectives: promoting responsible lending, paying attention and supporting homeownership, increasing the effort to provide access to underserved communities and discouraging lending for predatory purposes.
Fourth and last category is the US municipal bond market, a sector for which PIMCO applies a proprietary analysis that ranks each issuer on the basis of some predefined ESG pillars. Issuers are rated relative to peers for each of the ESG factors considered and the score is weighted considering the industry relevance, with the possibility for different credits from the same issuer to have different ratings.[48]

2.1.1.3 ESG benchmark comparison

Vannoni and Ciotti[45] in their study on the performance and integration of ESG factors in the PIMCO Global Bonds ESG Fund, conduct a qualitative analysis, analyzing the characteristics of the fund, and a benchmarking analysis, using as a comparison the Bloomberg Barclays Global Aggregate Index. The fund is a diversified portfolio of investments that are actively managed, consisting mainly of worldwide bonds (approximatively half corporate and half government bonds) that are rated BBB or more, picked by applying a ESG screening. Geographically, green bonds are issued from North America (33%), Europe (over 20%), Japan (17%), supranational (12%) and a group defined "rest of the world", including emerging countries.

As it is shown in *Figure n.5*, the study[45] shows that PIMCO fund managers prefers to invest in issuers that have an average rating higher than the Bloomberg benchmark, a result of the sophisticated selection based on the ESG screening.

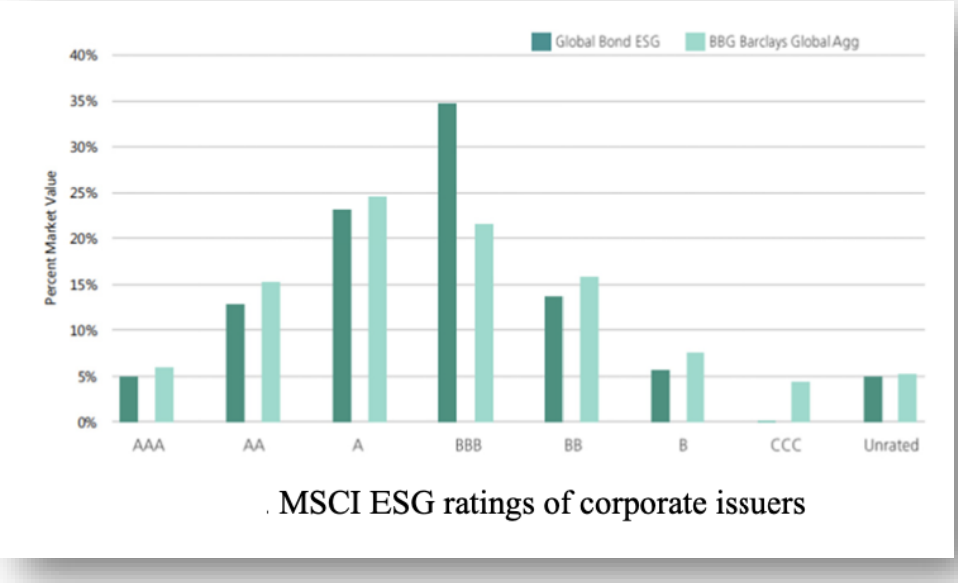

Figure n.5

Source: MSCI

Furthermore, *Table n.1* reports fund's performance versus the index: the gross performance for 2018 of the ESG fund has been more negative than the one of the indexes, a difference that has been recovered in 2019 when the fund performed better than the index. In average, Bloomberg benchmark has performed slightly better than the fund. However, what is interesting to observe is that the risk of the fund, that is measured by its volatility, compared

to its return, is lower than the one of the index. Moreover, another interesting indicator, the Sharpe index, that measures the excess portfolio return over the risk-free rate relative to its standard deviation, is higher for the PIMCO's fund, indicating a superior performance.

	PIMCO Global Bond ESG	Bloomberg Barclays Global Aggregate Index
Gross performance 2018	*(1.84%)*	*(1.04%)*
Gross performance 2019	*6.11%*	*5.58%*
Average performance	*2.14%*	*2.27%*
Duration	*6,8 yy*	*7,12 yy*
Volatility	*2.48%*	*4.72%*
Max Drawdown	*2.11%*	*2.25%*
Sharpe index	**1.78%**	**1.18%**

Table n.1

Source: Fideuram Bank

Therefore, the fund performs well compared to its benchmark, generates a reduction of the overall risk and allows investors to make a positive impact, with the possibility to also assess in quantitative terms their tangible contribution to the environment or society through transparent metrics adopted by PIMCO that provide quantitative assessment of the contribution.

The analysis succeeded in demonstrating that ESG screening and ESG integration can represent a competitive advantage in the long-term if well managed and that it can help to significantly reduce volatility and risks (direct and indirect), reducing their negative effects on the overall performance of the fund.

2.2 Equity vs Fixed Income ESG integration

2.2.1 Impact of ESG integration on Equity performance

The PRI organization has carried over an analysis[40] on the impact of ESG integration on the financial performance of companies, with a focus on the US market. US investors list clients' demand and financial performance as main reasons for ESG integration, with an increasing number of asset managers and asset owners believing that ESG investing leads to superior results. An interesting element that emerges from the analysis is that the last decade has been characterized by many ESG issues, such as climate change, labor and governance controversies, that have generated a negative impact on corporate performance.

Furthermore, data availability and reliability has also progressed a lot, with financial data providers delivering today high quality and accurate ESG data. However, US investors are still somehow skeptics when it comes to ESG analysis and data gathering, maybe due to the fact that it does not yet exist a common standard that allows to uniformly assess the ESG characteristics of all the companies. Asset managers have become more and more attentive to the due diligence process, posing their attention on how ESG issues are assessed and measured.

PRI analysis[40] presents concrete examples, based on three empirical studies, that ESG factors are involved into equities and fixed income performance, highlighting the fact that, today, the risk for investors no longer resides in the ESG integration, but in the lack or superficial consideration of ESG issues in the decision-making process. The three empirical studies on which the study lays its foundations are:

- A PRI proprietary study based on MSCI ESG Research analytics and data that aims to evaluate relative performance of portfolios adopting a "Momentum strategy" versus those adopting a "Tilt strategy." To specify, following the MSCI definitions, **ESG Momentum strategy** aims to overweight companies that increased their rating during the last 12 months, while **ESG Tilting strategy** aims to overweight stocks with higher ESG ratings. [46]
- BofA Merril Lynch Global Research study, that evaluates ESG materiality from an equity perspective.
- Calvet Research and Management study, that, instead, focuses on a fixed income perspective.

These three studies help to address common questions that arise within investors, focusing on certain issues such as the contribution of different strategies to return generation, the regional and industrial differences between alpha, and the effectiveness of ESG integration in both equity and fixed income universes.

[46] Nagy, Z., Kassam, A., & Lee, L. (2016). Can ESG Add Alpha? An Analysis of ESG Tilt and Momentum Strategies. *The Journal Of Investing*, *25*(2), 113-124. doi: 10.3905/joi.2016.25.2.113

Furthermore, the PRI study uses a 2017 CFA Institute survey[47] on ESG integration as one of its starting points. The results coming from the survey show that the link between ESG issues and financial performance can be among the top reasons for US investors that have not yet integrated ESG in their portfolios to do so.

This survey suggests that among the ESG issues, investors tend to integrate governance risk the most because lacks in this area have been responsible for financial crisis, instability and lots of companies' bankruptcies. Also, data disclosure and availability in the area of governance is wider than the one concerning environmental and social issues.

Nevertheless, the paper[40] highlights the possibility that there could be a greater return generation associated with environmental and social pillars, with the necessity, however, to be capable of gathering and exploiting the data. Incorporating ESG factors in investment decisions is becoming essential and it shows the materiality of the subject to investor analysis. Furthermore, ESG integration is gathering a greater attention also in the private equity field, because it helps to generate a solid long-term value for those companies who are capable of higher ESG standards and more performing business models, showing the tangible superiority of sustainable investments.

2.2.1.1 ESG Momentum vs ESG Tilt strategy

PRI study[40] has also analysed ESG data provided by MSCI to evaluate the performance of portfolios with assets that have improved ESG scores in the last 12 months versus portfolios with assets that present high ESG scores, with an extended geographical reach that comprises US, Europe and Japan. ESG Momentum strategy has been more beneficial for US and Japan, while for Europe it has been the ESG Tilt strategy to guarantee the best results. This can be a sign of the fact that Europe has been able to reach better levels of ESG performance faster than the rest of the world, probably due also to the major number of regulations that govern sustainable issues.

[4747] Environmental, Social and Governance (ESG) Survey – CFA Institute (2017). Retrieved 15 March 2021, from https://www.cfainstitute.org/-/media/documents/survey/esg-survey-report-2017.ashx

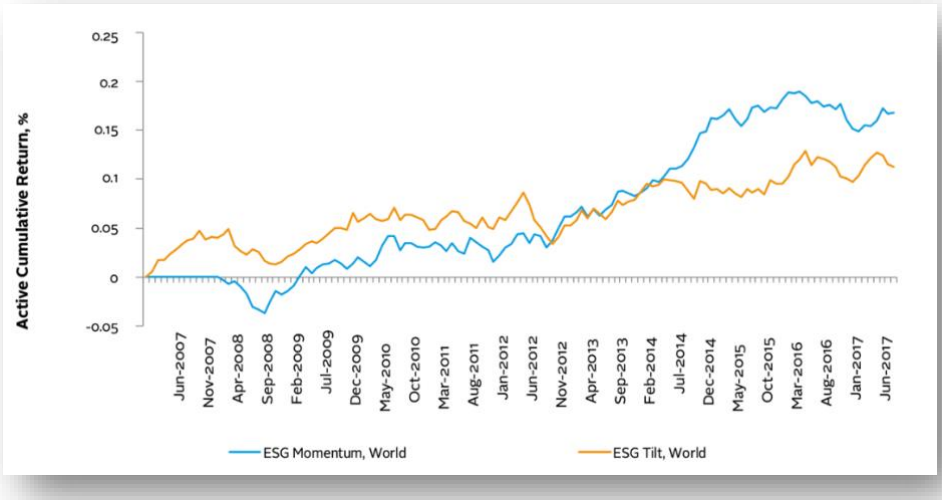

Figure n.7

Source: MSCI

From *Figure n.7* it is possible to observe the outperformance of the ESG Momentum world strategy over the ESG Tilt world strategy, starting from 2012, meaning that the first one has been able to generate a stronger alpha advantage with a higher active return given the same level of risk. The main component of this outperformance is the specific factor, that reflects the idiosyncratic risk and return of the specific industries, firms and securities.

A deeper look into country performance indicates that the US portfolio benefited from ESG momentum strategy, which outperformed the MSCI US Index by 18,8%[40] while ESG Tilt strategy registered an underperformance compared to the same index (considering a 10-year period). In this case, the outperformance of the ESG Momentum has been attributed to style, industry and specific factors, while the underperformance of the ESG Tilt has been explained as a drawback specific factor of the investable universe and sectors.

2.2.1.2 A geographical overview of the ESG issues

Investors are questioning the material dimension and the impact of ESG, questions that have been covered by the PRI study and the CFA Institute survey. In particular, from the survey it emerges that around 51% of respondents systematically consider ESG issues within their investment analyses, with equity (76%) being the asset class most commonly integrated. After the equity segment, in which nearly 80% of regional responders integrate ESG issues, concerning the fixed income spectrum, a higher proportion of respondents in EMEA

(Europe, Middle East and Africa) rather than AMER (North, Central and South America) and APAC (Asia-Pacific) integrate ESG analysis, with those in APAC being more likely to integrate ESG issues in private equity.

59% of the sample integrates ESG into its investment analysis, while 38% relies only on exclusionary screening, 33% on a best-in class investing and the rest of the sample is divided between active ownership, thematic investing and impact investing.

In respondents' perception, board accountability and human capital happen to be the most impactful ESG issue on financial markets, with 69% of the sample arguing that ESG disclosures should be subject to some level of independent verification, with a preference for professional services firms with experience in ESG matters to perform this analysis.

What is interesting to see from the survey is also the reason of the integration of ESG issues: a higher proportion of respondents in EMEA than AMER and APAC integrates these issues because they believe that it can help manage investment risks, generating a reputational benefit for the company. Fewer responders in APAC take ESG issues into consideration because of investors demand, being this topic more important in EMEA and AMER. Concerning the specific issues addressed by ESG investing, a higher proportion of respondents in EMEA rather than in AMER and APAC think that climate change will have an impact on financial markets, while board accountability presents the least considerable regional differences in responses.

The reasons identified by the respondents as limiting factors of a company's ability to integrate nonfinancial information in investment decisions are, in order of response: lack of appropriate quantitative ESG information, lack of comparability (and standards) across the firms, low data quality, too much genericity in ESG disclosure, high cost of data gathering, difficulties to access material information and infrequent disclosure. In terms of disclosure, a high proportion in APAC and EMEA, compared to AMER, agree that public companies should report at least once a year on a set of predefined ESG indicators. This introduction could alleviate the problems associated with the disclosure and the data gathering process.

Going into details, there is some granularity between the responses of institutional participants and private participants: in fact, concerning the institutional sample, the 53% says that it integrates ESG issues into its investment analysis motivated by demand from clients /investors, against a higher share of the private one, that stands at 76%. Instead, concerning the proven link between ESG and financial performance, the result is identical between the two categories, being the 55% of all respondents motivated by that reason for ESG integration.

The PRI financial study[40] has also incorporated a 2017 BofA Merrill Lynch Global Research study on the reliability of ESG data and, in particular, of the impact of these data on equity valuation. Fundamentals of companies within the highest ESG scores overperformed values of companies within the lowest ESG scores, with ratios such as enterprise value/EBITDA that have grown for the highest decile of the observation during the period considered (2005-2016). Furthermore, governance has also proven to have a strong impact on valuations: companies with negative scores have showed a drop in their P/E and P/B ratios. The magnitude of ESG integration depends also on the market capitalization, because larger companies have demonstrated to have higher ESG scores, and on the industry, because certain ESG factors are more relevant in certain industries rather than others.
The results demonstrate that it is possible to find attractive investment opportunities looking at companies that integrate ESG issues, with some sustainability pillars, firms and sectors having a greater financial materiality and profitability.

2.2.2 Fixed Income and Green Bonds

The PRI research[40] supports the idea that ESG integration results in having a larger impact on equities compared to fixed income, with share prices tending to be more responsive to ESG issues. However, the fixed income environment has been covered in the study, with data coming from a 2015 report issued by Calvert Research and Management, one of the major US asset managers, that focused on the impact of ESG issues on fixed income investment performance from 2003 to 2013. Results show that ESG factors are meaningful to companies' performance, with firms in the top half of the sample registering an overperformance of 6.8%. By analyzing in more details the results, from the study emerges that individual ESG pillars offer different degrees of alpha generation: in particular, companies in the top half have experienced 5.4%, 4.1% and 0.6% of alpha level respectively for environmental, social and governance scores. Even if governance is usually considered more often in the investment decision-making process, it has the lowest impact on fixed income performance according to the study, being environmental and social the two issues with the potential to deliver higher alpha.
Another simulation from the same Calvert research suggest that lower quality bonds are more likely to benefit on the spread side from the ESG integration compared to investment

grade bonds. A reason for this could lay on the fact that ESG information for high quality companies goes through a more transparent and efficient process, compared with lower quality firms, where ESG disclosure is rarer and more inaccurate.
Fixed income is, however, mainly characterized by the possibility for companies to issue bonds destined to specific sustainable projects, the so-called **"green bonds"**.

ESG bond funds buy debt of companies that have good scores in terms of ESG metrics. However, in this case, companies are not obliged to use the debt to finance a specific project. Here comes the difference with the green bonds, that are another way of investing in fixed income. John Hill's book Environmental, Social, and Governance Investing[48] defines the green bonds as *"securities issued for specific projects which are designed to achieve environmental goals".* This description mean that an investor is financing a specific green project when buying this kind of fixed income assets, instead of generally investing in companies who comply with the ESG requisites and that could use the money for different purposes. However, green bonds are not a different class of fixed income assets, but they still have all the requisite of conventional bonds, with the sole peculiarity to be issued for specific financing purposes. Here the transparency element is more evident, and investors can materially assess what are they contributing for, and which kind of investments are they financing, whit some implications in terms of emotions and sensibility, that are important drivers when investing in green bonds.
The range of project who are usually covered by the adjective "green" are related to energy efficiency, water and waste management, pollution prevention and others.[48] Besides being positive investments for the environment, green bonds usually carry tax incentives, certificates from third parties, and the same credit rating of the issuer: all of this together makes them more appealing than normal bonds.

The "Green Bond Market Summary"[49] for the third quarter of 2020 has collected some key figures about the importance and the awareness that have characterized the green bonds phenomenon in the last years. The third quarter has represented an all-time record, with almost 70 billion of dollars of issuance, the highest value in any third quarter period.

[48] Hill, J. (2020). Environmental, social, and governance (ESG) investing. Academic Press.
[49] Climate Bonds Initiative (2020). GREEN BOND MARKET SUMMARY Q3 2020. Retrieved 10 February, from:https://www.climatebonds.net/system/tdf/reports/cbi_q3_2020_report_01c.pdf?file=1&type=node&id=54810

Figure n.8 shows how the money poured into green bonds have been invested throughout the last years, with energy that in 2020 has been an important slice, representing the grown interest aroused around the concept of energy efficiency and energy production through clean energy sources.

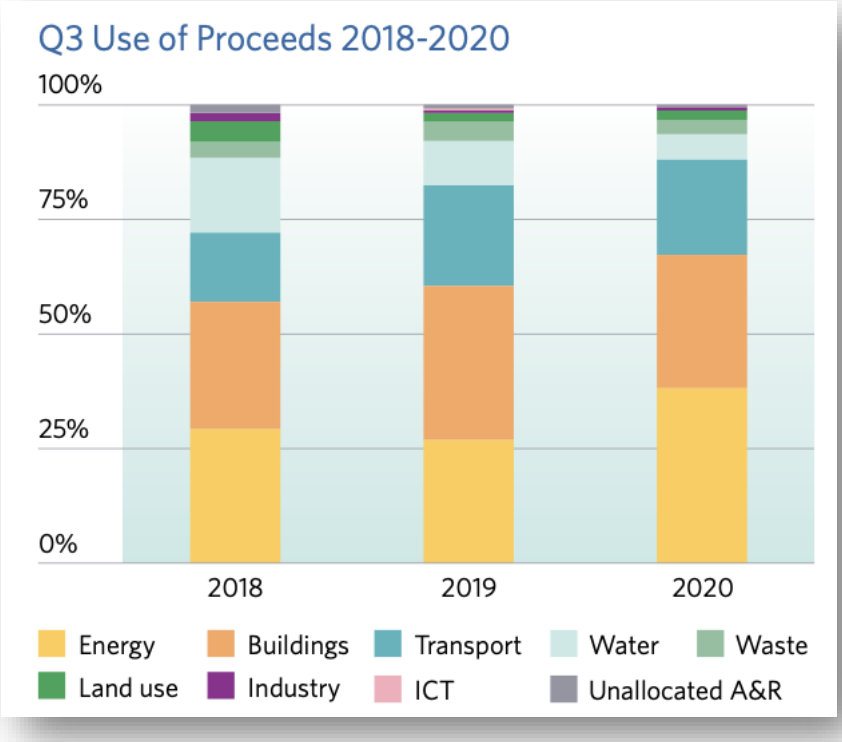

Figure n.8

Source: Climate Bonds Initiative, 2020

The cumulative issuance of green bonds since inception has reached 948 billion of dollars, surpassing the 1 trillion dollars milestone early in December 2020. The 2020 figure, 269,5 billion of dollars of green bonds issued, is the highest since market inception and holds the trend of nine consecutive years of steady green market growth.

The COVID-19 has been, between the others, one of the factors who has fostered the awareness increase around a sustainable and green recovery. Most countries and institutions around the world have shown concrete action to reduce their emissions and to comply with more stringent environmental and pollution policies. Some countries that have always been relying on energy from non-renewable sources as the basis of their economy have released public statements with challenging objectives in terms of pollution practices. China, for example, has stated to have set its goal to be carbon neutral by 2060, while the European

Union has set this goal for 2050 along with an important digital transformation.[49] Furthermore, in the last years China has started to show a stronger commitment in terms of environmentally friendly processes, being the second world issuer of green bonds in terms of volume, after the USA. France places itself at the third place, while Italy is still far from the first positions *(Figure n.9).*

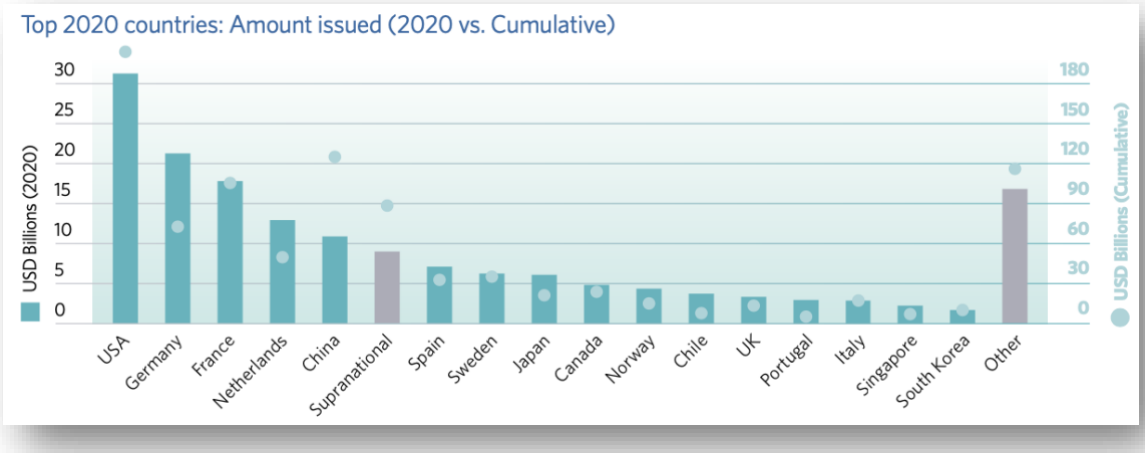

Figure n.9

Source: Climate Bonds Initiative, 2020

These challenging goals set by countries and institutions around the world imply also that a lot more companies need to align and transform their operations if they want to respect the new standard and to be competitive. *Figure n.10* shows that financial and non-financial corporate issuers have been the biggest issuers of green bonds in every quarter since 2018.

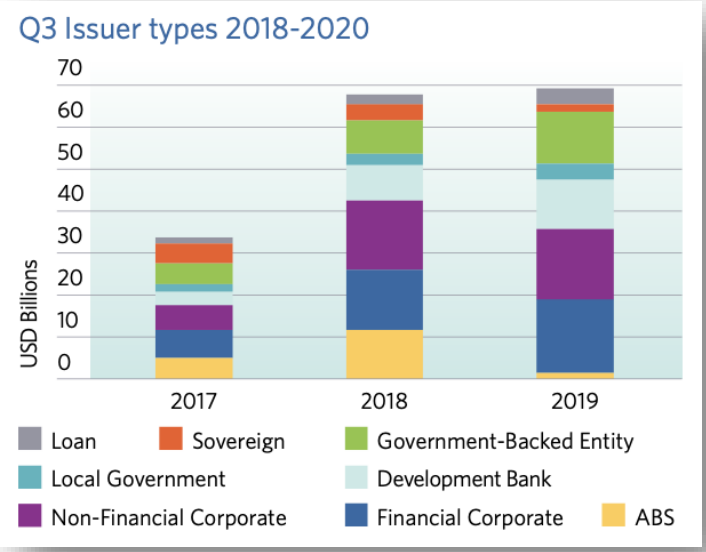

Figure n.10

Source: Climate Bonds Initiative, 2020

For the financial sector, Munich Re, ING, Rodaobank and the Norwegian covered bond issuer Sprebank 1 Boligkreditt have been the biggest contributors to green bonds. Furthermore, with the strong policy support that will be implemented through the next years, the bank sector is expected to expand at a faster rate, because of the wider green lending opportunities and the increased attention for this kind of financing. In terms of non-financial companies, utilities, real estate and electric mobility related companies have been the primary issuer of green bonds. Between these, Daimler and Volkswagen have been the largest issuers, with the aim of financing their electric vehicles market expansion.[49]

Around 69% of the total green bonds issued in 2020 are listed on stock exchanges, with the European ones outperforming the US and Asian counterparties: the Luxembourg Stock Exchange appear to be the most popular platform for green bonds, followed by Euronext Paris and German Stock Exchange.

It is also worth mentioning some green bond indexes, often used as a benchmark by asset managers who build sustainable portfolios. Some of the most known are:

-Bloomberg MSCI Barclays Green Bond Index, that assess the required green criteria using six MSCI eligible categories;

-BAML Green Bond Index, requiring bonds proceeds being used for climate change and environmentally sustainable projects;

-S&P Green Bond Index, characterized by securities with the "Climate bond initiative" label.

ETF are widely available for investors, making the investments easier and appealing, through a various range of offers.
A question that often arises is: "Who is in charge to check that a determined company uses the money from green bonds for the predefined projects?". The International capital market Association (ICMA) provides the guidelines for "green principles" that companies should follow, delegating the role of reviewers to external certified companies.[48]

Concluding, green bonds market has experienced an important expansion in the last years and, with the combination of the increasing number of sustainable projects and the climate related policies, their volume will likely reach new historical records. The opportunities are many, with the possibility for investors to finance sustainable projects relevant to the world's transition to a carbon-free economy.

2.3 The ESG investment decision-making process

If investors want to include in their investment decision-making process companies who comply with environmental and social friendly policies, they normally have to rely on external analysis or make one themselves. A recent Vanguard study[37] indicates four steps as main pillars of this decision-making process.

The first one is "Define goals": investors need to know which ESG issues want to address while deciding which approaches are the most appropriate. This decision can be harsh, considering all the variables that need to be taken into account. First of all, it is necessary to have a clear idea of the focus areas that the investment strategy will cover. This step helps to identify the market opportunities that can be considered and the ones that have to be avoided.
When it comes to ESG issues, investors preferences are often different. Some investors prefer to completely avoid investing in unmoral or undesired businesses, while others prefer to define a threshold of "sin activities" under which the company can still be considered as part of the investable universe. Some investors, instead, are uncertain about how to behave concerning companies that on one side operate in undesired businesses, and on the other are

actively engaging with innovation and complying with the increasingly new and stringent regulations.

Investor's choice is determined by a mix of elements, among which there are preferences, beliefs, goals, analysis and circumstances. Their objectives can consist in satisfying preferences (for instance environmental, moral and ethical preferences), generating financial results, contribute to a change in a particular domain (for example, an investment directed to finance a green project) or meet legal requirements (e.g., institutional investors who need to comply with certain regulations).

When the goal has been clearly set, investors can move to the second step described by the Vanguard research[37], "Evaluate options". This step aims to individuate ways to address the goal or set of goals set in the previous phase. Investors who want to consider ESG issues in their portfolio need to develop an integration approach. This integration can be conducted through engagement actions with companies who will be included in the portfolio, for instance through an active ownership. Shareholder engagement will be extensively examined in the next section.

Portfolio screening represents a key and more complete approach towards the evaluation of companies or securities. Screening can be **negative** (exclusionary), consisting in excluding companies operating in undesired or unethical industries, or **positive** (inclusionary), meaning that businesses with strong ESG commitment are purchased or overweighted in the portfolio. Usually, the inclusive screening is based on a "best-in-class" approach, meaning that only companies, with the highest ESG score, within peers in the same industry, with the strongest environmental and social practices are considered for an investment. A negative screening, however, carries a drawback: some firms who operate in industries that have a low ESG score but are allocating a consistent part of the budget to sustainable activities could be excluded from a portfolio because of that industry score. A best-in-class approach, however, could be an efficient way to avoid this situation.

An important element to take into consideration is that the screening approach could exclude some profitable companies from the portfolio, as well as including worst performing companies, generating a financial drawback. Evaluating options bears risks that investors need to be aware of, especially when choosing to invest in companies with a strong ESG commitment which, at least in the short term, may be subject to an underperformance.

After having evaluated the available options, the third step consist of "Deciding how to proceed", building on the goals and the preferences of the investors. This step includes the

development of a strategy and the necessary documentation to realize the pre-defined goals and an assessment of the direct and indirect effects of each single option that will be taken into consideration.
The fourth and last step of the process described by Vanguard is the "Periodical reassessment", that is the phase in which investors monitor and review their decisions, determining if the options have performed according to the expectations and if any action is required at this point.

2.4 Shareholder Engagement: a real impact on sustainable issues

Kölbel, Heeb, Paetzold and Busch[39] assert that the shareholder engagement occurs to be the best way for investors to make a real impact, supported by empirical demonstration. This shareholder engagement can be expressed in three ways: building a portfolio of companies who have good chances of success at for whom the investment will generate a positive development of the company impact; allocating the capital only to companies who operate in less mature financial markets but who have a positive impact; screening out investments who do not match the ESG criteria. The three ways underlined by the authors are respectively engagement, capital allocation and indirect impacts. These elements strongly influence the company, by allowing the firm to adapt to the activities that can be financed by investors interested in making a tangible impact and also to comply with social and environmental criteria that would otherwise reduce the amount of funding received.[39]
The study[39] also finds evidence that shareholder engagement is a factor that can help a company increase its ESG rating and can trigger adoption of reforms that are beneficial both for the quality of company activities and the environmental and social value generated.

An important element of the shareholder engagement is the cost of the engagement: how much does it cost for a firm to adopt a reform proposed by the shareholders.
Kölbel, Heeb, Paetzold and Busch analysis[39] points out that reforms related to the environmental issue are the most expensive and have less chances to succeed. Instead, the highest rate of success has been evidenced in issues concerning the social and corporate governance domains, who also carry a lower cost of implementation. This implies an inverse

relationship between the chances that a reform would be adopted and the cost of these reforms: the possibility of success decreases when the cost of the reform rises.

The research[39] has also addressed the investor influence topic: in fact, evidence suggest that engagement requests are more likely to succeed when the shareholder has an important financial participation in the company. Furthermore, previous ESG experiences account for a higher degree of success of reforms proposed by shareholders.

Capital allocation gives investors the possibility to influence company activities incentivizing improvements or affecting growth. Concerning the first point, when investors underinvest in certain companies or totally exclude them from their portfolios because they do not match ESG criteria, the portfolio allocation is different from the market portfolio. In this scenario, companies feel incentivized to adopt ESG practices, even though there is no empirical evidence that the screening approach adopted by some investors directly triggers any changes in corporate behaviour.

However, some evidence shows that screening approaches have an impact on asset prices. Fama and French[50] show that investors with neutral preferences require a premium for balancing out investors who take decisions based on non-financial preferences: in fact, because of this, preference-neutral investors are obliged to deviate from the market portfolio. Heinkel et al.[51] provide an analysis in this sense, making a numerical example that indicates the necessary effort from investors in order to generate a company reform: 20% or more of investors have to apply the same screening approach in order to foster a reform that costs 5% of the company's annual cash flow.

Notwithstanding, uncertainties remain around the required share size of sustainable investors necessary to cause meaningful movements in asset prices that consequently encourage the company to take action and improve practices.[39]

Other studies have showed that assets prices tend to be highly affected by screening approaches of sustainable investors. In fact, decisions taken by investors and asset managers related to the divestment or exclusion of some companies in their portfolios lead inevitably to a decrease in capital availability for those companies. In turns, excluded companies feel the need to adequate their policies in order to gather investments and foster profitability.

[50] Fama, E. F., & French, K. R. (2007). Disagreement, tastes, and asset prices. *Journal of Financial Economics*, *83*(3), 667-689. https://doi.org/10.1016/j.jfineco.2006.01.003

[51] Heinkel, R., Kraus, A., & Zechner, J. (2001). The effect of green investment on corporate behavior. *Journal of Financial and Quantitative Analysis*, *36*(4), 431-449. https://doi.org/10.2307/2676219

However, even if the literature demonstrates that the capital allocation of investors has an impact on asset prices, there is still an ongoing discussion about the width of this impact and about the effective translation of changes in asset prices into practical changes in ESG practices.[39]

Furthermore, some studies[39] indicates that the practice of providing capital at favourable conditions to companies considered to have a beneficial impact on the environment and the society is widely diffused by **development finance**, that is defined by the Council of Development Finance Agencies as *"the efforts of local communities to support, encourage and catalyze expansion through public and private investment in physical development, redevelopment and/or business and industry in a manner that benefits the long-term health of the community."* [52] In order to make a difference, the capital allocation has to come from investors holding an important market share: in this way, the impact will be both in terms of managerial incentives to change and reduction of the cost at which the company will be able to raise capital.[39] However, even if there is evidence that big companies who enjoy good ESG ratings are required to pay a lower cost of capital, there is some ambiguity when it comes to define if this cost of capital is due to investor impact or to better risk characteristics shown by those companies.
All that said, shareholder engagement appears to be a reliable way in which investors can have a real impact on the activities of a company, playing a key role in shifting the attention towards improvements around the ESG topic.

2.5 ESG Risks: data reliability and greenwashing

ESG investing is a phenomenon that has recently experienced an increased awareness as investors interest for sustainable topics grows. Investors and new regulations and policies push to invest in funds and companies that can benefit the society as a whole, while generating returns. In Europe only, ESG funds have attracted net inflows of 151 billion euros between January and October 2020, an increase of around 78% from the same period of 2019. However, there is a tangible concern that the boom has been overestimated, because some providers could have overestimated their sustainability credential during the estimation

[52] CDFA - What is Development Finance?. (2021). Retrieved 16 February 2021, from https://www.cdfa.net/cdfa/cdfaweb.nsf/pages/df.html

and assessment phase in order to attract more capital. This trend is known as "*greenwashing*".[53] More in details, *greenwashing* refers to a communication strategy aimed at supporting and enhancing the company's environmental reputation through the use of references to the environment in institutional and product communication, not supported by real results in terms of improving the processes adopted, company practices or the products offered.

Today, asset managers have the duty to consider risks related to the sustainable sphere of the investment decision-making process, alongside with financial risks, and disclose this information to investors or explain why certain information are not relevant.

Years ago, ESG integration was not widely diffused and it was left to few ESG specialists. Now, due to the new regulations who make compulsory for investment managers to disclose information about their financial products, more asset managers will need to take action and to consider ESG integration as a key requirement for all funds. The increased requirements will also increase competition between fund managers, raising the quality and the number of ESG-based funds. However, the regulation around reporting standards is not yet completely clear and main indicators have still to be drawn, leaving the possibility for some asset managers to overestimate their funds in order to attract business. In order to avoid this, the introduction of common indicators versus which funds have to report is necessary and regulators are working to come up with a complete framework that will leave little space to interpretations, building on what asset managers have already provided.

A major problem that asset managers could face is sourcing sustainability data from the companies they invest in. In fact, the lack of global standards for corporate ESG disclosures means that the availability and quality of information varies a lot between companies and data providers. Eurosif[54] estimates that of the 32 ESG data points that asset managers have to report on under current regulation, only eight of them are available today.

The lack of clear standards represents a risk that the EU is aiming to solve, though the implementation of the Non-Financial Reporting Directive, which provides guidelines for sustainability disclosures.

[53] EU rules promise to reshape opaque world of sustainable investment. (2021). Retrieved 5 April 2021, from https://www.ft.com/content/87615a23-0105-4210-8e7f-ccf84370656e

[54] The European Sustainable Investment Forum (Eurosif) is a European network dedicated to promoting the integration of ESG (Environmental, Social and Governance) criteria into financial management, mainly through lobbying European institutions, publishing research reports and organising events to raise investor awareness of ESG issues.

However, a fundamental long-term question is whether the disclosure regulation will be effective in avoiding greenwashing, while at the same time routing capitals to sustainable economic activities. The French financial regulator, the AMF, started to require local funds to comply with minimum thresholds in order to refer to themselves as ESG funds. The European regulator wants to introduce similar rules at EU level to safeguard investors, protect the credibility of ESG investing and uniform ESG data and methodologies.
European financial institutions, such as the European Leveraged Finance Association (ELFA), that includes all the international players of the leveraged financial market, the Loan Market association (LMA), which brings together participants in the syndicated loan market, are working on guidelines to which market participants must adhere when structuring terms that incorporate ESG factors, with the aim to draw a common standard and to avoid greenwashing practices.
ELFA and the LMA have identified some variables to be considered and included in sustainable finance documents:

- ESG targets to be considered relevant for the borrowing company should be established a priori (e.g., companies that emit large amounts of CO2 should include a measurable target for emission reduction in their ESG ratchets). This is useful to implement a sort of standard when evaluating and weighting ESG issues.

- ESG KPIs *(key performance indicators)* should be carefully defined in advance and should be meaningful and ambitious. They shouldn't represent something that can be achieved in a short period of time on the companies' side. This indicator can help understand if a company is consistent with its promises or if it is just trying to sell its activities as green, without real effort.[55]

Some sort of standardization and homogeneity in ESG practices is necessary in order to avoid ambiguous and unclear situations where greenwashing could spread, with the regulators playing a key role and the need for comprehensive guidelines that may remove any doubt about ESG issues, integration and disclosure.

[55] ELFA e LMA al lavoro per evitare il greenwashing nei regolamenti dei finanziamenti sostenibili alle imprese. (2021). Retrieved 8 April 2021, from https://www.bebeez.it/greenbeez/elfa-e-lma-al-lavoro-per-evitare-il-greenwashing-nei-regolamenti-dei-finanziamenti-sostenibili-alle-imprese/

CHAPTER 3: The global electric-vehicle market and ESG investment opportunities

3.1. The global electric-vehicle market

3.1.1 Outlook, characteristics, evolution and trends

The shift from traditional transport to electric mobility is now one of the major trends of the 21st century, strongly demonstrated by movements in the market: the respectively 1200% and 420% year-to-date surge in Chinese electric carmaker NIO's and Tesla's stock value show that investor excitement around electric vehicles is increasing. IHS Markit, a London-based information provider, reports that EVs sales amounted at around 2,5 million in 2020, accounting for about 3.3% of the 76.5 million vehicles sold globally, with expected sales for 2025 of 12.2 million, indicating annual growth of nearly 52%.

Due to a change in customers' preferences, increased awareness around the sustainability topic, carbon free global policies, governmental incentives, lowered manufacturing costs and mass production of electric vehicles, the market has gone through a consistent expansion, setting 2019 as a record year in terms of sales.

While 2018 has been an important year for the electric mobility sector, characterised by an unprecedent economic growth and increase in awareness, 2019 has represented one of the highest moments for the market, with 2020 confirming the enthusiasm for the alternative transportation despite the Covid-19 outbreak. Interestingly, as reported by PwC in a sales review for 2020[56], the pandemic has mostly affected sales of traditional vehicles, who have suffered the pressure of the market downturn.

A McKinsey's 2019 research[57] shows that the global electric vehicle industry is making solid progresses. From the report it is possible to notice that performance is different if the regional bias is taken into consideration, with some EV markets really opening up to the phenomenon,

[56] PwC, Strategy& – E-mobility Sales Review Q4 2020 (2021). Retrieved 13 April 2021, from https://www.strategyand.pwc.com/de/en/insights/2020/e-mobility-sales-review-q4/e-mobility-sales-review-q4.pdf

[57] The future of mobility is at our doorstep - McKinsey Center for Future Mobility (2019). Retrieved 9 April 2021, from https://www.mckinsey.com/~/media/McKinsey/Industries/Automotive%20and%20Assembly/Our%20Insights/The%20future%20of%20mobility%20is%20at%20our%20doorstep/The-future-of-mobility-is-at-our-doorstep.ashx

while others being neutral. This is shown by the fact that sales of electric vehicles worldwide are increasing, creating new sources of profit that were not there before, but also affecting the margins of the vehicles that do not use electric power *(Figure 11)*.

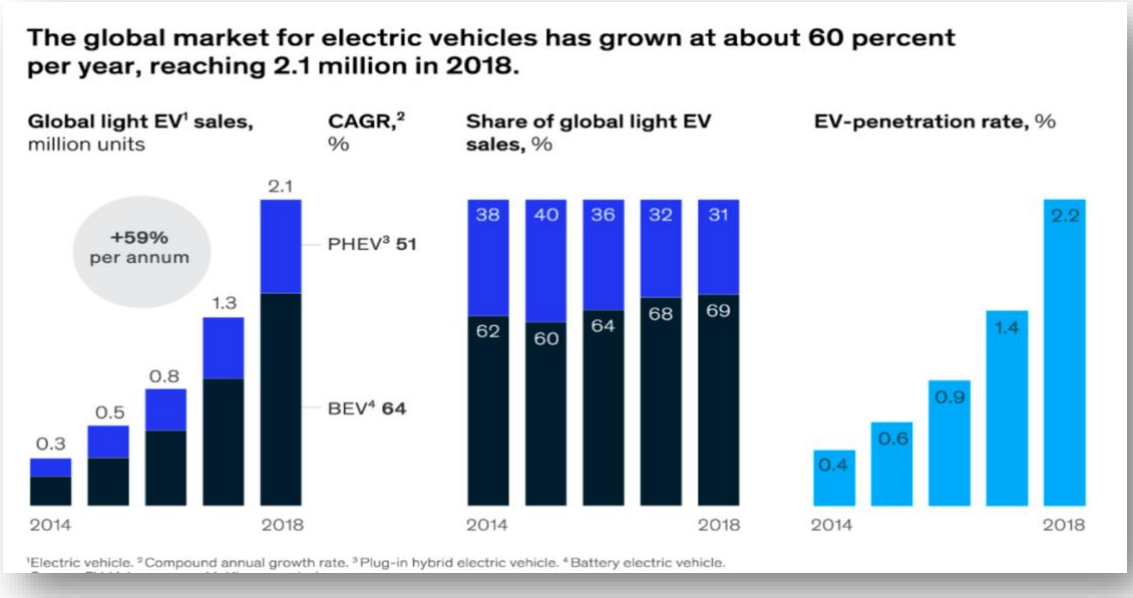

Figure n.11

Source: EV-Volumes.com; McKinsey analysis

The market in 2018 has experienced an increase in sales of around 2.1 million units worldwide, with an increase of 63% on a year-on-year.[57] In 2019, the number of units sold increased to only 2.3 million, a year-on-year growth of just 9 percent. Furthermore, more disappointing are the results of the first quarter of 2020, with a sales decline of 25%.[58]

The share of light EV sales has decreased, instead, showing that despite the disruptive growth, EVs still only represent a fraction of the overall market. However, the penetration rate has kept increasing, growing more than 5 times in 5 years, standing at 2.2%. Despite this, Europe has seen the most significant growth in EVs, with a market share expansion of 44%.

At the same time, instead, global automakers had a tougher time in 2018 and 2019, with higher expenses required to meet stricter emission regulations, tensions in global trade and slowing sales in key markets.

[58] McKinsey Electric Vehicle Index: Europe cushions a global plunge in EV sales (2020). Retrieved 11 April 2021, from https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/mckinsey-electric-vehicle-index-europe-cushions-a-global-plunge-in-ev-sales

On the investment side, there has been an acceleration of investments in the EV market, mainly directed to e-hailing (a process of ordering a car, taxi, or any other form of transportation pick up via a virtual device), sensors for semi and full autonomous driving systems, semiconductors, Electric Vehicle and charging manufacturers.

3.1.2 Regional outlook

McKinsey has developed a proprietary Electric Vehicle Index (EVI) that tracks the performance of key countries around the world in adopting EVs. The index explores both the market and demand dimension and the industry and supply sides. On the market side, it takes into consideration the share of EVs in the market, incentives and subsidies offered by the government and the actual infrastructure. On the industry side, instead, the index tracks the success in supporting the electric mobility diffusion.[57]

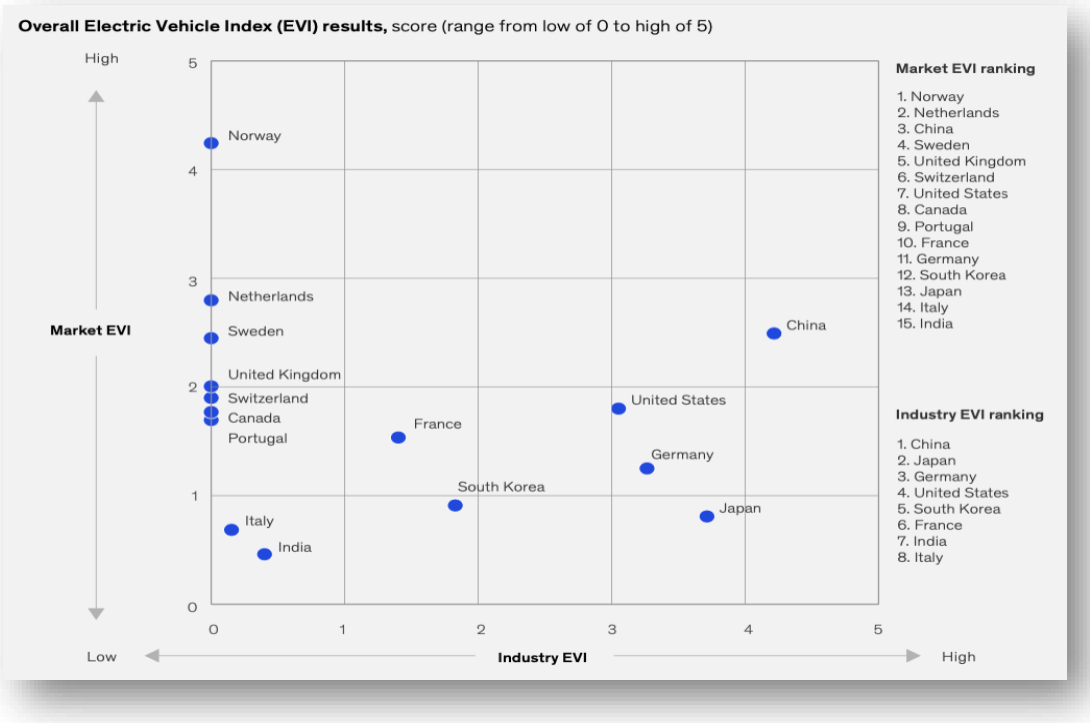

Figure n.12

Source: McKinsey analysis

Figure n.12 shows the EVI results for 2018, with Norway leading the electric-vehicle adoption on the market side and China being the leading country on the industry side. Norway is significantly ahead of the competitors and it is on its way to mass-market adoption. In the complex, the European market has seen an important growth, with a lot of differences at the country level. In 2019 sales have increased by 44%, the highest rate since 2016. The Netherlands alone has experienced an increase in sales of 144%, a result coming from larger battery size available on EVs, demand for new models and government incentives. Due to the new and more stringent sustainable regulations, especially in terms of CO2, adoption of EVs is expected to grow faster starting from 2021, with a resulting increase in EVs market share.

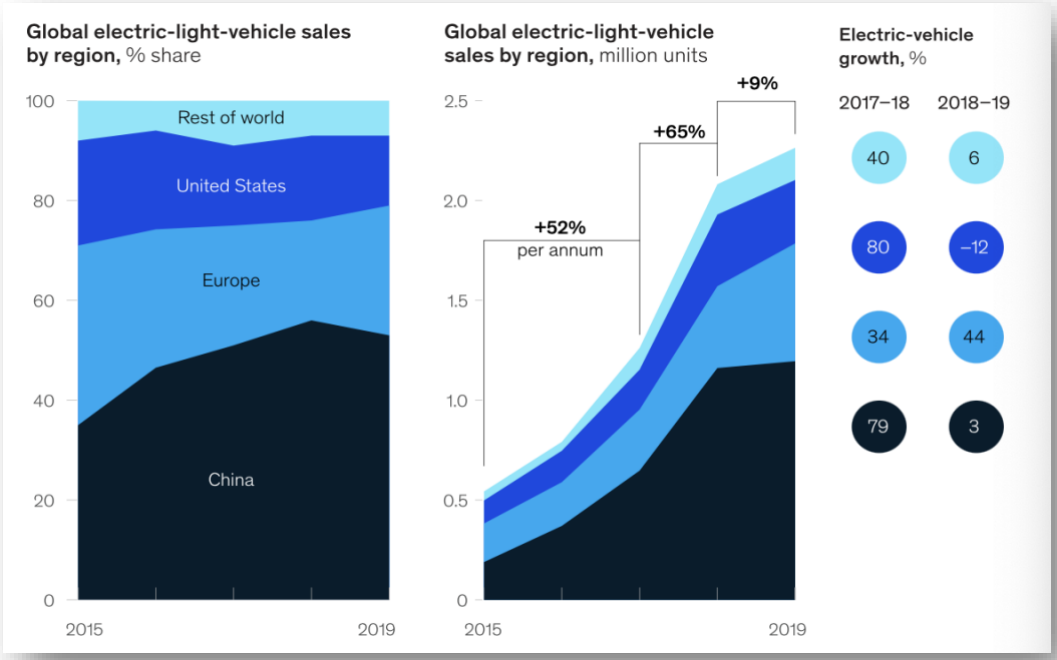

Figure n.13

Source: McKinsey analysis

In 2019, however, the situation is slightly different, with changing regional dynamics: Europe has gained ground to the detriment of China and United States *(Figure 13).* China has experienced a slowdown in EVs sales. The slowdown has been confirmed in the first quarter of 2020 due to the Covid-19 outbreak, with a drop in sales of 57% compared to last quarter of 2019. In the US, EV sales increased by 80% percent in 2018, especially pushed by the launch of a standardized and more affordable Tesla Model 3. Indeed, Tesla has

continued to be a market leader in 2019, with 370.000 units sold globally, with a market share of 16%.

In the biggest European EV markets, France, Germany, Italy, Spain and UK, sales have been growing rapidly in 2020, with an increase of 146% in Q3 alone compared to Q3 of the previous year, with a cumulative market share for the first five European markets of 19%. Sales of plug-in hybrids have grown exponentially, by 400%, in France and Germany, compared to the same period of last year.
In the USA, EVs have not experienced an important diffusion so far, with an overall increase in sales of only 8% and a market share standing at around 5%, mainly driven by hybrid vehicles.
Concerning China, EV sales have grown by 49% in Q3 2020 compared to the same period of 2019, stimulated also by the tax breaks announced by the government. The market share stands at 6%.

3.1.3 The future of electric mobility

Nine of the top ten markets for electric-vehicle penetration rate were European in Q1 2020.[58]
It is worth mentioning the fact that 143 new electric models have been released in 2019, with automakers planning to introduce more than 450 new models by 2022.
In order to cut the EVs production costs and to be competitive on the market, automakers have decided to relocate the production of vehicles and auto parts. Tesla, for example, has built a Gigafactory in Shanghai in 2019, planning to open another production plant in Germany by 2021. Other companies, such as Toyota and Volkswagen have followed the Tesla's example, making plans to open EV plants in China. Furthermore, after the affirmation of Tesla as the world's most valued automaker, Volkswagen has announced that more than 70% of European sales will be EVs by 2030, while the target is 50% for U.S. and China. Huge investments in this direction will in fact follow in next years. The German company plans to spend by 2025 about 19 billion dollars to invest in electric mobility, hybridization and digitalization, with the aim to make autonomous driving widely available for the mass market.**Error! Bookmark not defined.**

The EV has experienced a quick and strong growth in last years, with pronounced differences

between regions that will be likely to accentuate in next years. The transition from traditional vehicles to electric mobility, supported by strong environmental policies, the huge technological development in EV technologies and the subsequent cost cutting, and a diffuse and more efficient charging network, will probably continue building on these forces, expanding at a pace faster than ever.

To gain market share and to be competitive on the market, both automakers and suppliers need to have a clear view of what's happening in the market, the regulatory framework development, the moves of competitors and new entrants and carefully following consumers' demand.

However, lower oil prices could represent a threat to the adoption of EVs, considering that conventional and less expensive vehicles could be considered a better alternative to more expensive electric cars. High upfront prices for EVs are always the reason why consumers do not consider buying an EV as a real alternative. However, what consumers often fail to understand is the fact that the real cost of an EV is lower if considered in the long term, with the possibility to be amortised if considered through eco-incentives, tax benefits and the lower costs of a full recharge compared to fuelling a traditional vehicle over and over.

Another threat could come from the withdrawal of government incentives, as experienced in China, that could slow down the EVs adoption.

Electric mobility could mature also in the form of sharing mobility, with companies such as Uber and Lyft that are growing fast. However, considering the reduced long-term costs of buying an electric vehicle, compared to ridesharing, owning a vehicle will still be the best choice in terms of dollar cost per kilometre and, once the industry will be mature enough to offer competitive prices, together with private and public incentives, EVs will be more appealing than other solutions.

Another important development that will interest the sector is the implementation of artificial intelligence and internet of things (IoT) systems, which will make vehicles increasingly connected and autonomous. Estimates of the opportunities created by autonomous driving range from hundreds of billions to trillions.[64] The market, however, is already becoming competitive, due to the fact that many technology companies are pursuing these new revenue streams. An example of this interest of these companies, who have little in common with the transportation sector, is Apple, that in December 202 has confirmed to be working on a prototype of electric car, planning to release a vehicle in next three to six years.

The production of these advanced vehicles requires huge investments today and strategic partnerships that will allow some automakers to lead the race and gain precious market share and also to find a way to make profitable the time that future drivers will no longer have to spend driving their vehicles.

3.2 The critical role of the supply chain

The supply chain of electric vehicles is similar to the one of the internal combustion engine vehicles. The difference resides in the fact that, while for traditional cars the competition arises around engine and transmission, EVs compete based on battery capacity. In fact, batteries represent a key differentiator between the different EV manufacturers, who have spent millions of dollars to improve the capacity and the technology of batteries and chargers in order to make the final vehicle efficient and profitable. The fastest chargers take today no more than 15 minutes for a full recharge, solving the problem of long recharges that for years have also affected the mass diffusion of EVs.

Electric batteries are currently considered too expensive, priced between 150$ and 200$ per kWh, but projected to experience a price drop to 75$ per kWh between 2025 and 2030, mainly due to economies of scale and technology development.

According to Bloomberg New Energy Finance (BNEF), annual EV sales will increase to 11 million in 2025 and 30 million in 2030, with a consequent increase in batteries' demand.[59]

The key component in EVs production is the battery pack, that accounts for 30-40% of the price of an electric vehicle, being the costliest component. Battery packs are the final stage of EV's battery production and are composed by battery modules, electrical connections and cooling equipment.

Battery-cell manufacturers are working to increase production capacities and meet the demand. Due to the "learning effect", in recent years the price has experienced a significant drop, with manufacturers always finding new ways to improve efficiency. The lithium-ion-battery market for electric vehicles in fact has grown to 117 gigawatt-hours, an increase of 17% in 2019 alone, with China leading in terms of market share. In 2020, China accounts for 77% of the world production of lithium batteries, with the US at 9%, Asia (excluding

[59] Coffin, David, and Jeff Horowitz. "The supply chain for electric vehicle batteries." *J. Int'l Com. & Econ.* (2018): 1.

China) 8% and Europe holding only 6%. This data clearly explains the reason why an automaker like Tesla decided to open a Gigafactory in Shanghai: cutting supply chain bottlenecks and getting access to a critical component in a cheaper and faster way. In fact, lithium-ion batteries cell production located nearby auto plants minimizes supply chain disruptions, helps the relationships between automakers and battery manufacturers (long-term relationships are in fact fundamental for automakers to survive) and reduces costs.

Forecasts indicate that by 2025 Europe could increase its production to 25%, strongly impacting the market share of the other regions, especially lowering China's market share, who will settle at 65%. The biggest capacity increase through 2025 could be led by Tesla, reaching more than 100GWh, thanks to its new Gigafactory in Germany, followed by other manufacturers in Poland and Sweden.

The goal is set to 1000 gigawatt-hours by 2025, with global production of lithium-ion battery capacity set to increase by 218% between 2020 and 2025. South Korea is trying to catch up with the competition through overseas investments. For instance, the battery-cell manufacturer LG Chem is investing 2,3 billion dollars in a joint venture with General Motors in the U.S.

Joint Ventures, in fact, are becoming a key model in the battery industry, because they allow automaker to obtain the necessary power capacity to hit the EVs sales targets. Tesla is partnering with nickel mines amid growing concerns about the future supply of nickel. The partnership gives the company a greater control over the electric battery supply chain, allowing also to keep up with the demand of EVs. In addition to JVs, automakers sign numerous strategic contracts with different suppliers in order to secure the key component of electric vehicles. Furthermore, bigger companies have also started buying suppliers in an effort towards a vertical integration process.

At the regulator's level, Europe is moving to safeguard the raw material supply: in fact, the European Commission has launched the "European Raw Material Alliance" to protect EU economies against possible disruptions in the supply chain for critical raw materials, such as lithium. Furthermore, due to the high costs of transporting battery packs, international trade in EV batteries remain low, making automakers' decisions about where to establish the production of EVs a primary determinant for the lithium-ion battery market.

A study reports that the price of the most used EV battery technology, that is the lithium-ion nickel-manganese-cobalt battery, will drop as more batteries are manufactured. However, this decline will not last forever, because it will slow down as the price gets closer to the cost of the raw materials that compose the battery.

3.3 The role of policy measures in promoting electric mobility adoption

3.3.1 Europe

Europe is facing challenges to achieve targets set for 2020 and 2030. The European transportation sector has a big impact on the environmental side: in fact, it represents the sector with the largest consume of oil in EU and more than 33% of the whole energy consumption.

The European Commission has proposed that by 2030 the average CO2 emissions from new cars should be 50% below 2021 levels. This would represent an ambitious increase from the current target set at 37.5%. On 17 April 2019, the European Parliament and the Council adopted the Regulation (EU) 2019/631 which has introduced CO2 emission performance standards for new passenger cars and for new vans for 2025 and 2030. The new Regulation came into force on January 1st 2020 and has repealed and replaced the former Regulations for cars and vans. The CO2 target was fixed at 130 grams per kilometre between 2015 and 2019 and this has led to a reduction in emissions of around 14,2 %. Due to the increased importance and awareness of the climate change phenomenon, the target emission of the European Union starting from 2021 concerning new vehicles has been set to 95 g of CO2/km, lower than the 2015 target. This brings to the market the necessity to change the actual trend of using cars powered by fossil fuels. In order to do so, the EU Commission has also established incentives to be given to manufacturers producing vehicles with emission levels lower than 50 g/km providing for them a so called “super-credit” system.

The innovation in the EV sector, strongly supported by these polices and incentives, is moving forward, especially with further developments in terms of business model and battery production, showing a positive trend of electric automotive adoption.

In fact, the European Union’s new emissions standard of 95 grams of carbon dioxide per kilometre could also boost EV sales because it requires that 100 percent of the fleet must meet the standard by the end of 2021. Moreover, the European Commission has proposed to cut 2021’s emission levels by half by 2030. Germany is also working on this side, with a new tax that will affect from 2021 all the vehicles with high fuel consumption. The purpose

of the tax is to direct customers to avoid buying polluting cars, with the end goal to push the sales of electric powered vehicles.

A recent research[60] investigates the situation of policies for electric mobility development in Europe, taking five countries as a sample. The paper bases its findings on SWOT and PESTEL analysis that go deep into the characteristics and issues of the policies related to the transportation sector in Europe. EU directives and regulations are not the only factors affecting the EV market; in fact, national and local policies need to be considered as well. In northern European countries, such as Netherlands and Sweden, private initiatives and incentives helping the diffusion of EVs vehicles are widely present, while this doesn't hold for other countries of the sample such as Lithuania, Spain and Italy, where this kind of private initiatives are less common. Netherlands and Italy, instead, are stimulating some EVs' related projects, while Lithuania and Spain are experiencing an increased cooperation between public and private sector. Funding programs, public transport targeted to become electric, adoption of EV-promoting legislation, development of charging infrastructures and enhancement of solar power projects are common elements to the five countries analysed in the research. More broadly, these elements are common to the most part of the European countries, with an important acceleration in policy development in the last years. In Sweden, for example, the development is faster, because of a series of active plans and incentives, good financial support for EVs development and charging infrastructure (that are already well-developed compared to most part of EU countries), and a good financial incentive in the form of a tax reduction for EVs' adopters. In countries where these kind of policies and development are lacking, such as Lithuania, low purchasing power, non-adequate charging infrastructure and less public incentive, EVs market is not well developed. However, this mean that the country is open to new opportunities, such as the rejuvenation of car fleets with electric vehicles and the imposition of a tax for internal combustion engine vehicles.
Italy and Spain have a similar situation, having a high number of initiatives, favourable legislation, and good financial support. However, there is still space for development, especially concerning fragmented political decisions, weak relations between public and private sector and few investments in R&D. These countries do not have the technology advancements and public support that countries such as Netherlands and Sweden have, but

[60] Petrauskiene, K., Dvarioniene, J., Kaveckis, G., Kliaugaite, D., Chenadec, J., & Hehn, L. et al. (2020). Situation Analysis of Policies for Electric Mobility Development: Experience from Five European Regions. *Sustainability*, *12*(7), 2935. doi: 10.3390/su12072935

they present a lot of initiative and, together with the most part of EU countries, are going towards positive changes in EVs and ICTs policy, promoting policies that will promote sustainability.[60]

3.3.2 China

The Chinese central government extended through 2022, even if at reduced rates, monetary incentives that were about to expire, taking a step back from public statements where it was made clear that incentives would no longer be renewed. In fact, to counteract the side effect of the rapid economic growth of the country and the consequent increase in the number of people owning cars, the government decided to impose policies to encourage the adoption of electric vehicles. Being those policies too expensive due to the large number of buyers, Chinese government has mainly opted for a mandate that requires that a percentage of all the vehicles produced and sold in a year must be electric powered. The Chinese EV market is currently the biggest in the world and this mandate could play an enormous role in driving down costs and to stimulate the diffusion of the electric mobility.

The government also prolonged the purchase-tax exemptions of new EVs through 2022. These measures, together with the government's recent decision to invest billions of renminbi in the charging infrastructure as part of an economic stimulus program, could help EV sales rebound in next years.[58] China is also planning to extend its policy consisting in governmental incentives from the exclusive promotion of battery electric vehicles to other solutions, such as plug-in hybrids and hydrogen-powered vehicles.

As a concrete demonstration of its intention to augment EVs sales and to cut greenhouse emissions, China has recently imposed a mandate on automakers requiring that EVs will have to constitute the 40% of the whole market by 2030, an expansion that should bring down the cost of both EVs and EV batteries. The Massachusetts Institute of Technology estimates that between 2021 and 2030 the transition cost to EVs could cost 0,1% of the nation's GDP per year. However, according to the research, the benefits in terms of

amelioration of human health and reduction of air pollution and greenhouse emissions may offset the costs.[61]

Analyzing the cost of forcing the adoption of EVs in China through the introduction of the mandate, MIT research[61] reports that, assuming that an EV has an average lifetime of 12 years and is driven for 12.500 kilometers each year, the incremental cost of owning and driving an EV decreases from 2021 to 2020. This is true for both the pure battery EVs, where the decline is more prominent, and for hybrid vehicles, that experience a less steep decline also due to the fact that they are less costly. This is observable in *Figure n.14*, where pure battery EV's curve is higher than the hybrid EV's curve, but at the same time the drop is more consistent. On the same figure, on the right side, it is possible to observe the per-car cost that the society will have to bear.

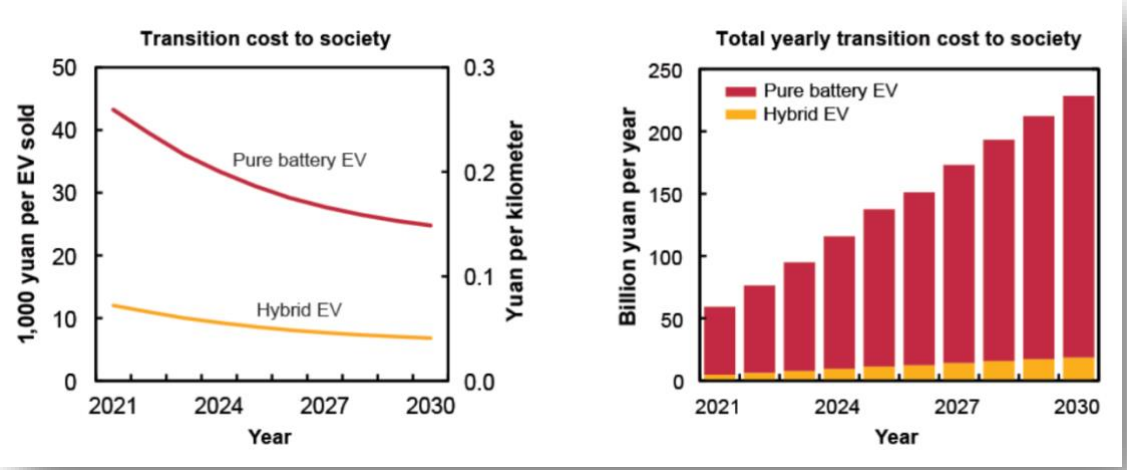

Figure n.14

Source: Massachusetts Institute of Technology Energy Initiative

The total number of EVs, pure and hybrid, will increase faster than the cost per vehicle will drop, making the incremental cost to society grow. This "forced transition" is expected to cost 100 billion yuan per year until 2030, representing 2% of the Chinese expenditure in the transportation sector every year.[61] However, the positive side will be represented by lower health costs and air pollution, CO2 emissions and reduced reliance on petroleum, mostly

[61] Massachusetts Technology Institute Energy Initiative – China's transition to electric vehicles. Benefits will come, but at what cost? (2020). Retrieved 16 April 2021, from https://energy.mit.edu/news/chinas-transition-to-electric-vehicles/

imported, increasing China's energy independence and ameliorating the balance of payments.

3.3.3 United States:

Electric vehicles made up just 2% of U.S. auto sales for 2020, calling for concrete action by the government to achieve the sustainable goals set for the coming years, and the Biden's administration will play a key role. In fact, in the wake of the aids granted to encourage the rapid development of renewable energies and greater independence from oil, Biden aims at making EVs more accessible to the American citizens.

According to the U.S. Energy information Administration, around 91% of the energy used in the U.S. transportation sector comes from oil. Moreover, the sector accounts for 28% of the nation's greenhouse emissions. Considering the current situation, many states are trying to deliver regulations and policies encouraging the adoption of alternative fuels, also implementing incentives to increase the adoption of EVs. In fact, according to an article of the National Conference of State Legislature[62], forty-five states provide an economic incentive when buying an electric vehicle: some common incentives come under the form of tax credits or financial reductions, high-occupancy vehicle (HOV) lane exemptions, vehicle inspections or test exemptions, parking and utility rate reductions. Colorado, for example, offers through 2021 a 4.000$ tax credit when purchasing light electric vehicle. Another important incentive, which goes hand in hand with the expansion of the charging network, is the price reduction for charging EVs during non-peak hours.

In March 2020, the U.S. government revised fuel-economy standards, bringing the 2026 target to 40 miles per gallon (mpg), down from the initial 54 mpg. The decline in oil prices has contributed to a partial slowdown in EV sales, since low fuel prices reduces the total cost of ownership of vehicles powered by internal-combustion engines (compared with EVs).[58]

These changes are creating great uncertainty, and the EVs market's development in the U.S. could depend largely on the number of states adopting new sustainable policies. California's Low-Emission vehicle (LEV) and Zero-Emission Vehicle (ZEV) programs aim at cutting the overall nation's emission levels, while promoting EV's adoption.[58] California, in fact,

[62] State Policies Promoting Hybrid and Electric Vehicles. (2021). Retrieved 17 April 2021, from https://www.ncsl.org/research/energy/state-electric-vehicle-incentives-state-chart.aspx

has stated that the production of gasoline-powered vehicles will be dismissed by 2035, becoming the first American state to promote this kind of policy, and imposing to manufacturers to sell a certain number of ZEVs per year. To date, eleven states have adopted both programs.

Multistate agreements strongly support the adoption of electric vehicles. Nine states, building on a 2014 ZEV action plan committing to more than 3,3 million ZEVs in circulation by 2025, have signed a ZEV 2018-2021 action plan that, between its goals, focuses on building the necessary infrastructure for EVs diffusion and increasing customer awareness and incentives. Furthermore, fifteen states have recently signed an agreement that aims at expanding ZEVs plans' reach to other sectors such as medium and heavy transportation, with a goal to reach 30% of sales in these sectors by 2030 and 100% by 2050.

Biden's administration plans to boost the development of the EVs market in two ways: first, by investing hundreds of billions in incentives and subsidies to automakers and customers and to promote the enhancement of the charging network; second, introducing new regulations that will affect fuel costs and the ownership of internal combustion engine vehicles, making them much costly.

Concluding, Senate Majority Leader, Schumer, has declared that the administration will raise the current EV tax credit, set at 7500$, and that 45 billion dollars will be invested to expand and ameliorate the charging infrastructure, with other 17 billion destined to subsidize automakers facilities with a goal to make EVs' mass adoption objective a reality in the medium and long term.[63]

3.4 Is electric mobility a good and sustainable investment opportunity?

The automotive sector has experienced un unprecedented growth and popularity, especially thanks to the diffusion of electric vehicles. This risen awareness resides especially in the fact that countries worldwide are trying to cut emissions significantly, with ambitious goals that need to be reached by 2025. The automotive industry is one of the most polluting worldwide, accounting for around 20-25% of global carbon emission, and is now more than ever under

[63] Blackmon, D. (2021). Biden's High-Cost Plan To Accelerate U.S. Adoption Of Electric Vehicles. Forbes. Retrieved 17 April 2021, from https://www.forbes.com/sites/davidblackmon/2021/03/24/bidens-high-cost-plan-to-accelerate-us-adoption-of-electric-vehicles/?sh=46c043415276

the spotlight due to the new regulations and an increased environmental awareness. The sector is experiencing a strong change thanks to numerous innovations in the electrification and autonomous driving.

One being the disruptor, now the automobile industry is being disrupted by new trends, technologies and customers preferences. During the years, with the development of the industry, millions of jobs in manufacturing and assembly line have been created, boosting the growth of steel producers and oil companies as well. After the Great Financial Crisis, a huge number of investments have been directed to this sector, favouring the decrease in unemployment rate and helping companies building solid financial basis.

Sales around the world, production and profit margin have reached record highs during the period 2009-2017, with a subsequent setback motived by environmental and social shifts in demand. In fact, almost 200 countries have signed the Paris Agreement, committing to cut emissions in the near future, boosting inevitably the shift from internal combustion engine vehicles to more sustainable and eco-friendly electric vehicles. And this is reflected also on the investment side, with automakers, governments and investors around the world pouring money into sustainable projects.

However, as explained in the previous paragraphs, with the increase of the EV penetration rate, battery demand will grow accordingly, with a subsequent impact on materials necessary for battery production: lithium, nickel, copper and cobalt are expected to raise to satisfy the demand. This phenomenon will boost the mining and steel sector, that has been screened out from many investment portfolios due to the really low ESG industry score. Controversies around this topic, and more broadly around the fact that electric mobility development could be detrimental to the environment and society, will be analysed in more details in the next section.

Companies operating in steel and mining sectors will be required to adapt to the increased market demand, with a strong production effort that will have to take into consideration also ESG issues. In fact, mining companies, who are usually subject to exclusion from portfolios aiming to pursue a sustainable strategy, have to address safety and human risks related to their activities, but they also have a critical role in addressing urgent environmental and social responsibilities.[64]

Descending into a more accurate investment perspective, some asset managers are still not confident enough to overweight the automobile sector in their portfolios. Western Asset, a

U.S. 500 billion dollars asset manager, has analysed all the inherent risks of investing in the automotive industry, eventually deciding to maintain a negative outlook and to underweight the sector.[64] Furthermore, Western Asset's research team has enlarged the analysis, explaining the reasons of the portfolio's underweight: the automotive industry presents deteriorating fundamentals, trade uncertainties have augmented, large U.S. companies could be downgraded to invest-grade or below because of controversies, raw materials costs are volatiles, financing costs could raise consistently. All of this, together with higher yields, larger spreads, decreased investor sentiment, and the possibility for the industry to be subject to cyclical forces, could represent a risk for portfolios, according to Western Asset. Looking ahead, however, it appears unthinkable to not consider the EV sector in a medium and long-term investment perspective, and Western Asset explains that industry consolidation, economies of size and scale, diversification, and strengthening of financial conditions of some automakers and original equipment manufacturers could lead to more attractive and safer investment opportunities.[64]

Based on different beliefs and expectations, other asset managers have decided, instead, to invest in a concrete and sustainable transition to electric mobility, betting on the future returns that investments in this sector can bring. Asset managers consider the sector as an opportunity due to the expected high excess returns, investing in a secular growth trend to take advantage of a mainstream shift towards electric vehicles.

Blackrock, the world's largest asset management company, offers the ETF iShares Electric Vehicles and Driving Technology that seeks to replicate the investment results of an index composed of companies operating in developed and emerging markets that focus on electric vehicles and driving technologies. The ETF tracks the STOXX Global Electric Vehicles & Driving Technology index, aiming also at integrating prominent ESG issues and considering an exclusionary approach to not consider controversial companies in the investment decision-making process.[65]

Another asset management company, Lyxor, has developed an Exchange Traded Fund (ETF) that tracks the MSCI ACWI IMI Future mobility, an index that is based on the MSCI

[64] Western Asset Insights - An ESG Perspective on the Automotive Industry. (2021). Retrieved 18 April 2021, from http://www.westernasset.com/sg/qe/research/whitepapers/an-esg-perspective-on-the-automotive-industry-2020-02.cfm

[65] iShares Electric Vehicles and Driving Technology UCITS ETF | ECAR. (2021). Retrieved 18 April 2021, from https://www.ishares.com/uk/individual/en/products/307130/ishares-electric-vehicles-and-driving-technology-ucits-etf-usd-acc-fund?switchLocale=y&siteEntryPassthrough=true

ACWI IMI, including large, mid and small-cap securities across developed and emerging markets that derive a significant part of revenues from energy storage technologies, autonomous vehicles, shared mobility and new transportation methods.[66] MSCI ACWI IMI Future mobility has performed better than its base index in the last year, generating a return more than four times higher for the year 2020 alone.
However, 2020 has been a peculiar year for stock markets and especially for electric mobility. This kind of investments, together with the higher returns paid, have recorded higher volatility levels and so, risk, pointing out that investments in this type of business are riskier, even if they hold attractive results.

3.4.1 ESG characteristics, issues and controversies

Despite the positive direct impacts on emissions coming from the adoption of a more sustainable mobility, EVs can have important social and secondary impacts. In fact, according to a research that aims to assess ESG impacts of the automotive industry[64], due to the fact that EVs production takes two thirds of the time necessary for ICEs production, and also less components, the immediate consequence is job loss and retraining of employees (who will be required to learn always new skills in order to be competitive on the market), because fewer and fewer workers will be needed in the production process. Furthermore, automakers are trying to automatize the most part of their processes, with technology moving at a faster pace. The value chain will also be affected, because the new distribution model will lower maintenance needs, the possibility to monitor, check and update vehicles through the internet connection, and new customer segments.

A very important discussion has raised around the concept of energy and power generation. The demand for electricity will, in fact, grow exponentially with the EVs diffusion on the market. Oil demand will be highly impacted by the shift to cleaner vehicles. According to the International Energy Agency, the current growth rate of 1 million barrels a day will hold for the next 4-5 years, slowing down to only 100.000 barrels a day by 2030, with a daily decrease of 90% of the actual value.[67]

[66] Lyxor MSCI Future Mobility ESG Filtered (DR) UCITS ETF - Acc | MOBI LN. (2021). Retrieved 14 September 2021, from https://www.lyxoretf.co.uk/en/instit/products/equity-etf/lyxor-msci-future-mobility-esg-filtered-dr-ucits-etf-acc/lu2023679090/usd

Due to heavy reliance of the EV sector on mineral products, the sector is not uniformly considered as a 'green' sector. Uncertainties about the sustainability of the EV industry come from the material used in the production line, but also from the fact that the energy needed to power EVs and the charging network could come from fossil fuels, thus negating the expected possible positive environmental effects of the electric mobility. An effective and strong governance is necessary to help manage this kind of risks and avoid that the transition from traditional mobility to electric mobility could be characterized by controversies and negatively perceived by the public, failing to address the need for greater sustainability and concern for the environment and society, rather than for profit. In fact, investments in the e-mobility sector could suffer from poor risk management, which could even lead to the exclusion of some companies, considered non-ESG, from the scope of sustainable investments.

In addition to ESG risks, the automotive industry is exposed to uncertainties around trade deals and negotiations between U.S., China, Mexico and Europe, with the necessity to manage re-structuring processes and an increasingly competitive and challenging production environment, while complying with all the new standards and regulations imposed by the regulators to address the climate change topic.

It is possible to consider as an example the Tesla case to observe which kind of controversies can directly affect an automaker. The company, in fact, has been under the spotlight due to its new partnerships and new contracts in the mining sector. While Tesla will not have a direct equity stake, its partnership in this business gives the company an increased and more stable control over its electric battery supply chain as it expects to scale up the production consistently.

Nickel is a key material in the automotive industry to produce stainless steel and it is mined mostly in Russia, Canada, New Caledonia and Indonesia. The growing production of electric vehicles has added pressure on the demand for this metal, pushing mining companies to increase the pace and satisfy automakers. The extraction of nickel is far from being sustainable, with the process based on the use of coal-fired power, coming at a high environmental and health cost. Mines have been criticised all around the world for their

[67] Bloomberg – Global Oil Demand to Hit a Plateau Around 2030, IEA Predicts (2019) Retrieved 18 April 2021, from https://www.bloomberg.com/news/articles/2019-11-13/global-oil-demand-to-hit-a-plateau-around-2030-iea-predicts?utm_medium=email&utm_source=newsletter&utm_term=191114&utm_campaign=climatechanged

detrimental role for the environment, with many associations trying to counteract the actions of mining companies and arouse public institutions and governments to issue concrete measures against them and set well-defined standards. Agreements are being set around the world, such as the recent ones in the New Caledonian's Goro mine, one of the biggest nickel producers of the world, with the scope to safeguard the environment and implement more sustainable extraction practices. Most of the new agreements requires mining companies to reach carbon neutrality by 2040.[68] The challenges are many and the sectors concerned are under the spotlight of the public opinion, regulators and investors. In fact, investors are considering moving towards increasingly sustainable portfolios, excluding certain companies from their investment spectrum, also indirectly impacting the financial capital conditions of these excluded companies.

To be competitive and attract further investments, the electric vehicles sector needs to actively respond to the growing concerns around the sustainability topic, addressing all the possible controversies and trying to face the ESG issues that arise. Automakers and companies in the value chain will have to adapt to this new scenario and to modify their structures and processes to be capable to offer products that comply with the regulations, that are efficient and that represent a real change towards the transition to electric mobility, delivering economic and social value to the society, while embarking on a sustainable path for the future.

[68] BBC - Tesla partners with nickel mine amid shortage fears. (2021). Retrieved 19 April 2021, from https://www.bbc.com/news/business-56288781

CHAPTER 4: Analysis of the financial impact of ESG Scores

4.1 Introduction to the analysis

An important question that arises while talking about ESG is whether investing in firms that have score on sustainability issues leads to higher returns.
Through the chapter, multiple regression analyses will be conducted to indagate the possible correlation within ESG metrics and financial and operating measures of a company. One interesting finding is that ESG performance is strongly correlated with the size of the firm: in fact, on average, larger companies tend to have better ESG scores.

The following analysis looks at the relationship between ESG scores of companies from five different sectors and their financial performance. The five sectors considered are the Automotive, Energy, Utilities, Materials and Future Mobility. These sectors have been chosen for the relationships they have between each other, for the impact that sustainability matters have on the performance of the companies and, on the other side, for the relationship that these sectors have with the sustainability issue. Furthermore, the sectors are strictly related to the electric mobility development.

- The Automotive sector is central when talking about ESG because, as previously seen, transportation makes up a consistent part of the world emissions, but at the same time employs many people around the world, having both strong environmental and social impacts. Analyzing this sector allows to extend the research begun in the previous chapters. All the other sectors considered in this chapter are related to this one and including them in the analysis gives a broader view of the ESG phenomenon and its impact on company performance.
  Automakers have a key role in the electrification of vehicles and the disengagement of fossil fuels, eventually leading the transition to a decarbonized world. Furthermore, the sector is undergoing a strong innovation process that will shift the transportation sector from a traditional one to a technological and forward-looking one. Numerous startups aiming at producing electric vehicles were born in recent years, with some of them being able to reach profitability levels fast and to be listed

on Stock Exchanges, thus collecting even more capital necessary for their development and the affirmation of alternative mobility.

- The Energy sector is one of the most affected by the transition to a more sustainable economy, with pressure coming from regulators and impacting energy producers and suppliers, who today feel the urge to shift towards sustainable sources. In fact, new environmental plans, especially in the European scenario, have ambitious goals to reach carbon neutrality by 2050. Policies about sustainability issues are not homogeneous throughout the world, being less strict in continents such as Asia and America, with however some kind of convergence with European directives. Carbon neutrality goal need a gradual shift away from energy production derived from fossil fuels, tilting towards renewable sources. The production of clean energy is the hearth of the development of the new approach to mobility that will lead the transportation sector to a more sustainable level.

- Materials sector includes companies operating in the discovery, development, and processing of raw materials, which are used across a broad range of sectors and industries. This sector is often labelled as an unsustainable one, due to controverse company practices and the negative reputation that have often surrounded this sector for years, not least because of the environmental disasters that have occurred over time. In fact, numerous raw material companies have failed to comply with social and environmental standards, fostering public disappointment. Today, however, many companies are trying to re-convert themselves to meet new society's demands and preserve the planet. As analysed in the previous chapter, raw materials are a key element for automakers, who must nevertheless strive to ensure that they respond to the growing concerns around the sustainability topic, addressing all the possible controversies and trying to properly face the ESG issues. Many large companies within the basic materials sector are also part of the energy sector.

- The Utility sector is a category of companies that provide basic services including electricity, natural gas, and water. Utility companies deliver, for example, electricity produced by energy suppliers, being the intermediary between the producer and the end customer. The movement towards clean energy, alongside with competition-

enhancing legislation, initiatives, and investments in renewable energy resources, has some analysts forecasting strong growth for the utilities industry in the 2020s. Typically, investors buy utilities as long-term holdings for their dividend income and stability. The utility sector tends to do well as a defensive play against macroeconomic downturns. [69]

- Furthermore, to extend the analysis and build on what mentioned in chapter three so far, an index grouping companies specifically related to the electric mobility has been considered. The index, in fact, is a good representation of the sector, aiming to represent the performance of companies that are expected to derive significant revenues from energy storage technologies, autonomous vehicles, shared mobility and new transportation methods.[70] Most part of these companies are startups that have originated from the idea of a more sustainable transportation, most of which have been listed only recently.

4.2 Industry characteristics and ESG risk profiles

4.2.1 Automotive sector

The primary trend of the industry is the electrification of the global vehicle fleet, with estimates pointing to an R&D global budget for electrification of 140 billion dollars for the next five years.

Sustainalytics[71] provides a detailed analysis of the industry, diving it into two subindustries: Automobiles and Motorcycles. In terms of composition, large-cap represent the higher share of the industry (57%), while mid-cap companies representing the 37% of the sector. Concerning the regional characteristics, most part of the companies operate in Asia, while

[69] How the Utilities Sector is Used by Investors for Dividends and Safety. (2021). Retrieved 24 April 2021, from https://www.investopedia.com/terms/u/utilities_sector.asp

[70] MSCI.com – MSCI ACWI IMI Future Mobility ESG Filtered Index (2021). Retrieved 13 May 2021, from https://www.msci.com/documents/10199/c0041df5-e1a1-113c-ff39-0a923a34fdaf

[71] Sustainalytics.com – Industry Report – Automobiles. (July 2021). Retrieved 2 June 2021, from Sustainalytics.com (*license required to access the report*)

Europe has the second biggest share and North America hosting 10% of the total number of companies.
The key role of the electrification process in the sector is pushed by the stringent 2021 EU C02 targets that motivate the increased expense towards R&D and a reconversion of industrial facilities to support an increase in production of EVs.

Concerning the ESG Risk Rating of the industry, the distribution of these scores leans toward medium and high-risk categories, with more than half of the industry (55%) considered as medium risk, having a ESG Risk Rating score between 20 and 30, while 29% of the industry falls in the high-risk classification (ESG Risk Rating score between 30 and 40). These results derive mainly from high exposure to material ESG issues and from an important management gap who makes the overall unmanaged risk higher.[72] In terms of material ESG issues, the Automotive sector shows a shift towards reduced exposure to carbon emissions compared to other industries, scoring however worse concerning the average issue management score. The most frequent and impactful event categories in the Automobiles industry are quality and safety. Furthermore, the industry is characterized by anti-competitive practices and price fixing as a small number of big companies tend to collude to form cartels. Lastly, some players have been exposed to controversies due to car emissions, such as for Volkswagen's "Dieselgate" scandal, which contributed to the increase of the overall ESG Risk Score of the industry. However, even if Automobile products tend to score low is terms of ESG issue management, due to the presence of polluting traditional ICE vehicles, the industry is one of the least exposed to the carbon issue. This positive result is due to modern machinery implementation, highly automated production lines, the increased proximity of auto parts suppliers to production sites, and implementation of renewable energy programs, all efforts that are consistently leading to maximize energy efficiency, reduce industry's footprint and ameliorate ESG management score.[72]

4.2.2 Energy sector

The sector is highly dependent on expenditures coming from oil and gas producers. Covid-19 pandemic has strongly affected the sector, reducing capital expenditures and revenues. In

[72] Sustainalytics ESG Ratings Methodology, Risk Scores, Material Issues, ESG Risk Management and Categories are explained in detail in the first Chapter, Section 1.6.1, alongside with the ESG metrics

addition to this, the whole sector faces new market uncertainties due to the fluctuations in oil prices and the trend to shift towards more renewable sources of energy, with consequent reconversion of some market players. Due to the high importance of ESG issues for the sector, management performance and supervision of risks also tend to be higher. Distribution of ESG Risk Scores in the industry is quite concentrated, with almost the totality of the sector (95% of companies) being in the medium or high-risk ranges. This translates in a medium level of exposure paired with weak and average management across the industry. The most part of the exposure across the industry seems to be manageable, with only about 10% being unmanageable. Events impacting the overall ESG score are mainly related to bribery and corruption and are typically more severe, being categorized in the high-risk events category. This is even more true in state-owned petroleum companies, such as Brazil, Mexico, Kazakhstan and Nigeria, where the most part of negative events is registered. On the human capital side, the peculiar characteristics of the Energy Service providers that often operate in highly demanding environments, requiring a specialized and skilled workforce, generate an important exposure for the players in the industry. Most part of the companies have weak or average management scores, with ESG Risk Ratings scores being within the medium and high-risk level. Finally, on carbon emissions, providers fall within the medium score for this issue. Few are the companies who have a strong management score, with more than half (55%) of the sample having a weak score (equal or less than 25). Not so many efforts in mitigating GHG emissions in the industry have been done until now, while recently there is a trend of shifting towards lower-carbon and renewable resources. These efforts are likely to be extended in next and the ESG Risk Rating Score of companies in the sector will go through a decrease, ameliorating the overall management score of the sector and achieving a higher ESG profile.[73]

4.2.3. Materials Sector

Sustainalytics' analysis goes deeper in the classification of Materials, dedicating a special analysis to diversified metals, between the rest. This industry, according to Sustainalytics'

[73] Sustainalytics.com – Industry Report – Energy Services. (July 2021). Retrieved 2 June 2021, from Sustainalytics.com (*license required to access the report*)

industry-specific analysis[74], is among the riskiest, with an average ESG Risk Rating score of 42,6. Covid-19 pandemic has had an important impact on demand and supply of materials. This negative effect will likely be offset by the growth of the industry triggered by the development of electric vehicles and the development of renewable energy infrastructures, which rely on materials such as copper, lithium and cobalt. Industry players operate both in extraction and processing of a variety of metals. In 2020 several producers have experienced a decrease in revenues. The industry is demanding governments to provide incentives to accelerate the shift towards a green economy. In some countries, however, such as India and China, highly reliant on conventional sources of energy, governments are still incentivizing coal demand. Around 60% of the companies are facing sever risk exposure, with score >40. The management gap is not severe, but considering an average risk exposure of 67,9, this gap represents a 36,2 absolute value, leaving room for improvement. On the geographic side, huge differences occur between the various areas of the world, with Asia-Pacific miners underperforming European counterparts, with higher ESG risks and lower performance in terms of management of ESG issues exposure. Furthermore, in the whole industry, without a specific geographic trend, events have a high impact on the scores, being high-impact incidents frequent and eroding company's reputation while worsening ESG management. Related to incidents, due to the nature of the activity, work-related injuries are also frequent, but few depends on company mismanagement. On the emissions and waste side, most firms in the industry are exposed to the issue, with a heterogeneous management of the issue: companies processing materials but not operating in the mining business are not exposed to the full range of risks; management depends on subindustry and geographic role with European and Canadian companies managing the issue better than Asian counterparties. According to Sustainalytics, energy costs represent around one third of the operational costs of the industry. Furthermore, mining metals such as aluminum, copper, iron, lead, manganese, nickel and zinc results in 7% of global carbon emissions. Negative events who affect diversified metals companies are also related to the mismanagement of GHG emissions, that companies are trying to offset through investments in renewable sources. These investments represent, however, a key aspect in relocation of refineries and product plants.

[74] Sustainalytics.com – Industry Report – Diversified Metals. (July 2021). Retrieved 2 June 2021, from Sustainalytics.com (*license required to access the report*)

4.2.4 Utilities sector

Concerning utilities, Sustainalytics indicates that this sector is going through an important transition, with government regulations, incentives and declines in renewable prices pushing for a greener economy and for the affirmation of clean energy over fossil fuels. To support this transition, the sector is building on new digital technologies and investments. Global electricity demand continues to grow at around 4% annually, with fossil fuels losing ground to the advantage of renewables and nuclear, that now cover around 54% of the demand. Furthermore, the sector alone is responsible of 25% of the world's greenhouse gas emissions, making it the largest source by industry. However, reducing emissions has become the core objective for the companies operating in Utilities and this is translated in better ESG Risk Management for companies in geographical areas where these goals are stronger and backed by governments' regulations. In fact, the distribution of ESG Risk Rating scores is broad and European utilities show a stronger management and a lower risk level, while Asian utilities show weak management and higher risk scores.

The average exposure score is high for issues such as carbon emissions and waste, with the ESG Risk Rating score distribution being skewed to the high side compared with the other sectors. Most of the companies fall in the medium (36% of the observation) or high risk (32% of the observation) range. While the average score in the industry is higher than the universe average, the exposure is affected by the specific business model of the utilities (for example, fossil fueled generation contributes a lot in increasing the risk exposure). For what concerns issues management, however, European utilities place themselves very well due to investments and a long industry experience with emissions: globally, these companies have the lowest average risk score. Also, in terms of the "Social" factor, European utilities perform better than their global counterparties.

4.3 Methodology

To build a significant database, data has been collected for companies operating in the Automotive, Energy, Materials, Utilities and Electric Mobility sectors. Companies have been retrieved looking at the MSCI's proprietary indexes. MSCI is a leading provider of financial services: equity, fixed income, hedge fund stock market indexes, multi-asset

portfolio analysis tools and ESG products. The company is very solid and offers a wide range of information.

While Sustainalytics, whose ESG Risk Score methodology has been analysed in chapter 2, has been used to retrieve the different industries' reports and to compute further analysis on ESG ratings, MSCI has been the main reference for the ESG ratings investigation. MSCI rates a total of around 8.500 companies (14.000 issuers) and more than 680.000 equity and fixed income securities worldwide. More than 1.000 data points are generally considered to analyze companies and securities and define a rating. Then, MSCI applies a standardized methodology that helps to assess the company's Risk Exposure and Risk Management relative to industry peers. Furthermore, MSCI team engages with companies to gather and verify data. Controversies and events are monitored and updated daily. Key ESG scores and weights are combined to create a single ESG rating per company: the ratings go from CCC (the lowest) to AAA (the highest). CCC and B are normally considered "laggards", BB, BBB and A are considered "average", while AA and AAA are considered "leader". Ratings are reviewed periodically. *Figure n.15* offers a good synthesis of the MSCI ESG Rating assignment process.

Figure n.15

Source: MSCI.com

Concerning the sectors considered in the analysis: Automotive, Energy, Materials, Utilities and Future Mobility indexes have been used as a reference. The first four indexes are part of the MSCI World family, which aggregates companies based in 23 different developed

markets around the world. The companies who make up the Future Mobility index, instead, have been collected from the MSCI ACWII family, that includes also developing countries (excluded from the World index). Furthermore, the repartition by sector made by MSCI is based on the Global Industry Classification Standard (GICS®).
A more detailed indication of the previously mentioned indexes follows.

- For the Automotive sector, companies have been retrieved from the MSCI World Automobiles and Components Index. The index is composed of 38 mid and large cap stocks that are classified in the Automobile and Components industry group, within the Consumer Discretionary sector. Looking at the sub-industry weights, the larger part of the index is represented by Automobile Manufacturers (82,36% of the whole index), with Auto Parts & Equipment, Tires & Rubber and Motorcycle Manufacturers making up the rest.[75]

- For what concerns the Energy sector, the index that has been used to retrieve the companies is the MSCI World Energy Index, that includes 52 between large and mid-cap companies classified in the Energy sector as per the GICS®. The sub-industries of the index are all related to Oil and Gas, under different forms: exploration, production, storage, transportation, refining, marketing, equipment and service. Finally, a small part, which constitutes 0,5% of the index, is related to coal and consumable fuels. [76]

- MSCI World Materials Index has been, instead, the reference index to retrieve companies classified in the Materials sector: 122 constituents who represents large and mid-cap companies operating in developed markets. More granularly, the index is divided in chemicals, metals and mining, industrial gases, gold, construction materials, steel, agricultural chemicals, paper packaging, copper and other materials.

- Concerning the Utilities, data has been retrieved for companies belonging to the MSCI World Utilities Index. The index comprises 85 companies that operate into the

[75] MSCI.com – MSCI World Automobiles and Components Index. (2021). Retrieved 02 May 2021, from https://www.msci.com/documents/10199/b28f1b13-1373-4d80-b081-59462e304d98

[76] MSCI.com – MSCI World Energy Index. (2021). Retrieved 02 May 2021 from: https://www.msci.com/documents/10199/de6dfd90-3fcd-42f0-aaf9-4b3565462b5a

electric utility, multi-utilities, gas, water, energy producers and traders, and renewable electricity sectors.[77]

- Company specifically related to the Electric Mobility sector have been identified looking at the MSCI ACWII IMI Future Mobility ESG Filtered Index, that aims to represent the performance of 59 companies that are expected to derive significant revenues from energy storage technologies, autonomous vehicles, shared mobility and new transportation methods and excludes companies which are ESG laggards relative to the selected universe being in the bottom quartile by ESG Industry Adjusted Score.

MSCI indexes are built following a specific methodology built and described by MSCI. In the specific, MSCI reports that "The indexes are based on the MSCI Global Investable Market Indexes (GIMI) Methodology — a comprehensive and consistent approach to index construction that allows for meaningful global views and cross regional comparisons across all market capitalization size, sector and style segments and combinations. This methodology aims to provide exhaustive coverage of the relevant investment opportunity set with a strong emphasis on index liquidity, investability and replicability. The index is reviewed quarterly—in February, May, August and November—with the objective of reflecting change in the underlying equity markets in a timely manner, while limiting undue index turnover. During the May and November semi-annual index reviews, the index is rebalanced and the large and mid-capitalization cut-off points are recalculated."
Concerning the MSCI Future Mobility index, it is a slightly different type of index compared to the others. In fact, this index is an ACWII index, meaning that it also includes developing countries: this feature brings with it also other characteristics. Also, the Future Mobility index is ESG-filtered, meaning that it excludes companies with MSCI ESG rating of 'CCC' and MSCI ESG Controversy score of '0'. Furthermore, companies showing involvement in Nuclear Weapons, Controversial Weapons, Civilian Firearms, Tobacco, Thermal Coal, Oil Sands and UN Global Compact Violators are also excluded from the index.

[77] MSCI.com – MSCI World Utilities Index. (2021). Retrieved 13 May 2021, from https://www.msci.com/documents/10199/970cc931-4db6-4b8c-801a-1a48f51b070f

After gathering all the company names included in the previously mentioned indexes, data collection has been conducted through the *Bloomberg* terminal, aiming at identifying the financial and operational characteristics of companies. From the terminal, the data has been gathered for each target company and then organized, for example removing some companies due to a lack of observations. In the specific, monthly returns data has been collected for the period 2017-2020: this data has been useful to subsequently calculate yearly returns. This piece of information has been collected also for the indexes, to calculate the Excess Return of all the companies included into the analysis against their reference index. Then, further data has been retrieved from *Bloomberg* about Profit Margin, Operating Margin, Market Cap, PE ratio, Revenues and other data necessary for the computations to assess the financial and operational state of the different companies.
To assess the ESG score of the companies analysed for the period 2017-2020, it has been used a database provided by MSCI containing all the historical ESG scores.
Data has been then further filtered, removing all the observations who lacked a large amount of information and that were therefore not significant for statistical purposes.

Data has then been used to run multiple regression analyses through GRETL, a software for econometrics and statistical analysis. The data is under the form of panel data, time series data characterized by cross-sectional features: it consists of researcher's observations of numerous phenomena collected over several time periods for the same group of entities. A pooled regression is the best way to analyse this kind of data, with all the cross-sectional data included within a single equation. Here, the data consist of multiple observations on multiple variables for many different firms over a specified period. The total number of significative **observations** is **1318**, comprising **341 companies** distributed in **5 sectors** over a **4-year period**.
Moreover, also fixed effects regressions have been conducted to deepen the analysis and look for further possible correlations within the data. Fixed effects regression is an estimation method in a panel data setting that uses only data on individuals having multiple observations, valuing effects only for those variables that change across these observations. A fixed effects regression allows one to control for time-invariant unobserved individual characteristics that can be correlated with the observed independent variables.

Furthermore, to enlarge the field of study of the analysis and also include the possible evolution of ratings overtime, a predictive analysis has been conducted through Orange

DataMining, a software that allows to perform data analysis and visualization, see data flow and to perform predictive analysis.

4.4 Results

This section aims at resuming the results of the various multiple regressions conducted to assess the impact of ESG ratings on the financial performance of companies, replying to the main research question of this dissertation, *"Does ESG guarantee better financial returns?"*. This question has been accompanied by related questions that allow to extend the subject of the analysis. The questions are:

1) *Do higher ESG scores have a positive impact on company size?*
2) *Do higher ESG scores predict returns?*
3) *Do higher ESG scores predict firm profits?*
4) *Do higher ESG scores bear lower risk for a company?*

The analysis includes both quantitative and qualitative variables. In *Table n.2* it is possible to observe all the quantitative variables used throughout the analysis and their characteristics: mean value, standard deviation, minimum and maximum. The total number of observations, after filtering the data, is 1318.

Concerning the qualitative variables, they are: Name of the company, Year of observation, Geographical Area, MSCI ESG rating and Sector. Year of observation, Geo Area and Sector have been used as control variables.

VARIABLE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM	OBSERVATIONS
SENIORITY	71,599	45,738	4,000	204,000	1318
MARKET CAP	24528,00	43404,000	376,850	677443,20	1318
REVENUES	23069,00	42840,000	7,898	388380,00	1318
EXCESS RETURN	0,052	0,573	-0,914	10,609	1318
VOLATILITY	0,298	0,176	0,056	1,386	1318
PROFIT MARGIN	0,157	1,195	-12,043	27,208	1318

OPERATING MARGIN	70,049	534,140	-5,581	10755,000	1318
PE RATIO	28,693	87,294	0,068	1891,357	1318

Table n.2

Within these quantitative variables, Seniority and Revenues have been used as control variables, while all the others have been tested for relations with the ESG rating variable.

Using the statistical software GRETL, the following results have come up.

- Concerning the Excess Return value, as it is possible to see in *Figure n.16* there is no correlation between the different ESG ratings and the Excess Return. In fact, the p-value of the independent variables are too high to explain the relationship and to reject the null hypotheses. With a p-value > 0,05 it is not possible to assert that the ratings have a real impact on the return. This holds also for the most part of the other variables, meaning that Geographical Zone, Revenues and Year of the observation are all not correlated with the dependent variable. However, some sectors do show a correlation with the Excess Return: in fact, Utilities, Materials and Auto all have negative impacts on the return, with Auto delivering the worst outcome. The fact that a sector such as the Automobile one delivers a negative contribution to the result could come from years of non-brilliant performance for automotive companies, confirmed by the data for year 2020 showing that all the automakers of the sample have registered negative stock returns (except for Tesla who has experienced an astonishing performance) probably due to the impact of the Covid-19 crisis. This element can be the factor that negatively impacts the Return. Another correlation is observed with the Seniority of the company, that shows a small negative impact on the Excess Return.

```
Model 24: Pooled OLS, using 1318 observations
Included 341 cross-sectional units
Time-series length: minimum 1, maximum 4
Dependent variable: ExcessReturn
Omitted due to exact collinearity: CCC Year_2020 Middle_West Future_Mobility

                  coefficient    std. error     t-ratio    p-value
  ------------------------------------------------------------------
  const            0.138236      0.315550       0.4381     0.6614
  AAA              0.0952253     0.131135       0.7262     0.4679
  AA               0.0582889     0.125156       0.4657     0.6415
  A                0.0533964     0.121776       0.4385     0.6611
  BBB             -0.00828399    0.120783      -0.06859    0.9453
  BB              -0.00620718    0.122731      -0.05058    0.9597
  B               -0.0528304     0.130711      -0.4042     0.6861
  Year_2017        0.000199032   0.0446501      0.004458    0.9964
  Year_2018        0.00656530    0.0443031      0.1482      0.8822
  Year_2019       -0.00219142    0.0439230     -0.04989     0.9602
  North_America    0.109564      0.288458       0.3798      0.7041
  South_America    0.156482      0.350120       0.4469      0.6550
  Europe           0.0175405     0.289220       0.06065     0.9516
  Oceania          0.0969447     0.294149       0.3296      0.7418
  Asia             0.0598683     0.289744       0.2066      0.8363
  Energy          -0.0689386     0.0608426     -1.133       0.2574
  Utilities       -0.100656      0.0538358     -1.870       0.0618  *
  Materials       -0.0945749     0.0503043     -1.880       0.0603  *
  Auto            -0.148462      0.0683327     -2.173       0.0300  **
  Seniority       -0.00134984    0.000354738   -3.805       0.0001  ***
  Revenues        -1.37635e-07   4.14055e-07   -0.3324      0.7396

Mean dependent var   0.051917   S.D. dependent var   0.572661
Sum squared resid    419.8130   S.E. of regression   0.568929
R-squared            0.027982   Adjusted R-squared   0.012993
F(20, 1297)          1.866854   P-value(F)           0.011496
Log-likelihood      -1116.224   Akaike criterion     2274.449
Schwarz criterion    2383.310   Hannan-Quinn         2315.266
rho                  0.139170   Durbin-Watson        0.976422

Excluding the constant, p-value was highest for variable 15 (Year_2017)
```

Figure n.16

A fixed effects regression has also been conducted for further verifications. The fixed-effect regression analysis (*Figure n.17*) confirms what previously said about the missing link between Excess Return and ESG ratings: there is no significant evidence that the value of the Returns is impacted by the ESG variable. The only relationship that is demonstrated here is one between the Revenues variable and the Excess Return, meaning that the latter can be influenced positively by the former one, with Returns moving in the same direction of the Revenues.

```
Model 30: Fixed-effects, using 1318 observations
Included 341 cross-sectional units
Time-series length: minimum 1, maximum 4
Dependent variable: ExcessReturn
Omitted due to exact collinearity: CCC

              coefficient    std. error    t-ratio   p-value
  ---------------------------------------------------------------
  const        0.874472      0.905077       0.9662   0.3342
  AAA          0.244279      0.303890       0.8038   0.4217
  AA           0.0537151     0.273572       0.1963   0.8444
  A            0.230717      0.265480       0.8691   0.3850
  BBB          0.178447      0.257063       0.6942   0.4877
  BB           0.215405      0.246583       0.8736   0.3826
  B            0.0898738     0.229616       0.3914   0.6956
  Seniority   -0.0155137     0.0133047     -1.166    0.2439
  Revenues     3.27416e-06   1.97797e-06    1.655    0.0982  *

Mean dependent var   0.051917   S.D. dependent var   0.572661
Sum squared resid    246.4516   S.E. of regression   0.504317
LSDV R-squared       0.429376   Within R-squared     0.010785
LSDV F(348, 969)     2.095231   P-value(F)           6.55e-19
Log-likelihood      -765.2123   Akaike criterion     2228.425
Schwarz criterion    4037.595   Hannan-Quinn         2906.768
rho                 -0.678679   Durbin-Watson        1.684908

Joint test on named regressors -
  Test statistic: F(8, 969) = 1.32057
  with p-value = P(F(8, 969) > 1.32057) = 0.229158

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(340, 969) = 2.05003
  with p-value = P(F(340, 969) > 2.05003) = 1.19197e-17
```

Figure n.17

-Investigating for the Market Cap variable, the results have proven to be interesting. In fact, as it is possible to see in *Figure n.18* better ratings are associated to a higher value of the market cap. The analysis signals a strong correlation here, with p-values for all the ratings being meaningful, allowing to reject the null hypothesis. For example, a triple-A is associated with a Market Cap higher than 32.000 (this value represents a Market Cap of more than 32 billion – data is indeed expressed in millions for simplicity reasons). The value associated to the different ratings tends to decrease moving from an AAA rating to a CCC one, with the only particularity being registered for the AA and A ratings: here, in fact, the former presents a lower value compared with the latter, meaning that a slightly lower grades (A) has a better impact than the slightly higher one (AA). However, a CCC rating (represented in this analysis by the value of the constant, who also contains the effect of the Middle East Zone, the Future Mobility sector and the Year 2020), the lowest one, does not have a correlation with the dependent variable.

This analysis can also be read in a slightly different way: companies with higher valuations can be able to invest more in ESG issues and sustainable projects, while smaller companies do have a limited budget for that, often being laggards in matching what larger competitors do. In fact, as seen in the previous chapters, companies who have available funds can invest

into projects that can have an important impact on their notes, raising the scores and ameliorating the company's public image.

R^2 is also not very strong in this analysis, representing an overall weak correlation between all independent variables and the dependent one. However, concerning only the ESG variables, the regression analysis helps to confirm a good relationship between these ratings and the Market Cap value.

```
Model 25: Pooled OLS, using 1318 observations
Included 341 cross-sectional units
Time-series length: minimum 1, maximum 4
Dependent variable: MarketCap
Omitted due to exact collinearity: CCC Year_2020 Middle_West Future_Mobility

                coefficient    std. error     t-ratio    p-value
  ------------------------------------------------------------------
  const          -10027.5       19402.0       -0.5168    0.6054
  AAA             32711.5        8063.00       4.057     5.27e-05  ***
  AA              19331.6        7695.35       2.512     0.0121    **
  A               23266.6        7487.53       3.107     0.0019    ***
  BBB             18302.2        7426.47       2.464     0.0139    **
  BB              16527.7        7546.23       2.190     0.0287    **
  B               10284.6        8036.92       1.280     0.2009
  Year_2017       -3270.48       2745.36      -1.191     0.2338
  Year_2018       -7212.62       2724.03      -2.648     0.0082    ***
  Year_2019       -5181.42       2700.66      -1.919     0.0553    *
  North_America   12996.1       17736.2        0.7327    0.4638
  South_America     997.620     21527.5        0.04634   0.9630
  Europe          -5333.18       17783.0      -0.2999    0.7643
  Oceania          6392.87       18086.1        0.3535    0.7238
  Asia            -5380.56       17815.3      -0.3020    0.7627
  Energy           -438.228       3740.97     -0.1171    0.9068
  Utilities          21.4886      3310.15       0.006492  0.9948
  Materials       -1798.88       3093.02      -0.5816    0.5609
  Auto            -6799.83       4201.51      -1.618     0.1058
  Seniority          43.3738        21.8114     1.989     0.0470    **
  Revenues            0.611736       0.0254586 24.03     7.84e-106 ***

Mean dependent var   24527.81   S.D. dependent var   43404.40
Sum squared resid    1.59e+12   S.E. of regression   34981.24
R-squared            0.360328   Adjusted R-squared   0.350465
F(20, 1297)          36.53015   P-value(F)           9.2e-111
Log-likelihood      -15649.24   Akaike criterion     31340.48
Schwarz criterion    31449.34   Hannan-Quinn         31381.30
rho                  0.998144   Durbin-Watson        0.523895

Excluding the constant, p-value was highest for variable 33 (Utilities)
```

Figure n.18

- Subsequently, the Expected Returns have been investigated. Expected Returns are hence expressed under the form of the PE ratio: this ratio represents how much the market is willing to pay for a stock based on its past or future earnings. In fact, previous studies have shown that a relationship between Expected Returns, measured by the PE ratio, and ESG does exist. However, in *Figure n.19* it is possible to observe that no relationship occurs between the most part of the rating values and the PE ratio itself. However, it is interesting to look at the coefficient of the constant (here representing, between the other excluded variables, the CCC): it is possible to see that this coefficient is positive, accompanied by a very small p-value that signals a strong significance of the relation. A triple-C rating, together with the effect of the Future Mobility sector, triggers a consistent increase in the PE ratio. This result

is also affected in this sense by the zone variable (Middle West) and the considered year (Year 2020). Results can be summed up saying that higher ratings have no impact on the PE ratio, while the lowest one impacts the ratio positively. The relationship observed here can come from the fact that having a bad ESG rating can trigger companies to try to attract investors compensating for the negative attribution through the promise of very attractive high expected returns.

Furthermore, also the sectoral variables show a correlation with the dependent variable. All of them, however, have a negative impact on the PE ratio, with Energy and Utilities contributing with the worst outcome.

What emerges from the analysis is that ESG scores are not a very good predictor of future returns and do explain only partially the future performance of a company.

Even if the analysis for ESG ratings has not produced significant results for the most part of the ESG variables, the R^2 value seems to be good enough, with a value of 0,697, signalling an overall strong correlation between the independent variables and the dependent one.

Model 26: Pooled OLS, using 1318 observations
Included 341 cross-sectional units
Time-series length: minimum 1, maximum 4
Dependent variable: PEratio
Omitted due to exact collinearity: CCC Year_2020 Middle_West Future_Mobility

	coefficient	std. error	t-ratio	p-value	
const	1067.83	110.817	9.636	2.85e-21	***
AAA	-31.5223	46.0529	-0.6845	0.4938	
AA	-44.2740	43.9530	-1.007	0.3140	
A	-19.9450	42.7659	-0.4664	0.6410	
BBB	-28.7644	42.4172	-0.6781	0.4978	
BB	-9.86843	43.1012	-0.2290	0.8189	
B	19.5790	45.9039	0.4265	0.6698	
Year_2017	-116.512	15.6805	-7.430	1.96e-13	***
Year_2018	-51.2848	15.5586	-3.296	0.0010	***
Year_2019	14.2302	15.4251	0.9225	0.3564	
North_America	-96.2899	101.302	-0.9505	0.3420	
South_America	-4.60086	122.957	-0.03742	0.9702	
Europe	-78.2581	101.570	-0.7705	0.4412	
Oceania	-93.3464	103.301	-0.9036	0.3664	
Asia	-48.9824	101.754	-0.4814	0.6303	
Energy	-842.433	21.3670	-39.43	4.04e-224	***
Utilities	-604.753	18.9064	-31.99	5.33e-166	***
Materials	-274.565	17.6662	-15.54	4.42e-50	***
Auto	-42.4618	23.9975	-1.769	0.0771	*
Seniority	0.0938372	0.124579	0.7532	0.4514	
Revenues	-0.000187439	0.000145410	-1.289	0.1976	

Mean dependent var	551.9036	S.D. dependent var	360.3868
Sum squared resid	51776153	S.E. of regression	199.7997
R-squared	0.697304	Adjusted R-squared	0.692637
F(20, 1297)	149.3916	P-value(F)	0.000000
Log-likelihood	-8841.438	Akaike criterion	17724.88
Schwarz criterion	17833.74	Hannan-Quinn	17765.69
rho	0.547397	Durbin-Watson	0.802884

Excluding the constant, p-value was highest for variable 30 (South_America)

Figure n.19

-Two further performance measures have been analysed: the Profit and the Operating Margin.

Profit Margin is a ratio of a company's profit (sales minus all expenses) divided by its revenue and it represents how many cents of profit have been generated for each dollar of sale.

In *Figure n.20* it is possible to see that there is no correlation between ratings and the value of the Profit Margin. In fact, the p-value is too high to reject the null hypotheses and no correlation is significant here. It is, therefore, possible to conclude that ESG ratings do not impact on company's profitability. Furthermore, the R^2 is not significant (0,033), confirming that globally there is no correlation between the independent variables and the dependent one. A small but interesting finding, however, is the fact that within the sectors, Utilities is the only one who shows a correlation with the Profit Margin, by generating a positive impact on profitability.

```
Model 27: Pooled OLS, using 1318 observations
Included 341 cross-sectional units
Time-series length: minimum 1, maximum 4
Dependent variable: ProfitMargin
Omitted due to exact collinearity: CCC Year_2020 Middle_West Future_Mobility

                  coefficient    std. error    t-ratio    p-value
  ---------------------------------------------------------------
  const           -0.104090      0.656710      -0.1585    0.8741
  AAA             -0.0759925     0.272913      -0.2784    0.7807
  AA              -0.146117      0.260469      -0.5610    0.5749
  A                0.149291      0.253435       0.5891    0.5559
  BBB              0.0480296     0.251368       0.1911    0.8485
  BB              -0.0146239     0.255422      -0.05725   0.9544
  B               -0.00280931    0.272030      -0.01033   0.9918
  Year_2017        0.191799      0.0929240      2.064     0.0392   **
  Year_2018        0.161780      0.0922019      1.755     0.0796   *
  Year_2019        0.162679      0.0914108      1.780     0.0754   *
  North_America   -0.109536      0.600328      -0.1825    0.8552
  South_America    0.0352528     0.728656       0.04838   0.9614
  Europe           0.184453      0.601913       0.3064    0.7593
  Oceania         -0.134112      0.612170      -0.2191    0.8266
  Asia             0.0315255     0.603004       0.05228   0.9583
  Energy           0.152420      0.126623       1.204     0.2289
  Utilities        0.452148      0.112041       4.036     5.77e-05 ***
  Materials        0.126462      0.104691       1.208     0.2273
  Auto             0.0555202     0.142211       0.3904    0.6963
  Seniority       -0.000692884   0.000738266   -0.9385    0.3481
  Revenues        -1.15667e-06   8.61714e-07   -1.342     0.1797

Mean dependent var   0.157235   S.D. dependent var   1.195046
Sum squared resid    1818.303   S.E. of regression   1.184031
R-squared            0.033257   Adjusted R-squared   0.018349
F(20, 1297)          2.230888   P-value(F)           0.001428
Log-likelihood      -2082.220   Akaike criterion     4206.439
Schwarz criterion    4315.300   Hannan-Quinn         4247.256
rho                  0.582700   Durbin-Watson        0.571982

Excluding the constant, p-value was highest for variable 19 (B)
```

Figure n.20

-Another indicator of the profitability of a company is the Operating Margin. It shows a company's ability to manage its indirect costs and be profitable and is obtained dividing operating income by revenues.

Figure n.21 provides a clear picture of the relation between the variables. The analysis here leaves no doubt of a no-correlation situation between the ESG ratings and the profitability measure. P-values are, in fact, too high to allow to reject the null hypothesis. However, it is

possible to observe a correlation between Year 2017 and the Materials sector with the dependent variable. The rest of the analysis shows no correlation with the Operating Margin. The results here confirm what has been seen in the previous section for the Profit Margin: the profitability of the companies does not depend on the ESG ratings they have been attributed.

```
Model 28: Pooled OLS, using 1318 observations
Included 341 cross-sectional units
Time-series length: minimum 1, maximum 4
Dependent variable: OperatingMargin
Omitted due to exact collinearity: CCC Year_2020 Middle_West Future_Mobility

                 coefficient     std. error    t-ratio   p-value
  ------------------------------------------------------------------
  const            9.27719      279.997         0.03313  0.9736
  AAA             94.2670       116.360         0.8101   0.4180
  AA             104.431        111.055         0.9404   0.3472
  A               68.1921       108.055         0.6311   0.5281
  BBB             98.5309       107.174         0.9194   0.3581
  BB              31.1825       108.902         0.2863   0.7747
  B               99.8210       115.984         0.8606   0.3896
  Year_2017      294.535         39.6194        7.434    1.91e-13 ***
  Year_2018        4.72704       39.3115        0.1202   0.9043
  Year_2019        4.42353       38.9742        0.1135   0.9097
  North_America  -229.422       255.958        -0.8963   0.3702
  South_America   -81.1855      310.672        -0.2613   0.7939
  Europe         -194.804       256.633        -0.7591   0.4479
  Oceania        -222.729       261.007        -0.8533   0.3936
  Asia             28.6443      257.099         0.1114   0.9113
  Energy           24.4820       53.9874        0.4535   0.6503
  Utilities        -7.51478      47.7701       -0.1573   0.8750
  Materials       183.859        44.6365        4.119    4.05e-05 ***
  Auto            -80.0021       60.6336       -1.319    0.1873
  Seniority         0.251164      0.314769      0.7979   0.4251
  Revenues         -2.90055e-05   0.000367403  -0.07895  0.9371

Mean dependent var   70.04921   S.D. dependent var   534.1423
Sum squared resid    3.31e+08   S.E. of regression   504.8273
R-squared            0.120318   Adjusted R-squared   0.106753
F(20, 1297)          8.869798   P-value(F)           2.76e-25
Log-likelihood      -10063.09   Akaike criterion     20168.19
Schwarz criterion    20277.05   Hannan-Quinn         20209.00
rho                 -0.019410   Durbin-Watson        1.074889

Excluding the constant, p-value was highest for variable 6 (Revenues)
```

Figure n.21

-Interesting results are, however, observed concerning the Volatility: in fact, as it is possible to see in *Figure n.22* some significant correlations are observed. The most interesting correlation is the one between the highest and lowest ratings with the Volatility value. Triple-A ratings in fact show the best positive impact on the Volatility, producing a direct reduction of the risk of 0,053 %. On the other side, a CCC rating has a very negative impact on the risk, generating an increase of 0,606 % for the Volatility value. The values can seem small and not very significant, but a reduction or an increase of this degree associated to a particular ESG rating is relevant when it comes to risk measures and it can change a lot for a company, especially when considering adopting a particular sustainable strategy over another. This finding can also motivate companies to try to be greener and to pursue more

environmental and social politics, while implementing a good governance, to lower stock risk and to attract further investors.

Looking at the R^2 instead, the value is 0,494, signalling a weak to moderate effect size, being the Volatility moderately dependent from the independent variables.

```
Model 29: Pooled OLS, using 1318 observations
Included 341 cross-sectional units
Time-series length: minimum 1, maximum 4
Dependent variable: Volatility
Omitted due to exact collinearity: CCC Year_2020 Middle_West Future_Mobility

                  coefficient    std. error    t-ratio     p-value
  ------------------------------------------------------------------
  const            0.606004      0.0699382      8.665    1.32e-17  ***
  AAA             -0.0527470     0.0290647     -1.815    0.0698    *
  AA              -0.0253196     0.0277394     -0.9128   0.3615
  A               -0.0140362     0.0269902     -0.5200   0.6031
  BBB             -0.0218318     0.0267702     -0.8155   0.4149
  BB              -0.0208244     0.0272018     -0.7656   0.4441
  B               -0.0110125     0.0289706     -0.3801   0.7039
  Year_2017       -0.234096      0.00989620    -23.66    3.87e-103 ***
  Year_2018       -0.187011      0.00981930    -19.05    1.67e-71  ***
  Year_2019       -0.169242      0.00973504    -17.38    5.14e-61  ***
  North_America    0.0432969     0.0639336      0.6772   0.4984
  South_America    0.112593      0.0776002      1.451    0.1470
  Europe           0.0166052     0.0641024      0.2590   0.7956
  Oceania          0.0106048     0.0651947      0.1627   0.8708
  Asia             0.0131069     0.0642185      0.2041   0.8383
  Energy          -0.0868120     0.0134851     -6.438    1.70e-10  ***
  Utilities       -0.240885      0.0119321     -20.19    4.97e-79  ***
  Materials       -0.140533      0.0111494     -12.60    1.90e-34  ***
  Auto            -0.0941216     0.0151452     -6.215    6.92e-10  ***
  Seniority       -0.000395713   7.86236e-05   -5.033    5.51e-07  ***
  Revenues        -3.72633e-07   9.17706e-08   -4.060    5.19e-05  ***

Mean dependent var   0.297528   S.D. dependent var   0.175900
Sum squared resid    20.62279   S.E. of regression   0.126097
R-squared            0.493907   Adjusted R-squared   0.486103
F(20, 1297)          63.28856   P-value(F)           1.7e-175
Log-likelihood       869.6145   Akaike criterion    -1697.229
Schwarz criterion   -1588.368   Hannan-Quinn        -1656.412
rho                  0.512176   Durbin-Watson        0.750304

Excluding the constant, p-value was highest for variable 28 (Oceania)
```

Figure n.22

Summing up all the results of the whole analysis, it is possible to reply to the questions listed at the beginning of the section.

From the analysis does not emerge a visible direct impact of ESG scores on financial performance, while when considering expected returns the ESG rating seems to play a role in contributing positively to increase the PE ratio when the rating is the lowest (CCC). These interesting findings can be interpreted as the behaviour of a company with the lowest rating pledging to offer higher earnings to compensate the negative rating it has been associated to. In fact, a collateral problem that could arise when the company has a very negative score is that the cost of capital could raise because investors would not be likely to put their money into unsustainable companies.

Furthermore, indagating for profitability measures, the regressions show that there is no direct relationship between ratings and Profit and Operating Margin. So, profitability appears to be independent from the ratings that are attributed to the company and these ratings do not help to predict firm profits.

Concerning the size of the company, the analyses confirm the belief that bigger companies tend to have better ratings. The analysis signals an important correlation between the variables. The value associated to the different ratings tends to decrease moving from an AAA rating to a CCC one, with the latter not showing a visible correlation with the dependent variable. What probably triggers this relation is the fact that companies with higher valuations can be able to invest more in sustainable projects and ameliorate the ESG score, while smaller companies do have limited financial resources for that, often being laggards in matching what larger competitors do. In fact, as specified in the previous chapters, companies who have available funds can invest into projects that can have an important impact on their notes, raising the scores and ameliorating the company's image.

A last metric that has been analysed is the Volatility, being often regarded as an important measure of risk for stocks. What is interesting is the correlation between the highest and lowest rating and the Volatility value. A triple-A rating contributes to reduce risk, while a triple-C has the opposite effect of increasing this risk. The finding is interesting because it could incentivize a company reduce its stock price volatility by working on sustainable issues.

4.5 Predictive Analysis

To deepen the discussion about the impact of ESG scores on company's financial performance and trying to assert if it is possible to predict how the ESG scores will move in the future, a predictive analysis has been conducted through Orange DataMining, a platform that allows to perform data analysis and visualization, see data flow and to perform predictive analysis. A *Naïve Bayes Classifier* has been used to conduct the analysis and the results have been modelized as a *Confusion Matrix*.

Naive Bayes Classifiers are a family of simple "probabilistic classifiers" based on applying Bayes' theorem with strong (naïve) independence assumptions between the features. Baye's theorem, seen in *Figure n*.23, describes the conditional probability: an event A occurs given that another event B has already occurred is equal to the probability that the event B occurs

given that A has already occurred multiplied by the probability of occurrence of event A and divided by the probability of occurrence of event B.[78]

$$P(A \mid B) = \frac{P(B \mid A) \cdot P(A)}{P(B)}$$

A, B = events
$P(A|B)$ = probability of A given B is true
$P(B|A)$ = probability of B given A is true
$P(A), P(B)$ = the independent probabilities of A and B

Figure n.23

A *Confusion Matrix*, instead, is an N x N matrix used for evaluating the performance of a classification model, where N is the number of classes of the target value (in this case, ESG ratings). The matrix compares the actual target values with those predicted by the machine learning model, providing results under the form of possible predicted outcomes. In the specific case of the analysis on the ESG ratings, the Confusion Matrix represented in *Figure n.24* shows how likely the ratings are to move up or down the ranking. In this kind of analysis, it is necessary to start from a so-called "training set", that is a portion of the available data; for this analysis, a training set of 70% has been applied, meaning that 70% of the data comes from the same dataset used for all the analysis conducted so far. The 70% of data that is inserted in the software is used to train the system and, thanks to a machine learning process, it tries to predict how the ESG ratings could evolve in the future. The data cannot be taken at a 100% level because otherwise there would be no meaningful prediction: accordingly, a 70/30 ratio is generally used to conduct this kind of analysis.
Only ratings ranging from AAA to B have been considered, because after conducting several tests, CCC ratings proved to affect the predictive results of the analysis in a way that makes the whole analysis meaningless. The total number of observations, with the exclusion of the CCC ratings, amounts to 1293. Furthermore, as it is possible to see in *Figure n.24* the software has tested for predictions 100 times. Considering that the machine learning software only needs 70% of the data to run the predictions, the 30% is the meaningful part of the result. 30% of the 1293 observations is 388 and this value is multiplied by 100 (the number of tests run by the software), so the total number of results is 38.800.

[78] https://www.merriam-webster.com/dictionary/Bayes%27%20theorem

Actual \ Predicted	A	AA	AAA	B	BB	BBB	Σ
A	2168	1741	764	482	951	2783	8889
AA	1168	2006	1149	154	545	1239	6261
AAA	513	902	1881	28	136	468	3928
B	555	255	138	409	432	778	2567
BB	1398	953	414	598	1227	2238	6828
BBB	2251	1672	580	673	1339	3812	10327
Σ	8053	7529	4926	2344	4630	11318	38800

Figure n.24

Looking at the predictions, it is possible to observe from the matrix that an A rating usually tends to stay as such or to worsen a little and to move towards a BBB rating, while in a significant number of observations there is an upgrade of the rating to an AA rating or even to an AAA rating. Only few are the ratings that plunge to B, with a BB being anyway consistent.

AA and AAA ratings are also interesting to observe, with a good "preservation" ratio: the ratings, in fact, remains at the same level, with few downgrades, for the most part of the observation. These results are encouraging, because the model forecasts that best ratings tend to stay around the same level or to move upwards. When it comes to B ratings, instead, here the model predicts that a higher number of ratings goes up to BBB, with few upgrades to AA and even less to AAA. Concerning the BB rating, the prediction is favourable, indicating a consistent increase of ratings to BBB, with only a small portion moving down to B. Also, a meaningful part of the observations points towards a BB rating that stays constant or that even because an A and AA, with however limited cases for AAA.

Concluding, when it comes to the lower rating analysed in the prediction, BBB, the most part of the ratings tend to stay at that level, with a consistent part moving to BB, A and AA. What the results show can be that companies with lower ratings are likely to try to move upwards in the rating scale. This can be triggered by the fact that a lower rating is not great for the company itself under all the aspects analysed so far, from financial to ethical ones. Increasing the rating becomes, then, one of the main goals of the company which, in turns, expects to gain an advantage for the better rating and to have a positive impact on the sustainability issue.

The analysis seen in this section is just a prediction computed starting from available data. The real outcome is likely to be different, considering that, as seen in previously chapters, ESG score (or ESG risk scores) are assigned by rating agencies who take into consideration a higher number of data points, a part of which is not easily available. The tendency to increase the ESG rating, confirmed by the predictive analysis of this paragraph, has been widely discussed in the financial panorama, with numerous studies pointing towards similar results.

4.6 Discussion of the results and limitations of the study

Previous research shows that ESG has an impact on the financial and operating profile of a company. Integrating ESG issues into company practices and having a good ESG score has been proved by several studies to have an impact on different valuations measures and stock returns. However, ESG does not show a correlation with some of the variables analysed, while lower ESG scores have been associated to higher expected returns (expressed here by the PE ratio), and higher ratings to a reduction in stock risk and a higher market cap. ESG is a relatively new concept and the impacts on the performance of a company may need more time to be fully understood.
The study has analysed a pool of observations large enough to have statistical significance and the number of companies involved has been able to provide a good representation of the trends in the sectors considered. Furthermore, the period of analysis (2017-2020) can be significant because it is only in recent years that the ESG concept has gained notoriety and that an ever-growing number of companies has started to disclose data about sustainable issues.

The Electric Mobility sector has been analysed to indagate for meaningful relationships between this sector and related ones, and ESG issues. The choice of this sector is motivated by the fact that ESG investing is often associated to the Electric Mobility sector for many reasons and in recent years it has been rewarding for the ones investing responsibly.
The shift from fossil fueled vehicles to electric ones is perceived as one of the main developments of this era, with a rise in the awareness and revenues for companies operating in the automotive sector. However not all the companies share the same luck. The stock performance, in fact, depends on several factors.

The performance of the stock market is a mix of how the company is behaving and performing and how the investors and the public perceive it. For a solid and well-established company, making higher profits and being less volatile is on average easier compared with new established companies who do not have the same financial strength and public awareness. On the ESG side, sustainable companies have proved to be, for certain aspects, more profitable than traditional ones, thanks to their better financial structure, good corporate social responsibility (CSR) and a positive reception from the investors. However, this is not always true, because sometimes the higher sustainability can come at a higher cost.

Nowadays, most part of the companies operating worldwide are required to comply with sustainability rules and failing to meet this requirement can have important negative effects on companies. When talking about ESG issues, the principle of investing in a company only with the goal to have a financial return does not always hold: in fact, sometimes, investors' preference for sustainable issues can have other motivations, such as ethical ones. Behavioral finance confirms that investors are not always rational and that there are other reasons for investing in some companies instead of others, even if those companies do not offer the highest returns.

The study has, probably, some limitations due to the nature of the study itself, the sectors and the subjects considered.

A limitation of the study could come from the analysis performed on the Electric Mobility sector. In fact, the sector is not mature enough to provide strong series of historical data for previous periods, because most of the companies are start-ups. Furthermore, most of the data is not publicly available since these start-ups were not listed on the stock exchange until the recent Electric Mobility revolution. With the development of the phenomenon, the future data availability could trigger a wider analysis for further studies. However, the data set used for the analysis is relatively large and includes many observations. The representation of firms in Europe and North America overall is rather extensive.

Another important limitation of the study could come from the fact that there is no standard in ESG disclosures and data measurement yet. This means that an analysis done with data coming from different providers could give discording results.

To verify this point, ESG Risk Ratings coming from Sustainalytics (whose methodology has been detailed in chapter 2) have been retrieved and used to carry regression analysis, with

some results slightly deviating from the ones obtained through MSCI ESG data. These results, however, are not astonishing, due to the different risk metrics and data points used by the two ratings agencies. This finding confirms also what previously said about the heterogeneity of the data: data coming from different financial providers is not fully comparable and, at the present time, what it is possible to do is to choose a provider (and so, a methodology) and conduct the analysis with it, without mixing the different methodologies. To give a wider spectrum to the non-homogeneity between ratings, the following results obtained through regression analyses conducted through Excel are reported.

The data analyses only the Year 2020 and is listed by sector.

Energy

Concerning the Energy sector, the correlation between the score ESG and the Excess Return is really weak, with a value of around 0,02, with an R^2 that is much smaller, indicating that the ESG is not a good indicator of companies' performance in the energy sector and does not explain the performance for the year 2020. In fact, changes in ESG score does not significantly influence the Excess Return of the firm. However, in this sector the link between the ESG performance and the returns could be undermined by the fact that all the companies being part of the sector are related to oil and gas operations, which normally accounts for higher ESG risks. In fact, the average ESG risk score of the sector is 30,25, that is between the medium and high-risk band according to Sustainalytics.

Conducting a regression analysis also on the PE ratio, here again the linear relationship, represented by the Multiple R factor, is weak, with a value of 0,109, while the R^2 is around 1,2%. The results are similar to the ones obtained through the analysis of Excess Returns, excluding again a strong direct relationship between the PE ratio and the ESG risk score.

In terms of margins, instead, the analysis points towards a stronger, in relative terms, but still weak in absolute terms, relationship between the Operating Margin and the ESG risk score attribution, with the Multiple R settling at 0,276 and the R^2 at 7,62%. For Profit Margin, the values are quite lower, with a value of 0,146 for the Multiple R and 7,62% for the R^2. Finally, also in terms of Volatility, the linear relationship with the ESG score is even weaker, with a Multiple R at 0,0148 and a R^2 with a much smaller and not significant value, meaning that the behaviour of stock's prices, and so the risk, is not directly related to the ESG risk score.

Materials

Materials sector shows a pattern similar to the one of Energy, probably due to the activities conducted by the companies included in the sector and that could account for a higher ESG risk in the industry: chemicals, metals and mining, industrial gases, gold, construction materials, steel and copper, between the others. The average ESG risk score for the sector is 27,24, signalling an overall medium risk in the sector. The linear relationship between Excess Return and ESG risk score is weak and does not show a significant link, with a Multiple R of 0,011 and a R^2 smaller and not significant. The PE ratio and ESG risk score have no relationship, signalled by a Multiple R of 0,02 and an R^2 that is much lower, and changes in ESG score does not account for significant changes in the Excess Return and PE ratio of the company.

Concerning the Profit and the Operating Margin, both show very low correlation with the ESG data, highlighting a missing link between the profitability of companies in the Materials sector and the score ESG that is assigned to companies.

In terms of Volatility, however, there is a higher correlation with the ESG risk score, with a Multiple R of 0,311, showing a linear relationship between the variables that is still weak, but stronger when compared with the other indicators, denoting that it is possible that stock risk could be partially related to the ESG risk.

Auto & Components

For the Automobiles sector, the results do not show a consistent relationship between the factors who have been analysed and the ESG risk score. However, the bias in this sector can be due to the particularity of the 2020's data: in fact, all the returns for car makers, expect Tesla, are negative, due to the pandemic impact on the market. The results of the regression analysis on this sector are not significant for year 2020.

Utilities

The Utilities sector shows an interesting pattern. In particular, the correlation here is stronger than the one found in each of the other sectors.

For the year 2020, Multiple R between Excess Return and ESG score is 0,403, being the highest value registered during the various regression analysis who have been conducted. R^2 settles at a value of 16,21%, a small result in absolute terms, but significant when considered relative to the other results. If considered on a quintile basis, the top quintiles show a higher linear correlation than the bottom quintile, a result that can indicate that part of the

performance of the companies of this sector is related to the ESG risk management. In the Utilities sector, who regroups companies related to the electric utility, multi-utilities, gas, water, energy production and trading, and renewable electricity, part of the Excess Return that companies achieved can be attributed to a positive ESG score and, so, a better ESG risk management. In terms of PE ratio, the linear dependence between the variables is weaker, with a Multiple R that is the half of the value of the relation between Excess Return and ESG Risk Score, totalling a modest 0,201 and an R^2 of 4%. A slightly lower value characterizes the linear relationship between the Operating Margin and the ESG Risk Score, with a Multiple R of 0,178 and a R^2 of around 3%. This data shows similarities with the PE ratio results. On the Profit Margin, instead, the relation appears to be even weaker, with a Multiple R of only 0,089 and a R^2 of 0,8%.
Results for this sector are the most consistent between the data analysed.

Even though similarities do occur on some variables, doing an analysis utilising different methodologies normally leads to slightly different results. Regulators around the world are trying to elaborate new policies and laws that aim to increase the level of homogeneity between different ESG metrics and valuations. When this goal will be met, even the results of analyses conducted starting from different financial providers will likely converge.

What is also interesting at this stage is the fact that companies who are perceived greener than the others are often able to manage better also financial risks. This turns into the possibility for the company to have access to a more convenient cost of debt and, in consequence, to keep the cost of equity low. Hart and Ahuja1, from the University of Michigan, have conducted an early analysis on this specific point in 1996, highlighting that the environmental profile of a company shows to influence its liability exposure, reputation and market value. Failing in pursuing a positive environmental policy affects the firm's cost of capital, the Return on Equity (ROE), more than the ROS (Return on Sales) and the ROA (Return on Assets), and the whole liability structure.
The sustainable elements on which the company can build and develop its mission and vision, and the consequent long-term sustainable structure that originates from that, combined with the positive public reputation, allow the company itself to generate a better performance and to reach more challenging goals. The Electric Mobility sector falls often within this scenario, with the companies perceived as an environmental-friendly alternative to the classical automotive sector. However, the work conducted so far does not necessarily

lead to the conclusion that this sector is the best choice investors have when it comes to reward sustainable aspects. In fact, it is also necessary to take into consideration how the energy behind the electric vehicles is produced, which policies have been implemented by the companies and, globally, how the E, S and G issues are addressed. ESG is a delicate matter that is now developing and involving a wide range of sectors and element. The legislation is moving fast and companies are adapting to this new trend, re-shaping when necessary their business models.

So far, studies on ESG have shown correlations, even if weak is some cases, between performance and risk measure and sustainable issues. Further research in this domain will help confirm or neglect these findings.

Conclusion

In the wake of the 2020 health crisis, conversations about health, environment and social justice have become even more important than in previous years. ESG has therefore undergone accelerated growth, and this allows us to observe the important role of finance in helping to find sustainable and impactful solutions for investors and society at large. ESG investing is a broad and fascinating topic that is here to stay and evolve. This paper has collected information and analyses to explain what ESG means, to cover its different aspects and to try to define in which measure it can impact companies and society, estimating also possible outlooks for the future.

On the global financial panorama, sustainability is a very hot topic. Analysts all over the world indicate that this is only the beginning of a trend that will reshape the economy. While being underestimated in the past, investing in a socially responsible way is today an obligation for companies and investors all around the world. The electric mobility sector, more than the others, has been perceived as the main driver of this modern revolution and trend, and therefore it has been the natural choice for the analysis of the potential impacts of good or bad ESG on company's performance. To have a broader spectrum, the analysis has been enlarged including sectors who are related to the electric mobility and that have a close link with the sustainability issue. The sector, however, has proven to be not always ESG-compliant, due to supply chain and energy production controversies. The analysis carried in the paper confirms no strong correlation between high ESG ratings and the specific sector.

On the data availability side, nowadays it is possible to conduct researches on ESG, but the non-homogeneity between data providers and between regulations generate discording or confusing results. Previous studies show that good ESG has somehow a general positive effect on firm performance and reputation. While the impact on the reputation is widely recognized, the impact on the performance is not always observed, with some studies indicating that superior ESG comes at a high cost. The analysis conducted through this work has, however, enlarged the spectrum of the research and highlighted that ESG is correlated positively with the size of companies, while mitigating the stock risk and also having a limited impact on the expected returns. Therefore, ESG represents a real opportunity for companies and a way to boost performance through ESG integration and to better manage financial risks. On the other side, we observe that large companies, which have larger investment capacities, have an advantage in integrating these criteria, representing an

additional challenge for smaller companies. Widely discussed in the paper is also the interesting trend of individuals who engage in this kind of investments not only to pursue financial objectives, while rather following ethical motivations, as behavioural finance explains.

ESG concept embraces many areas, from the legal to the financial one. Regulators and financial providers have been all challenged by the affirmation of this new trend and more homogeneity in the future is a necessary step that will help put the basis for a solid and clearer understanding of the phenomenon. Europe is one of the leading continents when it comes to sustainable finance, with an already advanced regulation. If institutions and regulators will work on harmonisation and standardization of guidelines, companies will find it easier to integrate ESG criteria, with a benefit for the whole community. While the data about ESG is already quite significant today and it allows us to affirm that ESG issues have an impact on company's value, further data and regulations will continue to develop and contribute to more interesting results in this area of research for years to come.

Concluding, ESG is a major issue, fraught with challenges and opportunities. A good financial performance, based on a balanced corporate governance and concern for the environmental and social aspects is a fundamental objective to achieve. As seen through the paper, sustainability and financial profit go hand in hand, one does not exclude the other, but rather they strengthen each other and can lay the foundations for projects that will make a difference in the world we live in.

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Summary

"In too many cases, the financial sector has strayed from its original, noble purpose. And too often, it has worked hard to serve itself rather than serve people and the economy at large." (Christine Lagarde, 2019)

This sentence has been pronounced by Christine Lagarde during a speech in London in 2019, resuming the poor image that is often associated to the financial sector. The bad image associated to the financial sector is due to the fact that it is seen as a profit-making industry who is tactless for the rest of the economy. Years ago, in fact, it was difficult to imagine that banks, asset managers and financial institutions would all aim to include Environmental, Social and Governance (ESG) criteria in their investment strategies. Finance, instead, has the potential to be the strongest engine of a sustainable revolution that could reshape the world.

Environmental, Social and Governance (ESG) is a broad concept that has attracted an increased attention during the last years, with an unprecedent growth in 2020, a particular year that has shaped industries worldwide and that has allowed people and companies to take a moment to reflect about some important themes, such as the environment and climate issues. The financial sector has undergone a profound change in structural terms, with investments directed towards sustainable assets to ameliorate the negative reputation that has been attributed to this sector for years. The electric mobility sector, as a prime example, has gone under a strong evolution that has brought the sector itself to a completely new level, attracting the attention of international investors. Habits of people around the world have changed in the last years and 2020 has probably had a role in accelerating all those changing processes that have been in a "working process" status for years. Shifting to renewable resources and clean energy has become the central point of most of the regulations around the world, with ambitious government objectives concerning the sustainability issue.

It is in particular on the investment side that the question of sustainability has gained notoriety, with investors perceiving socially responsible investments as a way to better manage risk, to make a positive impact on the society and to attain more sustainable long-term returns. In fact, the financial crises that have crossed the past decades and company controversies have shown how harmful it can be to focus on the short term, highlighting at the same time the importance of screening companies based on their governance and environmental and social practices. A strong push towards sustainable investments comes from the regulators, such as in the European Union, where it has recently emerged a strong

interest towards the development of the integration of ESG issues into the investment decision-making process and companies' practices, alongside with market and financial risks.

Climate and environment have always been crucial themes for the human evolution, but they were left out of global discussions until some years ago. Eventually, we have realized that the world we are living in needs an increased attention in order to preserve it for the next generations. CEOs from every angle of the planet have started reviewing company values to adapt them to the new challenges that the world is facing. Being a socially responsible company has become a basic requirement when operating globally, and everybody can play a role in making the world a better place.

The attention around the broad topic of "sustainability" is growing at an exponential pace. The durable negligence of resources is being perceived by the society as a threat to the economic, cultural and social world. This awareness is spreading like never before and there are some who are more than others interested in this shift in people's preferences: preoccupations and curiosity around the ESG concept have captured the attention of an increasing number of fund managers and high-profile investors, who are trying to make the best out of it. Some traditional companies are finding out that their business models have not been able to keep up with the times, delivering lower returns than more dynamic and socially involved companies, who have been able to design their models in a way that makes the company both competitive and attractive for capitals, receiving positive grades on the ESG side. These ESG ratings are becoming key assets for companies, with numerous studies pointing towards the fact that good ESG generates superior performance.

The paper analyses extensively the sectors related to the sustainability issue and the ESG ratings, trying to find interactions between profitability and sustainability, and showing how these elements influence each other. I analyze if and how integrating ESG issues can help a company lower the cost of capital, reach higher profits, reduce risks and how a company can use this status to gain consensus and make a positive impact. The starting point of the analysis will be the electric mobility sector, being often associated to the ESG topic. The analysis will move towards related sectors, automotive, energy, materials and utilities, indagating how ESG ratings are assigned and how they affect company's performance.

The central research question of the paper is "Does good ESG guarantee better financial performance?". Together with this central one, other related questions will be addressed to enlarge the focus of the research.

In the **first chapter**, the sustainable finance topic has been described and analysed. Sustainable investments are becoming more and more appealing, and they have gained enough notoriety to be the game changer of this era. The first chapter recalls the Environmental, Social and Governance (ESG) phenomenon: characteristics, sustainable principles and standards, regulations and issues have been deeply explored at this stage. Furthermore, different investment strategies, such as the Sustainable and Responsible Investment (SRI) and the impact investing are addressed, with a focus also on the ESG metrics that help define which companies are compliant and in which measure. In order to give a better taste of which metrics are usually used in evaluating the ESG issues management level, different examples are proposed, with a focus on specific rating methodologies that will be also included as part of the analysis in the last chapter.

"Sustainable finance generally refers to the process of taking due account of environmental, social and governance (ESG) considerations when making investment decisions in the financial sector, leading to increased longer-term investments into sustainable economic activities and projects" is the definition of the concept of sustainable finance provided by the European Commission. The importance of this process resides in the fact that it has a central role in providing the capital necessary to reach the objectives under the European Green Deal and the climate and sustainability goals defined by the European Union.

ESG issues and sustainable finance are in fact capturing the attention of an increasing number of investors around the world. The term "Environmental, Social and Governance" (ESG) is attributed to The Global Compact Leaders Summit of 2004, where nearly 500 leaders, including CEOs, executives, government officials and UN agencies, have discussed the concept of global corporate citizenship and the central role that governments and companies could play in safeguarding the world. The first concrete milestone of a transition to a greener world has been the adoption of the UN 2020 agenda and Sustainable Development Goals and the Paris Climate Agreement in 2015, international agreements that include the commitment to common goals, reduction of CO2 emissions and aligning businesses and finance towards low-carbon and sustainable development. In order to be widely accepted, ESG relies on principles, the so-called Principles for Responsible Investment (PRI) that help investors and managers define what ESG means and how to act to comply with this kind of investment. "Principles for Responsible Investment (PRI)" are a voluntary and ambitious set of investment principles that offer possible actions for incorporating ESG theme into investment practice. Organisations can become a signatory of

PRI principles if they respect certain characteristics, provide accurate disclosure about ESG data and company's activities.

Furthermore, ESG concepts are related both to Sustainable and Responsible Investment and to impact investing, two kind of investment strategies that help investors and asset managers navigate the spectrum of sustainable possibilities. ESG is also based on a large number of metrics that are used by rating companies to assess environmental and social risks and to assign ESG ratings.

"By shifting the horizon away from the short term and contributing to a more sustainable economic trajectory, the financial sector can become a powerful force acting in our collective best interest" is the vision of Christine Lagarde for the financial sector, expressed at the launch of the COP 26 Private Finance Agenda, the 27th of February 2020. The ECB chief, in fact, has expressed on several occasions that this sector is key for the development of a more sustainable and egalitarian community.

More than half of global asset owners are currently implementing or evaluating ESG in their investment strategy. This trend is also due to the adoption of the Sustainable Finance Disclosure Regulation (SFDR), a groundbreaking sustainable regulation recently introduced at the European level, aiming to provide greater transparency on the degree of sustainability of the financial products offered by asset managers. The largest institutional investors have highly diversified, long-term portfolios that can be a representation of the capital markets and their investment return depends inevitably on the financial sustainability of the whole economy. Finance is more and more perceived as part of the social and environmental problems the world is now facing, while being at the same time a possible solution to embrace them: in fact, the financial sector can provide the necessary resources for SRI projects.

Concerning the European scenario, it is possible to individuate three different phases in the transformation of the sustainable finance scenario from a niche market to a fundamental part of the financial system. Phase I (2009-2012) is the conflictual one, characterized by the weakening of the financial logic in society due to the financial crisis and the emergence of a small community of SRI hybrid funds. Phase II (2012-2017) has been depicted as the complementary one, with an expansion of SRI organizations into larger financial players and organizations, generating a boost in EU sustainable finance reforms. Phase III (2017-2019), the last, is again a conflictual phase between finance and sustainability logics, with sustainability eventually seen as a financial opportunity.

In order to be better understood and diffused, sustainable finance transition has been accompanied by the creation of the Sustainable Development Goals, a collection of 17 interlinked global goals designed to be a "blueprint to achieve a better and more sustainable future for all". With the adoption of the 2030 Agenda for Sustainable Development by the UN Member States in 2015 they have become a crucial point in countries' goals list. The Agenda for Sustainable Development recognizes the importance of the environmental, social and governmental thematics, claiming that climate change is a central topic and that it is necessary to accelerate the reduction of greenhouse gas emission.

Integrating sustainability criteria (ESG criteria) in investment decision and analysis is called socially responsible investment (SRI), and is one of the goals of sustainable finance. SRI factors are characterized by a screen out of some companies, while ESG investing provides guidelines on which companies and sectors to include in a portfolio while going through an investment decision-making process.

Institutional investors are becoming more concerned about these issues. Corporate scandals around the world have contributed to orientate the public attention towards the undeniable responsibility that companies, CEOs and governments have in relation to our planet. It exists a mismatch between the short-term view of financial markets, who wants companies to boost profits, and long-term view of ESG, that takes time in order to be properly realized.

Investors are all looking for profitable strategies, at the same time as contributing to the shift towards sustainable practices, sometimes through divestment strategies. A divestment strategy based on a negative screening of companies and assets carries some challenges that could make the strategy itself ineffective. Businesses who are believed to be not environmental-friendly, like for example oil companies, could be automatically excluded from the investment process, while instead some of them are seriously committing to carbon-free projects. Problems emerge when approaching ESG screening, because there is both a lack of understanding of ESG metrics and a lack of standards in the adoption and analysis of metrics. More transparency is, then, necessary at this stage. Financial providers are trying to offer solutions to navigate the ESG topic, assigning ratings to companies on ESG metrics. Between the others, Sustainalytics, a Morningstar Company, is one of the biggest and most known and complete providers of ESG metrics and company analysis. It splits the companies into five risk categories: negligible, low, medium, high and severe. This can help managers to take action to ameliorate their ESG practices. A deeper analysis on this point is presented in the second chapter.

The **second chapter** builds on the concepts of sustainability and investment opportunities to present the characteristics and the advantages of the integration of ESG issues in a portfolio, providing concrete examples from the financial world based on benchmark analysis and data coming from affirmed asset managers. Furthermore, the chapter enlarges the spectrum of the analysis illustrating the differences and the impacts of the integration of ESG investments in equity and fixed income portfolios. Remaining in the fixed income environment, the green bonds topic is widely discussed, with key figures and elements that help understand the importance of a phenomenon that has gained a renewed attention in the sustainable finance world.

The chapter has also drawn the attention on the advantages and drawbacks that can arise from different screening processes when it comes to pick the right companies to build a sustainable portfolio. It is not always the financial return that motivates investors to choose a company over another, because the ethical component plays its part: this element has been taken into consideration while explaining the investment decision-making process that brings to certain choices. In fact, often, investors are motivated to invest in sustainable funds and projects, even if gaining lower returns, because of a moral motivation. They can have this impact through engagement, capital allocation and indirect impacts. Studies confirm that engagement requests are more likely to succeed when the shareholder has an important financial participation in the company. Furthermore, some evidence shows that screening approaches have an impact on asset prices. When investors decide to screen out some companies from their portfolios, they have an impact on company's performance and capital availability. In fact, decisions taken by investors and asset managers related to the divestment or exclusion of some companies in their portfolios lead inevitably to a decrease in capital availability for those companies.

Finally, to give a wide and complete view of the phenomenon, the chapter tries to go through all the possible risks that it is possible to encounter when dealing with ESG investments: data reliability, incomplete standardization process, inhomogeneous data and greenwashing practices are all under the spotlight. ESG investing is a phenomenon that has recently experienced an increased awareness as investors interest for sustainable topics grows. Investors and new regulations and policies push to invest in funds and companies that can benefit the society, while generating returns. The chapter explores also the problems that can arise when considering ESG issues. One of these problems is *greenwashing:* a communication strategy aimed at supporting and enhancing the company's environmental reputation through the use of references to the environment in institutional and product

communication, not supported by real results in terms of improving company practices or the products offered. Some asset managers tend to overestimate their funds in order to attract business. The introduction of new and more comprehensive disclosure regulations could help avoiding this phenomenon.

The **third chapter** aims to look at sustainability from another angle, in particular the electric vehicle sector, a sector that is often referred to as the pioneer of sustainability, and that has become a vast trend especially in the last years. The sector has accounted for a discrete part of revenues of the overall automotive sector in recent times and it is expected to grow a lot in next years, in terms of sales, investments and technological growth. The shift from traditional transport to electric mobility is now one of the major trends of the 21st century, strongly demonstrated by movements in the market: outstanding performance of NIO's and Tesla's stock value, between the others, show that investor excitement around electric vehicles is increasing. The chapter offers an outlook of the market, presenting characteristics, evolution and trends.

2019 has represented one of the highest moments for the market, with 2020 confirming the enthusiasm for the alternative transportation despite the Covid-19 outbreak. The third chapter addresses also the regional differences of the EV market, with a focus on the local market features and the different regulations adopted worldwide. A lot of differences arise between Europe, United States and China, with markets being slightly different between each other, and national laws and governments' supports making the difference in the adoption of electric vehicles. China has experienced a slowdown in EVs sales, to the advantage of the European market. This is also due to the fact that the government has reduced economic incentives to buy vehicles. The slowdown has been confirmed in the first quarter of 2020 due to the Covid-19 outbreak, with a drop in sales of 57% compared to last quarter of 2019. Instead, nine of the top ten markets for electric-vehicle penetration rate were European in Q1 2020. Concerning the US, due to the high reliance of the country on fossil fuels, many states are trying to deliver regulations and policies encouraging the adoption of alternative fuels, also investing hundreds of billions in incentives and subsidies to automakers and customers.

Another element that has an important role in shaping the characteristics of this sector is the supply chain, that has been studied for its peculiarities, contradictions and the environmental impact. The supply chain of electric vehicles has been heavily criticized and is subject to numerous controversies related to the environmental aspect. It is similar to the one of the

internal combustion engine vehicles. The difference resides in the fact that, while for traditional cars the competition arises around engine and transmission, EVs compete based on battery capacity. Electric batteries are currently considered too expensive. Battery-cell manufacturers are working to increase production capacities and meet the demand. In 2020, China accounts for 77% of the world production of lithium batteries. Joint Ventures are becoming a key model in the battery industry, because they allow automaker to obtain the necessary power capacity to hit the EVs sales targets.

To gain market share and to be competitive on the market, both automakers and suppliers need to have a clear view of what's happening in the market, the regulatory framework development, the moves of competitors and new entrants and carefully following consumers' demand. An important boost to EV sales could come from European Commission's goals to cut CO2 emission by 2030, bringing it to 50% of the 2021 levels, and new emission standards.

The chapter also covers the investment opportunities in the electric mobility sector, trying to assess the question "Is Electric Mobility a good and sustainable investment opportunity?". A very important discussion has raised around the concept of energy and power generation. ESG risks, in fact, undermine the sustainability issue of the sector.

The **last chapter** takes this question further, while considering further sectors and assessing other questions that arise when dealing with the ESG topic. The objective of this chapter is to indagate if firms that have higher ESG ratings show a better performance, while assessing the strength of this bond. Companies have been picked from Automotive, Energy, Utilities, Materials and Future Mobility sectors, because of the relationships they have between each other, for the impact that sustainability matters have on the performance of the companies and for the relationship that these sectors have with the sustainability issue. Multiple regression analyses, conducted through the statistical software GRETL, have been used to assess these relationships. Companies have been retrieved through the MSCI's proprietary indexes. MSCI applies a standardized methodology that helps to assess the company's Risk Exposure and Risk Management relative to industry peers.

After gathering all the company names from the MSCI's indexes, data collection has been conducted through the *Bloomberg* terminal, aiming at identifying the financial and operational characteristics of companies. From the terminal, the data has been gathered for each target company and then organized, and filtered, removing companies who lacked information. The total number of significative **observations** is **1318**, comprising **341**

companies distributed in **5 sectors** over a **4-year period**. The following variables have been used to conduct the analysis: Seniority, Market Cap, Revenues, Excess Return, Volatility, Profit Margin, Operating Margin and PE Ratio.

The Automotive sector is central when talking about ESG because, as previously seen, transportation makes up a consistent part of the world emissions, but at the same time employs many people around the world, having both strong environmental and social impacts. The primary trend of the industry is the electrification of the global vehicle fleet, with estimates pointing to an R&D global budget for electrification of 140 billion dollars for the next five years. Concerning the ESG Risk Rating of the industry, the distribution of these scores leans toward medium and high-risk categories, with more than half of the industry (55%) considered as medium risk.

The Energy sector is one of the most affected by the transition to a more sustainable economy, with pressure coming from regulators and impacting energy producers and suppliers, who today feel the urge to shift towards sustainable sources. The sector is highly dependent on expenditures coming from oil and gas producers. Covid-19 pandemic has strongly affected the sector, reducing capital expenditures and revenues. In addition to this, the whole sector faces new market uncertainties due to the fluctuations in oil prices and the trend to shift towards more renewable sources of energy, with consequent reconversion of some market players. Due to the high importance of ESG issues for the sector, management performance and supervision of risks also tend to be higher, but part of the exposure seems to be manageable.

Materials sector includes companies operating in the discovery, development, and processing of raw materials, which are used across a broad range of sectors and industries. This sector is often labelled as an unsustainable one, due to controverse company practices. This industry is among the riskiest, with an average ESG Risk Rating score of 42,6. This negative effect will likely be offset by the growth of the industry triggered by the development of electric vehicles and the development of renewable energy infrastructures.

The Utility sector is a category of companies that provide basic services including electricity, natural gas, and water. The movement towards clean energy, alongside with competition-enhancing legislation, initiatives, and investments in renewable energy resources, has some analysts forecasting strong growth for the utilities industry in the 2020s. Sustainalytics indicates that this sector is going through an important transition towards the affirmation of clean energy over fossil fuels. European utilities place themselves very well due to investments and a long industry experience with emissions.

Results coming from the different analyses are interesting, allowing to widen the discussion about the relations between ESG issues and financial performance, leaving room to further broaden the discussion and extend the analysis.

An interesting finding is that ESG performance is strongly correlated with the size of the firm: on average, larger companies tend to have better ESG scores. Concerning the Excess Return value, there is no correlation between the different ESG ratings and the Excess Return. Investigating for the Market Cap variable, the results have proven to be interesting. In fact, better ratings are associated to a higher value of the market cap. This could be due to the fact that companies with higher valuations can be able to invest more in ESG issues and sustainable projects, while smaller companies do have limited resources for that, often being laggards in matching what larger competitors do. Companies who have available funds can invest into projects that can have an important impact on their notes, raising the scores and ameliorating the company's image.

Subsequently, the Expected Returns have been investigated. Expected Returns are hence expressed under the form of the PE ratio. Previous studies have shown that a relationship between Expected Returns and ESG does exist. A triple-C rating, together with the effect of the Future Mobility sector, triggers a consistent increase in the PE ratio. Results can be summed up saying that higher ratings have no impact on the PE ratio, while the lowest one impacts the ratio positively. The relationship observed here can come from the fact that having a bad ESG rating can trigger companies to try to attract investors compensating for the negative attribution through the promise of very attractive high expected returns. What emerges from the analysis, however, is that ESG scores are not a very good predictor of future returns.

Two further performance measures have been analysed: the Profit and the Operating Margin. For the Profit Margin, no correlation between ratings and the value of the Profit Margin has been observed. ESG ratings do not impact on company's profitability. Concerning the Operating Margin, once again, the analysis leaves no doubt of a no-correlation situation between the ESG ratings and the profitability measure.

Interesting results are, however, observed concerning the Volatility, where some significant correlations are observed. The most interesting correlation is the one between the highest and lowest ratings with the Volatility value, being often regarded as an important measure of risk for stocks: a CCC rating has a very negative impact on the risk, while the higher rating, AAA, can reduce risk.

Summing up the whole analysis, it does not emerge a visible direct impact of ESG scores on financial performance, while however showing a correlation with Volatility (and, so, risk) and partially with Expected Returns. The analyses confirm the belief that bigger companies tend to have better ratings.

To deepen the discussion about the impact of ESG scores on company's financial performance and trying to assert if it is possible to predict how the ESG scores will move in the future, a predictive analysis has been conducted through Orange DataMining. A *Naïve Bayes Classifier* has been used to conduct the analysis and the results have been modelized as a *Confusion Matrix.* The matrix compares the actual target values with those predicted by the machine learning model, providing results under the form of possible predicted outcomes. In the specific case of ESG ratings, the Confusion Matrix. shows how likely the ratings are to move up or down the ranking.

What the results show can be interpreted as companies with lower ratings being likely to move upwards in the rating scale. This can be triggered by the fact that a lower rating is not great for the company itself under all the aspects analysed so far, from financial to ethical ones. Increasing the rating becomes, then, one of the main goals of the company which, in turns, expects to gain an advantage for the better rating and to have a positive impact on the sustainability issue.

This work has been focused on searching for the impacts of sustainability issues and ESG integration on company's value and practices. Having a good ESG score has some sort of impact on different valuations measures, stock return and risk. However, ESG does not show a correlation with some of the variables analysed.

ESG is a relatively new concept and the impacts on the performance of a company may need more time to be fully understood. Sustainable companies have proved to be, for certain aspects, more profitable than traditional ones, thanks to their better financial structure, good corporate social responsibility (CSR) and a positive reception from the investors. The study has, probably, some limitations due to the nature of the study itself, the sectors and the subjects considered. Another important limitation of the study could come from the fact that there is no standard in ESG disclosures and data measurement yet. This means that an analysis done with data coming from different providers could give discording results. To verify this point, ESG Risk Ratings coming from Sustainalytics (whose methodology has been detailed in chapter 2) have been retrieved and used to carry regression analysis, with some results slightly deviating from the ones obtained through MSCI ESG data. Regulators around the world are trying to elaborate new policies and laws that aim to increase the level

of homogeneity between different ESG metrics and valuations. When this goal will be met, even the results of analyses conducted starting from different financial providers will likely converge. What is also interesting at this stage is the fact that companies who are perceived greener than others are often able to manage better also financial risks.

ESG is a delicate matter that is now developing and involving a wide range of sectors and elements. The legislation is moving fast and companies are adapting to this new trend, re-shaping when necessary their business models. In the wake of the 2020 health crisis, conversations about health, environment and social justice have become even more important than in previous years. ESG has therefore undergone accelerated growth, and this allows us to observe the important role of finance in helping to find sustainable and impactful solutions for investors and society at large. ESG investing is a broad and fascinating topic that is here to stay and evolve. This paper has collected information and analyses to explain what ESG means, to cover its different aspects and to try to define in which measure it can impact companies and society, estimating also possible outlooks for the future.

On the global financial panorama, sustainability is a very hot topic. Analysts all over the world indicate that this is only the beginning of a trend that will reshape the economy. While being underestimated in the past, investing in a socially responsible way is today an obligation for companies and investors all around the world. The electric mobility sector, more than the others, has been perceived as the main driver of this modern revolution and trend, and therefore it has been the natural choice for the analysis of the potential impacts of good or bad ESG on company's performance. To have a broader spectrum, the analysis has been enlarged including sectors who are related to the electric mobility and that have a close link with the sustainability issue. The sector, however, has proven to be not always ESG-compliant, due to supply chain and energy production controversies for example.

On the data availability side, nowadays it is possible to conduct researches on ESG, but the non-homogeneity between data providers and between regulations generate discording or confusing results. Previous studies show that good ESG has somehow a general positive effect on firm performance and reputation. While the impact on the reputation is widely recognized, the impact on the performance is not always observed, with some studies indicating that superior ESG comes at a high cost. The analysis conducted through this work has, however, enlarged the spectrum of the research and highlighted that ESG is correlated positively with the size of companies, while mitigating the stock risk and also having a limited impact on the expected returns. Therefore, ESG represents a real opportunity for companies and a way to boost performance through ESG integration and to better manage

financial risks. On the other side, we observe that large companies, which have larger investment capacities, could have an advantage in integrating ESG criteria, representing an additional challenge for smaller companies. Widely discussed in the paper is also the interesting trend of individuals who engage in this kind of investments not only to pursue financial objectives, while rather following ethical motivations, as behavioural finance explains.

ESG concept embraces many areas, from the legal to the financial one. Regulators and financial providers have been all challenged by the affirmation of this new trend and more homogeneity in the future is a necessary step that will help put the basis for a solid and clearer understanding of the phenomenon. Europe is one of the leading continents when it comes to sustainable finance, with an already advanced regulation. If institutions and regulators will work on harmonisation and standardization of guidelines, companies will find it easier to integrate ESG criteria, with a benefit for the whole community. While the data about ESG is already quite significant today and it allows us to affirm that ESG issues have some sort of impact on company's value and image, further data and regulations will continue to develop and contribute to more interesting results in this area of research for years to come.

Concluding, ESG is a major issue, fraught with challenges and opportunities. Sustainable finance will likely be the engine of a revolution in the financial sector, at the same time benefiting the environment and the whole society. A good financial performance, based on a balanced corporate governance and concern for the environmental and social aspects is a fundamental objective to achieve. Sustainability and financial profit go hand in hand, one does not exclude the other, but rather they strengthen each other and can lay the foundations for projects that will make a difference in the world we live in. ESG will become even more rooted in the financial environment in next years, becoming an inevitable element that companies and investor need to embrace.