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**Development and Divergence of ESG  
Reporting Standards in the EU and UK**

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## **Introduction**

In the past decade, investors have been more eager to finance sustainable initiatives and firms. This is driven by applying Environmental, Social, and Governance (ESG) criteria to investing strategies, allowing shareholders to create value while integrating into their financial analysis ESG-related possibilities and risks. This new need reflects the growing understanding that a company's long-term financial success and resilience are influenced by non-financial aspects, once considered external and overlooked by traditional financial analysis.

This heightened interest in sustainability has shifted into significant developments in the regulatory frameworks, resulting in the introduction of new, more comprehensive regulations. These policies serve a dual purpose: they aim at enhancing the transparency of how companies account for their ESG risks and opportunities, and they start designing a standardised model for reporting non-financial information. The fragmented regulatory landscape of early sustainability disclosure was source of challenges for investors seeking a way to compare information. This led towards the need for a more uniform approach which the European Union, for instance, managed to achieve with legislations as the Non-Financial Reporting Directive (NFRD), followed by the Sustainable Finance Disclosure Regulation (SFDR) and the EU Taxonomy Regulation.

This thesis aims to explore how firms in different countries, both within and outside the European Union, are implementing new ESG reporting standards and practices. In particular, it considers a sample of firms listed in the STOXX® Europe 600, focusing on those in the manufacturing sector and categorized under NAICS code as Pharmaceutical, Chemical and Petrochemical firms and their annual reports of year 2018, 2020, 2021 and 2022. Given that Brexit took place at the start of 2021, a comparative study can be conducted analysing the trajectory of ESG risk reporting of UK-based companies before and after this change, in parallel with observing the trends for other EU-based firms. A more international view is then considered, comparing Europe's sustainable legislations with the legal framework present in the United States.

This research is divided into the following sections. The "Sustainability" section aims at defining what sustainability is and it provides information on sustainability reporting characteristics. The description of voluntary sustainability reporting frameworks, namely

the GRI Standards and the Sustainability Accounting Standards Board (SASB), follows to then close the chapter by introducing Environmental, Social, and Governance (ESG) criteria and providing a disaggregation of the three pillars. In “Evolution of EU Legislation on Sustainability Reporting before Brexit”, there is an overview of the sustainability reporting practices which brought the introduction of the Non-Financial Reporting Directive (NFRD) and previous researches on the consequences and effects of this directive. Chapter III, “Country-Specific ESG Reporting Practices after Brexit”, is divided into two sub-paragraphs. The first follows the development of the EU’s Corporate Sustainability Reporting Directive (CSRD) and gives insights on the specific, operational non-financial reporting practices of Germany and the United Kingdom after the Brexit event (2021). The second sub-paragraph provides a view on the United States current situation on ESG reporting. In the section “Comparative Analysis”, there are the possible outcomes of this analysis, followed the description of all the steps of the investigation: from the data selection to the interpretation of the empirical results. At last, “Conclusions” closes this paper providing insights on future innovations and trends and summarising the outcomes of this thesis.

# Chapter I – Sustainability

## 1.1. Definition of Sustainability

Sustainability not only refers to environmental or social considerations, under an economic and financial perspective, it is synonym to a strategic long-term value creation and risk management. Economic sustainability translates in the balance between meeting current human needs and looking out for the future, requiring a harmonised approach to the exploitation of natural resources, conserving, and growing capital and finding new technological solution for production (Hassan, Alsallom & Aldershawi, 2024). Pursuing economic development without taking into consideration beforementioned sustainable elements may result neither efficient nor effective in the long run.

The strategy combining development and the environment was first defined as “sustainable development” in a report of the World Commission on Environment and Development (WCED) in 1987 known as ‘Our Common Future’ or ‘Brundtland Report’ after the Commission's chairwoman, Gro Harlem Brundtland. This pivotal document emphasized the fragmented international situation on the matter, accusing governments to have acted with reluctance and in a narrow way. In contrast, sustainable development is described as an interdependent and integrated process that requires the cooperation between national and international institutions. Another great institutional flaw identified by the WCED was the creation of policy bodies, following the rapid economic growth after the Second World War, which were concerned with improving air and water quality and other resources. Their work was focused only on after-the-fact repair of damages giving the false impression that they were able to protect the environment, however new problems occurred, for example desertification and pollution from new chemical substances. Moreover, the ecological dimension of policy was separate from the economic part, which was more focused on achieving production targets. In order to prevent further damages to the environment and to the society a global agenda is needed, where economic growth and environmental conservation are the main components. In the report it is more than once stressed that such sustainable development has limits that coincide with the carrying capacity of the planet, hence new technologies and social transformations are essential to manage sustainability related risks (WCED, 1987).

These shortcomings highlighted by the WCED made way for modern policies that manage to integrate economic, social, and environmental consideration and its theoretical framework set the basis for the United Nations Conference on Environment and Development, also known as the 'Earth Summit', that took place in Rio de Janeiro in June 1992. What were just ideas and suggestions in the Brundtland Report, became concrete international agreements and action plans after the conference which brought together 172 governments alongside with non-governmental organizations, scientists, and businesses. The Earth Summit had several outcomes including:

- The Rio Declaration.  
Is a non-legally binding document listing 27 principles which help achieving a sustainable development, while keeping human beings at the centre of attention. It promotes partnership between States, a continuous and constructive international dialogue, and the awareness that sustainable development should be a priority.
- The United Nations Framework Convention on Climate Change (UNFCCC).  
Is an international treaty focusing on greenhouse gases emission in the atmosphere and other climate-related risk factors due to human activities. Although it does not set quantitative thresholds for emissions, it recognises climate change as a real threat and paved the way for agreements like the Kyoto Protocol and the Paris Agreement.
- The Agenda 21.  
Is a non-binding action plan outlining a range of goals and strategies to address sustainable development in a forward-looking ambition for the 21<sup>st</sup> century. It incentivises governments to come up with their own agenda and solutions to environmental and social issues. The Commission on Sustainable Development (CSD) was then vested with the duty of monitoring and coordinating the Agenda 21's progress (UN, 1992).

To put it differently, sustainability per se is a state of living, a principle guiding how individuals interact with one another and with the planet. Sustainable development represents a dynamic process aimed at obtaining such state of living, involving the collaboration of both the economy and policy-making bodies to address contemporary challenges while also ensuring a future for the next generations.

## 1.2. Sustainability Reporting

The increasing integration of long-term, non-financial elements into the economy, highlight an important shift in perspective: elements like environmental health, social equity, and human well-being are not seen any more as mere externalities, but as integral components of a sustainable economy. This comprehensive view redirects the focus of shareholders from maximising short-term returns to creating long-term value, implying a change in corporate purpose, accountability, and regulatory frameworks to ensure transparency and comparability. This shift aligns with Edward Freeman's Stakeholder Theory, which suggests that companies should care for the interest of all stakeholders, rather than focusing only on shareholders, as the Shareholder Theory of Milton Friedman suggested (Freeman, 1984). The Stakeholder's Theory perspective explains that it is in the company's self-interest to act in a more sustainable approach as stakeholders contribute greatly to its success and longevity. Thus, enhancing corporate responsibility is not just an ethical obligation, but a strategic action. The application of this principle extended rapidly to the accounting sector and the term sustainable accounting – or sustainable reporting – was coined. It represents a transition from a single-capital perspective, namely financial, to a multi-capital perspective which follows Elkington's triple-bottom-line theory, encompassing not only financial elements, but also environmental, social, and human (Pickford, 2021).

Sustainability reporting aims at ensuring transparency when publicly disclosing the contribution of companies to sustainable development (Abeysekera, 2022) by offering standardized metrics and encouraging comparability. It reflects how an entity manages both risks and opportunities associated with sustainability, such as climate change, social matters, and ethical governance. When reporting on sustainability matters two perspectives can be investigated:

- Inside-out perspective.

It focuses on how the company impacts the external world, both in a positive or negative manner. It promotes the transition to a sustainable society and offers information to a broad range of stakeholders.

- Outside-in perspective.

It points at what risks and opportunities do sustainability issues pose for companies and their financial impact. In particular, when considering climate

change, entities face two types of risks: physical and transitional risks. On one hand, physical risks, which apply to the company's assets, are further divided into two categories: acute and chronic. Acute physical risks derive from specific events that directly damage assets; chronic physical risks stem from medium and long-term events. On the other hand, transitional risks emerge from the legislative and economic shift towards a 'greener' economy. It aims at improving the entities' financial performance, thus interesting primarily financial capital providers.

In this context, the importance of stakeholder engagement was acknowledged during the Earth Summit in 1992, emphasizing that the participation of a wide range of stakeholders is necessary for achieving sustainable development. Supporting this statement, research by Sady (2023) demonstrates that sustainability compliance often arises from stakeholder influence, in other words, some entities adopt sustainability practices, including reporting, only when compelled to do. However, having a broad range of stakeholders can be a challenge: collaboration between them is often hindered by the differences in objectives, values, norms, expectations, and cultural divergences. This might bring the entity to engage only with a minimal group for consultation, resulting in a biased approach to sustainability (Sady, 2023). One of the most important mechanisms to engage with stakeholders is through sustainability reporting. Given that there are different types of stakeholders, companies employ different reporting strategies to address their needs and facilitate their engagement. The following table (Table 1), adapted from the work of Irene M. Herremans, Jamal A. Nazari, and Fereshteh Mahmoudian (2016), outlines different stakeholder categories and their connections to sustainability reporting. Specifically, it summarizes how the interests of the different groups influence the use of sustainability reports.

Table 1: Stakeholder Engagement. Source: *Stakeholder Relationships, Engagement, and Sustainability Reporting*, Herremans I. M., Nazari J. A., Mahmoudian F., 2016.

<b>Stakeholder Category</b>	<b>Relationship with Sustainability Reporting</b>
<b>Financial and Equity Markets</b>	Mainly equity and debt investors which are interested in understanding where a company stands in the financial market by looking at environmental and social practices to ensure the organization can secure economic resources.
<b>Product and Consumer Markets</b>	Stakeholders associated with core business operations which are more interested in assessing the organization’s reputation and effectiveness.
<b>Labor Markets</b>	Current and potential employees which evaluate employment opportunities.
<b>Political and Social Markets</b>	Stakeholders consult reports to understand if the company meets societal and political norms and expectations.

By understanding the different stakeholder groups, companies can meaningfully address their needs and expectations while enhancing transparency and strengthen the foundation for sustainable business practices and long-term success.

A key concept of corporate reports is the independent evaluation of a third-party professional on the accuracy, and transparency of the information disclosed: the assurance. This process provides investors and stakeholders with a further level of confidence on the report’s contents, both financial and non-financial, and their compliance with established standards. Since assurance is provided by external auditors, it ensures objectivity in evaluating the data of the report and it comes in different levels:

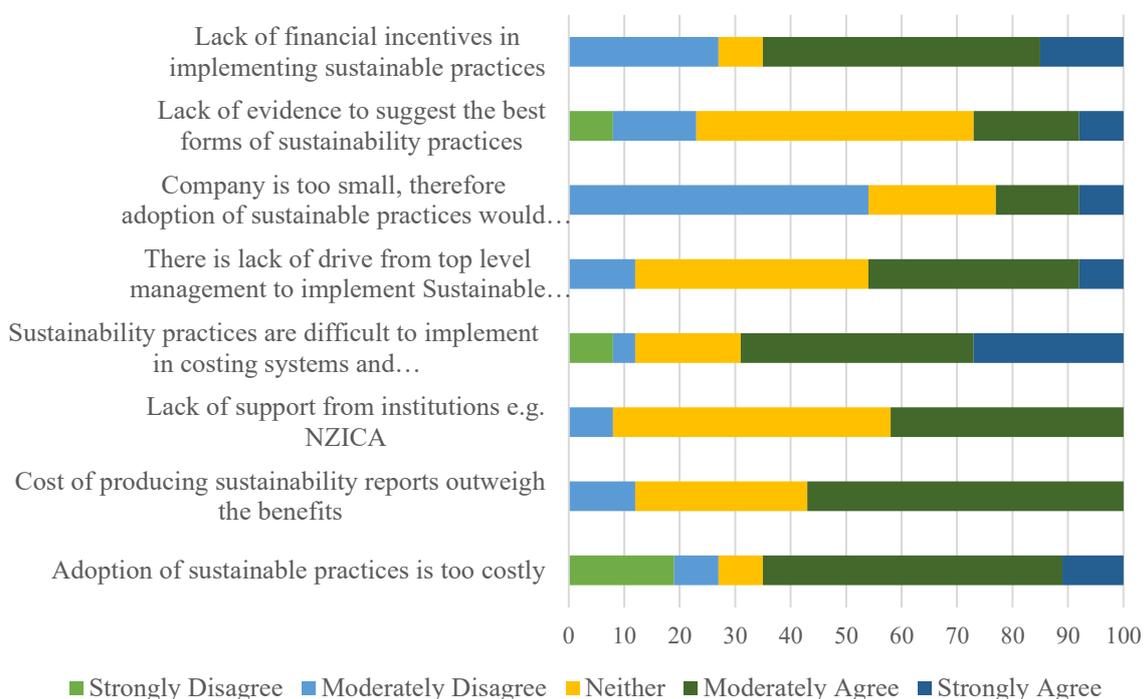
- **Limited Assurance.**  
This provides a moderate level of confidence, where the assurance provider identifies whether anything has come to their attention suggesting the information may be materially misstated.
- **Reasonable Assurance.**  
This provides a high level of confidence but not absolute certainty that the information is free of material misstatement.

Reporting on non-financial capitals presents different challenges for companies. One problem is that such capitals are difficult to assign an arbitrary or non-reductive value, making them in a sense priceless. On top of that, these assets are often external to the businesses and are shared between different entities, in contrast with machineries or buildings, making them difficult to account for (Mayer & Roche, 2021). Other perceived barriers were identified by management accountants in 2014 in a survey by Vinal Mistry, Umesh Sharma and Mary Low. The study wanted to examine the management accountants' perceptions on their role in sustainable reporting by conducting interviews on a population of 26 management accountants (MA) from different industries and organization types in New Zealand. Their findings indicated that a significant number of respondents perceived implementing sustainability data into their reports too costly, hinting that financial constraints are a major concern (Table 2 & Graph 1) (Mistry, Sharma & Low, 2014).

These complexities highlight the need for frameworks, for example, the Global Reporting Initiative (GRI) Guidelines and the Sustainability Accounting Standards Board (SASB) Standards, together with the assistance of the Taskforce for Climate-Related Financial Disclosure (TCFD).

Table 2 & Graph 1: Management Accountants Perceived Barriers for Sustainable Reporting. Source: *Management Accountants' Perception of their Role in Accounting for Sustainable Development – An exploratory study*, Mistry V., Sharma U., Low M., 2014.

	Strongly Disagree		Moderately Disagree		Neither		Moderately Agree		Strongly Agree		Ranking	Median	Mean
	%	No. of MA	%	No. of MA	%	No. of MA	%	No. of MA	%	No. of MA			
Adoption of sustainable practices is too costly	19	5	8	2	8	2	54	14	11	3	5	4	3.28
Cost of producing sustainability reports outweigh the benefits	0	0	12	3	31	8	57	15	0	0	3	4	3.44
Lack of support from institutions e.g. NZICA	0	0	8	2	50	13	42	11	0	0	4	3	3.36
Sustainability practices are difficult to implement in costing systems and organisations structure	8	2	4	1	19	5	42	11	27	7	1	4	3.76
There is lack of drive from top level management to implement Sustainable development practices	0	0	12	3	42	11	38	10	8	2	3	3	3.44
Company is too small, therefore adoption of sustainable practices would be considered as too much of a burden	0	0	54	14	23	6	15	4	8	2	7	2	2.80
Lack of evidence to suggest the best forms of sustainability practices	8	2	15	4	50	13	19	5	8	2	6	3	2.88
Lack of financial incentives in implementing sustainable practices	0	0	27	7	8	2	50	13	15	4	2	4	3.52

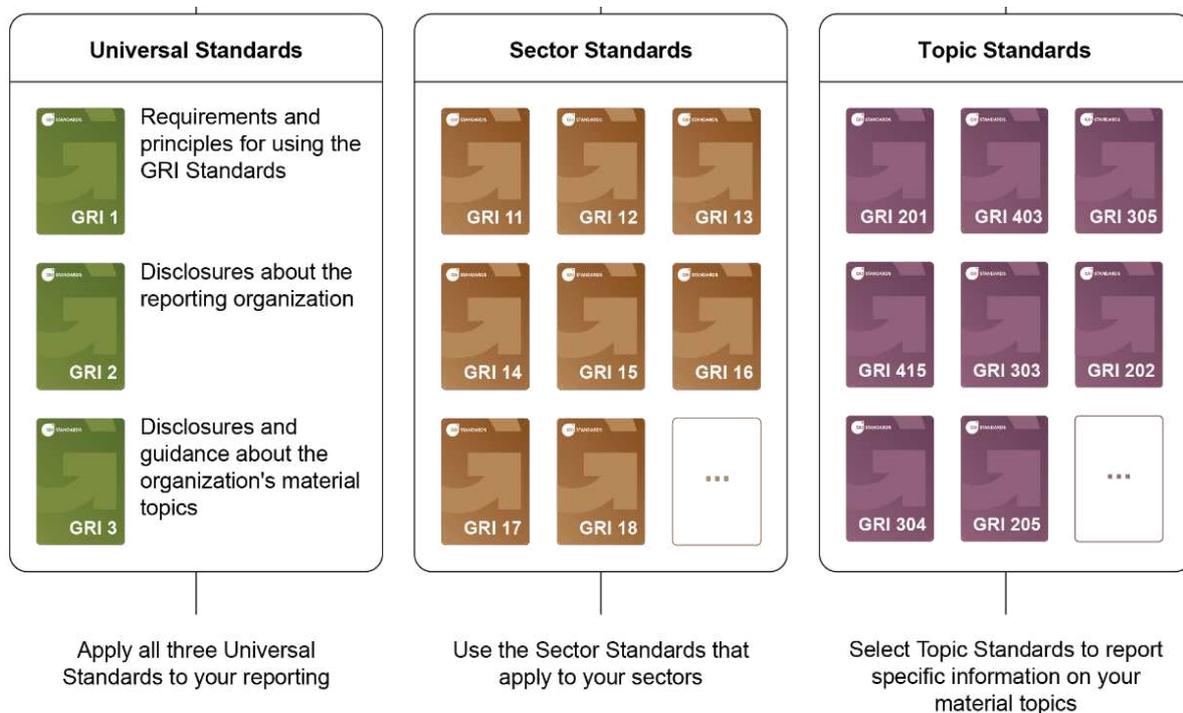


### 1.2.1. Global Reporting Initiative (GRI) Standards

The GRI Guidelines were first released in 2000 by the United Nations Environmental Programme (UNEP) and the Coalition for Environmentally Responsible Economies (CERES). The GRI is a non-profit organization founded in Boston in 1997 and seeks to assist companies in writing sustainable-aligned reports by creating an internationally accepted voluntary reporting inside-out perspective guideline, which makes comparability between firms possible too (Isaksson & Steimle, 2009). The GRI framework is structured as a modular system of interrelated standards that are organized into three categories:

- GRI Universal Standards, which apply to all organizations reporting in accordance with the GRI standards.
- GRI Sector Standards, which enhance the quality, completeness, and consistency of sustainability reporting across 40 different industry sectors with the highest environmental, social, and economic impacts.
- GRI Topic Standards, are 32 standards related to specific topics across economic, environmental, and social dimensions.

Figure 1: Global Reporting Initiative Framework. Source: *GRI Standards*, 2021.



Having an inside-out perspective, when firms follow the GRI Standards they report on their impact on the economy, environment, and people, including effects on their human rights, as a result of their activities or business relationships. These impacts can be actual or potential, negative or positive, short-term or long-term, intended or unintended, and reversible or irreversible and represent the firm's contribution to sustainable development. However, not all impacts should be included, materiality determines which are most significant and therefore to be reported, ensuring clarity by not considering irrelevant information. In the 2016 version of the GRI Universal Standards, impacts were considered material topics if they reflected at least one of the following dimensions:

1. the organization's significant economic, environmental, and social impacts;
2. they influenced the assessment and decision of stakeholders.

In 2021 a slight difference in the definition was made: material topics were those that "represent the organization's most significant impacts on the economy, environment, and people, including impacts on their human rights" (GRI, 2021). The influence on stakeholders was removed due to its subjectivity. The GRI Standards have indeed helped organizations identifying material information for sustainable reporting. However, companies still ask for clearer indicators to measure these impacts: many preparers struggle to identify and disclose all material topics due to the varying interpretations of GRI indicators (De Villiers, La Torre & Molinari, 2022).

GRI's materiality assessment is strictly linked to the will to improve comparability between firms. Still, a study made by Blerita Korca, Ericka Costa and Bouten Lies in 2019 showed that two banks, namely CREDEM and BPER, despite both being in the same industry, reported on different environmental and social topics, making inter-firm comparability not possible. This was in part justified by the fact that sustainability materiality is socially constructed by discussions with stakeholders, which encourages obfuscation of data and strategic actions (Korca, Costa & Bouten, 2023).

Another issue identified by Korca et al. (2023) was that GRI topic-specific disclosures focused on historical data. While this may meet the needs of readers interested in short-term economic insights, it does not satisfy stakeholders seeking what long-term consequences of actions taken today might result in. This highlights the need for a forward-looking approach driven by estimating such impacts through future assumptions and scenario analysis, which might be a challenge.

When companies are not able to comply with all the requirements for reporting *in accordance* with GRI Standards, reporting *with reference* to the GRI Standards is possible. In this case the firm uses selected parts of the standards to report on. This discretionary nature diminishes the effectiveness and reliability of GRI guidelines, highlighted by the lack of mandatory compliance.

### *1.2.2. Sustainability Accounting Standards Board (SASB)*

The Sustainability Accounting Standards Board (SASB) is a US-based independent organisation established in 2011. The SASB, differently from GRI, has established standards focused on measuring and reporting sustainable issues for investors, adopting an outside-in perspective. The set of SASB's 77 industry-specific accountability standards was developed and provisionally published in a staggered manner between 2012 and 2016. The final version was officially launched at the end of 2018 and was based on the idea that sustainability and a firm's economic performance can coexist without conflict, best aligning shareholders' expectations, and its materiality concept. In late 2020, SASB announced a merger with the International Integrated Reporting Council (IIRC) and soon after, in 2021, the IFRS Foundation established the International Sustainability Standards Board (ISSB) and acquired the organization.

The SASB goal was to offer a framework that enables businesses to develop, assess, and trade intangible "ethical assets". These are ethical claims converted into measurable assets and made understandable to capital and markets and correspond to sustainability-related risks and opportunities that could affect the companies' cash flows, access to finance or cost of capital over the short, medium, or long term. By targeting financially relevant information regarding what it refers to as sustainability topics, SASB aims to quantify the intangible value linked to sustainable risks and opportunities. Following such practice, companies can enhance their intangible value through improved sustainable practices (Parfitt, 2024).

For companies to understand on which issues to report on, the SASB shaped a "Materiality Map" (Appendix A), which prioritizes sustainability topics for each of the 77 industries. To establish materiality for its standards, SASB used data-driven algorithms to go through publicly available documents to pinpoint critical issues in the various industries. This methodology identified sustainability topics that are significant

in public discussions and that carry social, political, economic, or legal risks. The resulting SASB standards provide a set of issues for companies to report on. However, companies are allowed to have a degree of flexibility to decide what to consider material for their own, specific context. Topics not assumed to have a substantial financial impact on the firm can be omitted, raising concerns on corporate moral responsibility (Parfitt, 2024).

Nonetheless, following the publication of the SASB standards, an increase in discussions about sustainability issues was registered. A study made by Bochkay et al. showed that the influence of these standards is particularly notable in industries where there was significant uncertainty about which sustainability matters were financially significant. In these industries, not only managers faced uncertainty on what to report, but also were not encouraged to disclose on such matters due to the high cost of reporting, due to data collection challenges, legal risks, or proprietary concerns. In such scenarios, the establishment of sustainability disclosure standards, even on a voluntary basis, can lead to a more comprehensive reporting, aligning expectations between companies and investors. From the study emerged that during the release of SASB's 77 industry-specific accountability standards, there was a significant increase in industry-specific sustainability discussions, amounting to a 21.3% rise in sustainable disclosures compared to the sample median, reinforcing the idea that the SASB standards help companies report on issues which are important for investors (Bochkay, Hales & Serafeim, 2025).

An additional phase in the investigation indicated that companies which exhibited a higher initial disagreement about sustainability reporting, responded more favourably to SASB standards than those in sectors characterised with a first greater consensus. This reflects positive feedback on the implementation of these new voluntary standards. Companies that previously had no disclosures on relevant sustainability topics significantly increased their disclosures after the introduction of SASB standards. In contrast, no increase was observed in the publishing of irrelevant topics (Bochkay, Hales & Serafeim, 2025). These findings suggest that the SASB standards not only assist companies by standardizing sustainability reporting language, but also specify the key topics each sector and industry should address and report on.

When companies are found to have a strong rating on SASB's material sustainability issues, they are more likely to significantly outperform those with a lower rating. At the

same time, firms with good ratings on non-material sustainability issues under SASB, did not lead to the same result. This suggests that following the materiality concept of the SASB standards goes beyond being a “do-good” idea, it can be a strategy to mitigate risks and for investors to have a potential source of excess returns (Khan, Serafeim & Yoon, 2016).

### **1.3. Overview of Environmental, Social, and Governance (ESG) criteria**

Corporate Social Responsibility (CSR) – also known as Responsible Business Conduct (RBC) – and ESG are both concerned with how a business will impact the environment and society. However, they do not have the same meaning.

The European Commission defines corporate social responsibility (CSR) as a concept where social and environmental issues are merged with the company’s business operation and interaction with its stakeholders, in other words, it is a component of an enterprise's duties. This implies that the company has an impact on society: CSR can be used to aid the transaction towards a more sustainable economic system and toward a more united society. Since CSR provides major benefits for risk management, cost reductions, customer relationships, HR management, and innovation potential, the organization itself should be interested in addressing it (European Commission, 2011). ESG is a metric that evaluates a company's overall sustainability by taking into account environmental, social, and governance indicators, compared to CSR, which is an investment strategy and business model. The term "ESG" itself was officially coined in 2004 in the United Nations landmark report "Who Cares Wins". The purpose of ESG ratings is to assess how a company's activities and policies affect the environment, society, and its stakeholders. Furthermore, while CSR just takes into account social and environmental factors, ESG formally encompasses corporate governance too.

A solid ESG proposition helps in gaining trust from authorities, who are more inclined to provide additional licenses and permissions to the company. An example of this occurred in Long Beach, California, in a public-private infrastructure project in which firms were scrutinized based on their previous sustainability achievements. By gaining trust through sustainability, a greater freedom can be obtained, resulting in the reduction of firms’ risk of adverse external actions made by governments or authorities (Henisz, Koller & Nuttall, 2019).

In most cases, financial performance is traded off when a corporation decides to invest in ESG concerns. However, ESG reports can help investors discover firms with lower financial risk due to their strong environmental policies, high social standards, or robust governance structure (Eccles & Serafeim, 2013). These may prevent assets from underperforming due to long-term sustainability problems or crises, in other words, ESG factors are now recognised as material financial risks and opportunities. Existing literature indicates that asset managers and established investors both increasingly prioritise ESG in their decision-making to enhance risk-adjusted returns. Surveys show that 70% of investors base their decisions on sustainable investment criteria, while another 14% actively considers ESG factors. Over half of asset managers and investors integrate ESG policies to enhance a firm reputation and to achieve long-term benefits, only a minority (less than 30%) do so to diversify their assets. Looking forward, projections of future investment in this area could reach several trillions (Ahmad, Yaqub & Lee, 2024).

The “E” in ESG represents the environmental criteria and it focuses on how a company manages the environment. The environmental aspect is considered as the most evident between the three ESG pillars and it encompasses climate change, carbon emissions, air and water pollution, biodiversity loss, deforestation, energy efficiency, waste management, and water scarcity covering all the firm’s supply chain and primary business operations. Among these, carbon emissions and climate change are the primary focus of the pillar and emphasised as the core metric for environmental impact. Companies that prioritise environmental sustainability typically have better financial results and market value (Eccles & Serafeim, 2013); besides, a company may encounter legal penalties as a result of poor environmental policies. Consistent with this idea is the traditional neoclassical view of environmental economics, where environmental regulation serves to rectify negative externalities and correct a market failure, while imposing additional costs on firms. This situation is accentuated when environmental impacts exceed the value added to the firm, which may face competitive disadvantages. Conversely, the modern perspective views environmental performance as a source of competitive advantage given by the benefits of more enhanced productivity and reduced compliant costs. In other words, companies are incentivised to invest in innovative technologies and production methods in order not to encounter higher expenses due to polluting activities (Schaltegger & Wagner, 2017).

The “S” in ESG represents the social dimension and this aspect revolves around the company’s relationship with its various stakeholders, including employees, customers, suppliers, and the communities with which it operates. This pillar evaluates every interaction between individuals in light of the ethical, justice, and well-being-oriented ideals. It takes into consideration issues like inequality, poor working conditions, human rights, product safety, and supply chain transparency. However, social ESG concerns might not be as straightforward to quantify as environmental issues. To address this, corporations report their social influence to stakeholders in accordance with legal guidelines or based on customer expectations. An example is to align a firm’s social issues to the United Nations Sustainable Development Goals (UN SDGs) (Molnar, 2022). When social standards are not met, the companies may face low productivity, high absenteeism, and strained customer relationships, resulting in loss of revenues (Ahmad, Yaqub & Lee, 2024).

The “G” in ESG represents the governance criteria and it addresses the arrangement of the board and audit committee structure, the prevention of bribery and corruption, executive remuneration policies, lobbying, political funding, and whistleblower programs. According to research on governance aspects conducted by S&P Global, Organizations with inadequate governance are more likely to engage in mediocre management practices and lose their ability to capitalize on future economic opportunities (S&P Global, 2020). This ESG pillar is often undervalued, nevertheless there are various benefits from having good governance, such as reduced regulatory and legal intrusions, higher financial performance and investors have more confidence in the firm (Campbell, 2022).

The different aspects of ESG are intricately linked, indicating a synergistic relationship. For example, social criteria typically intersect with environmental issues and governance principles when corporations attempt to comply with environmental regulations and address larger sustainability problems. ESG ratings assess a company's risk and performance on environmental, social, and governance parameters. Various index providers have examined elements associated with ESG policies and have offered different descriptions of the three pillars, complicating the selection process for investors and asset managers (Ahmad, Yaqub & Lee, 2024). Table 3 shows examples of metrics used by three major ESG indices providers.

Table 3: Different index providers and factors considered. Source: *Environmental-, social-, and governance-related factors for business investment and sustainability: a scientometric review of global trends*, Environment, Development and Sustainability, Ahmad H., Yaqub M., Lee S. H., 2024.

Major indices	Environmental	Social	Governance
Bloomberg	Carbon emission Climate change Pollution/Waste Resource depletion Renewable energy	Supply chain Gender diversity Political influence Human rights Community relations	Executive compensation Shareholder rights Staggered boards Independent directors Cumulative voting
Thomson Reuters	Resource usage Carbon releases Invention	Employee Basic rights Public Product accountability	Corporate governance Corporate behavior
MSCI	Climate change Sustainability initiative Pollution/Waste Natural resources	Human capital Product liability Stakeholder opposition Social opportunities	Management Shareholders CSR strategy

An example of a guide on data providers was given by Douglas et al. in 2017 (Douglas, Van Holt & Whelan, 2017) which categorized data suppliers into:

- Market Data Providers.

This class focuses on analytical tools and information, such as fixed income or equities, to help investors make decisions. In addition, they deliver indexes on specific ESG matters like MSCI's assessment of fossil fuel reserves or carbon emission and Thomson Reuters' Carbon Data and Estimation Model.

- ESG-Exclusive Data Providers.

As the name suggests, this class focuses only on ESG rating and analysis. While the major part of these providers is working for exchanges and financial institutions, others like Sustainalytics grant direct data inputs for portfolio construction.

- Specialized Data Providers.

Differently from the other two classes, the data suppliers of this category focus only on one of the three areas of ESG: either environmental, social or governance.



## **Chapter II – Evolution of EU Legislation on Sustainability Reporting before Brexit**

### **2.1. Introduction to EU Sustainability-related Regulation**

Climate change, resource depletion and all the other sustainability-related issues are major concerns for today's society. For this reason, the European Union has consistently shown a growing commitment to sustainable development by taking action involving public policies that guide companies towards a "greener" future. The driving force behind this type of reporting is the necessity to mobilize capital towards long-term, ESG-aligned investments, which consequently encourage a more sustainable economic model. This in turn, requires a transparent disclosure of non-financial information, which stakeholders are increasingly demanding from both firms and their whole supply chain. Investors have the capacity to influence the companies' behaviour, encouraging the shift towards sustainability. Simultaneously, consumers started demanding more transparency and alignment with sustainable principles. However, in the absence of harmonised rules on sustainability-related disclosures, divergent policies will be implemented at national levels and such diversification will bring major competitive distortions. Furthermore, economically motivated practices further fragment the market and may potentially worsen existing inefficiencies in market operations.

With regard to these asymmetries, the European Union first encouraged Corporate Social Responsibility (CSR) through voluntary initiatives, laying the groundwork for the following regulatory developments. A first initial effort to motivate organizations to share their environmental information in a transparent way came in the 1990s with the launch of the Environmental Reporting Guidelines (ERG) by the European Commission (De Graaf & Bochenek, 2023), which was of voluntary basis. The EU decided to first adopt a "soft law" strategy, letting multiple-stakeholders dialogue promote sustainability in reporting practices. Meanwhile, policy makers continued to explore and identify motivations, best practices and areas that needed a more comprehensive intervention. With time, the voluntary nature of sustainability-related policies was revealed to be insufficient to achieve the desired level of transparency and quality of information that stakeholders demanded, making comparability between firms a problem too. These inconsistencies brought the issuing of mandatory reporting policies: the Non-Financial

Reporting Directive (NFRD) (Directive 2014/95/EU), adopted in September 2014, represented a pivotal moment in the EU's journey towards enhanced corporate transparency.

### *2.1.1. Non-Financial Reporting Directive (NFRD)*

The NFRD was an amendment to the Accounting Directive (Directive 2013/34/EU) and was implemented across all EU member states between 2017 and 2018. Being a directive, it had to be changed into national law by every member state, to facilitate such process, Article 4 of the NFRD provided some observation to follow. The main differences in national transpositions regarded the directive's scope, contents to disclose, location of information, and whether external assurance was required (Hummel & Jobst, 2024) (Appendix B). The NFRD's purpose was of improving corporate disclosure on environmental and social topics, and increases non-financial information disclosed by large undertakings across all sectors. Additionally, it aimed at enhancing the markets' strength by incorporating risks related to non-financial topics and by directing capital towards sustainable investments improving availability of data. The NFRD baseline scope of application was limited to large public interest entities (PIEs), like listed companies, banks, and insurance companies, with over 500 employees, on consolidated basis in case of groups and with more than €20 million total assets or more than € 40 million turnover. Approximately 6000 EU companies fall within the directive's scope (Hummel & Jobst, 2024).

Entities subject to the NFRD were obliged to prepare a non-financial statement which could either be located within the management report or published separately in an individual report. Moreover, any recognised reporting international framework could be used (for example GRI or SASB), giving companies flexibility of implementation. The report had to include five core factors:

- Environmental matters.  
They include pollution prevention and control, atmospheric emission, use of products, green products, and services.
- Social and employees matters,  
Which consist employment and working conditions, health and safety environment and community relations.

- Human rights.  
Including methods to prevent human rights abuses both within the company and its value chain.
- Anti-corruption and bribery.  
Similarly to human rights, companies had to disclose preventing methods for corruption and bribery.
- Diversity within the company.  
Including diversity policies for management and supervisory boards regarding aspects such as gender, age, and professional experience.

What made the NFRD even more flexible and comprehensive were the concepts of “Comply-or-Explain” and the “Double Materiality”. The “Comply-or-Explain” principle stipulates that the non-financial statement must provide a clear and reasoned explanation for the company’s failure to pursue policies regarding the directive’s five core factors listed above (European Parliamentary Research Service (EPRS), 2021). The purpose of this regulatory technique was to encourage self-commitment while still demanding accountability for non-compliance. The concept of “Double Materiality” requires entities to disclose information on two dimensions: the inside-out perspective, known also as impact materiality, and the outside-in perspective, or financial materiality. Together, these two dimensions work to provide a solid framework that help entities understand their responsibilities and the interconnectedness between their business operations and the environment they operate in.

The Commission released additional guidelines in June 2019 regarding double materiality, specifically on reporting climate-change information, following the EU sustainable financial action plan. In 2020, the European Commission published an online public consultation to understand issues regarding sustainability reporting. A total of 588 responses were collected including individual companies (32%), business associations (20%), and NGOs (14%). Of the participating companies, 30% were small and medium-sized enterprises (SMEs), and 70% were larger firms. In addition, 29% of respondents admitted to be both users and preparers of non-financial data. Regarding issues for users, from the consultation emerged three main concerns on non-financial information which were lacking in terms of relevance (57%), comparability (71%), and dependability (60%). When respondents who classified only as non-financial information consumers were examined, these numbers increased even more: relevance (70%), comparability (84%),

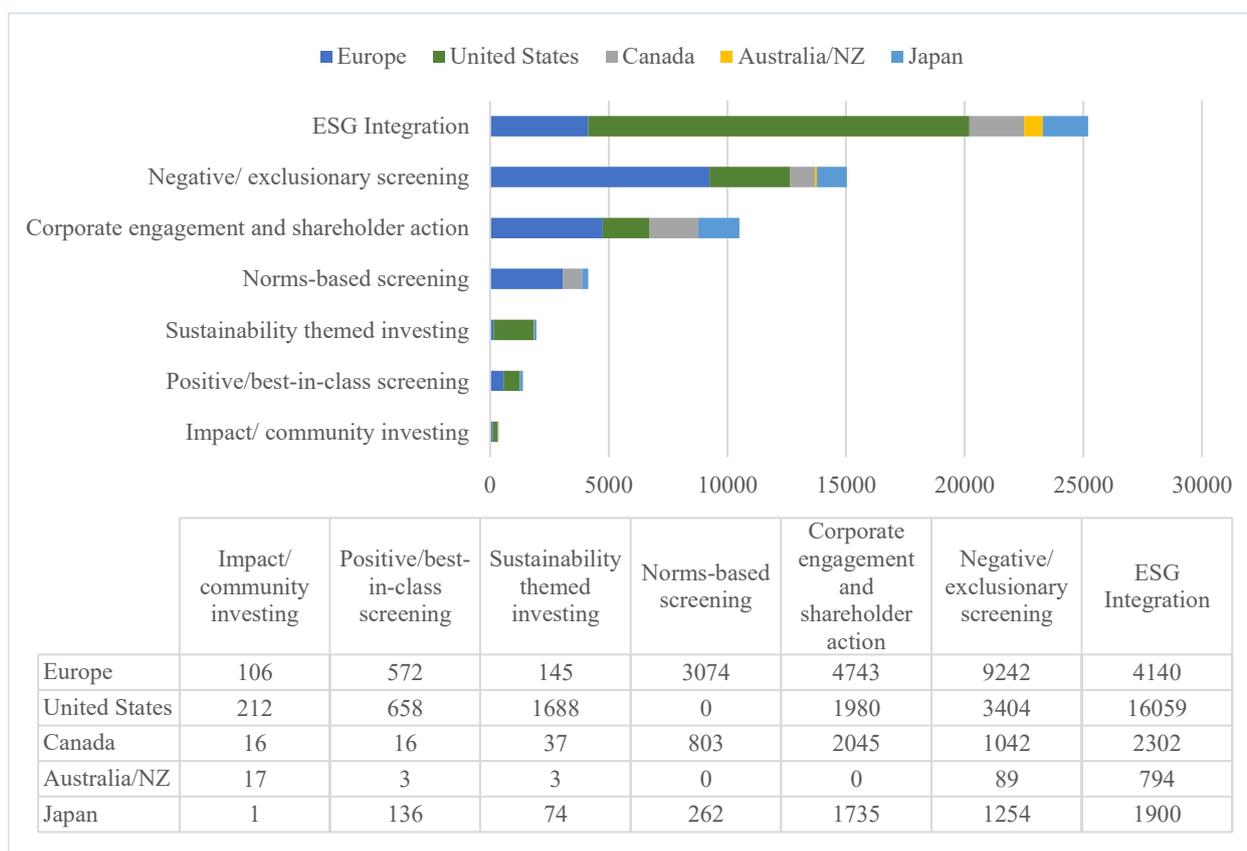
and dependability (74%). According to 88% of respondents, these problems could have been solved by implementing a common standard for companies to follow. For preparers of non-financial information, 64% of reporting firms said that receiving more requests for non-financial data was a major issue. Furthermore, while determining what, where, and how to disclose non-financial information, organizations reporting under NFRD experienced confusion and complexity (43% of respondents). Looking only at SMEs, a similar result was found, with 46% of respondents supporting mandatory standards, while in favour of developing a simplified version framework. Another desire identified by respondents, mainly users of non-financial information, (64%) was making sustainability data machine-readable and in order to improve searchability, readability, and comparison, all reports should be available on a single platform. Digitalization could be a solution to enhance comparability and decision making, while encouraging corporate reporting practices, however many businesses debated the cost-benefit of making information machine-readable (European Parliamentary Research Service (EPRS), 2021).

Despite these shortcomings, the Global Sustainable Investment Alliance (GSIA) in its 2020 review highlighted how there was an increase of 15% of global green investments, reaching USD 3.5 trillion. The largest increase happened in Canada (48% growth), however between 2018 and 2020, sustainable investing assets worldwide were largely dominated by the United States and Europe, accounting for over 80% of the total. In this study, ESG integration emerged as the prevailing sustainable strategy, surpassing negative/exclusionary screening as the most used approach (Graph 2) (Table 4) (GSIA, 2020).

Table 4: Description of the seven different strategies to sustainable investments. Source: *Global Sustainable Investment Review 2020*, p.7, GSIA, 2020.

<b>ESG integration</b>	The systematic and explicit inclusion by investment managers of environmental, social and governance factors into financial analysis.
<b>Corporate engagement &amp; shareholder action</b>	Employing shareholder power to influence corporate behaviour, including through direct corporate engagement (i.e., communicating with senior management and/or boards of companies), filing or co-filing shareholder proposals, and proxy voting that is guided by comprehensive ESG guidelines.
<b>Norms-based screening</b>	Screening of investments against minimum standards of business or issuer practice based on international norms such as those issued by the UN, ILO, OECD and NGOs (e.g. Transparency International).
<b>Negative/exclusionary screening</b>	The exclusion from a fund or portfolio of certain sectors, companies, countries or other issuers based on activities considered not investable.  Exclusion criteria (based on norms and values) can refer, for example, to product categories (e.g., weapons, tobacco), company practices (e.g., animal testing, violation of human rights, corruption) or controversies.
<b>Best-in-class/positive screening</b>	Investment in sectors, companies or projects selected for positive ESG performance relative to industry peers, and that achieve a rating above a defined threshold.
<b>Sustainability themed/thematic investing</b>	Investing in themes or assets specifically contributing to sustainable solutions - environmental and social - (e.g., sustainable agriculture, green buildings, lower carbon tilted portfolio, gender equity, diversity).
<b>Impact investing and community investing</b>	<b>Impact investing</b> Investing to achieve positive, social and environmental impacts - requires measuring and reporting against these impacts, demonstrating the intentionality of investor and underlying asset/investee, and demonstrating the investor contribution.  <b>Community investing</b> Where capital is specifically directed to traditionally underserved individuals or communities, as well as financing that is provided to businesses with a clear social or environmental purpose. Some community investing is impact investing, but community investing is broader and considers other forms of investing and targeted lending activities.

Graph 2: Composition of Sustainable Investment by Region. Data source: *Global Sustainable Investment Review 2020*, p.11, GSIA, 2020. Expressed in billions USD, made with Microsoft Excel.



Australia/NZ did not report on the categories: Norms-based screening and Corporate engagement and shareholder action; in the same way, the US did not report on Norms-based screening – these are represented in the graph with value zero.

## **2.2. Effects and Consequences of the NFRD**

The aftermath and impact of the Directive 2014/95/EU were broadly discussed in several studies. In particular, Breijer et al. explored the contrasting effects of mandatory versus voluntary non-financial reporting and the related economic outcomes of the companies. Their investigation encompassed 497 firms in the STOXX Europe 600 index from 2012 to 2020. The findings revealed that firms which started reporting voluntarily in advance of the NFRD experienced a positive cost-benefit dynamics. These businesses not only made meaningful disclosures, but they also saw a decrease in information asymmetries, while their company value remained unchanged. In contrast, firms that adhered to mandated non-financial reporting rules after the issuance of the directive, were found to be more likely to provide generic, uninformative disclosures. This is consistent with them encountering an unfavourable cost-benefit trade-off of reporting. As a result, these companies witnessed a decrease in firm value and an increase in information asymmetries. Summing up, Breijer et al. findings suggest that the Directive's flexibility make it inefficient for encouraging non-financial information disclosure among companies with poor incentives to reveal meaningful information (Breijer et al., 2024).

This analysis aligns with the broader discussion about heterogeneity of non-financial disclosures among publicly traded corporations across Europe made by Breijer and Orij in the paper titled "The Comparability of Non-Financial Information: An Exploration of the Impact of the Non-Financial Reporting Directive (NFRD, 2014/95/EU)" of 2022. Breijer and Orij's research methodology included a review of annual and standalone non-financial reports from 221 firms in the STOXX Europe 600 Index from 2012 to 2020. The core findings demonstrate a duality in reporting methods, distinguishing between firms voluntarily adopting non-financial reporting and companies legally mandated to comply with sustainable reporting laws. Voluntary adopters frequently use multi-stakeholder frameworks, such as the Global Reporting Initiative (GRI), motivated by the expected advantages of transparency and to minimize information asymmetry. In contrast, mandatory adopters primarily rely on outside-in frameworks, such as

the Sustainability Accounting Standards Board (SASB), however, disclosures may increase information asymmetry through the use of ambiguous language. It also became evident that voluntary adopters have begun to incorporate investor-oriented frameworks in conjunction with their established inside-out perspective. This advancement improved the comparability across both categories of firms. The authors then took into consideration that listed European firms often operate outside the EU, for such reason they investigated whether a firm having geographical segments in the US (67% of the sample) or a firm cross-listing its shares on US stock exchanges (8% of the sample) impacts their reporting framework choice. Results suggest that there is a positive correlation between the adoption of SASB standards and firms with US-based segments. On the contrary, no relationship was found between the SASB usage and firms cross-listing their shares US stock exchanges (Breijer & Orij, 2022). Table 5 shows the increase in the usage of non-financial frameworks among the sample of firms over the period from 2012 to 2020.

Table 5: Non-Financial Frameworks Used by Sample Firms from 2012 to 2020. Source: *The Comparability of Non-Financial Information: An Exploration of the Impact of the Non-Financial Reporting Directive (NFRD, 2014/95/EU)*, p. 343, Accounting in Europe, Breijer R. & Orij R. P., 2022.

Framework		2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Firm-year observations</b>	<b>(Total 1622)</b>	<b>157</b>	<b>155</b>	<b>164</b>	<b>170</b>	<b>187</b>	<b>200</b>	<b>203</b>	<b>198</b>	<b>188</b>
<i>SASB</i>	n	0	0	0	1	1	3	6	19	67
	%	0%	0%	0%	1%	1%	2%	3%	10%	36%
<i>IIRC</i>	n	2	3	9	8	12	14	20	21	24
	%	1%	2%	5%	5%	6%	7%	10%	11%	13%
<i>EFFAS</i>	n	0	0	0	0	0	0	0	0	0
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%
<i>GRI</i>	n	44	49	58	66	81	106	109	111	118
	%	28%	32%	35%	39%	43%	53%	54%	56%	63%
<i>UNGC</i>	n	14	15	25	32	37	45	48	51	58
	%	9%	10%	15%	19%	20%	23%	24%	26%	31%
<i>ISO</i>	n	4	4	6	6	8	10	10	10	13
	%	3%	3%	4%	4%	4%	5%	5%	5%	7%
<i>AA</i>	n	5	7	12	13	12	15	14	13	15
	%	3%	5%	7%	8%	6%	8%	7%	7%	8%
<i>FEE</i>	n	0	0	0	0	0	0	0	0	0
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Note: SASB (Sustainability Accounting Standards Board), IIRC (International Integrated Reporting Council), EFFAS (European Federation of Financial Analysts Societies), GRI (Global Reporting Initiative), UNGC (United Nations Global Compact), ISO (International Organization for Standardization), AA (AccountAbility), FEE (Federation of European Accountants).

The document "Effects on Corporate Stakeholders and Limitations of The Implementation of The Non-Financial Reporting Directive (2014/95/EU)", as suggested by the title, explores the diverse impacts of the NFRD on various stakeholders. As non-financial information disclosures improved decision-making by highlighting risks and opportunities that were not included in traditional financial statements, investors and financial institutions gained a more comprehensive view of the different markets. This improved transparency, which consequently helped reducing information asymmetry and creating more trust between firms and investors. Furthermore, organizations that publish non-financial disclosures can improve both the enterprises' reputation and value by following sustainable development goals. An example were Sweden firms, which significantly enhanced reporting on employee-related issues. However, employee representation in governance processes should be actively encouraged in order to collect more accurate data. Governments play an important role in this scenario, since mandatory disclosures can reduce information asymmetry and increase the credibility of disclosed ESG data. Nevertheless, the NFRD is not without limits. A key obstacle is the absence of a uniform reporting and external verification process, which results in uneven outcomes and limitations in cross-company comparison. This issue is worsened by worries about validity, as the voluntary nature of reporting can lead to "greenwashing," meaning corporations selectively publish only positive performance elements, manipulating consumers' ability to evaluate their performance (Hao, Dragomir & Radu, 2023).

## **Chapter III - Country-Specific ESG Reporting Practices after Brexit**

### **3.1. ESG reporting practices in Europe after Brexit: the CSRD and the EU Taxonomy**

In direct response to the shortcomings of the NFRD, the European Commission proposed the Corporate Sustainability Reporting Directive (CSRD) on April 20th 2021, then approved in December 2022. It consists in an amendment of the NFRD, expanding its scope and imposing mandatory sustainability reporting requirements. Such regulatory framework is needed to enhance consistency and comparability of non-financial information throughout the European Union and establish a common legal requirement regarding the degree of the information that should be disclosed. The CSRD mandates companies falling under its scope to prepare a Sustainable Statement within the management report, not a separate sustainability report. It has a phased implementation: starting from fiscal year (FY) 2024 it gradually incorporates various entities within its scope beginning with large public-interest entities (PIEs) that have more than 500 employees (similarly to the NFRD). The subsequent phase takes effect from the FY 2025, with the first reports due in 2026 and it will expand its reach to all large companies meeting two out of the following three criteria:

- More than 250 employees,
- More than € 50 million turnover,
- More than € 25 million total assets.

In a further progression, starting from FY 2026, the CSRD will extend its reporting requirements to include listed small and medium-sized enterprises (SMEs), excluding micro-undertakings, which can disclose non-financial information following the directive on a voluntary basis. This voluntary framework is designed to encourage smaller firms to start looking at a sustainable future and encourage a culture of ESG-aligned investments in the economy. The final inclusion phase set to begin in FY 2028, introduces a new element to the EU sustainable reporting framework by incorporating non-EU groups that generate more than €150 million turnover in the European Union and which have either a subsidiary in the EU or a branch in the EU which generates more than € 40 million turnover. This inclusion highlights the willingness to held accountable non-EU

corporations to EU sustainability standards, thereby enhancing the overall integrity and comparability of the CSRD.

Another step forward from the NFRD, consists in the thematic aspects described in the new directive. While the NFRD merely provides an outline of the general topics to report on, the CSRD enters into detail expressing what to disclose on each of the three ESG pillars. This was achieved by acknowledging the interests of different types of stakeholders including investors, customers, employees, and the broader society – aligning with stakeholder theory. The CSRD emerges from a negotiation process and interplay between corporations, non-governmental organizations (NGOs), and European Union legislators, resulting in a multifaced directive focused on both accountability and sustainability (Azevedo et al., 2025). Furthermore, under the NFRD, companies were supposed to disclose information following a double materiality perspective. However, this framework remained mainly theoretical, since companies predominantly chose to follow the GRI guidelines to write their report. As a result, they primarily focused on impact materiality, and neglected the financial implications of sustainability-related risks and opportunities. In contrast, entities falling under the scope of the CSRD must publish sustainability matters that may hold significance from either an impact perspective, a financial perspective, or both by following the disclosure and metrics detailed in the European Sustainability Reporting Standards (ESRS).

The ESRS were developed by the European Financial Reporting Advisory Group (EFRAG) and they specify the information that a company shall disclose about its material impacts, risks, and opportunities in relation to ESG matters. These standards impose obligations only regarding the transparency of information, but they do not prescribe any duties in terms of behaviour. Companies may disclose the absence of a future plan, clearly this will pose a reputational problem, however on a regulatory perspective, it is not considered an issue. Nonetheless, companies are strongly encouraged, not legally, to develop a strategic plan to address ESG concerns. To assist small and medium-sized enterprises (SMEs) the EFRAG has established two different reporting standards: the ESRS for Listed SMEs and the Voluntary ESRS for Non-listed SMEs. The latter provides a simplified version of the reporting tool, replacing the ESG data questionnaires commonly required by business partners. Despite this simplification, the considerable amount of reporting obligations remains a challenge for smaller

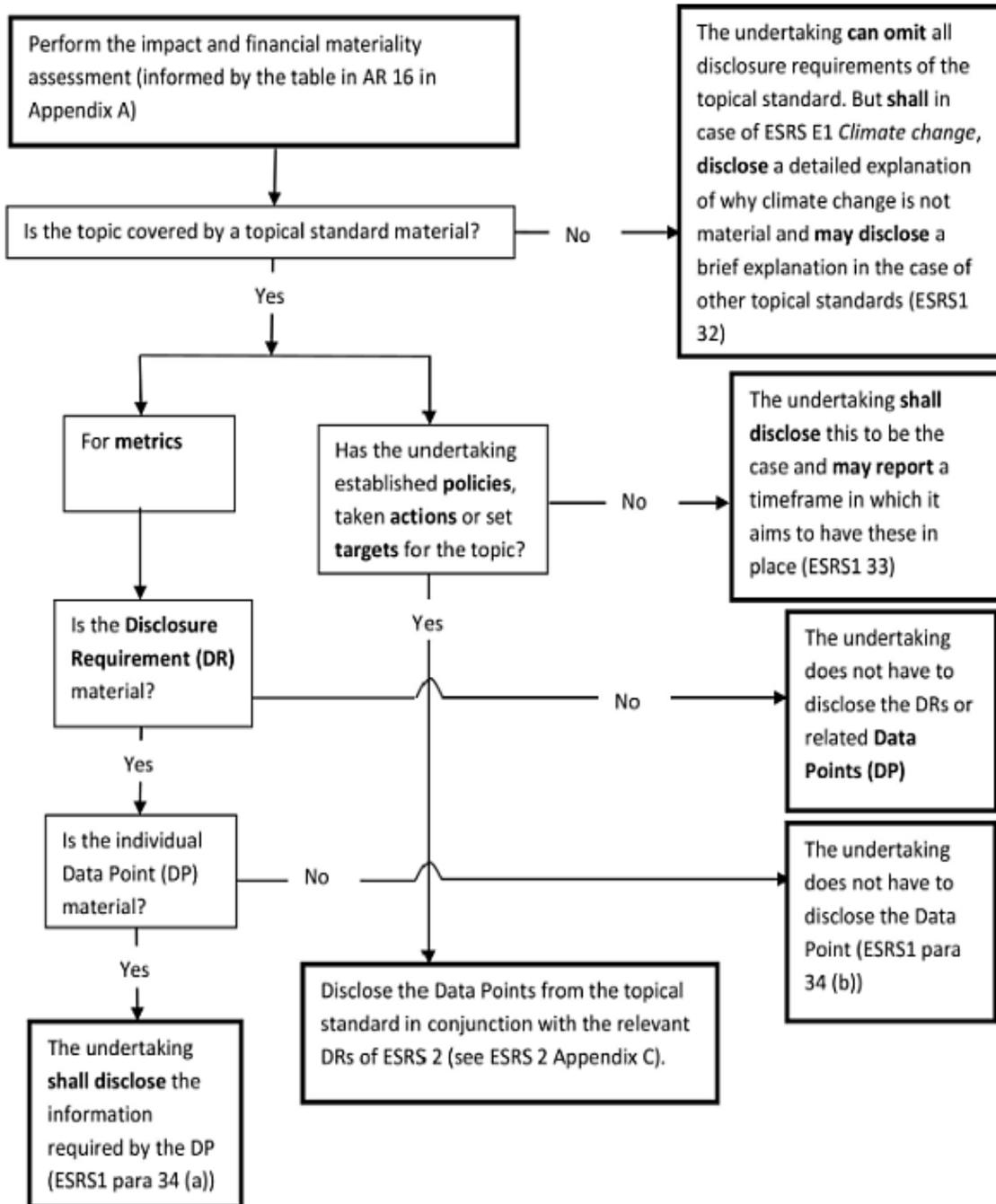
companies (Di Tullio, La Torre & Rea, 2025). The full ESRS used by listed and large companies are composed of three categories of standards:

- Cross-cutting standards (ESRS 1 and ESRS 2).
- Topic standards.
  - E1–E5 – requirements specific to environmental reporting objectives;
  - S1–S4 – requirements specific to social reporting objectives;
  - G1 – requirements specific to governance reporting objectives.
- Sector-specific standards (not adopted yet).

These standards are tailored to all entities within a specific sector. They address impact, risks, and opportunities which are likely to be material for every entity operating in that sector. This offers a high level of comparability between firms (ESRS, 2024).

Cross-cutting and topic standards are intended to be applied to all organizations regardless of their industry. ESRS 1, similarly to GRI 1, describes the framework's structure, detailing essential principles and general requirements for preparing and presenting ESG-related information (ESRS, 2024). Each disclosure requirement consists of one or more datapoints which can be mandatory ("Shall disclose") or voluntary ("May disclose"). Datapoints can require narrative (e.g., policies and actions) or quantitative data (e.g., metrics and targets). The starting point of ESRS is the materiality assessment (Graph 3): an entity may omit to disclose information on a topic if it determines that it is not material, however a brief explanation of the conclusions drawn from the materiality assessment for that specific topic should be provided. In the case that the omitted topic belongs to ESRS E1 related to climate change, a more detailed explanation is required. As specified in the ESRS 2 section, ESRS do not demand information on every participant in the value chain, but simply relevant upstream and downstream value chain information, in line with the ESRS's value chain-specific standards. If the entity is unable to access upstream and downstream information despite reasonable attempts, information such as sector average statistics and proxies may be employed. In such case, the undertaking shall outline the proposed efforts to increase accuracy in the future (ESRS, 2024)

Graph 3: Materiality Assessment Flowchart under ESRS. Source: ESRS, *ANNEX I to Commission Delegated Regulation (EU) 2023/2772 supplementing Directive 2013/34/EU of the European Parliament and of the Council, 2024.*



Note: the flowchart does not address the circumstance in which the entity evaluates a sustainability issue as material, but it is not regulated by a topical standard. In such case, the undertaking must make additional entity-specific disclosures (ESRS, 2024).

The CSRD mandates companies to adopt a limited assurance by October 2026, while looking to expand towards a reasonable assurance by October 2028. Moreover, the directive introduces a new requirement for entities' sustainable statements: they must be machine-readable, hence of electronic format. The EFRAG was entrusted with developing the XBRL digital taxonomy for sustainability reporting. This change strives to improve accessibility for stakeholders, make data comparison more efficient and reduce expenses for both users and preparers of the sustainability statements.

The CSRD obliges large businesses falling under its scope to submit reports on their sustainability performance in light of the EU Taxonomy as well (Barral, 2023). The EU Taxonomy, established under Regulation No. 2020/852, is a fraction of the European Green Deal, whose goal is to reduce climate change and environmental issues caused by emissions of greenhouse gases and misuse of natural resources. Specifically, the EU Taxonomy's main goal is to identify which economic activities are "green" and channel capital flows in order to reach Europe's Sustainable Development Goals (SDGs). It applies to all activities and companies subject to the CSRD and it provides a categorization system which defines sustainable economic activity based on six environmental objectives:

- Climate change mitigation;
- Climate change adaptation;
- Sustainable use and protection of water and marine resources;
- Transition to a circular economy;
- Pollution prevention and control;
- Protection of biodiversity and ecosystems.

To be considered environmentally sustainable, an economic activity must meet four requirements:

- it contributes significantly to addressing at least one of the six environmental objectives,
- it does not significantly harm any of the six environmental objectives, also known as DNSH criteria,
- it follows minimum safeguards established by the OECD and UN Guiding Principles, and
- it complies with technical screening criteria.

The EU Taxonomy delineates between economic activities that are taxonomy-eligible and those that are taxonomy-aligned. Economic activities are taxonomy-eligible if they meet the technical screening requirements outlined in the Appendices of delegated rules. An economic activity is taxonomically aligned if it passes the technological screening requirements and the minimum social safeguards (Hummel & Bauernhofer, 2024). It is necessary to note that an activity's eligibility does not automatically imply its sustainability; rather, eligibility only verifies its inclusion in the delegated acts based on defined technical screening criteria. Instead, alignment includes adhering to particular criteria relevant to the activity inside the Taxonomy framework. Therefore, a comprehensive understanding of economic activities requires an investigation into their eligibility status, followed by an assessment for alignment. Companies subject to the CSRD are required to provide information on the extent to which their operations are environmentally sustainable.

The CSRD plan not only establishes a uniform sustainability reporting system, but it also mandates the unification of the penalty system. It specifies the minimum types of sanctions that member states must implement in response to violations. Such sanctions include: (I) a public statement mentioning the responsible individual or entity, outlining the nature of the infringement, (II) an order instructing the liable individual or entity to stop such behaviour and prevent future occurrences, (III) and administrative monetary penalties. Member states must ensure that, when deciding the nature and level of the fines, all relevant facts are taken into account, such as: the seriousness and duration of the violation, as well as the degree of responsibility of the entity involved (Primec & Belak, 2022).

The CSRD and ESRS place strict restrictions on organizations, posing economic, cultural, and technical hurdles that may lead to resistance to change (Nicolo, Zamponi, Sannino & Polcini, 2025). Moreover, Draghi in his 2024 report described the EU's sustainability reporting as a significant regulatory burden, which lacks guidance for firms to apply the complicated standards, entailing compliance costs ranging from EUR 150,000 for non-listed firms to EUR 1 million for listed ones (Draghi, 2024). For these reasons, the European Commission launched a legislative project in February 2025: the Omnibus Simplification Package, with the goal of simplifying and consolidating existing EU legislation on sustainability reporting. The first component of the Omnibus Simplification Package was formally announced in the Official Journal of the European Union on April

2025, as Directive (EU) 2025/794, known as the Stop-the-Clock Directive. The document demands a two-year delay in the beginning application dates for the CSRD for large organizations that were originally required to report for fiscal years 2025 or 2026 (Grenzebach & Rau, 2025) and a delay of one year for SMEs falling under wave 3, now required to report in 2029 as opposed to 2028 (Ries-Coward et al., 2025). The Omnibus Simplification Package main changes included amendments to the CSRD and the EU Taxonomy, by raising the bar for required sustainability reporting, restricting its application to businesses with:

- over 1000 employees and
- either €50 million in revenue or €25 million in total assets.

This reduces the number of companies subject to CSRD responsibilities by almost 80%. Alongside this change, the European Commission envisioned a simplification of the ESRS in order to reduce the burden of reporting, and potential "ESG overregulation," given the existing ESRS framework's excessive amount of needed datapoints (Nicolo, Zamponi, Sannino & Polcini, 2025). Furthermore, sector-specific standards will refrain from being adopted. However, these changes do not necessarily affect the amount of data that must be disclosed, as firms were previously only required to report material data indicators and not on all 1200 data points present in the ESRS. In light of the changes in scope by the Omnibus Package, the EU sacrifices its ambitious sustainability outcomes while providing little short-term benefits and no future advantages to businesses. Another issue is the timing: firms will not necessarily see a reduction of their administrative costs following the Stop-the-Clock Directive, since the changes are implemented when businesses had already started preparing to meet the original reporting requirements (Figure 2) (Bertram, 2025).

Figure 2: Regulation Timeline. Source: *Deregulating to No Avail: How the Omnibus Package Falls Short in Simplifying Key EU Green Deal Instruments*, Bertram A., 2025.



In the context of the CSRD discussion, it is important to note that in the EU can be found two diverse systems of corporate governance and economic systems, which hindered the establishment of a common sustainability reporting framework. The systems in question are namely the insider and the outsider models. Insider systems exist in Germany and France, where shares remain concentrated in the hands of a limited number of investors and block-holders who have close ties with the company's management and have an incentive to closely monitor the firms, considering to the substantial stock they possess. Examples of outsider models include the United Kingdom and Ireland. Companies in these systems feature scattered ownership structures as well as lax management. The Anglo-Saxon model prioritizes shareholder welfare centred around ownership rights, whereas the German model seeks to balance broader interests within the company and gives high consideration towards employees' rights and their participation in the company's decision-making processes (Tsagas, 2020).

### *3.1.1. Germany*

Germany is more than just an implementer of EU law; it is actively shaping the ESG environment, frequently leading with national legislations which impact major European policies. Since the UN Rio Conference, the country has relentlessly followed a National Sustainable Development Strategy (Nachhaltigkeit Strategien für Deutschland), first introduced at the World Summit on Sustainable Development in Johannesburg in 2002. This strategy has been continuously updated, the most recent update occurred in 2021, demonstrating Germany's long-standing political consensus on the importance of ESG matters. The 2012 update outlined the four guiding principles of the strategy: intergenerational equity, quality of life, social cohesion, and international responsibility. In the same document, the Management Concept for Sustainable Development offered norms, objectives, and indicators to keep monitoring the results of the strategy, including key metrics for 21 action areas related to 38 measurable goals. The State Secretaries' Committee for Sustainable Development oversees the plan and issues reports every four years, in which the progress is reviewed and steps to accomplish the defined goals are suggested (German Federal Government, 2012).

In the last revision of 2021, the Committee highlighted the German Government's decision of September 2020 to integrate the German Sustainability Code, Deutscher

Nachhaltigkeitskodex (DNK), into the concept of efficient corporate management within the federal administration (German Federal Government, 2021). The DNK was introduced in 2011 by the German Council for Sustainable Development (RNE) in collaboration with private companies and it offers a set of 20 criteria (Figure 3) to guide companies on providing information on the environmental, social, and economic aspect of sustainability. Sustainability topics considered material under the scope of the DNK are those which fall under one of three categories:

- Outside-in perspective,
- Inside-out perspective, and
- Stakeholder perspective, which encompasses all topics considered relevant by stakeholders (German Council for Sustainable Development, 2020).

Figure 3: German Sustainability Code 20 Criteria Overview. Source: *The Sustainability Code (DNK)*, Envoria, 2022.

01 Strategy	02 Materiality	03 Objectives	04 Depth of Value Chain	05 Responsibility	06 Rules and Processes	07 Control
08 Incentiv Schemes	09 Stakeholder Engagement	10 Innovation and Product Management	11 Usage of Natural Ressources	12 Resource Management	13 Climate-relevant Emissions	14 Employee Rights
15 Equal Opportunities	16 Qualifications	17 Human Rights	18 Corporate Citizenship	19 Political Influence	20 Conduct that complies with the Law and Policy	

It is of voluntary basis and can be applied by companies outside Germany as well, since it is based on international reporting standards like the GRI and indicators from the European Federation of Financial Analysts Societies (EFFAS). Although it is a voluntary tool, the German government explicitly encourages its application as it both promotes sustainable development and enhances comparability between firms: due to its standardised nature, it can be applied to all sizes and legal forms of companies. Similarity to the NFRD, the DNK follows a “Comply-or-Explain” principle according to which companies are required to state when they intend to disclose the missing information. The UN Conference on Trade and Development (UNCTAD) highlighted the code's excellent contribution to transparency in the domain of corporate sustainability, particularly in

terms of enhancing the comparability and quality of reporting (German Council for Sustainable Development, 2020). In 2021, over 600 enterprises used the DNK's free tools, which are backed by a national network of over 100 training partners that help businesses adjust to new reporting requirements (German Federal Government, 2021).

The first German National Action Plan for Business and Human Rights (NAP), established by the German federal government in 2016, is in line with Tsagas' classification of Germany as an insider economic model, with a focus on employee and human rights (Tsagas, 2020). This Action Plan states that it is the duty of all enterprises to respect human rights, include human rights due diligence responsibilities into their operations, and report on this by 2020. Companies can also make use of the DNK criterion 17 (Table 6) as a basis to disclose on such topic, followed by information on:

- Human rights policy statements;
- Identification of actual or potential adverse impacts on human rights;
- Measures to review effectiveness;
- Human rights due diligence obligations in the value chain (German Council for Sustainable Development, 2020).

The first NAP expired in 2020; however, it outlined the basis for the German Supply Chain Act (Lieferkettensorgfaltspflichtengesetz or LkSG), adopted in 2021 and entered into force in 2023. It applies to all business, irrespective of their corporate form which have at least 1,000 employees in Germany (Sinnig & Zetzsche, 2025). The LkSG was thought to mandate German firms to inspect their whole supply chain for human rights violations and environmental damages. It requires corporations to take early measures to monitor and report on human rights and environmental standards across their supply chains, meeting their due diligence by building an internal risk management system which include direct suppliers and by making public statements on such topics. Moreover, firms must grant a compliant system which allows to report on violations of human rights and damages towards the environment. The LkSG asks companies a passive monitoring of indirect suppliers as well, and when proof of sustainability concerns is found, they must take rapid action. This new legislation capability to achieve sustainability across the value chain depends on stringent enforcement and while some political parties advocate for its abolition, current economic studies show that major corporations are successfully meeting its criteria (Mardenli, Strater, Herrmann & Sackmann, 2025).

Table 6: DNK Criterion 17: Human Rights: Aspects and Performance Indicators. Source: German Council for Sustainable Development, *The Sustainability Code – Benchmarking sustainable business*, p.54, 2020.

Checklist	
<b>Aspect 1:</b>	Report on the goals and planned goal achievement time frames for the upholding of human rights by your company, any subsidiaries, and suppliers and service providers.
<b>Aspect 2:</b>	Report on the strategies and concrete measures for the upholding of human rights by your company, any subsidiaries and suppliers.
<b>Aspect 3:</b>	State whether previous goals were achieved and, if so, to what extent, and disclose any goals which were not achieved and why.
<b>Aspect 4:</b>	Report on the material risks arising from your business activities, your business relations and your products and/or services that are likely to have a negative impact on human rights.
Performance indicators related to criterion 17	
<b>GRI SRS 412-3:</b>	Significant investment agreements and contracts that include human rights clauses or that underwent human rights screening
<b>GRI SRS 412-1:</b>	Operations that have been subject to human rights reviews or impact assessments
<b>GRI SRS 414-1:</b>	New suppliers that were screened using social criteria
<b>GRI SRS 414-2:</b>	Negative social impacts in the supply chain and actions taken
<b>EFFAS S07-02 II:</b>	Percentage of total facilities certificated according to SA 8000 standard

In parallel to the German Sustainability Code (DNK), which serves as a voluntary framework, mandatory non-financial reporting has been established as a legal requirement for companies in Sections 289b-e and Sections 315b-c of the Third Book of Commercial Code (Handelsgesetzbuch or HGB). This represents a transposition of the Directive 2014/95/EU in 2017 by the German Bundestag, also known as Transposition Act or CSR-RUG. Specifically, the CSR-RUG changes and complements the HGB's Third Book, which covers firms' accounting and reporting requirements. Since the reporting year 2017, big capital-market-oriented firms have been required to disclose

complete information about their corporate social responsibility programs, with a focus on environmental factors. The CSR-RUG's implementation is remarkable for its restricted flexibility in implementing the Directive into national legislation, resulting in an almost identical adaptation (Uwer & Schramm, 2018). The non-financial statement, as required by section 289c paragraph 2, must include information from five essential domains:

- Environmental issues.  
Such as greenhouse gas emissions, water consumption, air and water pollution and the use of renewable and non-renewable energy.
- Social issues.  
Such as actions to protect local communities and dialogue at regional level.
- Human rights.
- Employee issues  
Such as ensuring gender equality and positive working conditions.
- Anti-corruption efforts.  
Such as instruments in place to prevent corruption and bribery (Federal Ministry of Justice, 2021).

Section 289c paragraph 3 specifies the materiality criteria for the non-financial statement, which must fulfil a dual relevance condition. Specifically, the disclosures must be necessary for understanding the organization's operations, results, and general status, as well as illustrating the effects on the designated non-financial factors. According to this hybrid nature, while major negative impacts on sustainability issues may justify reporting, such disclosures are only needed if they are judged important for understanding the company's commercial trajectory and performance. This caveat underlines that, while unfavourable ESG consequences may be substantial, they do not need to be reported by companies unless they are relevant to understanding the business's operating context. Nonetheless, the legislative logic implies that, due to the interaction of business conditions and environmental externalities, both relevant criteria are generally met simultaneously. Furthermore, the traditional management report, as specified in section 289 HGB, is audited by professional third-parties who check its compliance with the yearly financial statements and the audit findings to ensure that it accurately represents the corporation's status. Section 317 paragraph 2 of the HGB extends the auditing responsibility to non-financial information, but to a limited extent (Uwer & Schramm, 2018).

The European Union (EU) has given Member States until July 2024, to incorporate the new CSR Directive into their national legislation. As previous, similar circumstances, Member States tend to keep the requirements stipulated in EU directives, with little to no changes. This conservative stance is primarily motivated by concerns about future fines or litigation before the European Court of Justice (ECJ) (Todeschini, 2024). However, some EU states failed to meet the deadline, including Germany, which on July 2024 adopted just a draft CSRD Implementation Act (Latham & Watkins, 2024). In such draft, Germany embraced the CSRD assurance framework, which consists in the gradual increase of assurance level through time. Moreover, both Germany and Italy have decided to wait for the EU Commission's delegated acts before adopting a more stringent assurance level. Other countries like Spain, on the other hand, have not taken a similar stance, implying that it may seek reasonable assurance at the national level before or in addition to EU laws. Additionally, German laws require that assurance must be provided in a separate assurance report. While this regulation reform may strengthen the credibility of sustainability statements, it also imposes greater compliance costs on German corporations compared to those from other Member States, hence affecting their competitiveness (Todeschini, 2024). The July 2024 draft was to be implemented by changing Sections 289b et seq. and 315b et seq. of the HGB and the Legal Affairs Committee held a public hearing on October 16<sup>th</sup> 2024, to have implementation of the draft expected for the same year (Krause, 2024). However, Olaf Scholz, the German chancellor, then fired his finance minister Christian Lindner, leading to a disagreement in the German government and eventually forcing the coalition of Social Democrats, Greens, and the Free Democratic Party to collapse (Connolly, 2024); the breakdown of the coalition government rendered the timeline of the draft almost impossible (Krause, 2024).

Based on the principle of discontinuity, the laws from previous parliamentary cycles are no longer valid, hence on July 2025, the German Federal Ministry of Justice presented a new draft law to implement the CSRD. This draft intends to completely incorporate the EU's sustainability reporting obligations into German legislation, in accordance with the Stop-the-Clock Directive's extended timetables. The proposal closely follows the EU framework, avoiding the implementation of more demanding national standards and incorporating reporting requirements into existing sections of the German Commercial Code, maintaining consistency within the national legal system (Grenzebach & Rau,

2025). On September 3<sup>rd</sup> 2025, the Federal Cabinet passed the Federal Ministry of Justice's draft bill to implement the CSRD in German law (Jang et al., 2025).

### *3.1.2. United Kingdom*

The inclusion of sustainability into UK's company law is represented in Section 172 of the Companies Act 2006. This provision requires directors to promote their firms' long-term prosperity while considering the interests of employees, suppliers, consumers, the community, and the environment. In 2019, the United Kingdom became the first large economy to pass a net zero emission law, modifying the Climate Change Act 2008 to set a legally enforceable goal of reaching net zero greenhouse gas emissions by 2050. Building on this target, the government has vowed to cut emissions by 78% compared to 1990 levels by 2035 (Lin, 2022).

In addition, the UK has taken important steps towards erasing unethical practices and social problems like modern slavery with its Modern Slavery Act of 2015, which is divided into 7 parts each encompassing 62 sections and 5 schedules. This legislation promoted transparency in factory conditions across the businesses' global supply chains. Specifically, Section 54 mandates companies with an annual revenue of over £36 million to disclose a statement, also known as a 'Transparency in Supply Chains (TISC) statement', every year and provide information on:

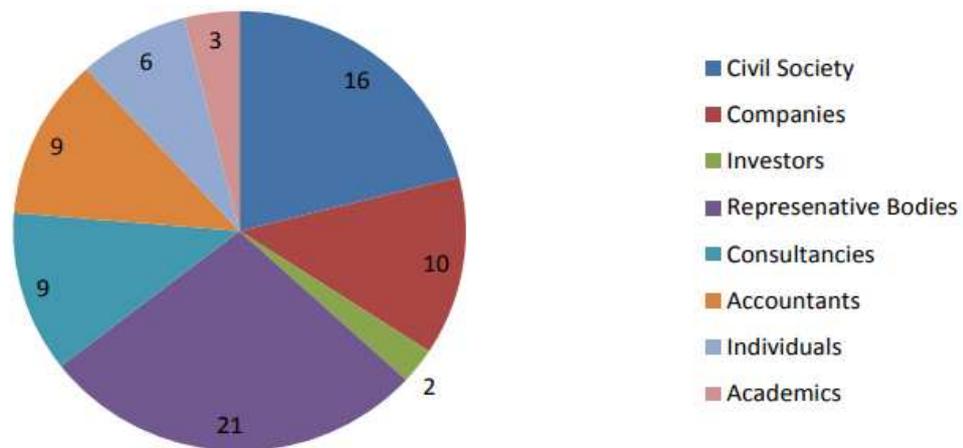
- The organisation structure, operations, and supply chains;
- Policies addressing human trafficking and slavery;
- Due diligence measures in relation to human trafficking and slavery;
- Business' areas which have higher risk of slavery, together with actions taken to assess and mitigate those risks;
- Effectiveness in preventing human trafficking and slavery;
- Training initiatives offered to employees.

However, at first the act's scope included only the private sector (Islam & Van Staden, 2021), it was only in March 2020 that the UK government published the world's first Government Modern Slavery Statement (Slave-Free Alliance, 2020). With the Modern Slavery Act, for the first time, slavery offences were consolidated, facilitating the prosecution of traffickers and raising maximum punishments for offenders. Despite the

initial gains, the UK has reversed course in later years, leaving victims at risk since the legislation and its execution are not keeping up with the ever-changing nature of contemporary slavery (Unseen, 2025). Modern slavery still remains an awful truth in the UK: while 22,756 victims of forced labour, sexual abuse, and domestic slavery were identified between 2017 and 2019, only 64 offenders were sentenced in the same period (Balch, 2025).

Prior to Brexit, the NFRD was incorporated through amendments to Sections 414C, 414CA, and 414CB of the Companies Act (Lin, 2022). At the beginning of 2016, the UK government launched a consultation to investigate efficient strategies for implementing the NFRD while addressing disparities between EU legislation and preexisting UK frameworks. A total of 76 replies were received (Department for Business, Energy & Industrial Strategy, 2016). The graph below shows the breakdown of answers by sector.

Graph 4: Number of Consultation Responses by Sector. Source: *The Non-Financial Reporting Directive - The Government Response to the consultation on implementation of the Directive*, Department for Business, Energy & Industrial Strategy, 2016.



The first section of the consultation addressed suggestions on allowing corporations to disclose information in a more flexible manner, along with evaluating the obligation of a separate report or not. While some groups supported additional flexibility, there was a noticeable lack of support for the concept of a separate report. As a result, the government has opted against pursuing a separate report and plans to partner with the Financial Reporting Council (FRC) to encourage innovative and flexible approaches for incorporating information into annual reports. The second set of questions gave possibilities concerning the directive's scope. Some responses urged for expanding the NFRD rules to all listed corporations rather than just those under focus. In response, the

government determined that companies falling under the directive's scope must follow its provisions, while those outside the scope will continue to comply with existing UK regulations but will be able to choose to comply with the EU's requirements as well. Furthermore, the government requested feedback on the need for an independent verification of non-financial information. Although some participants advocated for mandated assurance to boost consumer confidence, the majority believed that such verification should develop as a market-led effort. Concerns were raised about potential increased expenses, administrative difficulties, and the lack of uniform standards for non-financial reporting, which might complicate procedure for verification. As a result, the government has decided not to mandate independent assurance; rather, corporations will be able to pursue it freely. At last, the government encouraged feedback on the advantages and disadvantages of electronically releasing yearly reports. The majority of responders saw many benefits, including improved accessibility, lower printing costs, and more chances for innovative information display. Nonetheless, several concerns were expressed about the accessibility of annual reports in the online world. The government has committed to continuing collaboration with the FRC to promote original digital reporting (Department for Business, Energy & Industrial Strategy, 2016).

Following its departure from the European Union, the UK chose to forge its own distinct ESG reporting framework, opting out of applying EU legislations, including the CSRD. In this context, the United Kingdom has vowed to become a worldwide leader in sustainable finance. This includes the creation of a regulatory framework that promotes long-term growth and allows the private sector to profit on the journey to a more environmentally sensible economy. According to Bloomberg New Energy Finance, the UK requires an average annual investment of £130 billion until 2050 to remain on track with its Net Zero Scenario, with the private sector accounting for a significant portion of this investment. However, this number is more than quadruple the amount of low-carbon investment expected for 2024. To close this investment gap, joint work is required to build legislative frameworks that will encourage growth in investment. The Department for Business & Trade specified that fundamental goal of this program is to present investors with trustworthy and decision-relevant information about sustainability risks and possibilities. With these priorities in mind, the English government is taking a progressive approach, through three consultations, towards modernising the UK's

corporate reporting structure, ensuring that stakeholders have adequate opportunities and ensuring a sustainable growth (Department for Business & Trade, 2025).

The first consultation concerns the drafts of UK Sustainability Reporting Standards (UK SRS), which are based on the IFRS Sustainability Disclosure Standards published by the International Sustainability Standards Board (ISSB) in 2023. The UK SRS are intended to provide the core framework for future sustainability disclosures in the United Kingdom. The government wanted to promote international comparability and tried to reduce deviation from the ISSB Standards, in line with worldwide attempts to develop a single set of guidelines. As a result, the consultation suggests minimal changes to adapt the standards to the UK, while maintaining the benefits of worldwide comparison (Department for Business & Trade, 2025). The six amendments are:

- Abolition of Delayed Reporting Relief.

The UK SRS abolished the transition relief offered by IFRS S1, which previously permitted firms to delay the posting of sustainability disclosures in their first reporting year.

- Extension of 'Climate-First' Relief.

The UK SRS has extended the transition relief under IFRS S1, enabling firms to focus primarily on climate-related disclosures for an extra year, bringing the timeframe from one to two years. However, the transitional exemption in IFRS S2, which allows for the delay of Scope 3 emissions reporting until after the first reporting year, remains unchanged.

- Elimination of GICS Requirement.

The UK SRS has removed the IFRS S2 requirement to adopt the Global Industry Classification Standard (GICS) for reporting 'financed emissions.' This modification enables companies to use alternative standards that are more consistent with their current reporting procedures.

- Absence of Specific Effective Dates.

The UK does not provide precise dates for reporting obligations. Rather, such dates will be set by the relevant UK authorities.

- Modification of SASB Standards Language.

The UK SRS has changed the language around the SASB Standards in IFRS S1 and S2 from a mandatory "shall" to a more permissive "may".

- Linking Transition Relief to Mandatory Requirements.

The UK SRS specifies that transition reliefs will only apply after the reporting obligations become required. This rule assures that organizations who participate in voluntary reporting do not suffer for their efforts (Appleton, 2025).

It also encourages suggestions on costs and advantages of the UK SRS, which will help shape the conclusions on required disclosures for enterprises (Department for Business & Trade, 2025).

The second consultation, concluding in September 2025, focuses on assurance service providers for sustainability-related reporting. In particular, the government proposed an assurance regime overlooked by the Audit, Reporting, and Governance Authority (ARGA) to improve auditing and corporate governance. This will certify assurance providers as qualified for checking the information given in compliance with the UK SRS. Furthermore, it asks feedback to decide if assurance disclosures should be required, or if trust can be developed by voluntary assurance and firm transparency (Perversi, 2025).

The third consultation, issued by the Department for Energy Security and Net Zero, seeks suggestions on transition planning (Department for Business & Trade, 2025). It proposes two approaches to integrate transition plans into ESG reporting:

- Comply or Explain Framework.

Firms are not required to publish a transition strategy in their reports. Those who do not publish a transition plan must provide an explanation for their inability to disclose the information.

- Mandatory Development and Disclosure.

This method requires companies to prepare a transition strategy as part of their yearly sustainability reporting. In addition, it might demand the release of a separate transition plan document at regular periods in accordance with the Transition Plan Taskforce's recommendations.

In addition, it covers other areas including the firms' responsibility for meeting targets, the need to align transition plans with the aim of attaining net-zero emissions by 2050, and taking into account adaptation and resilience under different global warming scenarios (Appleton, 2025).

These consultations are the starting point in creating an independent UK sustainability reporting system that is intended to be effective in the long run. In October 2024, the Secretary of State for Business and Trade launched an examination aimed at improving the present non-financial reporting regime under the Companies Act 2006. This assessment will focus on improving the Annual Report to include sustainability-related reporting obligations while removing duplicative regulations that have accrued over time. The non-financial reporting review aims to boost growth, increase the United Kingdom's worldwide competitiveness, and contribute to the government's target of reducing administrative regulatory costs for firms by 25% (Department for Business & Trade, 2025).

In response to the EU Green Taxonomy, a consultation on a national Green Taxonomy was made public from November 2024 and February 2025. Of the 150 responses, only 45% of the participants were supporting the taxonomy development, while the remaining 55% were either sceptic or opposed to it. The primary criticisms focused on the lack of clarity in the framework and the increase in compliance costs the companies will be facing. Consequently, in July 2025 the Hm Treasury formally announced that the UK Green Taxonomy would not be pursued as a sustainability reporting framework. Instead, the government will be prioritising the development of the UK SRS and the implementation of transition plans (Bandini, 2025).

### *3.1.3. Comparing Germany and the United Kingdom Reporting Frameworks*

The legislative frameworks administering sustainability matters in Germany and the United Kingdom reflect both diverse approaches and common goals for encouraging the incorporation and attention on sustainability in corporate accountability. Each country's aim is to become a model of ESG inclusion; while keeping their enterprises competitive on the market and they achieve this by emphasizing different degrees of voluntary and mandatory frameworks.

In Germany, the German Sustainability Code, or DNK, is a voluntary regulatory framework that encourages businesses to report on sustainability matters. The DNK provides companies with a guidance for sustainability reporting, operating on a "Comply-or-Explain" principle. It is actively supported by the government, which promotes its use by businesses. Whereas, the implementation of the Non-Financial Reporting Directive

(NFRD) through its Commercial Code (HGB), also known as Transposition Act or CSR-RUG, represents the mandatory legislations on sustainability. Similarly, in the United Kingdom the NFRD was incorporated through amendments to Sections 414C, 414CA, and 414CB of the Companies Act of 2006. The latter mandates directors to take into consideration the interests of the different stakeholders and the environment. Opposite to Germany's rigorous frameworks for corporate reporting, the consultations made in the UK directed legislation towards a more flexible approach. Another notable difference lies in the approach to assurance. Under German law, companies are required to prepare a separate limited assurance report for non-financial information, which may increase costs for German companies. In contrast, the UK decided against mandating assurance reports, to simplify the administrative processes and not induce additional costs for firms; corporations are free to decide if seek an independent verification or not.

Post Brexit, Germany kept following the European Union sustainability accounting development by implementing the CSR Directive and the Omnibus package into German Law. The UK started to forge its own distinct ESG reporting framework, opting out of applying EU legislations, hence not implementing the CSRD. Instead, it took a three-step consultation leading to the establishment of the UK Sustainability Reporting Standards (UK SRS) based on the International Sustainability Standards Board (ISSB) Standards. By leaning towards an international framework, the UK aims to enhance worldwide comparability and separate from the European Union. With the UK SRS a new assurance regime overseen by the Audit, Reporting, and Governance Authority (ARGA) will be introduced, however is yet to be decided whether mandatory assurance will be adopted. Furthermore, the UK seeks to integrate transition plans into ESG reporting either applying the "Comply-or-Explain" principle or through mandatory development and disclosure

On the topic of protection of human rights, both countries tried to develop legal frameworks protecting individuals and preventing slavery. On one hand, the UK's Modern Slavery Act of 2015 mandates transparency in supply chains regarding human trafficking and slavery, focusing primarily on larger corporations. These are required to issue annual Transparency in Supply Chains (TISC) statements. Germany, on the other hand, highlighted the importance of human rights through instruments like the first National Action Plan (NAP) and subsequently, the Supply Chain Act (LkSG) of 2024.

Both aiming at increasing human rights due diligence throughout the businesses supply chains.

As both countries keep evolving their ESG reporting frameworks, on one hand Germany faces challenges when integrating the new EU directive due to the political changes and tensions the country is experiencing in recent years. On the other hand, the UK's Modern Slavery Act is facing criticism for its effectiveness, since the legislation and its execution are not keeping up with constant changes in nature of contemporary slavery.

Table 7 summarises the differences and similarities between the sustainable reporting frameworks of Germany and the UK.

Table 7: Comparative Analysis between Non-financial Reporting Frameworks between Germany and the United Kingdom.

	<b>Germany</b>	<b>United Kingdom</b>
<b>Non- financial Reporting Frameworks prior to 2021</b>	<ul style="list-style-type: none"> <li>- DNK (German Sustainability Code): Voluntary framework for reporting.</li> <li>- NFRD (Non-Financial Reporting Directive): Mandatory under Commercial Code (HGB).</li> </ul>	<ul style="list-style-type: none"> <li>- Companies Act 2006, Section 172</li> <li>- NFRD (Non-Financial Reporting Directive): incorporated through amendments to the Companies Act 2006.</li> </ul>
<b>Materiality</b>	- Double materiality.	- Financial materiality.
<b>Reporting Principles</b>	- DNK operates on a “Comply-or-Explain” principle.	- More flexible approach following consultations
<b>Assurance Requirements</b>	- Requires a separate limited assurance report for non-financial information.	- No mandatory assurance reports; companies can choose to seek verification.
<b>Human Rights Legislation</b>	- National Action Plan (NAP) followed by the Supply Chain Act (LkSG) in 2024.	- Modern Slavery Act of 2015
<b>Post-Brexit Developments</b>	- Continued alignment with EU directives (CSR Directive, Omnibus package).	<ul style="list-style-type: none"> <li>- Developing the UK SRS based on ISSB standards for international comparability.</li> <li>- Integration of transition plans into ESG reporting</li> </ul>
<b>Challenges</b>	- Political changes and tensions affecting EU directive integration.	- Criticism of the effectiveness of the Modern Slavery Act and its execution.

## **3.2. International view**

### *3.2.1. United States*

The United States started committing to sustainability in 1969 when it passed the National Environment Policy Act (NEPA). Its aim was to preserve the harmony and coexistence between humans and the environment in order to address the needs not only of present generations, but of the future as well. The following year, in 1970, the Nixon administration appointed the Environmental Protection Agency (EPA) and started incorporating the Brundtland report's ideas into their sustainable management practices (Sisaye & Birnberg, 2025).

In 2002, President Bush signed the Sarbanes-Oxley Act (SOX) which introduced standards for Environmental and Sustainability Reporting. In its scope fall all public companies listed on the US Exchange or that have over 300 U.S. shareholders when considering a foreign firm. According to the UK journal *Accountancy Age*, between 10 and 20 of the 113 UK firms listed on the NYSE and NASDAQ were considering delisting as of November 2004. For those who opted to persist, it was anticipated that the cost of compliance for a big British firm would be in the £10-20 million range. Interestingly, Asian corporations did not appear to be considering delisting. Asian organizations saw SOX compliance as a beneficial and essential tool for increasing visibility and reputation. For U.S. larger companies estimates of initial cost are in the millions, similarly for maintenance and audit expenses. Among the most expensive features of SOX are the establishment and maintenance of an appropriate Internal Control System. The Internal Control framework operates on the premise of a typical hierarchical organizational structure. Management provides guidelines, and staff execute them using processes designed to guarantee that the policies are implemented as precisely as possible. This system minimizes staff fraud and inefficiency by leaving minimal leeway for deviation from specified processes, but it does nothing to eliminate managerial fraud. In general, SOX has compelled public firms to fix up their act in terms of financial reporting, which appears to have increased investor trust while also costing a lot of money. Some private firms have voluntarily joined, recognizing that SOX laws may enhance their operations through more control and increased efficiency, as well as setting them favourably for IPOs and acquisitions (Holt, 2007).

In the U.S., non-financial reporting typically depends on market pressures. Because the Securities and Exchange Commission (SEC) has yet to establish specific regulations governing ESG risks, many large public companies choose to publish voluntary sustainability reports (such as GRI and SASB). However, such solutions frequently lead to inconsistencies and lack of comparability. Several institutional considerations contribute to the gap between US sustainability reporting and European Union reforms:

- The concept of shareholder primacy.  
A corporation's primary goal is to maximize shareholder wealth. The concept of materiality focuses on data deemed relevant to investors, frequently overlooking the concerns of other stakeholders. Furthermore, there is scepticism among firms and regulators on the materiality of non-financial risks, which are often viewed as 'political'.
- Regulatory scepticism.  
There is distrust between people and the government, defined by suspicion of the latter and faith in the ability of the market to deliver societal benefits itself (Ho, 2020).

In 2024 the SEC tried adopting new legislations requiring the U.S. public companies to disclose information on climate change in registration statements and annual reports, namely The Enhancement and Standardization of Climate-Related Disclosures: Final Rules. It focused only on a financial perspective, being investors the main receivers of data regarding material climate related risks, the activities to mitigate or adapt to such risks, information about the board of directors' oversight of climate-related risks and management's role in managing these risks, climate-related targets or goals, expenses and losses resulting from severe weather events and other natural conditions and information on greenhouse gas (GHG) emissions. Nonetheless, the SEC has paused its implementation following arguments against it, the main criticisms were that following the requirements resulted expensive for the companies, information to report on were considered overly speculative and the public argued that implementing such rules was beyond the SEC's authority.

In the absence of a stable federal legislation, a new force has emerged to drive U.S. sustainable reporting: state-level legislation. On the topic of human rights, the California Transparency in Supply Chains Act (CTSCA) of 2010, which went into effect in January

2012, is an example of legislative attempt to erase forced labour and human trafficking in business supply chains. The act requires large companies, meaning with annual gross revenues over \$100 million, to publicly report their efforts to prevent human trafficking on their websites. In doing so, companies provide customers with the knowledge they need to make sensible choices, while also boosting socially responsible businesses and discouraging those that abuse forced labour. However, the CTSCA is not designed to ban the sale of items made in unethical ways; rather, it promotes openness, allowing customers to distinguish between firms based on their commitment to ethical sourcing (Prokopets, 2014).



## Chapter IV – Comparative Analysis

### 4.1. Hypothesis Development

In the past decade, investors have been more eager to fund sustainable projects and businesses. This growth is supported by the consideration of ESG principles into investment strategies, which enable shareholders to generate value while including ESG-related risks and opportunities into their financial analysis. This highlights the rising recognition that non-financial factors, which were previously seen as external by traditional financial analysis, have an impact on a company's long-term financial performance and resilience. The increased interest in sustainability has led to major changes in regulatory frameworks, leading up to the implementation of new, more comprehensive rules.

The central question that this study seeks to answer is how firms in different countries, both within and outside the European Union, are implementing new ESG reporting standards and practices and will focus on the comparative analysis between the United Kingdom and Germany. For this purpose, the hypotheses put forth in this study are:

- **H1: Post-Brexit Divergence.**  
After the Brexit of 2021, UK-based firms may show a change in behaviour when reporting for sustainable matters. Due to the period of significant economic and regulatory uncertainty, companies could have diverted their resources and time away from ESG reporting, leading to a deceleration or decrease of progress compared to when the country was under EU legislation, namely the NFRD. The fact that the UK is just recently coming up with a new sustainability reporting set of regulations, compared to the already established laws of the EU, contributes to the gap in volume of reported data. To sum up, under this hypothesis sustainability reporting for UK-based firms will show a negative trend when compared to the same firms during the period prior to Brexit.
- **H2: The Influence of Mandatory Regulations.**  
Firms within the European Union, in particular, for the purpose of this paper, Germany, may show a constant increase in the completeness and quantity of

sustainability information reported between 2018 and 2022. The reason for this is the mandatory implementation of the Non-Financial Reporting Directive and subsequently, to the preparation phase for the Corporate Sustainability Reporting Directive. On the contrary, UK firms, while initially under NFRD regime, past 2021 were no longer subject to the EU directives, which could lead to German firms improving their reporting of ESG data more significantly than the UK companies. To summarise, the second hypothesis expects Germany-based enterprises to show a positive trend in sustainability reporting throughout the years and a positive gap from firms from the United Kingdom following Brexit.

- H3: Improved Reporting Over Time.

Firms may exhibit an improvement of ESG reporting practices through the years independently from the country of origin. This might be driven by the heightened attention investors and the public place on the manufacturing sector, which includes firms with high environmental and social impacts. Pharmaceutical, Chemical and Petrochemical companies specifically, might be under a greater degree of scrutiny from multiple types of stakeholders, especially regulators. This brings the third hypothesis to suggest a positive slope for ESG reporting practices of all the firms under analysis.

## **4.2. Research Methodology**

### *4.2.1 Data Selection*

To explore how firms in different countries, both within and outside the European Union, are adopting and implementing new ESG reporting standards and practices, I gathered information from different companies' annual reports and undertook a comprehensive analysis across the numerous documents. I found these annual reports by inputting on Google the following search string: “[enterprise name] annual report [year]”. In particular, the reports were from firms listed in the STOXX® Europe 600 falling under the manufacturing sector. As a first sample, I considered a group of 28 firms categorized under the North American Industry Classification System (NAICS) 2022 code as Pharmaceutical, Chemical and Petrochemical firms. The NAICS classifies enterprises into industries based on production processes, clearly outlining borders to reflect process variances. It divides the market into 20 sectors, and its production-oriented strategy was

chosen to allow for the gathering and distribution of data on inputs and outputs, assuring uniform classification for statistical reasons. The primary goal of the 2022 NAICS revision was to improve the classification's representation of new activities and developing technology (Executive Office of the President Office of Management and Budget, 2022). In this study, the main primary NAICS 2022 code identified was number 325, corresponding to the Chemical Manufacturing sector, which encompasses a diverse range of activities going from Synthetic Dye and Pigment Manufacturing (code 32513) to Pharmaceutical Preparation Manufacturing (code 325412). The latter subgroup is the most common: within fall over 10 of the companies of the sample (Appendix C).

I chose the Pharmaceutical, Chemical and Petrochemical firms as they present a notably rich landscape for examining the implementation of environmental, social and governance reporting standards due to the infamous impact they have on their surroundings, in particular on the environment (Munzarova, Kostalova & Fialova, 2022). Chemical and petrochemical products are manufactured in a series of steps using a range of activities which mostly results in the creation of waste of different quality and quantity. As a result, chemical emissions and untreated waste have severely disrupted the ecosystem, posing significant risk both for the environment and for societies. Therefore, internally, and outwardly, a rising worry has evolved that the chemical industry's long-term viability will rely on its progress toward economic, social, and environmental sustainability (Mitra, Agrawal & Ghosh, 2015).

The reports of the selected companies were collected for the years 2018, 2020, 2021 and 2022. Given that Brexit took place at the start of 2021, a comparative study can be conducted analysing the trajectory of ESG risk reporting of UK-based companies before and after this change, in parallel with observing the trends for other EU-based firms. Of the 28 companies making up for the Pharmaceutical, Chemical and Petrochemical sample, 5 are UK-based, so to understand what would be a proper comparison group of companies to compare them with, I divided the remaining firms by country. What emerged is that to most of the countries corresponded only one enterprise under the abovementioned sectors, only Germany and Switzerland had respectively 7 and 6 firms. Since Switzerland is not part of the European Union, the best choice was to take as a comparative sample, companies from Germany.

To sum up, on one hand the enterprises considered for the UK are:

- BP PLC
- GSK PLC
- ASTRAZENECA PLC
- RECKITT BENCKISER GROUP PLC
- HALEON PLC

On the other hand, the companies considered for Germany are:

- BASF SE
- BAYER AG
- FRESENIUS SE & CO. KGAA
- HENKEL AG & CO. KGAA
- MERCK KOMMANDITGESELLSCHAFT AUF AKTIEN
- LANXESS AG
- K+S AKTIENGESELLSCHAFT.

#### 4.2.2 Methodology

The research methodology of this paper was recommended by Prof. Marisa Agostini and adapted from the following works:

- Agostini M., Costa E., *Financial and Sustainability Reporting: An Empirical Investigation of Their Relationship in the Italian Context*, Sustainability and Social Responsibility: Regulation and Reporting, Springer, Singapore (ISBN 978-981-10-4501-1), and
- Costa E., Agostini M., *Mandatory Disclosure about Environmental and Employee Matters in the Reports of Italian-Listed Corporate Groups* in SOCIAL & ENVIRONMENTAL 5 ACCOUNTING, vol. 36, pp. 10-33 (ISSN 0969-160X).

In order to better understand how firms in different countries, both within and outside the EU, are adopting and implementing new non-financial reporting standards and practices, this study explores the companies' annual reports. Specifically, I am looking for phrases used in annual reports from the years 2018, 2020, 2021 and 2022 containing the term "risk" and its derivate (for example "risks", "risky", "riskiness", "risk-taking", etc.). To find such phrases, I am using the search function pressing the Ctrl + F keys at the same

time on the PC (for Windows, or Cmd + F keys, on iMac or MacBook) and inputting the term “risk”. If a sentence contains the word “risk” or one of its derivate more than once, I am counting it only once. However, I am not taking into consideration all expressions: the analysis focuses only on those falling under the variable named TYPE, which defines the typology of non-financial risk examined. The variable TYPE can take the following values:

- Environment.  
A phrase falls under this category when it mentions environmental matters: in describing health and safety of the environment following the firm actions or processes, the use of renewable and/or non-renewable energy, pollution of air and water and emission of greenhouse gases. Moreover, it considers topics related to climate change and the transition to a low-carbon economy.
- Social.  
A sentence is part of this group when it mentions social and employee-related matters in the sense of health and safety. Some examples are actions taken to ensure gender equality and dialogues with local communities.
- Human.  
All sentences mentioning human rights are part of this category.
- Corruption.  
Under this category fall all expressions regarding the topics of (anti-) corruption and bribery.
- Multiple.  
When a sentence contains more than one of the abovementioned categories it is part of this group.
- General.  
Part of this category are all expressions that do not mention any of the topics of previous groups, however they do refer to risks related to sustainability or corporate social responsibility.

Once this first categorisation is complete, other three variables are taken into consideration when analysing the single expressions:

- PERSPECTIVE: this variable measures the timing of the analysed expression and it can take the following values:

- Past.  
When the sentence refers to risks or consequences that affected the company in the past.
- Present.  
When the sentence refers to risks or consequences that affect the company in the present.
- Future.  
When the sentence refers to risks or consequences that will affect the company in the future.
- TONE: this variable examines the nature of the analysed expression and it can take the following values:
  - Positive.  
When the phrase refers to an opportunity or to a positive consequence or action.
  - Neutral.  
When the phrase does not refer to an opportunity, a positive outcome, or action, nor to risks or negative consequences.
  - Negative.  
When the phrase refers to a risk or to a negative consequence or action.
- COMPLETENESS: this variable aims at evaluating the degree of exhaustiveness of the information presented in the analysed risk sentences. It can take the following values:
  - Mention.  
When the information is not presented in an exhaustive manner, leaving the reader with not enough data to understand the impacts and characteristics of the risk or opportunity.
  - Description.  
When the information is presented in a descriptive and exhaustive manner, without, however, adding quantitative or numerical data of the related risk or opportunity.
  - Evaluation.  
When information is presented in an exhaustive manner, giving quantitative and numerical data related to the risk or opportunity.

When the analysis of a phrase is complete, the results are inputted in an Excel page named after the company and in the table corresponding to the year of the annual report (Table 8).

Table 8: Example of Analysis from BP PLC’s Annual Report of the Year 2022. Source: *BP PLC’s Annual Report of the Year 2022*, p.30, 2022.

Phrases	TYPE	PERSPECTIVE	TO NE	COMPLETENESS
Safety risk management at bp is underpinned by our operating management system« that is designed to help us sustainably deliver safe, reliable and compliant bp operations.	SOCIAL	PRESENT	POSITIVE	MENTION

Some expressions may be associated with visual elements as tables or pictures, or might be part of them. In such cases, the variable VISUAL REPORTING evaluates the number of phrases with this characteristic. The variable is divided into two sub-categories:

- TABLES.  
This group takes either value one or zero. That is, if there are related tables on the page from which the sentence is taken and/or on the previous or following page, the variable takes value 1. If no tables are linked, it takes value zero.
- PICTURES.  
This category takes either value one or zero. That is, if there are related images or pictures on the page from which the sentence is taken and/or on the previous or following page, the variable takes value one. If none are linked, it takes value zero.

This binary mechanism facilitates the computation of the total number of visual representations related to non-financial risks for each annual report: the simple Excel function “SUM” delivers the final result.

It is also important to record the page number corresponding to each sentence. This is classified under the variable named REFERENCE PAGE and it is done to facilitate the assessment of the total number of pages allocated to non-financial matters identified within each report, subsequently noted under the variable *pages\_section*. Following this,

the column *pages\_report* aims at quantify the overall number of pages of each annual report, which corresponds to the last page number available in the report. By having both *pages\_section* and *pages\_report*, it is unchallenging to compute the percentage of the report dedicated to ESG-related risks and opportunities.

The last variable I took into consideration is VOLUME, which is divided into two sub-variables:

- VOLUME\_RISK.

It aims at computing the number of phrases relevant for this project's goals. This is done by using the Excel formula "COUNTA" on the column in which the analysed phrases are pasted.

- VOLUME\_REPORT.

It aims at computing the total number of sentences within the whole annual report. In order to carry out this count, it is enough to use the search function pressing the Ctrl + F keys at the same time on the PC (for Windows, or Cmd + F keys, on iMac or MacBook) and inputting ". " (dot space).

Once all the variables were inputted for every annual report, I created a single Excel page, named "Risk Sentences\_Values", which summarises the findings relevant for this paper. Every column in the dataset represents a different variable, while each row corresponds to the annual reports of the 28 firms in the sample for the years 2018, 2020, 2021 and 2022. To understand how many phrases are under each variable, I used the "COUNTIF" formula from Excel.

For the purpose of this paper, I imported the complete dataset from Excel to R Studio using the library "readxl" and the function "read\_excel( )". Next, I filtered the data employing the library "dplyr" to create two distinct datasets: data\_GB and data\_DE. This sub-setting effectively isolated all information pertaining to the companies based in the UK and Germany, respectively, thereby facilitating the comparative analysis between these two groups. For the aim of this analysis, I chose to focus mainly on the variables VOLUME, TYPE and COMPLETENESS, as they highlight both the quantity and quality of the information reported. Once the data was organised, I generated a graph to enhance the visual representation of the changes in volume of reported information, the TYPE variable and the COMPLETENESS variable, using the library "ggplot2" and the function

“ggplot( )” for the firms from the UK. This visualization contributes to the discussion on Hypothesis 1: Post-Brexit Divergence.

To test for Hypothesis 2: The Influence of Mandatory Regulations, and Hypothesis 3: Improved Reporting Over Time, I also computed the percentage change of the relevant variables across the years for every company in data\_GB and data\_DE. With these results, I created another table and, once I imported it in Excel, I used the “MEAN( )” formula to understand the trends of both countries. For all the firms from UK and Germany, then I considered the percentage of the reports dedicated to ESG-related risks and opportunities by solving

$$100 * \frac{VOLUME\_RISK}{VOLUME\_REPORT}$$

and computed the percentage change for VOLUME.

To make this analysis more complete, I found the percentage change for variable TYPE and COMPLETENESS for all the 28 Pharmaceutical, Chemical and Petrochemical firms in the sample.

### **4.3. Data Analysis**

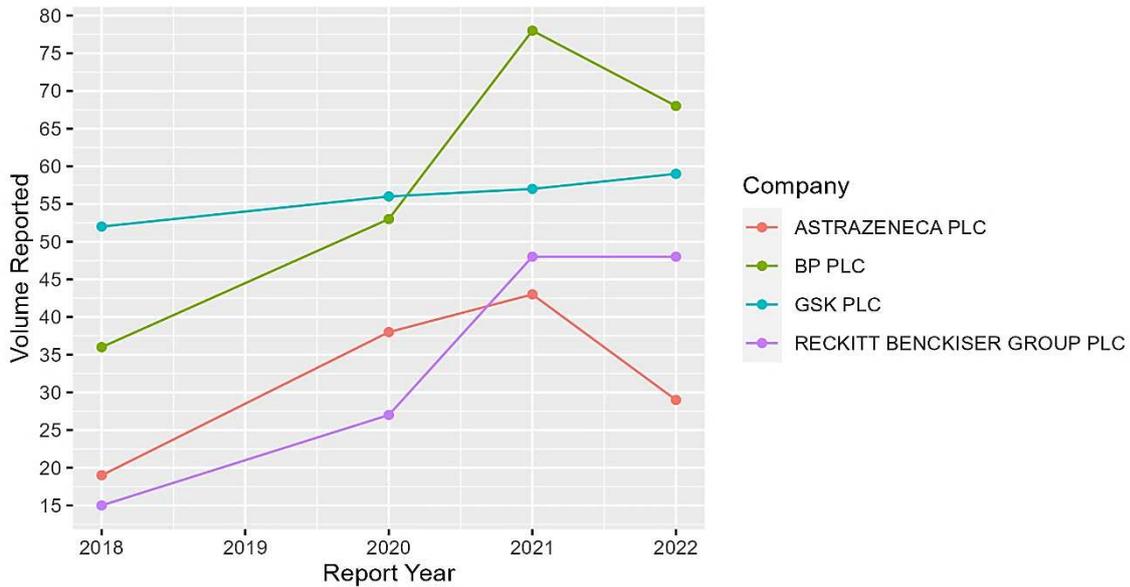
#### *4.3.1 Empirical Results*

In this section, there are the outcomes of the empirical investigation carried out for the purpose of this paper: how firms in different countries, both within and outside the European Union, are implementing new ESG reporting standards and practices. The first point to take note of is that I was unable to find the annual reports online for HALEON PLC, a UK-based company, leaving the UK sample with only four firms (Appendix D). Hence, I modified the comparative sample of German enterprises (Appendix E) to reduce the number to five firms by cutting out HENKEL AG & CO. KGAA and BASF SE, which respectively have the lowest (10,5) and highest (53) mean VOLUME\_RISK, employing the “slice ( )” formula in R studio.

When investigating for H1: Post-Brexit Divergence, just by looking at the volume of sustainability-related risks reported in the United Kingdom-based sample firms (Graph

5), it is clear that 2021, the year when Brexit happened, marked the start of a period of negative slope with respect to the years before.

Graph 5: Volume of Risk Information Reported in the Annual Reports of UK companies. Made using the program “R” and the function ggplot( ).



When considering the quantity of phrases in each report over the total sentences in the documents, namely  $VOLUME\_RISK$  over  $VOLUME\_REPORT$ , for the four years analysed, the UK-based companies show slightly different levels of risk emphasis (Table 9). First, all firms experienced a notable increase in the percentage of data reported from 2018 to 2021 apart for GSK PLC which displays a decrease (from 0,88% in 2018 to 0,75% in 2021). What is also interesting to notice is that during the year 2021, the gap between the highest percentage and the lowest was at its minimum: 0,870% of BP PLC was the highest, whereas ASTRAZENECA PLC had the lowest percentage of 0,597%, giving a spread of only 0,273%. In 2022, this trend changed dramatically, as the spread widened significantly to levels similar to 2018, with RECKITT BENCKISER GROUP PLC demonstrating a steady increase throughout the entire period and GSK PLC performance recovering slightly. The remaining firms both faced a significant decline.

Table 9: VOLUME\_RISK over VOLUME\_REPORT for years 2018, 2020, 2021 & 2022.

Made using Excel.

UK COMPANIES	2018	2020	2021	2022
BP PLC	0,46845%	0,64235%	0,87034%	0,70833%
GSK PLC	0,88076%	0,77994%	0,75198%	0,80185%
ASTRAZENECA PLC	0,25812%	0,45916%	0,59739%	0,43629%
RECKITT BENCKISER GROUP PLC	0,42992%	0,50819%	0,82319%	1,00482%

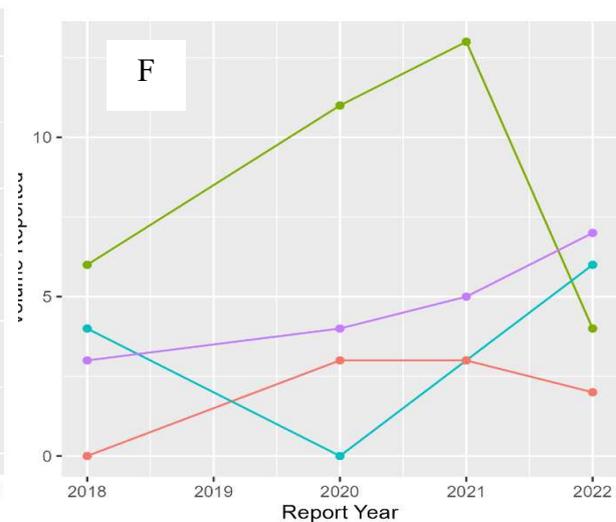
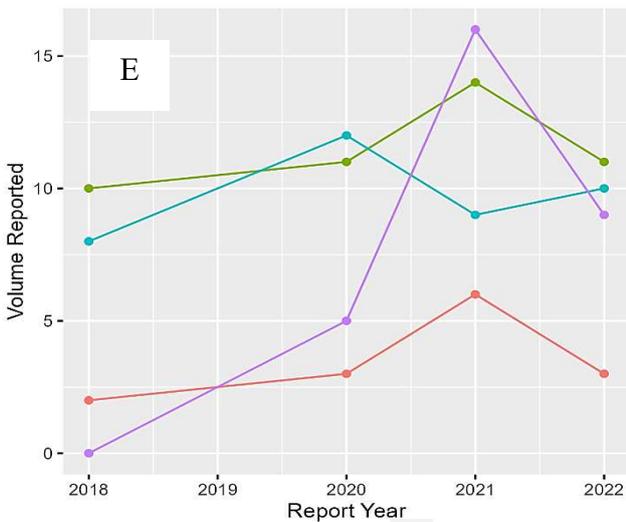
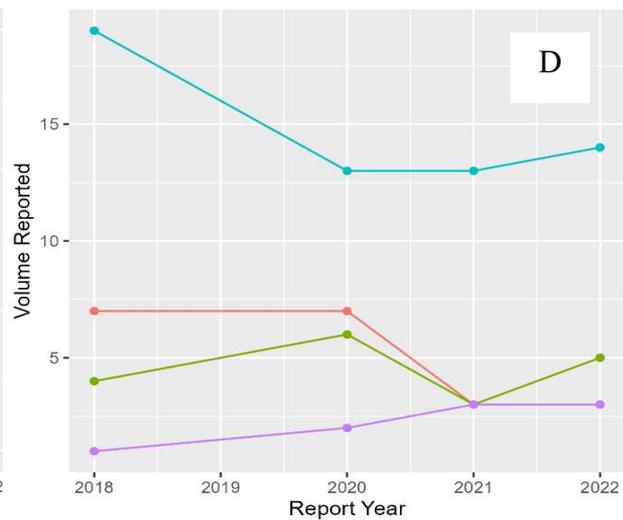
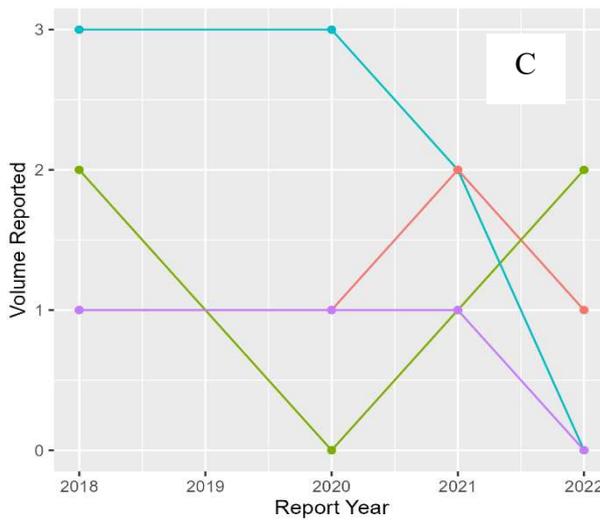
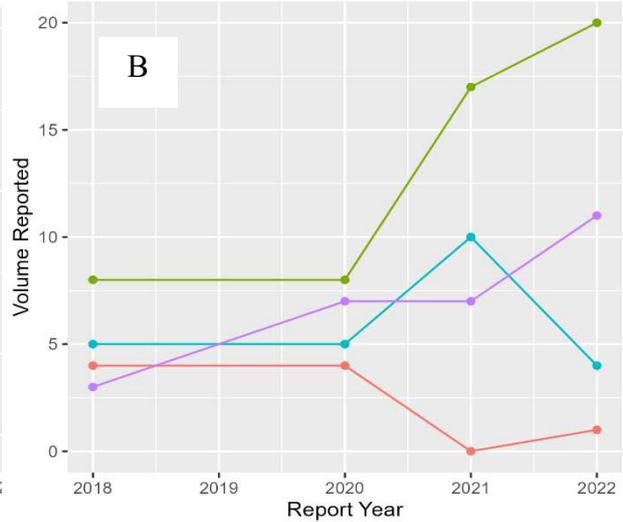
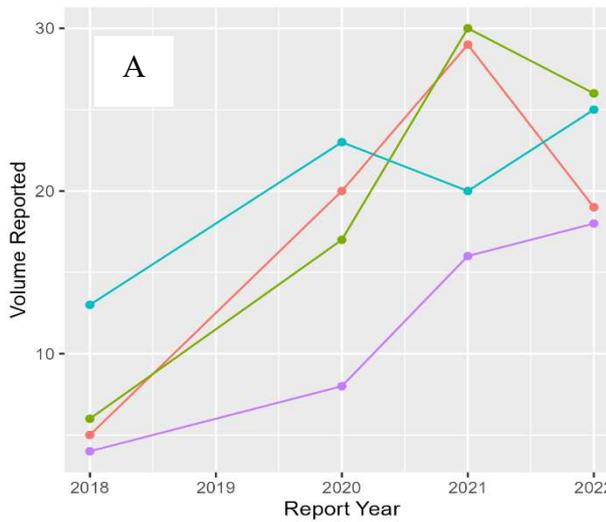
Table 10: Percentage Change for VOLUME\_RISK over VOLUME\_REPORT. Made with Excel.

UK COMPANIES	2018-2020	2020-2021	2021-2022
BP PLC	37,123%	35,494%	-18,614%
GSK PLC	-11,446%	-3,586%	6,632%
ASTRAZENECA PLC	77,888%	30,105%	-26,968%
RECKITT BENCKISER GROUP PLC	18,204%	61,985%	22,064%
MEAN	30,442%	31,000%	-4,222%

The mean percentage change for the variable VOLUME highlighted in Table 10 as “MEAN” through the analysed period indicates a fluctating trend, reaching its peak in 2021. The year after, despite the divergence in trend of the single firms, there is a general decline (-4,222%) of reported sustainable data for UK companies. The highest entity-specific improvement amounted to 77,888% for ASTRAZENECA PLC (GB0009895292) under NAICS code 325412 “Pharmaceutical Preparation Manufacturing”, between years 2018 and 2020. The lowest percentage was -26,968% for ASTRAZENECA PLC as well, recorded during the period post-Brexit (2021-2022).

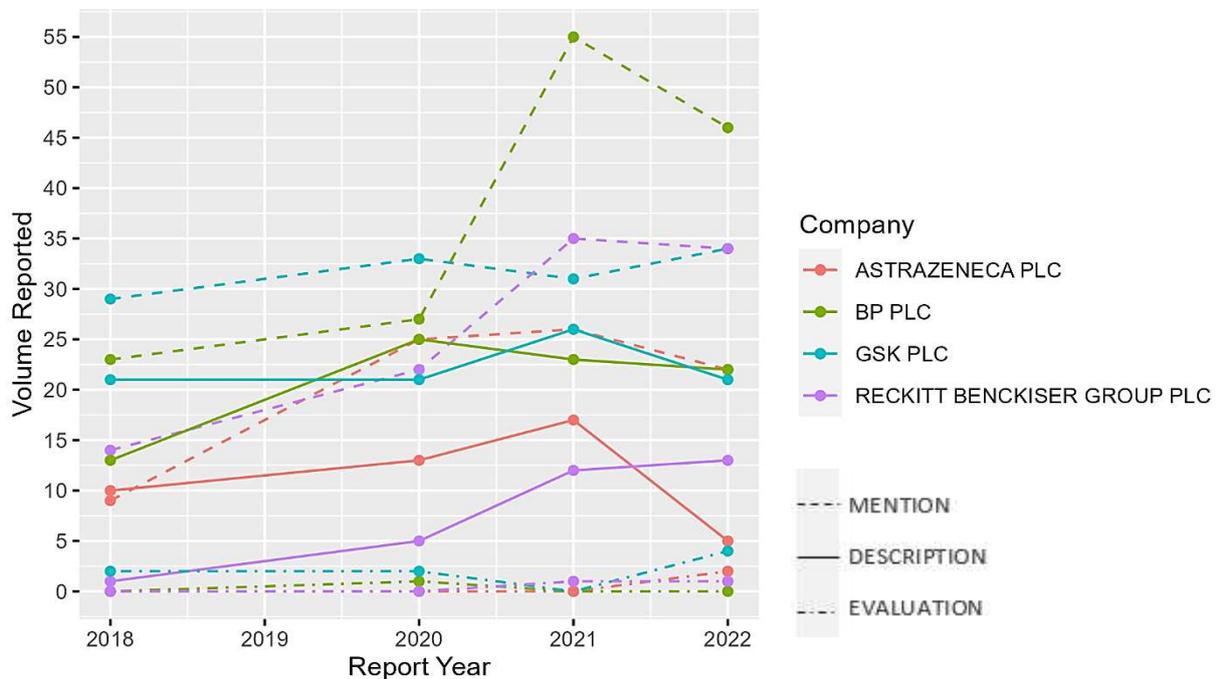
Graph 6 (A-F) offers a disaggregated view on the quantity of data reported by TYPE.

Graph 6: For UK-based firms - (A) Line Graph for Environmental Variable; (B) Line Graph for Social Variable; (C) Line Graph for Human Variable; (D) Line Graph for Corruption Variable; (E) Line Graph for Multiple; (F) Line Graph for General.



The COMPLETENESS variable is a significant statistic for assessing the quality of the data reported by the enterprises and has three degrees of exhaustiveness: mention, description, and evaluation. This hierarchical structure facilitates the examination of how effectively organisations communicate their data over time. Graph 7 identifies the patterns and changes from 2018 to 2022 of the UK-based companies for this variable. As one might expect, the “mention” category contains the greatest number of reported phrases, followed by “description” and leaving “evaluation” with less than five sentences per annual report found.

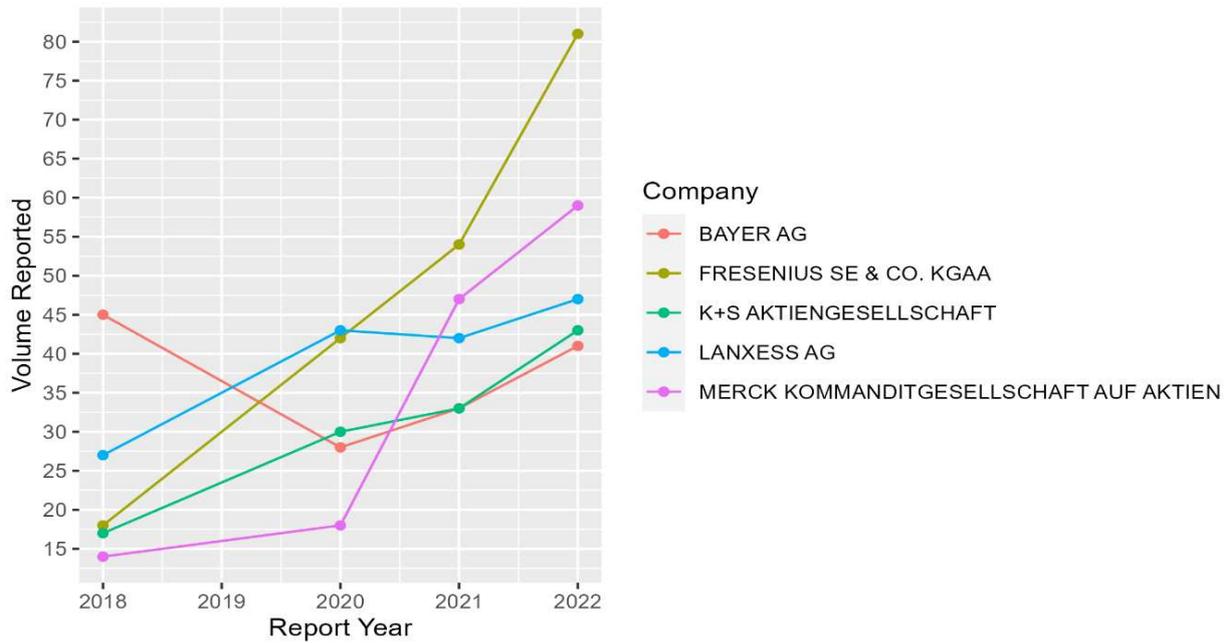
Graph 7: Line Graph for the Variable COMPLETENESS in UK Firms’ Annual Report. Made using the program “R” and the function ggplot( ).



Following the analysis on the UK, I focused on German companies to check for H2: The Influence of Mandatory Regulations and H3: Improved Reporting Over Time.

It is clear from Graph 8 that the majority of the German enterprises in the sample demonstrate a continuous increase from 2018 to 2022 in the amount of data reported in their annual reports. The only outliers are BAYER AG and LANXESS AG. The former presents a significant decrease from 2018 to 2020, however, from 2021 onward the amount of sustainable information in the annual reports have a steady growth, almost reaching the same level it had reported in 2018. On the other hand, LANXESS AG only presents a minimal decrease between 2020 and 2021.

Graph 8: Volume of Risk Information Reported in the Annual Reports of German companies. Made using the program “R” and the function ggplot( ).



When considering VOLUME\_RISK over VOLUME\_REPORT for the four years analysed (Table 11), the German companies mostly follow the trends already represented on Graph 8. Furthermore, there does not seem to be a significant change in the gap between the highest and lowest percentage reported risk per year, as opposed to the UK.

Table 11: VOLUME\_RISK over VOLUME\_REPORT for years 2018, 2020, 2021 & 2022. Made using Excel.

DE COMPANIES	2018	2020	2021	2022
BAYER AG	0,59071%	0,40954%	0,47109%	0,57359%
FRESENIUS SE & CO. KGAA	0,23175%	0,44346%	0,50144%	0,71904%
MERCK KOMMANDITGESELLSCHAFT AUF AKTIEN	0,27575%	0,35743%	0,91174%	1,10549%
LANXESS AG	0,63232%	0,86781%	0,85925%	0,93198%
K+S AKTIENGESELLSCHAFT	0,43973%	0,71056%	0,71075%	0,87755%

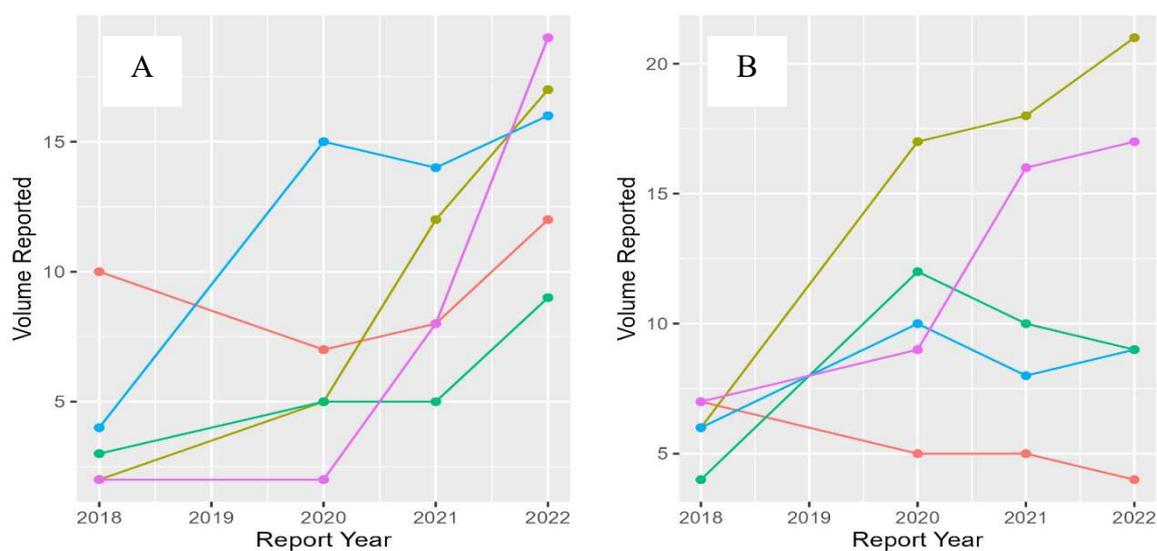
Table 12: Percentage Change for VOLUME\_RISK over VOLUME\_REPORT. Made with Excel.

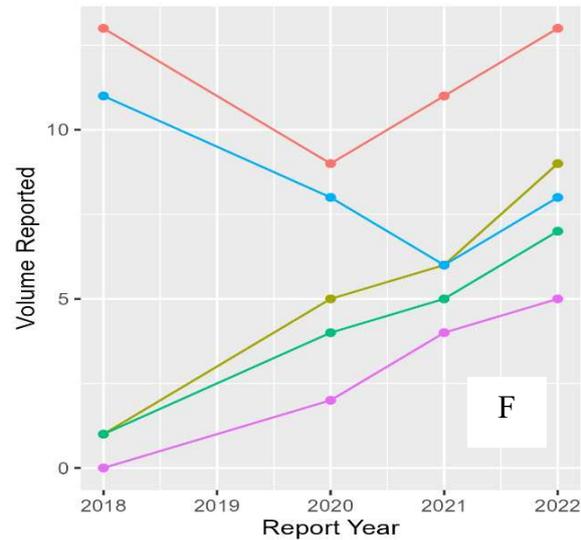
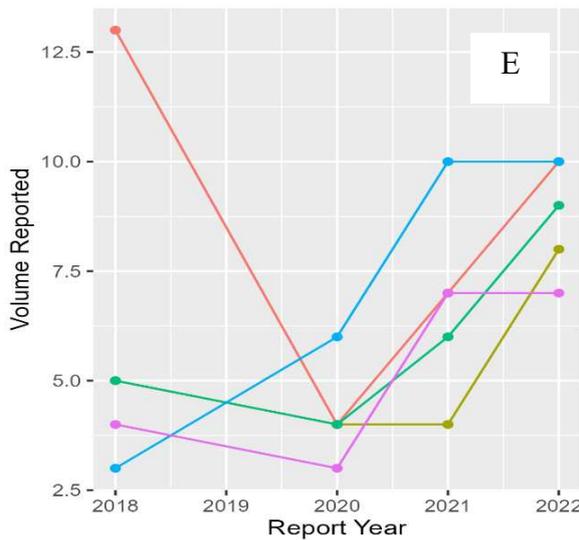
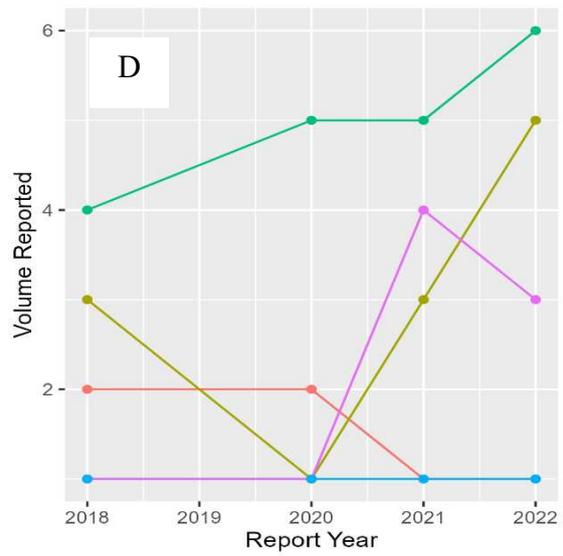
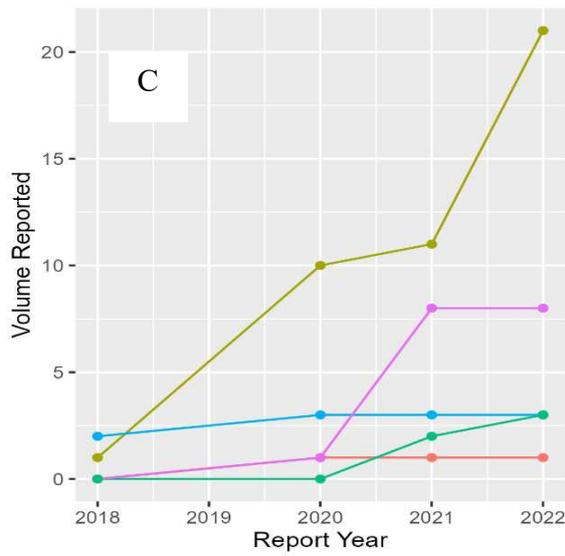
DE COMPANIES	2018-2020	2020-2021	2021-2022
BAYER AG	-30,67005%	15,03061%	21,75687%
FRESENIUS SE & CO. KGAA	91,35257%	13,07456%	43,39548%
MERCK KOMMANDITGESELLSCHAFT AUF AKTIEN	29,61817%	155,08355%	21,25108%
LANXESS AG	37,24259%	-0,98676%	8,46529%
K+S AKTIENGESELLSCHAFT	61,59054%	0,02585%	23,46876%
MEAN	37,827%	36,446%	23,667%

The mean percentage change for the variable VOLUME highlighted in Table 12 as “MEAN” through the analysed period indicates a fluctuating trend, reaching its peak in 2021, similarly to the UK. The year after, there is a decline in improvement, however the mean percentage remains positive (23,667%). The highest entity-specific improvement amounted to 155,083% for MERCK KOMMANDITGESELLSCHAFT AUF AKTIEN (DE0006599905) under NAICS code 325412 “Pharmaceutical Preparation Manufacturing”, between years 2020 and 2021. The lowest percentage was -30,670% for BAYER AG (DE000BAY0017) which is under NAICS code 325412 “Pharmaceutical Preparation Manufacturing” as well.

Graph 9 (A-F) offers a disaggregated view on the quantity of data reported by TYPE.

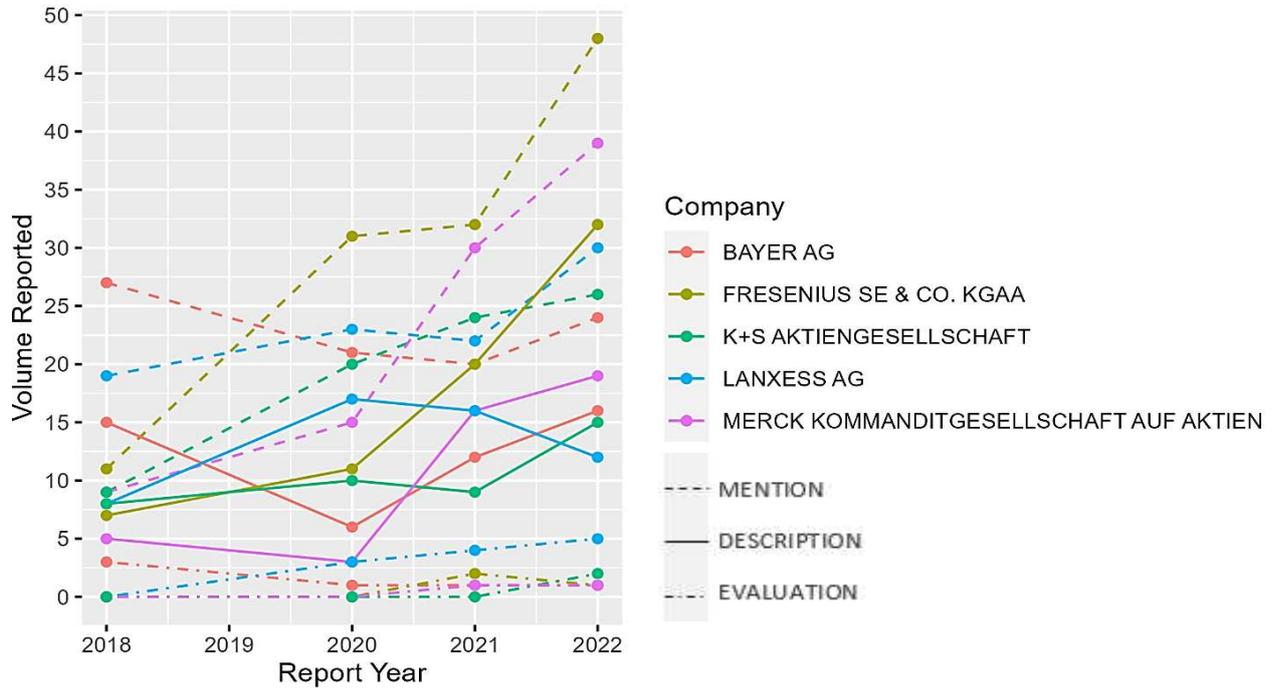
Graph 9: For Germany-based firms - (A) Line Graph for Environmental Variable; (B) Line Graph for Social Variable; (C) Line Graph for Human Variable; (D) Line Graph for Corruption Variable; (E) Line Graph for Multiple; (F) Line Graph for General.





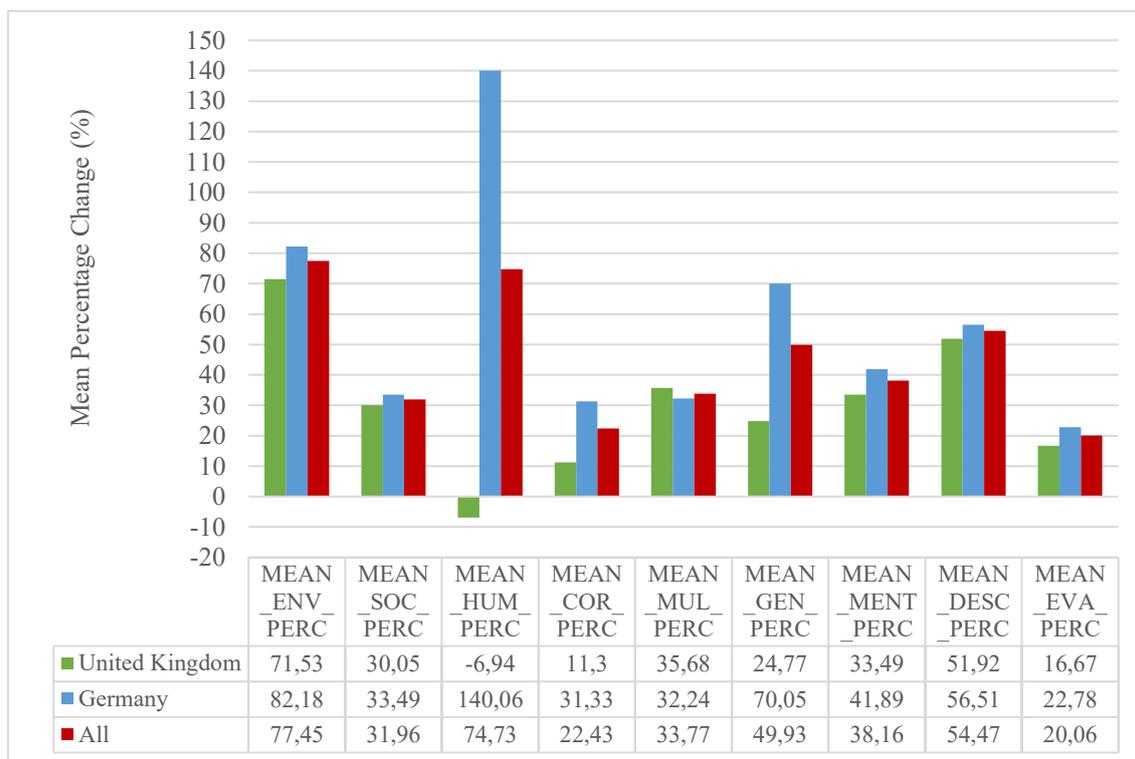
Graph 10, analysing the COMPLETENESS variable for German firms, demonstrates once more the positive trend in sustainable reporting, while highlighting that the majority of the information reported is evaluated as “mention”. Notably, LANXESS AG shows a constant growth in the evaluation category, whilst not improving in description after 2020.

Graph 10: Line Graph for the Variable COMPLETENESS in German Firms' Annual Report. Made using the program "R" and the function ggplot().



Graph 11 presents a bar chart illustrating the mean percentage change of the TYPE and COMPLETENESS variable from 2018 to 2022. When computing this percentage, some of the results came out as infinite or NaN in R Studio (respectively, when the denominator is zero and the numerator positive, and when two subsequent years have zero volume reported). In these cases, the infinite is considered as a 100% increase and a NaN to a 0%. By using percentage change, it is possible to gain insights into possible improvements, or lack thereof, in sustainability reporting practices of the companies in the sample. It is particularly effective to use it as a statistic as it helps to achieve a consistent comparison between enterprises with different sizes and scope. Each variable in the bar chart is accompanied by three different coloured bars: green for the UK, blue for Germany and red displays the average for all companies under the study; and it represents the mean percentage change from year 2018 to 2022.

Graph 11: Bar Chart of Percentage Change in Variables TYPE and COMPLETENESS.  
Made using Excel.



The mean percentage change for variable TYPE and COMPLETENESS for all the 28 Pharmaceutical, Chemical and Petrochemical firms in the sample from year 2018 to 2022 is illustrated in Table 13.

Table 13: Mean Percentage Change from year 2018 to 2022 for companies in the STOXX® Europe 600, categorised under NAICS 2022 code as Pharmaceutical, Chemical and Petrochemical firms. Made using Excel.

	pct_change_environment	pct_change_social	pct_change_human	pct_change_corruption
Mean % Change	75,618	23,777	36,408	29,531

pct_change_multiple	pct_change_general	pct_change_mention	pct_change_description	pct_change_evaluation
43,590	45,657	36,142	40,191	12,183

The highest company-specific increase recorded amounted to 1600% for SIKA AG (CH0418792922), a company from Switzerland under NAICS code 325998 “All Other Miscellaneous Chemical Product and Preparation Manufacturing”. This growth occurred for the environmental variable between the years 2018 and 2020.

### *4.3.2 Interpretation of Data*

In this section, the focus is on the interpretation of the previous empirical results, which provide insights on the effects of Brexit and mandatory reporting framework on sustainability disclosures, and the support they provide on the three hypotheses formulated for this study.

The data shows that after Brexit, UK-based enterprises' sustainability reporting procedures and implementation differed greatly from the years before. The findings indicate that 2021 was a pivotal year: if performance was increasing at a steady pace until that date, the years following saw a drop in data disclosed for a great proportion of the firms considered. To be specific, the overall amount of data submitted by firms for ESG-related risks and opportunities from 2020 to 2021 improved to an average percentage change of 31%, après Brexit the mean percentage experienced a significant drop, resulting to -4,222%. The boost in sustainability reporting from 2018 to 2021 might have been driven by two factors: first, when the UK was part of the EU it promoted the compliance to both European and international ESG-reporting frameworks (Johnston, 2024) and this willingness can be observed in the firms' constant improvements of their annual reports. Second, 2020 was the start of the COVID-19 pandemic: a study on Corporate Social Responsibility (CSR) and ESG, suggests that a company's compliance with its social responsibilities during times of crisis can be seen as an advantage that can increase its value after the crisis and improve its reputation (Coombs & Holladay, 2015). As a result, many companies invested into sustainable reporting to attract more investors.

On the contrary, in 2022 the percentage of phrases found in firms' annual reports diminished compared to the previous year, which is likely due to the departure of UK from the EU and the fact that the country would not be bound to the new EU CSR Directive. This change translated into a period of legal and economic uncertainty for the English firms, characterised by the adoption of voluntary international standards, which focused mainly on financially material data reporting (Johnston, 2024). The UK then chose to forge its own distinct ESG reporting framework: the UK Sustainability Reporting Standards (UK SRS), which are based on the IFRS Sustainability Disclosure Standards published by the International Sustainability Standards Board (ISSB) in 2023. The UK SRS are intended to provide the core framework for future sustainability disclosures in the United Kingdom.

A peculiar case is GSK PLC, which shows a constant increase in absolute values of ESG information reported throughout the entire time period (Graph 5). However, when analysing VOLUME\_RISK over VOLUME\_REPORTED (Table 9 and 10), the company unexpectedly saw a decline until 2021 and recorded a 6,632% increase in data reported from 2021 to 2022. This last improvement in percentage might be driven by the demerger of the Consumer Healthcare business to form Haleon PLC, hence modifying the amount of information reported. RECKITT BENCKISER GROUP PLC is another outlier among the UK sample companies, managing to maintain a positive percentage change for VOLUME\_RISK over VOLUME\_REPORT during the timeframe, showing their high-level commitment to transparency and ESG-risk disclosure.

Notably, when disaggregating VOLUME\_RISK into the different variables in TYPE, the most phrases are reported under category “environment”, followed by “multiple”, “social”, “corruption”, “general” and at last “human”, which has no more than three phrases reported per year on firms’ annual reports (Graph 6-C). This scarcity in information reflects the criticisms the UK's Modern Slavery Act is facing for its effectiveness, since the legislation and its execution are not keeping up with constant changes in nature of contemporary slavery. Furthermore, "corruption" (Graph 6-D) is the only variable that has a positive slope for all firms between 2021 and 2022. This is interesting because, aside from the NFDR, neither the Corporate Governance Code nor the Bribery Act require the disclosure of specific requirements related to bribery and corruption. Under the 2006 Companies Act as well there are no particular anti-corruption regulations apart from the examination of the governance structure (Nicaise & Rahman, 2025).

Regarding the variable COMPLETENESS, a great percentage of the sentences relevant for this study fall under the category “mention”, while only a small proportion is identified as “evaluation”, hence providing quantitative data. Knowing that the volume of information reported decreased in the last period (2021-2022), it stands out how as both “mention” and “description” predominantly follow the same trend, the “evaluation” category has a slight increase. Meaning that, while annual reports were dedicating less space for sustainability data, such information became more precise and quantifiable.

These findings are in line with the expectations of Hypothesis 1: Post-Brexit Divergence: the UK-based companies’ annual reports exhibited a decline in information due to the

uncertainty surrounding the market after leaving the EU and the regulatory changes. However, the empirical results show that the quality of the data seems to increase in quality, providing quantifiable information too.

Shifting the focus to Germany, the empirical results show a clearly different development from UK-based enterprises: German firms experience a constant increase of volume of data reported through the whole period analysed. The robust positive trend aligns with the continuous implementation of mandatory reporting practices like the NFRD, together with the anticipation of the CSRD. The mean percentage change for the variable VOLUME highlighted in Table 12 as “MEAN” reached its peak in 2020. The periods after, there are minimal declines in improvement, however the mean percentage remains positive (36,4460% for period 2020-2021 and 23,667% for period 2021-2022). The highest entity-specific improvement amounted to 155,083% for MERCK KOMMANDITGESELLSCHAFT AUF AKTIEN, which corresponds to double the highest entity-specific improvement for the English firm ASTRAZENECA PLC, which amounted to 77,888%. This indicates once more that, not only that sustainable reporting is in continuous advancement in Germany, but also it is improving at a significantly higher rate compared to the UK.

In the examination of volume reported for German companies (Graph 8), an outlier emerged: BAYER AG exhibits a negative percentage change in VOLUME\_RISK over VOLUME\_REPORTED (-30,670%) during the period 2018 to 2020, to then improve throughout the following years. Similarly to the UK, the growth in ESG-reporting following 2020 could have been encouraged by the advent of the COVID-19 pandemic, which brought companies to take more into consideration non-financial elements to be more attractive for investors and other stakeholders.

Interestingly, when breaking down VOLUME\_RISK into the many variables in TYPE, the most phrases are reported under category “social”, followed by “environment”, “general”, “multiple”, “human” and at last “corruption”. This hierarchy is in line with Tsagas' classification of Germany as an insider economic model, with a focus on employee and human rights (Tsagas, 2020). Plus, it highlights the efforts of instruments like the first National Action Plan (NAP) to enhance human right protection: Graph 9-C shows no negative trends for variable “human” and a peak of more than 20 reported sentences reported in a single annual document.

Regarding the variable COMPLETENESS, only a small percentage of phrases pertinent to this study are classified as “evaluation”, similarly to the UK, the majority come under the “mention” category. Notably, LANXESS AG exhibits the highest increase in the “evaluation” category among all companies in the German sample, but no improvement in “description” following 2020. In general, all the COMPLETENESS variables exhibit a positive trend throughout the analysed period, highlighting once again the positive trend for ESG reporting in Germany.

This trend, together with the downward slope of UK-based companies, follows the second hypothesis thought for this paper: The Influence of Mandatory Regulations. Germany shows a constant increase in the completeness and quantity of sustainability information reported between 2018 and 2022. The reason for this is the mandatory implementation of the NFRD and subsequently, to the preparation phase for the CSRD. On the contrary, UK firms past 2021 were no longer subject to the EU directives, which led to German firms improving their reporting of ESG data more significantly than the UK companies. At the same time, these trends cancel out Hypothesis 3: Improved Reporting Over Time, which expected firms to have an improvement of ESG reporting practices independently from the country of origin as the main driver for sustainability should have been stakeholder needs.

To compare more efficiently the variables TYPE and COMPLETENESS between the United Kingdom and Germany, Graph 11 uses the mean percentage change across the analysed period. What emerged is a stark contrast between the EU member state and the UK, with Germany showing a constant positive mean percentage change across all categories. The UK has a significant decrease in information falling under the human variable, which resulted in a percentage change of -6,94%. On the contrary, the variable concerning human rights is the most improved through the years for German firms, reaching a mean percentage change of 140,06%.

Lastly, Table 13 exhibits the mean percentage change for variables TYPE and COMPLETENESS for all the 28 companies in the sample of Pharmaceutical, Chemical and Petrochemical firms. In general, all variables have improved through the year 2018, 2020, 2021 and 2022. The highest percentage change for the variables TYPE corresponds to “environment” (75,618%), while the lowest was “social” which amounted to a 23,777% increase. One of the reasons for such a high improvement in the environmental

reporting area could be the more quantifiable nature of its factors, such as GHG emissions and water usage, which renders them more trackable over time with respect to other categories. Whereas, the low percentage recorded for the social group could be caused by the difficulties in assessing social factors (Hahn & Kühnen, 2013), which could be of qualitative or subjective nature. Regarding the COMPLETENESS variable, the “description” category has the highest percentage increase, corresponding to 40,191%. This improvement is important as it translates to a shift to more detailed and comprehensive delivery of information regarding non-financial matters. This led to enhanced stakeholder trust and engagement, enabling for more informed possibilities in decision making. Pharmaceutical, Chemical and Petrochemical companies specifically, are under a greater degree of scrutiny from multiple types of stakeholders, especially regulators. As a result, the remarkable increase in descriptive data demonstrates these enterprises' proactive reaction to increasingly strict demands and public expectations.



## Chapter V - Conclusions

### 5.1. Discussion of Results

Over the last decade, investors have been more inclined to fund sustainable activities and businesses. This is led by the inclusion of ESG criteria to investment strategies, which enables stakeholders to generate value while including ESG-related risks and opportunities into their financial analysis. This new requirement reflects the rising recognition that non-financial factors, which were previously seen as external and disregarded by traditional financial analysis, have an impact on a company's financial performance and resilience on the long-run. New, more extensive regulations have been introduced as a result of the substantial changes in focus of regulatory frameworks brought about by the increased interest in sustainability.

The aim of this paper was to determine how firms in different countries, both within and outside the European Union, are implementing new ESG reporting standards and practices. In particular, it considers a sample of firms listed in the STOXX® Europe 600, focusing on those in the manufacturing sector and categorized under NAICS code as Pharmaceutical, Chemical and Petrochemical firms and their annual reports of year 2018, 2020, 2021 and 2022. Given that Brexit took place at the start of 2021, a comparative study is conducted, analysing the trajectory of ESG risk reporting of UK-based companies before and after this change, in parallel with observing the trends for other EU-based firms.

In light of the empirical evidence, after Brexit, UK-based enterprises' sustainability reporting procedures and implementation differed greatly from the years before. The findings indicate that 2021 was a pivotal year: if performance was increasing at a steady pace until that date, the years following saw a drop in data disclosed for a great proportion of the firms considered. This is consistent with Hypothesis 1: Post-Brexit Divergence, which expected a decline in information due to the uncertainty surrounding the market after leaving the EU and the regulatory changes. It is also true that the UK is currently delineating the characteristics of a new sustainability reporting legislation: the UK Sustainable Reporting Standards, which will probably adjust the country negative trend and improve it in the following years. What the United Kingdom's government must find in the near future is a solution on the decline of reported information on human rights, as

it is the only TYPE variable with a mean negative trend throughout the whole period analysed.

This decline in reporting cancels out Hypothesis 3: Improved Reporting Over Time, meaning that firms are in fact impacted by the environment they operate in, in particular by the regulatory framework they must follow. The heightened attention investors and the public place on the manufacturing sector, which includes firms with high environmental and social impacts. Pharmaceutical, Chemical and Petrochemical companies specifically, might be under a greater degree of scrutiny, but it is not enough to see a voluntary improvement in data reported in annual documents.

On the contrary, the analysis on Germany as representative for EU member states, revealed that German firms experience a constant increase of volume of data reported through the whole timeframe considered. The robust positive trend aligns with the continuous implementation of mandatory reporting practices like the NFRD, together with the anticipation of the CSRD, expected by Hypothesis 2: The Influence of Mandatory Regulations. These regulatory frameworks managed to establish a more structured reporting environment, which enhanced transparency and comparability. Regarding human rights reporting, the no negative trend for the variable with a peak of more than 20 reported sentences reported in a single annual document and a mean improvement through the whole period considered, reaching 140,06%, highlights the efforts of instruments like the first National Action Plan (NAP) to enhance human right protection.

These findings have implications for companies and regulators. From the standpoint of the company, taking part in ESG activities considerably benefits from improved stock performance. This said, managers should improve their commitment to creating a suitable ESG plan and a transparent reporting process. From the standpoint of regulators, it implies that the work on sustainability of the EU seems to be going the right way, hence they must continue refining and harmonising reporting standards to facilitate comparability and transparency across jurisdictions.

Finally, a few constraints that apply to this empirical investigation present chances for further study. First, because I only considered a very little observation time following Brexit, the study solely discusses the immediate implications of the uncertainty surrounding the market after leaving the EU and the regulatory changes. The long-term

impacts of UK's recent legislation on sustainability standards, namely the UK SRS, could be an interesting topic to investigate on. Additionally, the comparison with Germany, which will be implementing the CSRD and the Omnibus Package, could provide further insights on the development of these sustainability reporting legislations. Second, the sample of firms considered might be expanded by implementing other private firms from the manufacturing sector with NAICS code different from the ones employed in this study. Such investigation would be able to confirm the trends identified in this paper or provide a different result depending on the sector considered. Furthermore, there is a lot of room for investigation into how new technologies, such as AI, can improve ESG reporting practices, enhancing data precision, and enabling real-time reporting.

Notwithstanding these limitations, overall, this paper provides valuable insights into the evolving landscape of ESG reporting, particularly in the context of Europe. The comparative analysis between the before EU member state, the United Kingdom, and the current member, Germany, highlights the profound impact that regulatory frameworks have on sustainability reporting practices. Moreover, this paper emphasizes the critical areas for improvement that the UK is encouraged to improve, that is human rights reporting, which has a persistent negative trend. As the focus on sustainability continues to grow, businesses and regulators alike must continue to proactively respond to emerging challenges and opportunities in an ever-changing environment.

## **5.2. Future Trends and Recommendations**

A study by Ein et al. (2025) investigates the global landscape of sustainable development research and publications. The authors reveal a distinct geographical concentration: according to the United Nations World Economic Situation and Prospects, as published in its 2023 edition, over 154 evaluations of ESG initiatives have been documented in 77 different countries. Around 61,7% of these evaluations (95) were concentrated in 36 developed countries, indicating that economically advanced nations are willing to become a leading player in sustainability development. Looking further into the breakdown of this dominant cluster, showcases an even more prominent concentration among a small number of high-income nations. Nine countries account for 45% of the total research activity within the developed countries group and among these, the leaders are the United Kingdom, Germany, France and Spain, together accounting for approximately 25% of the

studies made in developed nations. This concentration of research, likely translates to the leading countries trying to continuously develop new frameworks and reporting standards or improve already existing ones, some examples are the UK SRS and the CRSD for EU member states.

On the contrary, the United States are facing a decline in sustainability reports filed: in the first half of 2025, only 432 companies in the Russell 3000 index disclosed on non-financial data, compared to the 831 that did report during the same period on 2024 (Giles, 2025). This decline was attributed to the policy shifts both in the single U.S. states and the EU CSRD (Williment, 2025). As a matter of fact, while the SEC's climate disclosure mandate remains stuck in limbo, some federal states are following California in paving their way towards sustainability, for example New York proposed two Senate Bills, namely S897C and S5437. The first requires several firms to submit an annual climate-related financial risk report and; the second establishes the climate corporate data accountability act. These laws are still in the early stages of legislative drafting and are expected to impact enterprises within the next years (Varma, 2025). These state-level initiatives signal the willingness to improve transparency in non-financial data, however, the diversification in legislation between states in the U.S. could hinder the companies' abilities to adapt effectively to the frameworks.

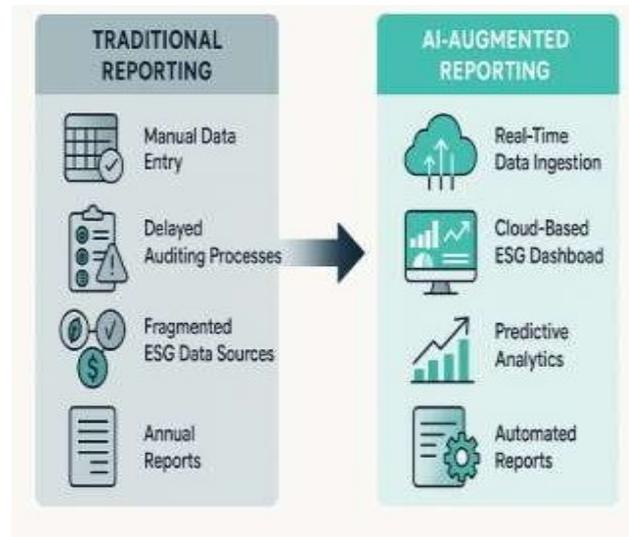
In parallel with the rise of ESG and sustainability, the rapid ascent of digital technologies has impacted all industries worldwide, including both traditional and innovative sectors. One radical innovation which is starting to interest companies and regulators is the digital transformation of corporate processes like accounting and auditing procedures (Pizzi, Venturelli, Variale & Macario, 2021). The increasing necessity for robust sustainability reporting practices calls for an evolution of the management accounting sector and the digital world offers sophisticated tools and mechanisms to store, alter and track information (Ciriello, Richter & Schwabe, 2018). On top of these supporting instruments, the recent advancement in technology enables companies to reshape and correct their traditional business models through Artificial Intelligence (AI), along with Robotic Process Automation (RPA), powerful Big Data analytics, and versatile cloud computing platforms (Yigitbasioglu, Green & Cheung, 2023). The identification of fraud is another great motivator for many enterprises to implement these technological advancements, particularly in their audit and accounting operations, as it helps to better evaluate virtually

all kinds of risks. An example is the use of AI to predict potential events, such as company bankruptcy (Alsulami, 2025).

Legislations like the European Union's Corporate Sustainability Reporting Directive (CSRD) place non-financial data at the core of corporate reporting and stakeholders increasingly demand more transparency and reliable data; since 2011 approximately 1255 new sustainable regulations were introduced globally (growing by 155% in the last decade). As a result, businesses are increasingly using AI as a need rather than a helpful tool: as of April 2025, 63% of entities use or plan to use this new technology for non-financial data gathering, interpretation and reporting (Gergely, 2025). AI could be employed by enterprises to deliver improved environmental and social for reporting and to heighten the accuracy of ESG assurance. Some empirical data on the matter come from MDPI Sustainable Editors (2024), which demonstrates that, Chinese company adopting AI not only have increased their reporting quality, but also their ESG performance improved. At the same time, World Wide Technology (2023) accentuates how AI makes ESG auditing more cost efficient. AI also increases the frequency and comparability of ESG data, as it gives the possibility to provide for real-time reporting of non-financial information, thus assisting business in meeting tougher regulatory requirements such as those set by the European Union's CSRD. Regarding the dilemma of low comparability of ESG data between firms, an AI-driven reporting model could standardize the process and solve this problem, while also discovering abnormalities and pointing out possible greenwashing attempts (Salim Malik, Siddhi & Vinay, 2025).

Despite the advantages associated with the digitalization of sustainable accounting, the reliance in technology brings new difficulties and vulnerabilities. Relying on technology for dealing with inside tasks and for managing data, may expose the companies to a greater number of cyberattacks and data breaches, which result in further financial and reputational harm. Not only that, but systems downtime or failure may result in severe economic losses for firms. Lastly, acquiring new technology requires a large upfront investment, which not only covers the expenses for equipment and eventual specific infrastructures, but also the education that existing employees might need to keep up with these new mechanisms or to go through the time-consuming process of hiring new, skilled employees (Alsulami, 2025). Salim Malik et al. suggest that businesses should establish supervision systems to guarantee that AI technologies improve, not damage, reporting accuracy.

Figure 4: Traditional Vs. AI-Augmented Sustainability Reporting Process. Source: *Harnessing Big Data and AI to Revolutionize Sustainability Accounting and Integrated Corporate Financial Reporting*, Kabirat O. M., Chinonso N., 2025.



To sum up, what will impact both countries within and outside the European Union is the evolving role of technology in sustainability reporting: while digital tools like AI and Big Data analytics can enhance accuracy and efficiency of non-financial reporting, they also introduce new risks in relation to cybersecurity and data breaches. In order to work against these challenges, businesses must find a balance between the use of technologies and a strong governance structure. Once these hazards are controlled for, companies will be capable of improving not only their sustainability reports, but their ESG performance altogether, paving the path to a more sustainable market. Moreover, it is essential for countries, especially those falling behind, to take a more coordinate and effective approach to sustainability, as demonstrated by the diversified geographical concentration of ESG research and the decline in sustainability reporting in the United States.

# Appendix A

Materiality Map screenshot. Source: The SASB Foundation, 2018.

	Consumer Goods	Extractives & Minerals Processing								Financials	Food & Beverage	Health Care	Infrastructure
Dimension	General Issue Category <sup>1</sup>	Click to expand	Coal Operations	Construction Materials	Iron & Steel Producers	Metals & Mining	Oil & Gas - Exploration & Production	Oil & Gas - Midstream	Oil & Gas - Refining & Marketing	Oil & Gas - Services	Click to expand	Click to expand	Click to expand
Environment	GHG Emissions												
	Air Quality												
	Energy Management												
	Water & Wastewater Management												
	Waste & Hazardous Materials Management												
Social Capital	Ecological Impacts												
	Human Rights & Community Relations												
	Customer Privacy												
	Data Security												
	Access & Affordability												
Human Capital	Product Quality & Safety												
	Customer Welfare												
	Selling Practices & Product Labeling												
	Labor Practices												
	Employee Health & Safety												
Business Model & Innovation	Employee Engagement, Diversity & Inclusion												
	Product Design & Lifecycle Management												
	Business Model Resilience												
	Supply Chain Management												
	Materials Sourcing & Efficiency												
Leadership & Governance	Physical Impacts of Climate Change												
	Business Ethics												
	Competitive Behavior												
	Management of the Legal & Regulatory Environment												
	Critical Incident Risk Management												
Systemic Risk Management													

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## Appendix B

Overview of the national implementations of the NFRD. Source: Hummel K., Jobst D., An Overview of Corporate Sustainability Reporting Legislation in the European Union, Accounting in Europe, 2024.

	Baseline	Differences
<b>Scope</b>		
<i>PIEs</i>	PIE-status as a requirement for being in scope ((i) listed enterprises/capital market oriented enterprises, (ii) credit institutions, (iii) insurance undertakings or (iv) other companies designated by member states as PIE)	<ul style="list-style-type: none"> <li>– No PIE-status requirement or scope is not limited to PIEs (DK, EL, ES, FR, LU, SE)</li> <li>– Additional PIEs determined nationally or under national law (AT, BE, BG, CY, CZ, EL, ES, HR, HU, IT, LV, LT, NL, PL, PT, RO, SK)</li> </ul>
<i>Balance-sheet and turnover threshold</i>	Balance sheet > EUR 20 million or net turnover > EUR 40 million	<ul style="list-style-type: none"> <li>– No thresholds (EE, RO, UK)</li> <li>– Lower thresholds (BE, HU, SE)</li> <li>– Different thresholds for specific entities (FR, LU)</li> <li>– Only turnover threshold (CZ)</li> <li>– No general thresholds but               <ul style="list-style-type: none"> <li>○ lower thresholds for specific topics (EL)</li> <li>○ higher thresholds for specific entities (PT)</li> </ul> </li> </ul>
<i>Employee-number threshold</i>	Number of employees > 500	<ul style="list-style-type: none"> <li>– Lower threshold (DK, LU, SE)</li> <li>– Lower threshold for specific topics (EL)</li> </ul>
<b>Content</b>		
<i>Disclosure requirements</i>	Business model, policies including due diligence processes, outcome of those policies, risks and key performance indicators regarding social, environmental, employee-related, human rights, anti-corruption, and bribery matters	<ul style="list-style-type: none"> <li>– More reporting details (EL, RO)</li> <li>– Reporting of CSR-relevant sums (ES, LT, LV, MT, SE, SL)</li> </ul>
<b>Assurance</b>		
<i>Content</i>	Statutory auditor to check for presence only	<ul style="list-style-type: none"> <li>– Statutory auditor to also check               <ul style="list-style-type: none"> <li>○ the content (BG, CY, FR<sup>61</sup>, IT, RO, UK)</li> <li>○ the consistency with financial statements (DK)</li> <li>○ the content when the statement is included in the consolidated management report (LV)</li> </ul> </li> </ul>
<i>Independent assurance</i>	No specific requirements	<ul style="list-style-type: none"> <li>– Independent assurance provider (ES, FR, IT)</li> </ul>
<b>Location of information</b>		
<i>Management Report</i>	Nonfinancial information to be disclosed in the management report or in a separate section of the annual report or a stand-alone report possible	<ul style="list-style-type: none"> <li>– Stand-alone report not possible (EE, EL, FR, HU, MT, NL, SK, UK)</li> </ul>

Country codes: AT = Austria, BE = Belgium, BG = Bulgaria, CY = Cyprus, CZ = Czech Republic, DE = Germany, DK = Denmark, EE = Estonia, EL = Greece, ES = Spain, FI = Finland, FR = France, HR = Croatia, HU = Hungary, IE = Ireland, IT = Italy, LT = Lithuania, LU = Luxembourg, LV = Latvia, MT = Malta, NL = Netherlands, PL = Poland, PT = Portugal, RO = Romania, SE = Sweden, SL = Slovenia, SK = Slovakia, UK = United Kingdom.

## Appendix C

Sample of 28 Companies with relative NAICS 2022 Codes.

COMPANY	ISIN	NAICS 2022 CODE	CODE DESCRIPTION
BP PLC	GB0007980591	32411	Petroleum Refineries
ORLEN S.A.	PLPKN0000018	32411	Petroleum Refineries
NESTE OYJ	FI0009013296	32411	Petroleum Refineries
L'AIR LIQUIDE SOCIETE ANONYME POUR L'ETUDE ET L'EXPLOITATION DES PROCEDES GEORGES CLAUDE	FR0000120073	32512	Industrial Gas Manufacturing
CLARIANT AG	CH0012142631	32513	Synthetic Dye and Pigment Manufacturing
ARKEMA	FR0010313833	32518	Other Basic Inorganic Chemical Manufacturing
BASF SE	DE000BASF111	32551	Paint and Coating Manufacturing
AKZO NOBEL NV	NL0013267909	32551	Paint and Coating Manufacturing
HENKEL AG & CO. KGAA	DE0006048432	32552	Adhesive Manufacturing
OCI N.V.	NL0010558797	325311	Nitrogenous Fertilizer Manufacturing
K+S AKTIENGESELLSCHAFT	DE000KSAG888	325312	Phosphatic Fertilizer Manufacturing
GSK PLC	GB00BN7SWP63	325412	Pharmaceutical Preparation Manufacturing
BAYER AG	DE000BAY0017	325412	Pharmaceutical Preparation Manufacturing
ROCHE HOLDING AG	CH0012032048	325412	Pharmaceutical Preparation Manufacturing

NOVARTIS AG	CH0012005267	325412	Pharmaceutical Preparation Manufacturing
SANOFI	FR0000120578	325412	Pharmaceutical Preparation Manufacturing
ASTRAZENECA PLC	GB0009895292	325412	Pharmaceutical Preparation Manufacturing
NOVO NORDISK A/S	DK0062498333	325412	Pharmaceutical Preparation Manufacturing
MERCK KOMMANDITGESELLSCHAFT AUF AKTIEN	DE0006599905	325412	Pharmaceutical Preparation Manufacturing
HALEON PLC	GB00BMX86B70	325412	Pharmaceutical Preparation Manufacturing
ALCON AG	CH0432492467	325412	Pharmaceutical Preparation Manufacturing
UCB S.A.	BE0003739530	325412	Pharmaceutical Preparation Manufacturing
GRIFOLS S.A.	ES0171996087	325414	Biological Product (except Diagnostic) Manufacturing
RECKITT BENCKISER GROUP PLC	GB00B24CGK77	325611	Soap and Other Detergent Manufacturing
SIKA AG	CH0418792922	325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing
LANXESS AG	DE0005470405	325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing
LONZA GROUP AG	CH0013841017	325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing
FRESENIUS SE & CO. KGAA	DE0005785604	339112	Surgical and Medical Instrument Manufacturing

## Appendix D

UK-based firm sample analysis.

COMPANY	COUNTRY	ISIN	REPORT_YEAR	VOLUME_RISK	VOLUME_REPORT
BP PLC	GB	GB0007980591	2018	36	7.685
BP PLC	GB	GB0007980591	2020	53	8.251
BP PLC	GB	GB0007980591	2021	78	8.962
BP PLC	GB	GB0007980591	2022	68	9.600
GSK PLC	GB	GB00BN7SWP63	2018	52	5.904
GSK PLC	GB	GB00BN7SWP63	2020	56	7.180
GSK PLC	GB	GB00BN7SWP63	2021	57	7.580
GSK PLC	GB	GB00BN7SWP63	2022	59	7.358
ASTRAZENECA PLC	GB	GB0009895292	2018	19	7.361
ASTRAZENECA PLC	GB	GB0009895292	2020	38	8.276
ASTRAZENECA PLC	GB	GB0009895292	2021	43	7.198
ASTRAZENECA PLC	GB	GB0009895292	2022	29	6.647
RECKITT BENCKISER GROUP PLC	GB	GB00B24CGK77	2018	15	3.489
RECKITT BENCKISER GROUP PLC	GB	GB00B24CGK77	2020	27	5.313
RECKITT BENCKISER GROUP PLC	GB	GB00B24CGK77	2021	48	5.831
RECKITT BENCKISER GROUP PLC	GB	GB00B24CGK77	2022	48	4.777
HALEON PLC	GB	GB00BMX86B70	2018	NA	NA
HALEON PLC	GB	GB00BMX86B70	2020	NA	NA
HALEON PLC	GB	GB00BMX86B70	2021	NA	NA
HALEON PLC	GB	GB00BMX86B70	2022	NA	NA

COMPANY	TYPE	environment	social	human	corruption	multiple	general
BP PLC		6	8	2	4	10	6
BP PLC		17	8	0	6	11	11
BP PLC		30	17	1	3	14	13
BP PLC		26	20	2	5	11	4
GSK PLC		13	5	3	19	8	4
GSK PLC		23	5	3	13	12	0
GSK PLC		20	10	2	13	9	3
GSK PLC		25	4	0	14	10	6
ASTRAZENECA PLC		5	4	1	7	2	0
ASTRAZENECA PLC		20	4	1	7	3	3
ASTRAZENECA PLC		29	0	2	3	6	3
ASTRAZENECA PLC		19	1	1	3	3	2
RECKITT BENCKISER GROUP PLC		4	3	1	1	0	3
RECKITT BENCKISER GROUP PLC		8	7	1	2	5	4
RECKITT BENCKISER GROUP PLC		16	7	1	3	16	5
RECKITT BENCKISER GROUP PLC		18	11	0	3	9	7
HALEON PLC		NA	NA	NA	NA	NA	NA
HALEON PLC		NA	NA	NA	NA	NA	NA
HALEON PLC		NA	NA	NA	NA	NA	NA
HALEON PLC		NA	NA	NA	NA	NA	NA

COMPANY	PERSPECTIVE				TONE			positive
	past	present	future	negative	neutral	positive		
BP PLC	1	28	7	10	14	12		
BP PLC	2	43	8	16	23	14		
BP PLC	18	40	20	23	31	24		
BP PLC	16	47	5	25	24	19		
GSK PLC	9	20	23	18	7	27		
GSK PLC	9	36	11	20	13	23		
GSK PLC	5	46	6	16	18	23		
GSK PLC	3	45	11	19	20	20		
ASTRAZENECA PLC	3	15	1	7	4	8		
ASTRAZENECA PLC	3	28	7	10	10	18		
ASTRAZENECA PLC	5	29	9	12	7	24		
ASTRAZENECA PLC	4	20	5	8	5	16		
RECKITT BENCKISER GROUP PLC	1	13	1	5	8	2		
RECKITT BENCKISER GROUP PLC	3	23	1	10	9	8		
RECKITT BENCKISER GROUP PLC	6	39	3	17	16	15		
RECKITT BENCKISER GROUP PLC	9	36	3	13	20	15		
HALEON PLC	NA	NA	NA	NA	NA	NA		
HALEON PLC	NA	NA	NA	NA	NA	NA		
HALEON PLC	NA	NA	NA	NA	NA	NA		
HALEON PLC	NA	NA	NA	NA	NA	NA		

COMPANY	COMPLETENESS	mention	description	evaluation	PAGES_SECTION	PAGES_REPORT
BP PLC		23	13	0	22	326
BP PLC		27	25	1	20	356
BP PLC		55	23	0	33	396
BP PLC		46	22	0	14	406
GSK PLC		29	21	2	17	273
GSK PLC		33	21	2	22	304
GSK PLC		31	26	0	19	316
GSK PLC		34	21	4	20	320
ASTRAZENECA PLC		9	10	0	13	248
ASTRAZENECA PLC		25	13	0	22	288
ASTRAZENECA PLC		26	17	0	18	232
ASTRAZENECA PLC		22	5	2	17	228
RECKITT BENCKISER GROUP PLC		14	1	0	11	228
RECKITT BENCKISER GROUP PLC		22	5	0	17	244
RECKITT BENCKISER GROUP PLC		35	12	1	25	276
RECKITT BENCKISER GROUP PLC		34	13	1	24	248
HALEON PLC		NA	NA	NA	NA	NA
HALEON PLC		NA	NA	NA	NA	NA
HALEON PLC		NA	NA	NA	NA	NA
HALEON PLC		NA	NA	NA	NA	NA

## Appendix E

Germany-based firm sample analysis.

COMPANY	COUNTRY	ISIN	REPORT_YEAR	VOLUME_RISK	VOLUME_REPORT
BASF SE	DE	DE000BASF111	2018	42	6.335
BASF SE	DE	DE000BASF111	2020	51	8.141
BASF SE	DE	DE000BASF111	2021	52	7.852
BASF SE	DE	DE000BASF111	2022	67	8.112
BAYER AG	DE	DE000BAY0017	2018	45	7.618
BAYER AG	DE	DE000BAY0017	2020	28	6.837
BAYER AG	DE	DE000BAY0017	2021	33	7.005
BAYER AG	DE	DE000BAY0017	2022	41	7.148
FRESENIUS SE & CO. KGAA	DE	DE0005785604	2018	18	7.767
FRESENIUS SE & CO. KGAA	DE	DE0005785604	2020	42	9.471
FRESENIUS SE & CO. KGAA	DE	DE0005785604	2021	54	10.769
FRESENIUS SE & CO. KGAA	DE	DE0005785604	2022	81	11.265
HENKEL AG & CO. KGAA	DE	DE0006048432	2018	6	3.832
HENKEL AG & CO. KGAA	DE	DE0006048432	2020	8	4.199
HENKEL AG & CO. KGAA	DE	DE0006048432	2021	14	3.937
HENKEL AG & CO. KGAA	DE	DE0006048432	2022	14	4.076
MERCK KOMMANDITGESELLSCHAFT AUF AKTIEN	DE	DE0006599905	2018	14	5.077
MERCK KOMMANDITGESELLSCHAFT AUF AKTIEN	DE	DE0006599905	2020	18	5.036
MERCK KOMMANDITGESELLSCHAFT AUF AKTIEN	DE	DE0006599905	2021	47	5.155
MERCK KOMMANDITGESELLSCHAFT AUF AKTIEN	DE	DE0006599905	2022	59	5.337
LANXESS AG	DE	DE0005470405	2018	27	4.270
LANXESS AG	DE	DE0005470405	2020	43	4.955
LANXESS AG	DE	DE0005470405	2021	42	4.888
LANXESS AG	DE	DE0005470405	2022	47	5.043
K+S AKTIENGESELLSCHAFT	DE	DE000KSAG888	2018	17	3.866
K+S AKTIENGESELLSCHAFT	DE	DE000KSAG888	2020	30	4.222
K+S AKTIENGESELLSCHAFT	DE	DE000KSAG888	2021	33	4.643
K+S AKTIENGESELLSCHAFT	DE	DE000KSAG888	2022	43	4.900

COMPANY	TYPE	environment	social	human	corruption	multiple	general
BASF SE		9	16	0	1	6	10
BASF SE		16	9	2	1	10	13
BASF SE		14	13	1	1	9	14
BASF SE		19	14	6	1	12	15
BAYER AG		10	7	0	2	13	13
BAYER AG		7	5	1	2	4	9
BAYER AG		8	5	1	1	7	11
BAYER AG		12	4	1	1	10	13
FRESENIUS SE & CO. KGAA		2	6	1	3	5	1
FRESENIUS SE & CO. KGAA		5	17	10	1	4	5
FRESENIUS SE & CO. KGAA		12	18	11	3	4	6
FRESENIUS SE & CO. KGAA		17	21	21	5	8	9
HENKEL AG & CO. KGAA		2	1	0	0	2	1
HENKEL AG & CO. KGAA		1	2	0	0	5	0
HENKEL AG & CO. KGAA		2	4	2	0	4	2
HENKEL AG & CO. KGAA		2	3	2	0	4	3
MERCK							
KOMMANDITGESELLSCHAFT AUF AKTIEN		2	7	0	1	4	0
MERCK							
KOMMANDITGESELLSCHAFT AUF AKTIEN		2	9	1	1	3	2
MERCK							
KOMMANDITGESELLSCHAFT AUF AKTIEN		8	16	8	4	7	4
MERCK							
KOMMANDITGESELLSCHAFT AUF AKTIEN		19	17	8	3	7	5
LANXESS AG		4	6	2	1	3	11
LANXESS AG		15	10	3	1	6	8
LANXESS AG		14	8	3	1	10	6
LANXESS AG		16	9	3	1	10	8
K+S AKTIENGESELLSCHAFT		3	4	0	4	5	1
K+S AKTIENGESELLSCHAFT		5	12	0	5	4	4
K+S AKTIENGESELLSCHAFT		5	10	2	5	6	5
K+S AKTIENGESELLSCHAFT		9	9	3	6	9	7

COMPANY	PERSPECTIV E	PAST	PRESENT	FUTURE	STONE	NEGATIV E	NEUTRAL	POSITIV E
BASF SE		3	32	7		4	9	29
BASF SE		2	43	6		10	14	27
BASF SE		6	41	4		8	20	24
BASF SE		9	51	7		12	23	32
BAYER AG		15	22	8		10	17	18
BAYER AG		3	23	2		10	5	13
BAYER AG		3	29	1		12	5	16
BAYER AG		3	36	2		10	15	16
FRESENIUS SE & CO. KGAA		0	18	0		4	2	12
FRESENIUS SE & CO. KGAA		6	34	2		4	16	22
FRESENIUS SE & CO. KGAA		10	42	2		10	17	27
FRESENIUS SE & CO. KGAA		16	62	3		11	32	38
HENKEL AG & CO. KGAA		0	6	0		4	1	1
HENKEL AG & CO. KGAA		0	8	0		7	1	0
HENKEL AG & CO. KGAA		0	14	0		10	2	2
HENKEL AG & CO. KGAA		0	14	0		9	2	3
MERCK		0	14	0		3	9	2
KOMMANDITGESELLSCHAFT AUF AKTIEN		0	18	0		3	12	3
MERCK		0	18	0		3	12	3
KOMMANDITGESELLSCHAFT AUF AKTIEN		0	18	0		3	12	3
MERCK		3	43	1		11	19	17
KOMMANDITGESELLSCHAFT AUF AKTIEN		3	43	1		11	19	17
MERCK		3	53	3		19	19	21
KOMMANDITGESELLSCHAFT AUF AKTIEN		3	53	3		19	19	21
LANXESS AG		1	22	4		6	10	11
LANXESS AG		1	40	2		15	19	9
LANXESS AG		1	39	2		13	21	8
LANXESS AG		1	45	1		13	22	12
K+S AKTIENGESELLSCHAFT		1	15	1		8	8	1
K+S AKTIENGESELLSCHAFT		1	24	5		10	15	5
K+S AKTIENGESELLSCHAFT		2	26	5		9	17	7
K+S AKTIENGESELLSCHAFT		1	34	8		12	18	13

COMPANY	COMPLETENESS	mention	description	evaluation	PAGES_SECTION	PAGES_REPORT
BASF SE		24	16	2	21	290
BASF SE		33	17	1	30	324
BASF SE		34	16	2	27	290
BASF SE		43	23	1	38	296
BAYER AG		27	15	3	26	279
BAYER AG		21	6	1	17	265
BAYER AG		20	12	1	20	277
BAYER AG		24	16	1	25	295
FRESENIUS SE & CO. KGAA		11	7	0	12	281
FRESENIUS SE & CO. KGAA		31	11	0	17	338
FRESENIUS SE & CO. KGAA		32	20	2	27	405
FRESENIUS SE & CO. KGAA		48	32	1	39	417
HENKEL AG & CO. KGAA		4	2	0	5	252
HENKEL AG & CO. KGAA		4	4	0	6	299
HENKEL AG & CO. KGAA		9	5	0	9	327
HENKEL AG & CO. KGAA		10	4	0	9	374
MERCK						
KOMMANDITGESELLSCHAFT AUF AKTIEN		9	5	0	9	338
MERCK						
KOMMANDITGESELLSCHAFT AUF AKTIEN		15	3	0	9	336
MERCK						
KOMMANDITGESELLSCHAFT AUF AKTIEN		30	16	1	27	368
MERCK						
KOMMANDITGESELLSCHAFT AUF AKTIEN		39	19	1	29	364
LANXESS AG		19	8	0	15	212
LANXESS AG		23	17	3	22	263
LANXESS AG		22	16	4	27	269
LANXESS AG		30	12	5	30	275
K+S AKTIENGESELLSCHAFT		9	8	0	11	249
K+S AKTIENGESELLSCHAFT		20	10	0	19	234
K+S AKTIENGESELLSCHAFT		24	9	0	21	253
K+S AKTIENGESELLSCHAFT		26	15	2	28	252

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