Does mandating corporate social and environmental disclosure improve social and environmental performance?: Broad-based evidence regarding the effectiveness of directive 2014/95/EU

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ABSTRACT

Given that the aim of corporate social and environmental *disclosure* mandates is to improve corporate social and environmental *performance*, this study investigates the impact of such mandates on performance. Using a difference-in-differences analysis, we examine trends in corporate social and environmental performance before and after the introduction of Directive 2014/95/EU (hereafter, the Directive), comparing affected European companies with companies in the United States (US), based on a balanced sample of 358 European companies (excluding United Kingdom (UK) companies, because they were subject to additional regulations that came into effect around the same time) and 470 US companies from 2009 to 2020. We find that European companies' performance has not improved substantially since the Directive came into effect in 2017, nor have they improved compared to US companies. Thus, the evidence suggests that the Directive has not improved European companies' social and environmental performance. Our study provides broad-based evidence of the (in)effectiveness of mandating corporate social and environmental disclosures to enhance performance. Our findings will be of interest to regulators considering disclosure mandates, as well as stakeholders and investors interested in enhancing social and environmental performance.

1. Introduction

There are currently major developments in creating sustainability[2] disclosure standards that are broad-based and globally supported. Examples include the standards by the International Financial Reporting Standards Foundation/International Sustainability

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[2] In this study, we use the terminology corporate social responsibility (CSR), sustainability, social and environmental, and non-financial more or less interchangeably. We understand that "sustainability" is a controversial term that can be used in different ways. However, these different interpretations are beyond the scope of this paper. The IFRS/ISSB refers to sustainability reporting, whereas the EU Directive 2014/95/EU refers to non-financial disclosure. However, both address social and environmental matters under these umbrella terms. Therefore, we use 'non-financial' when we discuss the Directive, 'sustainability' when we discuss IFRS/ISSB initiatives, and 'social and environmental' under most other conditions.

Standards Board (IFRS/ISSB), which have global reach and will require sustainability and climate change disclosures for investors for reporting periods starting from January 1, 2024; the US-based Securities and Exchange Commission (SEC), which is promoting climate change information for investors; and the EU-based European Financial Reporting Advisory Group (EFRAG), which is promising broader notions of sustainability for all stakeholders. The underlying philosophy of all these disclosure mandates is that corporate sustainability disclosures will improve corporate impacts on social and environmental matters. Therefore, with all this activity, now is an opportune time to propose our research question that asks whether this underlying philosophy is based on past evidence: Can we demonstrate, through broad-based evidence, that sustainability disclosure regulation has, in the past, led to enhanced corporate social and environmental performance?

Companies provide essential products and services; however, their activities may harm society and the natural environment, such as, through toxic emissions, mistreating employees, or condoning inequities in their supply chains. Baumgartner and Rauter (2017, p. 83) state that "all corporate activities have an influence on society and the natural environment", and there is a need "for more concrete guidance that will allow businesses to act strategically and successfully in a sustainable way". Regulation and accounting can play important roles in supporting guidance, disclosure, and accountability (Bebbington & Larrinaga, 2014).

In recent years, voluntary corporate disclosure regarding social and environmental performance has grown substantially (KPMG, 2013, 2015, 2017, 2020). Alongside increased voluntary disclosure, several countries and regions have introduced mandatory sustainability disclosure requirements (e.g., United Nations Environment Programme and KPMG, 2006; United Nations Environment Programme, KPMG, Global Reporting Initiative and Centre for Corporate Governance in Africa, 2010, 2013, 2016). One prominent example is the European Union's (EU) introduction of Directive 2014/95/EU (hereafter, the Directive), which requires companies that are (i) listed on EU exchanges or have significant operations within the EU; (ii) employing more than 500 people; or (iii) deemed to be public-interest entities; to report their performance on non-financial matters, including environmental issues, social and employee matters, human rights, anti-corruption, and bribery (European Union, 2014).

In this study, we investigate whether the Directive has improved the social and environmental performance of EU companies. We are interested in the potential impact of the Directive on companies' social and environmental performance for two reasons. First, although the Directive is deemed to be "a turning point for EU companies that had to reshape their accounting and sustainability management practices to be compliant with the new requirements" (Cupertino, Vitale, & Ruggiero, 2021, p. 163), we know little about its impact on corporate behaviour (Grewal, Riedl, & Serafeim, 2019)[3] and, consequently, on the benefits of implementing such regulation elsewhere. Specifically, as Haji, Coram, and Troshani (2023, p. 194) suggest, "a growing number of studies provide early evidence supporting real effects of CSR reporting regulations (… Fiechter, Hitz, & Lehmann, 2022 …). However, these studies provide evidence based on the early stages of the regulations, rather than real effects after implementation".

Second, investors and other stakeholders consider mandates on sustainability disclosure as necessary. In evidence, Stubbs and Higgins (2018, p. 504) find that "half of the financial stakeholders did support mandatory Integrated Reporting (IR), with [others] supporting some level of regulation". However, the literature appears unclear regarding the impact or the effectiveness of mandatory sustainability disclosure on company behaviour. For example, Frost (2007) finds that Section 299 (1) (f) of the Corporations Law Act in Australia effectively encourages Australian companies to disclose environmental performance. However, another mandate, sustainability risk reporting, as part of the Australian Securities Exchange Corporate Governance Principles, conversely has had a minimal impact on disclosures by Australian companies (Dumay & Hossain, 2019). Evidence that regulations are effective in enhancing disclosure and performance is always of interest to policymakers. Therefore, whether disclosure mandates effectively change underlying performance deserves further examination.

From the institutional theory perspective, we posit that the Directive should have improved the social and environmental performance of EU companies. First, the Directive pressures EU companies to disclose their efforts regarding social and environmental matters. Increased attention to these non-financial matters, including their disclosure, could reduce information asymmetry, allowing external stakeholders to identify companies with unsatisfactory social and environmental performance. They may then coerce these companies to improve. In institutional theory terms, these pressures can lead to coercive isomorphism. Second, the Directive should raise awareness of social and environmental performance within EU companies and strengthen the resolve of managers to internalise the new social and environmental norms. This internalisation should improve practice, which could be seen as normative isomorphism (Adams & Frost, 2008; Dobbin, Schrage, & Kalev, 2009, p. 65; Higgins, Milne, & Van Gramberg, 2015).

However, Leong and Hazelton (2019) suggest that disclosure mandates may not always be effective. Analysing two cases pertaining to sustainability accounts in the US (Pollutant release and transfer registers as a successful case and the universal health coverage plan as a failed case), they list five conditions[4] likely to maximise the chances of mandatory disclosure resulting in change. Drawing upon their list, we have identified three characteristics of the Directive that could reduce its impact. First, the lack of specific disclosure guidelines on content and metrics may mean EU companies are less likely to disclose their non-financial information in useful and appropriate ways for investors and other stakeholders to make decisions. Second, the lack of effective requirements for auditing or assuring non-financial disclosure may further reduce its usefulness and lead to greenwashing (Bowen, 2014). Third, the relatively weak

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[3] Grewal et al. (2019, p. 3079) state: "Future research can examine the real effects as the regulation takes place, such as *changes in nonfinancial* and financial *performance …*".

[4] Specifically, the conditions are: (1) the mandatory disclosure comprises indicators which are appropriate for being used by information intermediaries or other stakeholders; (2) the disclosure provides information "at the appropriate level of aggregation"; (3) the disclosed data are comparable to external benchmarks; (4) different sustainability accounts can be connected to a network of information; and (5) the mandate is supported by stakeholders (Leong & Hazelton, 2019, p. 828).

sanctions for non-compliance with the Directive may further undermine the reliability and comparability of the non-financial information (Gatti, Vishwanath, Seele, & Cottier, 2019). Therefore, the Directive may, in fact, not mitigate information asymmetry and may not help stakeholders identify companies with poor social and environmental performance. Therefore, whether the Directive enhanced social and environmental performance remains an empirical question.

To examine whether EU companies' social and environmental performance increased when the Directive was implemented, we first graph the data over time (2009–2020). This analysis reveals no jump to a higher level of performance after the Directive was promulgated in 2014, implemented in 2017, or over the entire period. Instead, the long-established trend of gradual increases up to 2013 continued during and after the implementation of the Directive. Next, to refute the potential interpretation that this gradual increase may still, in some way, be related to the Directive, we compare the trend in performance in Europe with a jurisdiction that is not impacted by the Directive, the US, aligning with the approach taken by Ioannou and Serafeim (2019). The Directive could only be interpreted to have influenced European companies' performance if it could be shown that the difference in the performance of European companies after the Directive was greater than the difference for US companies. In our difference-in-difference (DiD) analyses, EU companies[5] are the treatment group, while US companies are the control group. Our DiD analyses show that EU company increases in performance were not more than US company increases. To ensure these DiD results are reliable, we perform tests to ensure the parallel trends assumption holds, and we use gradient boosted regression tree (GBRT) to compare the predictive ability of a model including the Directive and company characteristics against a model based solely on company characteristics. We find that including the implementation of the Directive does not improve the model's predictive ability, providing further evidence in support of our conclusion that the implementation of the Directive did not impact EU companies' social and environmental performance. We also conducted the least absolute shrinkage and selection operation (LASSO) to identify the most relevant predictors. We find that LASSO does not select the Directive as one of its predictors of either corporate social or environmental performance. This supports the GBRT results and indicates that the 'entry-into-force' effect of the Directive on corporate environmental and social performance is negligible.

These findings provide broad-based evidence on the effectiveness of sustainability/non-financial disclosure mandates in improving social and environmental performance and contribute to the mandatory non-financial disclosure literature in at least three ways. First, Fiechter et al. (2022), and Grewal et al. (2019) are two early investigations analysing the Directive's impact. Distinct from Grewal et al. (2019), who focus on how capital markets have reacted to the Directive, we investigate the impact of the Directive on companies' social and environmental performance. Fiechter et al. (2022), the study closest to ours, focus on the 'passage' effect of the Directive (2014–2017) and largely leave the implementation of the Directive aside (apart from including a single post-implementation year). They find that the 'passage' of the Directive positively affects the regulated companies' social performance (but not their environmental performance). As Fiechter et al. (2022, p. 1542) explain, a limitation of their work is that it "presents early evidence, as we include in our analyses only one reporting year after the entry-into-force of the CSR Directive". This corresponds to Haji, Coram, and Troshani's (2023) view that Fiechter et al. (2022) provide early evidence, while more evidence regarding the effect of Directive, after implementation, is needed to fully understand its effect on EU companies' social and environmental performance. Our DiD analyses include several post-implementation years. In addition, since almost a third (31.77%) of Fiechter et al.'s (2022) EU sample consists of UK companies that were subject to UK legislation that came into effect during the same time as the Directive (e.g. the 2015 Modern Slavery Act), their results are likely due to the increase in social performance of UK companies.[6] Therefore, our results, based on a cleaner treatment group, provide a better understanding of the impact of the EU Directive itself, and places Fiechter et al.'s (2022) results in perspective. In addition, we use two machine learning methods, GBRT and LASSO, which provide evidence that including the Directive in a model does not enhance its predictive ability, both of which support the results of our DiD analyses. Overall, our study effectively addresses a question still unanswered by Fiechter et al. (2022), namely how the Directive itself, after implementation, and excluding the effect of other regulations, such as the UK's 2015 Modern Slavery Act, affected EU companies' social and environmental performance.

Second, aligning with Arvidsson and Dumay (2022) and Jackson, Bartosch, Avetisyan, Kinderman, and Knudsen (2020), we examine the non-economic consequences of mandatory non-financial disclosure. However, Arvidsson and Dumay (2022) only consider the Directive's impact on a small sample of Swedish companies; therefore, their results may not be generalisable to other contexts. Further, Jackson et al. (2020) do not consider the Directive in their work, relying on 2002–2014 data, i.e., before the Directive took effect. Given the importance of the Directive, its impact on social and environmental performance deserves to be separately examined.

Third, we contribute essential evidence to the debate on whether mandatory non-financial disclosures can drive improvements in corporate social and environmental performance. The cross-regional empirical evidence examines an important mandate affecting a large world region. The EU represents a major economic block, which is said to be dominated by a more social and environmental-friendly stakeholder logic (De Schutter, 2008; Steurer, 2010). Our evidence is that non-financial disclosure mandates fail to improve social and environmental performance in this context, suggesting that disclosure mandates are unlikely to successfully improve practice anywhere in the world.

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[5] We exclude United Kingdom (UK) companies from our analyses, due to the unknown effects of Brexit and specific UK legislation on UK companies' motivation to manage social and environmental matters.

[6] When we include UK companies in additional untabulated analyses similar to our main analyses in Table 4, our results for social performance become significant at the 10% level, indicating that social performance of the treatment group is higher than the control group after the Directive, while our results for environmental performance remain qualitatively similar to our main results. Thus, we are able to replicate Fiechter et al.'s (2022) results with our data, but this may lead to the conclusion that EU companies improved their social performance, while the result is due to improved UK corporate social performance, which was influenced by additional factors over and above the Directive.

Our study also has three practical implications. First, as policymakers continue to rely on non-financial disclosure mandates instead of performance mandates, we provide evidence of the effect of such mandates on social and environmental performance. Second, assessing our results against research regarding the characteristics that render mandates ineffective may be helpful. For example, Leong and Hazelton (2019) maintain that, due to the lack of specific guidelines for disclosure, the absence of auditing or assurance requirements, and the relatively weak sanctions, the Directive will not drive changes in social and environmental performance. Therefore, initiating isomorphic change through disclosure mandates may require certain key enabling characteristics. Our findings should interest policymakers in countries considering implementing or increasing non-financial disclosure mandates. Third, our findings should be of keen interest to stakeholders. For example, Stubbs and Higgins (2018) find that investors and other stakeholders support mandates for non-financial disclosure.

This paper comprises the following sections. Section 2 introduces the Directive, and Section 3 reviews prior studies relevant to our research aim and develops our RQ. Section 4 describes the research design. The empirical results and discussion are presented in Section 5, while Section 6 summarises and concludes the paper.

2. Background

Increasing awareness of corporate social and environmental impacts and a rise in the need for non-financial information by stakeholders has seen a series of corporate social and environmental initiatives introduced by the EU in recent years. Climate change, gender inequality, and child labour are only examples of current world issues. The COVID-19 pandemic has raised awareness of the risk posed by such threats (Adams and Abhayawansa, 2022). Stock market performance has also been linked to corporate ES decisions (Shackleton, Yan, & Yao, 2022).

The antecedents of the Directive begin with a Green Paper by the Commission of the European Communities (2001), in which the EU promoted triple-bottom-line reporting to measure corporate performance against economic, environmental, and social criteria. At this time, a discussion was also started on third-party verification and guidelines "on standardised reporting and accounting metrics, reporting formats and audit procedures" (Contrafatto, Ferguson, Power, Stevenson, & Collison, 2020). In 2003, the EU introduced Directive 51/2003, outlining that disclosures by companies should include key performance indicators of a non-financial kind. Then, in a communication adopted on April 13, 2011 titled the "Single Market Act: Twelve Levers to Boost Growth and Strengthen Confidence – 'Working Together to Create New Growth'", the EU Commission identified a need to increase the transparency of the non-financial disclosures provided by companies (European Commission, 2011a). Other regulations before the Directive included Directive 34/2013 EU on annual financial statements, consolidated financial statements and related reports, and Europe 2020; European Commission, 2011b), outlining a vision for a sustainable future. Finally, replacing Directive 34/2013 EU, the Directive (i.e., Directive 2014/95/EU) was approved by the European Parliament on November 15, 2014. Member states had two years to enact the Directive (until December 6, 2016). Therefore, EU companies had to comply with this law for financial years that started on or after January 1, 2017.

The Directive aims to provide new impetus to drive the vision for a sustainable future and harmonise non-financial disclosures (Zangheri & Farneti, 2019). As the Directive outlines, it is "necessary to establish a certain minimum legal requirement as regards the extent of the information that should be made available to the public and authorities by undertakings across the Union" (European Union, 2014, p. 2). A key issue of the Directive is providing non-financial disclosures to investors. As the Directive indicates, giving investors access to non-financial information is a step towards reaching the milestone of having market and policy incentives in place by 2020 that reward a business's investments in efficiency under the roadmap to a resource-efficient Europe (European Union, 2014, p. 3).

The main requirements of the Directive consist of scope, guidance, audit, and sanctions. In terms of scope, the Directive requires large undertakings, i.e., public interest entities with more than 500 employees, to disclose a non-financial statement containing the information necessary to understand the development, performance, position, and impact of its activities in various non-financial issues. The Directive suggests choosing from different international, national, and union-based frameworks, such as the Eco-Management and Audit Scheme (EMAS). The Directive requires statutory auditors and audit firms to express opinions on whether non-financial information has been disclosed. In addition, the Directive leaves it to member states to decide whether they require independent assurance of non-financial information. Lastly, the Directive does not specify sanctions and leaves this to the discretion of member states.

The November 2021 Cop26[7] reinforced the urgency to take action on climate change and the need to establish a global sustainability standard-setter for financial markets (VRF, 2021). Several initiatives and regulations require and enhance the importance of "rendering the entire realm of the now-relevant invisible transparent" (Quattrone, 2022). Among these, the Global Reporting Initiative (GRI) and the Directive are the most prominent. Several disclosure initiatives are now being harmonised through the newly formed ISSB. At the start of 2022, the ISSB's proposals aimed to create a comprehensive global baseline for sustainability disclosures and launch a consultation on its first two proposed standards (VRF, 2022). These different approaches have widened the realm of measurable performance from financial to societal and environmental metrics, i.e. approaches to measure and assess social and environmental performance and any threats emanating from these sources.

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[7] The conference of the parties attended by the countries that signed the United Nations Framework Convention on Climate Change in 1994.

3. Literature review and the research question

3.1. Literature review

The impact of mandating corporate social and environmental disclosures is still debatable. On the one hand, some studies have reported that mandatory social and environmental disclosures appear to have little impact on companies (see, e.g., Adams, Coutts, & Harte, 1995; Arvidsson & Dumay, 2022; Costa & Agostini, 2016; Criado-Jiménez, Fernández-Chulián, Larrinaga-González, & Javier Husillos-Carqués, 2008; Day & Woodward, 2004; Dumay & Hossain, 2019; Larrinaga, Carrasco, Correa, Llena, & Moneva, 2002; Llena, Moneva, & Hernandez, 2007; Luque-Vílchez & Larrinaga, 2016). For example, focusing on mandates in Spain, both Larrinaga et al. (2002) and Luque-Vílchez and Larrinaga (2016) find that the Environmental Disclosure Standard 437/98 and the Sustainable Economy Law February 2011 did not have a discernible impact on how Spanish companies communicate their social and environmental information. Costa and Agostini's (2016, p. 12) research into Legislative Decree 32/2007, which mandates social and environmental disclosures by Italian companies, finds that "the 2007 regulation has been ineffective". The Sustainable Economy Law February 2011 in Spain is an input to the Directive (Luque-Vílchez & Larrinaga, 2016), while the Legislative Decree 32/2007 is "the first Italian regulation to promote the presence of extra-financial information in the consolidated reports of corporate groups" (Costa & Agostini, 2016, p. 14). Given the lack of success at modifying social and environmental performance in Spain and Italy, we question whether the Directive will be any different.

Even for countries outside the EU, the impact of mandatory social and environmental disclosure seems to be limited. For example, Dumay and Hossain (2019) examined sustainability risk reporting as part of compliance with the Australian Securities Exchange Corporate Governance Principles. They found that the mandate had no impact. Day and Woodward (2004) examined Schedule 7, Section 234 (3) and (4) of the UK Companies Act 1985 and found a low level of compliance with the required disclosures.

On the other hand, several studies provide evidence that mandatory social and environmental disclosures impact practice. For example, Aureli, Del Baldo, Lombardi, and Nappo (2020) provide case-based evidence that one company improved their social and environmental procedures because of the Directive. Krasodomska, Michalak, and Świetla (2020) find that, although Polish accountants are not entirely familiar with the Directive, they generally support it and recognise its potential impact on companies. Chauvey, Giordano-Spring, Cho, and Patten (2015) find evidence that an early mandate on social and environmental disclosure in France, the Nouvelles Régulations Economiques of 2001, moderately impacted corporate social and environmental performance. Chen, Hung, and Wang (2018) find that mandatory environmental disclosure in China has been associated with reducing regional pollution, but the causal link remains unclear. Arvidsson and Dumay (2022) find that 27 Swedish companies did not improve their social and environmental performance after 2015, and Jackson et al. (2020) examine an earlier time (2002–2014) before the Directive while focusing on social but not environmental performance. To summarise, these studies do not rely on large datasets, focus on single countries, do not compare regions, do not find strong results, do not focus on both social and environmental performance, or do not address the Directive.

Overall, given that the impact of mandatory non-financial disclosures, especially for the Directive, is uncertain and debatable, Johansen (2016) calls for research on the broader effects of requiring companies to disclose more social and environmental information and for research specifically related to the Directive. Thus, responding to this call, we analyse whether the Directive impacts corporate social and environmental performance.

3.2. Development of the research question

Our study's research question and theoretical foundation, informed by institutional theory, considers how disclosure regulation affects corporate social and environmental performance. Institutionalisation could happen through isomorphic pressure, as theorised in institutional theory (Deephouse, 1996; de Villiers, Low, & Samkin, 2014). Socio-political pressures can coerce companies to establish procedures, rules, and structures to improve social and environmental performance, thus legitimising themselves in the eyes of stakeholders and ensuring continued access to resources. As they transform, companies become isomorphic with their institutional environment. The theory has two approaches, structuralist and agency (de Villiers et al., 2014). Our study follows the structuralist approach concerning how observable rules and structures, such as mandatory social and environmental disclosures, affect a company's behaviour. These behaviours lead to observable outcomes that do not rely on examining managerial beliefs (Scott, 2008). By contrast, the agency approach focuses on the relationship between managerial beliefs and socio-political pressures (Scott, 2008). The structuralist approach is more appropriate for this study since we examine archival material and not directly querying management on their beliefs. We discuss the key concepts of institutional theory used in our study below.

3.2.1. Legitimacy

Legitimacy is "a generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995, p. 574). A company's legitimacy is granted by its stakeholders, including regulators, investors, customers, and employees. Legitimacy can be considered a resource, so companies often attempt to influence the legitimating process through disclosures (Suchman, 1995, p. 576). Maintaining legitimacy is a strong motivation behind companies' efforts regarding social and environmental issues (de Villiers & Van Staden, 2006; Deegan, 2002). To maintain legitimacy, companies must disclose their effort on social and environmental issues to ensure access to resources, such as customers, employees, and finance (de Villiers et al., 2014; Scott, 2001).

3.2.2. Isomorphism

According to institutional theory, the socio-political environment pressurises companies through three types of isomorphic forces: coercive, mimetic, and normative (de Villiers et al., 2014). Coercive isomorphism is based on the pressure directly exerted by stakeholders and regulations. An example of coercive isomorphism is that the Directive legally requires large EU companies to disclose their non-financial information. Mimetic isomorphism refers to companies imitating each other (Scott, 2001). For example, a company may copy its leading competitor's social/environmental behaviour and disclosures. Normative isomorphism relates to internalising norms and practices, i.e., seeing certain courses of action as the right thing to do. The copying is often driven by shared education at universities, professional bodies, and consultants. For example, the Global Reporting Initiative (GRI) (2022, p. 10) promotes normative isomorphism through statements such as: "the organisation should identify the interests of these and other stakeholders who are unable to articulate their views (e.g., future generations)".

From an institutional theory perspective, complying with the Directive's disclosure rules provides legitimacy to EU companies, which could improve corporate social and environmental performance. Alternatively, companies failing to comply with institutional pressures will likely come under pressure to conform, securing their legitimacy. Thus, we expect coercive isomorphism to ensure that EU companies comply with the Directive's disclosure requirements. In turn, this compliance may give rise to internal changes within companies that lead to social and environmental performance improvements.

Several scholars have suggested that disclosures can offset the information asymmetry between management and stakeholders regarding corporate social and environmental performance (Chen et al., 2018; Fung, Graham, & Weil, 2007; Weil, Graham, & Fung, 2013). However, stakeholders can also hold different degrees of power to influence a company's actions. Less powerful stakeholders may not be able to affect company behaviour. However, collective action can be effective, for example, if enough customers boycott a company's products or services because they are unsafe or violate human rights. In that case, management must conform (Lawrence and Weber, 2020). In theory, the Directive could ensure disclosures of the kind stakeholders need to identify companies with un-satisfactory social and environmental performance, which could ultimately pressure them to improve. This progression from reporting to pressure is empirically supported (Weil et al., 2013). For example, Jin and Leslie (2003, 2009) found that restaurants improved their hygiene when required to display a hygiene grade card.

In addition to coercive isomorphism, normative isomorphism may be relevant. The Directive could promote awareness of social and environmental performance within companies, encouraging them to internalise norms and implement good practices around non-financial matters (Adams & Frost, 2008; Dobbin et al., 2009, p. 65; Edelman, 1992; Higgins et al., 2015). For example, Adams and Frost (2008, p. 298) suggest that "the commitment to report and the sustainability reporting process has thus led to the development of data collection and performance management systems, in theory at least enabling managers to access greater levels of information on comparative performance and better manage their performance". Similarly, Higgins et al. (2015, p. 454) find that non-financial disclosure is associated with "pursuing a sustainability/values-based strategy (78%) or seeking to manage social and environmental impacts (75%)". In institutional theory terms, the Directive may improve social and environmental performance in European companies through coercive and normative isomorphism.

3.2.3. Characteristics for disclosure regulation to affect performance

Following Leong and Hazelton's (2019) analysis, we identify three characteristics of the Directive that might undermine its impact on social and environmental performance. First, the Directive does not provide specific guidelines for items to be included or prescribe content or indicators. This first characteristic corresponds to the first condition mentioned by Leong and Hazelton (2019, p. 827) that "indicators are appropriate for information intermediaries or other intended users". In terms of guidelines, the Directive is flexible, indicating that companies can use national, union-based, or international frameworks as long as the reporting entity specifies them. The Directive does not provide sufficient guidance or definitive methods for non-financial information disclosures, and the disclosure content required is general. As Dumay, Bernardi, Guthrie, and La Torre (2017, p. 465) indicate, such vagueness requires "professional judgement" and allows for interpretations that "are adaptable so organisations can adjust them to suit their needs". While the vagueness increases flexibility and encourages companies to address substantial issues rather than taking a tick-box approach, it does raise the problem of not knowing which boxes should be ticked (Dumay & Hossain, 2019). The result may be disclosures that are difficult to compare between companies and a higher level of information asymmetry. If this holds, pressure due to coercive isomorphism is less likely to be initiated, and companies will be less likely to improve their social and environmental performance.

Second, the Directive does not always require auditing or assuring the non-financial disclosures. This second characteristic corresponds to the third condition specified by Leong and Hazelton (2019, p. 828) that "data are comparable to external benchmarks and/or other corporations", the implication being that it is impossible to make a meaningful comparison if the disclosures are un-trustworthy. The Directive leaves this as optional to be legislated by member states. As CSR Europe and the GRI (2017) report, only nine member states make specific reference to assurance in their laws. For example, in Denmark, an auditor must go further than commenting on the "presence and content of the statement" and assure that a "check of disclosures is a part of the review of the management report" (CSR Europe & GRI, 2017, p. 19). However, most member states do not diverge from the Directive. For example, in Germany, there is "no mandatory verification, but if the report is verified by an auditor or an independent assurance services provider, the audit report has to be published" (CSR Europe & GRI, 2017, p. 21).

Moreover, even for the member states requiring audit or assurance, the audit and assurance processes could be challenging to develop, given that there are no specific assurance guidelines. Companies may report self-congratulatory non-financial disclosures highlighting positive aspects and glossing over negatives without assurance. If such greenwashing holds, non-financial disclosure is less likely to reveal poor corporate social and environmental performance (Bowen, 2014), and companies will not be encouraged to improve their social and environmental performance.

Third, the lack of sanctions is another vital concern. This third characteristic corresponds to the third and fourth conditions proposed by Leong and Hazelton (2019, p. 829) that disclosed data need to be comparable to external benchmarks and linked to a "network of other relevant information. Clearly, the non-financial disclosures need to exist first, allowing stakeholders to compare the disclosures and connect the disclosures to other relevant information. Most member states have not specified any sanctions above and beyond the current penalties for not complying with corporate reporting legislation (CSR Europe & GRI, 2017). However, the sanctions may still have little impact, even with specific penalties. For example, in Italy, the sanctions of the Directive are "for omission of relevant information, non-compliance, or failure to submit within [the] timeframe, EUR 20,000–150,000" (CSR Europe & GRI, 2017, p. 23). For a large company with a turnover above 40,000,000 Euros, even a maximum fine is more of an annoyance than a deterrent. Although the non-compliance fines can extend to persons responsible for compliance in Bulgaria, the maximum fine is about 1500 Euros.

Moreover, given that the threshold for compliance with the minimum requirements of the Directive is low, the likelihood of a company or a person being sanctioned for non-compliance is low. For example, as the Directive specifies, companies may withhold "information relating to impending developments or matters in the course of negotiation to be omitted where the disclosure of such information would be seriously prejudicial to the commercial position of the undertaking" (CSR Europe & GRI, 2017, p. 8). Therefore, given the absence of sanctions with a sufficient deterrent to greenwashing and misinformation, isomorphic pressure is less likely to be initiated, and companies are less likely to improve their social and environmental performance.

Following Leong and Hazelton's (2019) analysis, we identify that the Directive lacks three characteristics critical to driving changes in companies' social and environmental performance: specific guidelines for content and indicators, mandatory auditing and assurance, and stricter sanctions for non-compliance. Thus, the Directive is unlikely to improve an entity's social and environmental performance.

3.2.4. Research question

Given these shortcomings and mixed results, it is uncertain whether mandating non-financial disclosures can effectively improve social and environmental performance. Therefore, our study aims to answer the following research question:

RQ: Can we demonstrate, through broad-based evidence, that sustainability disclosure regulation has, in the past, led to enhanced corporate social and environmental performance? Specifically, has the implementation of the Directive improved the social and environmental performance of EU companies?

4. Data and research design

Following prior research, we obtained social and environmental performance data from the Thomson Reuters Asset4 database (Asset4)[8] (de Villiers, Venter, & Hsiao, 2017; de Villiers, Jia, & Li, 2022; Liang & Renneboog, 2017; Michelon, Pilonato, & Ricceri, 2015; Nguyen, Agbola, & Choi, 2019). Because this database has been rebranded as Refinitiv, we adopt this new name in this paper. Refinitiv uses a multilevel rating structure with more than 750 data points for each company each year, aggregated into more than 250 performance indicators across different categories that comprise the three pillars of environmental performance, social performance, and governance performance. Refinitiv data are comprehensive (Baboukardos, 2018). In Refinitiv, a higher score indicates a better performance, which facilitates the assessment of trends in a company's social and environmental performance.

Social performance includes community, human rights, product responsibility, and workforce. *Environmental performance* consists of emissions reduction, product innovation, and resource reduction. Although Refinitiv considers corporate disclosure in its rating process, its ratings include information gathered directly from NGOs and the news media. Thus, Refinitiv measures underlying performance rather than company disclosures (de Villiers et al., 2017). Refinitiv (Asset4) is a leading environmental, social and governance (ESG) database and is well-regarded by investors. For example, "it is estimated that investors that use Asset4 data manage more than €2.5 trillion assets" (Ferrero-Ferrero, Fernández-Izquierdo, & Muñoz-Torres, 2015, p. 197). In addition, Refinitiv has a high-quality rating process. Its data are "verified in a multistep process control procedure including data entry checks, automated quality rules, and historical comparisons" (Hartmann & Uhlenbruck, 2015, p. 735). More details on Refinitiv are provided in Appendix A.

Our initial sample consisted of all EU and US companies from 2009 to 2020 represented in the Refinitiv database. This sample period allows us to observe companies' social and environmental performance before and after the Directive took effect. Refinitiv covered more and more companies over the years. Changes in average performance over time could thus be due to the addition of new companies in later years. Using a balanced sample prevents bias from being introduced based on the composition of the sample changing over time (Fuest, Hugger, & Wildgruber, 2020; Pittman & Fortin, 2004). In addition, using a balanced sample can control for potential survivorship bias and omitted-variables problems (Wang & Yung, 2011). Therefore, we focus on the companies that appear in Refinitiv in each of the years 2009–2020 to ensure a fair assessment of trends (Gartenberg, Prat, & Serafeim, 2019). The focus reduced the initial sample to a balanced sample of 813 companies with 9756 firm-year observations. Table 1 shows the country sample, consisting of 343 EU companies and 470 US companies. Among the 343 EU companies, there are 64 French companies, followed by 48 German and 40 Swedish companies.

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[8] Asset4 was rebranded as Refinitiv in 2018.

5. Results and discussion

5.1. Univariate analysis – corporate environmental performance

Fig. 1 presents a line graph of the average environmental performance for the two groups of companies (EU and US). As Fig. 1 shows, there was an upward trend in average scores, indicating better environmental performance, for both groups from 2009 to 2020. Note that the gap between the EU and the US remained relatively constant. This observation suggests that, compared with the US (a jurisdiction not affected by the Directive), EU companies did not suddenly improve their environmental performance because of the Directive. Thus, this result suggests that the Directive has had little impact on the environmental performance of EU companies.

Table 2 shows the average environmental performance by country between 2009 and 2020. Overall, it reinforces the findings reflected in Fig. 1. We observe a consistent increase in average environmental performance scores for all countries in our sample. For example, in 2009, Spain had the highest environmental performance of the EU member states, with a score of 66.62, followed by Hungary (65.82) and France (61.95). In 2020, the top 3 countries were still Spain (78.81), France (75.65) and Hungary (74.36). In addition, the average increase for the EU from 2013, the year before the Directive, to 2015, the year after the Directive was promulgated, is 2.75%.[9] In the US, the average increase was 11.76%.[10] Thus, while the Directive was approved in 2014, EU companies did not dramatically improve their environmental performance compared to US companies. In fact, EU companies fell behind, comparatively. The same applies to increases around 2017 when the Directive came into force. From 2016 to 2018, the EU increased its average environmental performance score by 6.03%, compared to 10.63% for US companies, with the EU again falling behind the US. Over the entire period from 2013 (the year before the promulgation of the Directive) to 2020 (the most recent year in our dataset), EU companies increased their environmental performance score by 17.08% compared to a much higher 51.91% for US companies. These results again evidence that the environmental performance of EU companies did not improve more than in a region unaffected by the Directive.

5.2. Univariate analysis – corporate social performance

Our social performance findings mirror our environmental performance results. Fig. 2 shows the average social performance for the two groups of companies (EU and US), demonstrating that social performance steadily improved over the period. For example, for companies in the US, their average social performance score increased from 40.70 in 2009 to 58.91 in 2020; for EU companies, their social performance score consistently increased from 52.06 in 2009 to 74.41 in 2020. Again, the two lines in Fig. 2 do not converge, but the gap between EU companies and companies in the US slightly widened from 11.36 in 2009 to 15.50 in 2020. This evidence again shows that the Directive did not dramatically improve EU companies' social performance.

Table 3 shows the average social performance by country during 2009–2020. The figures reinforce what we learned from Fig. 2. All countries in the sample saw an increase in social performance scores. Spain had the highest social performance in 2009, scoring 69.57, followed by Hungary (66.44) and Portugal (65.47). Spain still topped the list with 86.47 in 2020, followed by France (81.34) and Hungary (79.76). The average increase in the social performance score in the EU from 2013 to 2015 was 9.98%[11], against 6.93%[12] in the US. The same applies to increases when the Directive came into force in 2017. The EU's increase from 2016 to 2018 was 8.21% compared to 6.93% for the US. From 2013 (just before the promulgation of the Directive) to 2020 (our most recent data), the average increase in social performance for the EU was 28.09%, compared to 31.76% for the US. The EU shows increases in social performance scores, but the increases are not much different from those in the US.

5.3. Difference-in-difference (DiD) analysis

Following the prior literature (e.g., Chen et al., 2018; de Villiers et al., 2022; Li, Jia, & Chapple, 2022; Wang, Cao, & Ye, 2018), we test the effect of the Directive on social and environmental performance by estimating the following DiD model (Equation (1))[13]:

$$\text{SOC/ENV}_{i,t} = b_0 + b_1 \text{POST}_{i,t} \times \text{TREAT}_{i,t} + \text{Control Variables}_{i,t} + \alpha_i + \delta_t + \varepsilon_{i,t} \tag{1}$$

The specification estimates a DiD model in which EU companies affected by the Directive are 'treatment companies'/the treatment group, and US companies, are selected as 'control companies'/the control group. Year and firm fixed effects (δ_t and α_I, respectively) are included in the regression to control for economy-wide shocks and time-invariant differences between treatment and control companies. We use robust standard errors clustered by firm, consistent with Adhikari (2016) and Wang, Yin, and Yu (2021).[14]

The dependent variables, SOC and ENV, capture corporate social and environmental performance, respectively. TREAT is an

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[9] (60.05–58.44)/58.44.

[10] (35.72–31.96)/31.96.

[11] (63.89–58.09)/58.09.

[12] (47.81–44.71)/44.71.

[13] In our regression model, TREAT and POST were omitted from the regression models, which is consistent with prior studies (e.g., Chen et al., 2018; Hu, Li, & Shevlin, 2021; Wang et al., 2018). Treat is absorbed by firm fixed effects and POST is omitted due to collinearity with POST × TREAT.

[14] We clustered at the firm level as we are interested in the firm-level outcome. Our results are also robust to clustering at the country level.

Table 1
Sample Selection per Country
Table 1 reports the number of companies in our sample per country.

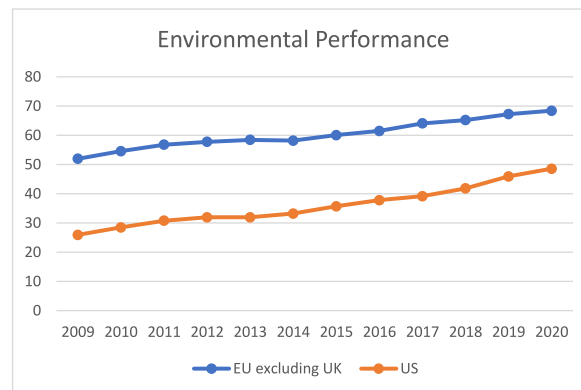| Country	Number of Companies
Austria	14
Belgium	20
Czech Republic	2
Denmark	22
Finland	21
France	64
Germany	48
Greece	1
Hungary	2
Ireland	12
Italy	29
Luxembourg	5
Netherlands	23
Poland	6
Portugal	8
Spain	26
Sweden	40
European Union in total (EU)	343
United States (US)	470
Total	813

Fig. 1. Average environmental performance of companies in the EU and the US (2009–2020).

indicator equal to 1 for EU companies mandated to comply with the Directive and 0 otherwise, i.e. US companies unaffected by the Directive. POST equals 1 for the years 2018–2020 and 0 for the years 2009–2013. Transition years (2014–2017) are omitted from the analysis to minimise any transition impact. Our main coefficient of interest is b_1, which captures the change in social and environmental performance for our treatment companies relative to the change for our control companies after the Directive mandate. If the exogenous increases in the performance are due to the enactment of Directive, b_1 is expected to be positive.

In terms of control variables, we follow previous studies (e.g., Cahan, De Villiers, Jeter, Naiker, & Van Staden, 2016; de Villiers & Marques, 2016; Flammer, 2015; Ioannou & Serafeim, 2012; Li, Jia, & Chapple, 2023) by controlling for firm size (measured as lnTA, the natural logarithm of total assets), firm performance (measured as ROA, return on assets ratio), NEWNESS (measured as net PPE scaled by gross PPE), cash holding (measured as CASHTA, cash and cash equivalents deflated by total assets), market-to-book ratio (measured as MTB), leverage (measured as LEV, total liabilities deflated by total assets), capital expenditure (CAPEXP, capital expenditure scaled by total assets) and firm risk (measured as VOLAT, volatility in stock price).

As mentioned in Section 4, we start with 9756 firm-year observations. After excluding control variables with missing data and the transition years, there are 5664 firm-year observations in the DiD analysis.

Panel A of Table 4 presents the results of the DiD analysis. In our regression model, TREAT and POST were omitted from the regression models. The results show that the POST × TREAT is not positively associated with ENV or SOC. For example, Column (1) of Table 4 shows the coefficient of POST × TREAT is significant and negative, evidencing that the Directive did not improve the environmental performance of EU companies. In fact, US companies' performance increased more than EU companies' performance. Column (2) shows no difference between the increase in EU and US companies' social performance after the Directive. These DiD results provide further evidence that the social and environmental performance of EU companies did not improve substantially after the Directive was implemented.

Table 2

Average Environmental Performance by Country (2009–2020)

Table 2 reports the average environmental performance per country per year.

Country	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	36.61	41.02	47.09	47.51	48.63	48.95	50.74	55.98	60.20	60.55	62.11	64.07
Belgium	42.34	45.04	45.76	46.63	47.73	47.10	48.98	50.18	53.64	59.65	64.18	66.15
Czech Republic	29.28	31.13	29.66	33.61	31.72	34.85	48.43	45.51	49.24	53.37	55.96	58.41
Denmark	39.65	47.52	46.92	47.10	48.75	47.21	48.13	47.94	50.36	51.31	54.78	58.41
Finland	56.73	60.11	64.72	66.14	67.38	66.62	70.87	70.88	72.00	74.48	73.50	74.33
France	61.95	62.43	64.01	67.58	68.08	68.79	70.33	71.77	74.03	74.41	75.18	75.65
Germany	49.57	52.98	52.25	55.30	54.67	54.92	56.43	58.55	60.83	61.51	62.89	63.62
Greece[a]	9.03	4.80	0	0	0	0	0	5.1	13.97	17.85	26.30	23.31
Hungary	65.82	72.27	70.98	73.59	68.81	74.23	77.44	75.87	74.02	75.95	72.36	74.36
Ireland	37.96	37.21	35.69	32.09	37.05	39.43	38.89	41.56	43.26	42.69	45.71	51.00
Italy	50.87	54.78	59.96	59.53	59.75	58.84	64.61	60.48	64.40	67.00	71.12	71.56
Luxembourg	39.08	41.78	42.58	44.71	43.00	43.62	44.59	46.74	49.97	51.90	61.35	63.23
Netherlands	53.01	56.82	59.77	58.17	60.82	59.86	62.64	64.52	69.04	69.07	69.52	68.99
Poland	11.82	14.51	19.22	19.64	20.96	19.70	23.15	35.86	49.60	49.92	51.96	52.55
Portugal	61.44	62.91	70.80	70.34	70.55	68.84	67.71	68.17	64.93	63.74	67.16	68.89
Spain	66.62	70.04	72.89	73.02	72.72	71.73	72.30	73.31	74.63	76.00	77.34	78.81
Sweden	56.98	56.73	60.80	59.53	60.15	59.40	62.01	63.32	65.19	65.34	68.23	69.13
European Union in total (EU)	51.97	54.58	56.79	57.76	58.44	58.18	60.05	61.49	64.08	65.20	67.25	68.42
United States (US)	25.92	28.48	30.79	31.94	31.96	33.22	35.72	37.80	39.16	41.82	45.93	48.55

[a] Greece has only one observation, with an environmental performance of 0 during 2011–2015.
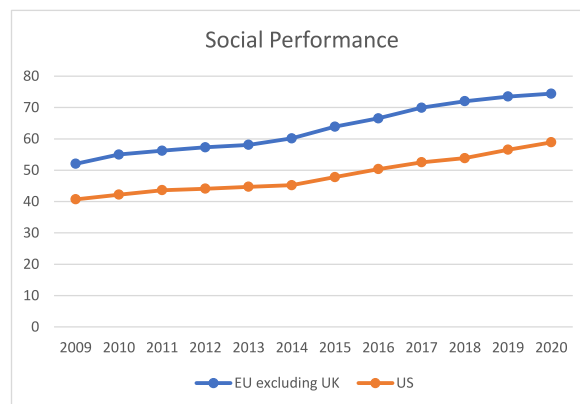

Fig. 2. Average social performance of companies in the EU and the US (2009–2020).

The validity of DiD analyses depends on the parallel trends assumption.[15] To examine whether there are any pre-treatment trends in our sample, we replace POST with several indicators. The indicator variables *Year-3*, *Year-2*, and *Year-1* refer to the years before 2014 (the passage year of the Directive). *Year 1 and after* refers to the years after 2018 (the implementation year of the Directive). Panel B of Table 4 presents the results of parallel trends. We find that the coefficient estimates on *Year-3*, *Year-2*, and *Year-1* are insignificant, indicating that the treatment group (EU companies) and their control group (US companies) share a similar trend in corporate social and environmental performance prior to the Directive, thus supporting the parallel trends assumption. We find that, in relation to environmental performance, the coefficient of *Year1 and after* is negative and significant. With regard to social performance, the coefficient of *Year1 and after* is insignificant. These results provide evidence, consistent with our main results, that the social and environmental performance of EU companies did not improve after the Directive was implemented.

5.4. Further tests

5.4.1. Machine learning techniques: GBRT and LASSO

Machine learning techniques are increasingly relied on in empirical accounting research (Bertomeu , 2020; Bao et al., 2020; Bertomeu, Cheynel, Floyd, & Pan, 2021; Chen, Cho, Dou, & Lev, 2022). Machine learning has designed algorithms that provide

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[15] As explained by Lemmon and Roberts (2010, p. 568), this analysis relates to the parallel trend assumption, which states that there are "… … similar trends in the outcome variables during the pre-shock era for both treatment and control groups". In other words, the results before the regulation are the key outcomes of parallel trend analysis.

Table 3

Average Social Performance by Country (2009–2020)

Table 3 reports the average social performance per country per year.

Country	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	35.95	43.61	43.78	45.14	47.08	46.77	48.54	54.28	62.72	63.25	64.80	64.80
Belgium	38.80	41.17	41.95	43.82	41.83	43.46	49.42	50.43	53.18	58.45	60.93	62.70
Czech Republic	42.90	33.99	33.04	31.40	31.20	29.04	33.58	38.52	52.02	55.42	52.90	65.56
Denmark	40.31	43.48	45.37	48.56	49.94	53.32	56.41	59.63	62.11	62.85	65.06	65.97
Finland	48.50	52.67	54.91	55.29	55.57	60.23	66.01	68.21	70.34	73.06	74.66	75.02
France	55.74	57.23	60.17	63.51	63.83	67.55	71.31	75.31	77.76	79.61	80.73	81.34
Germany	46.78	52.90	53.48	56.16	57.02	58.41	62.33	63.89	68.88	70.223	71.54	72.04
Greece	7.16	5.65	6.48	3.86	4.26	10.75	8.33	15.83	37.72	43.39	40.86	37.30
Hungary	66.44	70.68	58.99	78.13	75.24	81.46	80.28	77.69	77.90	76.86	78.39	79.76
Ireland	41.04	40.43	40.00	31.89	37.85	40.06	44.92	46.41	50.25	51.28	54.43	59.21
Italy	58.49	62.17	62.69	63.13	61.83	63.83	66.80	69.15	71.59	75.18	78.02	79.52
Luxembourg	40.07	43.98	43.44	40.41	40.90	43.38	49.73	53.59	58.49	60.55	72.19	71.17
Netherlands	62.93	67.14	65.47	60.89	65.54	64.01	69.27	68.86	72.63	73.94	75.17	77.34
Poland	26.81	32.18	38.81	37.67	36.54	31.87	29.74	37.05	51.66	61.33	63.10	63.27
Portugal	65.47	63.86	67.83	66.61	66.72	71.07	69.89	75.47	72.35	73.29	73.12	73.51
Spain	69.57	71.48	73.22	72.96	73.63	76.16	76.79	78.73	80.68	84.59	85.92	86.47
Sweden	57.85	58.57	60.89	62.10	62.96	64.54	70.31	73.39	75.62	75.92	45.61	75.05
European Union in total (EU)	52.06	54.99	56.21	57.30	58.09	60.17	63.89	66.54	69.93	72.00	73.51	74.41
United States (US)	40.70	42.19	43.62	44.10	44.71	45.24	47.81	50.37	52.54	53.86	56.53	58.91

advantages in detecting complex patterns in datasets, selecting "the best variables to explain an outcome variable", and revealing "suitable combinations of variables to make accurate out-of-sample predictions" (Bertomeu et al., 2021, p. 469). Therefore, we use machine learning methods to provide additional evidence regarding the reliability of our findings.

Following Gow, Larcker, and Zakolyukina (2023), we assess the out-of-sample predictive ability of the implementation of the Directive on EU companies' social and environmental performance to test the robustness of our baseline results discussed in Section 5.3. This assessment on out-of-sample predictive ability mitigates the potential for in-sample over-fitting and avoids an (undue) incentive "… … to validate a theory (or, at least, to organize a set of results along the predictions of a particular theory)" (Bertomeu , 2020, p. 1152). Specifically, if a relationship between the implementation of the Directive and EU companies' social and environmental performance is causal, adding this variable (i.e., the implementation of the Directive) to a model should improve the model's out-of-sample predictive ability and lower prediction errors. If the effect of this variable is mediated by other company characteristics or vice versa, the addition of the variable will not significantly change the prediction errors, and while the existence of a causal effect cannot be completely ruled out, the Directive is likely to have a minimal causal effect.

Following Bertomeu (2020), Bertomeu et al. (2021), and Gow et al. (2023), we first use the GBRT developed by Friedman (2001) to compare the predictive ability of a model including the Directive and company characteristics (i.e., our control variables in Eq. (1)) against another model based solely on company characteristics. As Bertomeu et al. (2021) and Yang, Chuang, and Kuan (2020) suggest, GBRT is preferred to other machine learning methods, because GBRT is robust in the face of outliers, variable scaling/transformations, inclusion of irrelevant inputs, missing observations, database errors, and even data snooping (Freedman, 2010). One significant advantage of GBRT is its ability to automatically identify all important interaction effects within the full set of predictors, which can assist in revealing more complex and insightful relationships among predictors (Jones, 2017). GBRT (Friedman, 2001) can be implemented in many software packages. In this study, we use the gbm package in R (Ridgeway, 2020).

Following Chen et al. (2022) and Gow et al. (2023), we split the training, validation and test data sets temporally. The training set is utilized to estimate the models, the validation set is employed to select the most suitable model, and the test set is used to assess the predictive performance. We use the last two years of data (i.e., 2019 and 2020) as an out-of-sample test set and the remaining data from earlier years as a training set. Consistent with Gow et al. (2023), for each year t in our training data, we use all the data up to and including year t to estimate the model and then use the following year t +1 as the validation set and apply the estimated model to the data from t+1 to compute the prediction error, also known as the validation error. We use cross-validation in the training data set to select the optimal hyperparameters for the gradient boosted regressor, including interaction depth, shrinkage parameter, bag fraction and the number of trees (Gow et al., 2023). The validation data set is used in assessing the performance of selected models. Once optimal hyperparameters are selected for the models, we then use the models to make predictions on the test data set and compare the models' predictions with the actual outcomes in the test data set. For each of our outcomes (i.e., ENV and SOC), we compute the test error as Root Mean Squared Error (RSME). Errors are positive with lower values corresponding to a better model, i.e., a model with better predictive ability.

Errors for each of our outcomes, ENV and SOC, are shown in Panel A and Panel B of Table 5. We also report t-statistics values that test for statistically significant differences in the errors. With t-statistics, we compare the model that includes company characteristics and the Directive with the model that includes only company characteristics. We find that adding the Directive does not statistically decrease RSME. This suggests that adding the Directive does not yield statistically significant improvements in the predictive ability of model. As Gow et al. (2023, p. 10) suggest, if addition of the Directive does not improve the predictive ability, "while the existence of a causal effect cannot be completely ruled out", the Directive has "a trivial causal effect, if any".

Table 4

Difference-in-differences (DiD) Analysis

Panel A of Table 4 reports the results of DiD analyses. *ENV* is measured as the corporate environmental performance. *SOC* is measured as corporate social performance. *TREAT* is an indicator equal to 1 for EU companies (which are mandated to comply with the Directive, i.e. the treatment group), and 0 for US companies (which are the control group). *POST* equals 1 for the years 2018–2020 and 0 for the years 2009–2013. Panel B of Table 4 examines whether there are any pre-treatment trends in corporate social and environmental performance. The indicator variables *Year-3, Year-2*, and *Year-1* refer to the years before 2014. *Year 1 and after* refers to the year after 2018. The definitions of control variables are presented in Section 5.3.

Panel A. DiD Analysis	(1)	(2)
	ENV	SOC
POST × TREAT	−6.301***	3.231
	(-4.24)	(1.43)
lnTA	5.225***	5.095***
	(4.08)	(4.72)
ROA	−0.135	4.775
	(-0.02)	(0.98)
NEWNESS	−4.876	−5.952
	(-1.07)	(-1.53)
CASHTA	3.777	8.209*
	(0.69)	(1.68)
MTB	−0.044	−0.069
	(-0.43)	(-0.82)
LEV	−5.442	−0.137
	(-1.35)	(-0.04)
CAPEXP	−7.564	3.497
	(-0.63)	(0.34)
VOLAT	−27.013**	−16.588*
	(-2.48)	(-1.89)
Constant included	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	5664	5664
R square	0.85	0.87

Panel B: Parallel Trend Analysis	(1)	(2)
	ENV	SOC
Year-3 × TREAT	0.170	0.155
	(0.17)	(0.17)
Year-2 × TREAT	0.351	1.341
	(0.29)	(1.22)
Year-1 × TREAT	0.847	1.256
	(0.68)	(1.12)
Year1 and after × TREAT	−6.170***	3.733
	(-3.65)	(1.55)
Controls and Constant included	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	5664	5664
R square	0.85	0.87

The t-statistics using clustered standard errors by firms are included in parentheses.

***, **, * indicate significance at the 0.01, 0.05, and 0.1 levels.

In addition, we adopt the LASSO method, which assists us in examining the robustness of our baseline results from another perspective, namely predictive variable selection. LASSO has been widely used in variable-selection studies (Efron et al., 2004), and it "… … is a state-of-the-art selection tool" (Tian, Yu, & Guo, 2015, p. 90). As the literature (e.g., Croux, Jagtiani, Korivi, & Vulanovic, 2020; Hoang & Wiegratz, 2023; Li, Lou, Luo, & Xing, 2021; Tian et al., 2015) elaborates, LASSO has a penalty term to penalise large variable coefficients with little information, and the penalty term will reduce irrelevant coefficients to zero. Thus, it can effectively identify and exclude irrelevant or less important variables or predictors. For example, Chinco, Clark-Joseph, and Ye (2019) use LASSO to screen and identify unexpected, short-lived variables or predictors of stock returns. In our case, LASSO helps identify the predictors of EU companies' environmental and social performance. Therefore, if an association between the implementation of the Directive and EU companies' social and environmental performance is strong, LASSO would identify the Directive as a predictor. We use the STATA command 'lasso' to perform the analysis. We find that LASSO does not select the implementation of the Directive as a predictor. As Panel C of Table 5 shows, regarding EU companies' environmental performance, firm size, risk, leverage, the newness of property, plant, and equipment, and market-to-book ratio are the predictors selected by LASSO. Firm size, the newness of property, plant, and

equipment, risk, financial performance, and leverage are the LASSO predictors of the social performance. Given that the implementation of the Directive is not identified as a predictor, this reinforces our DiD results that the social and environmental performance of EU companies did not improve substantially after the Directive was implemented.

5.4.2. Regression analysis on the performance gaps between EU and US companies

In addition to the DiD analysis and GBRT, we conducted an alternative analysis focusing on the social and environmental performance gap between EU companies and those in the US to investigate whether the gap remained constant. If the 'entry-into-force' of the Directive increased the social and environmental performance of EU companies, we would expect the social and environmental performance differences between EU and US companies to increase, i.e. EU companies will outstrip their US counterparts. To test this, we use the following model (i.e., Equation (2)):

$$\text{SOC\_EU-US or ENV\_EU-US}_{i,t} = b_0 + b_1 \text{Directive}_{i,t} + \text{Control Variables}_{i,t} + \alpha_i + \delta_t + \varepsilon_{i,t} \quad (2)$$

Similar to our DiD analysis, we include year fixed effects (δ_t) in the model to control for economy-wide shocks and firm fixed effects (α_i) to capture time-invariant differences. We use robust standard errors clustered by firm.[16]

The dependent variables, SOC_EU-US and ENV_EU-US, capture the social and environmental performance differences between EU companies and the average country-level performance of the US in a particular year. Specifically, ENV_EU-US is measured as the corporate environmental performance of each EU firm year minus the average of the corporate environmental performance of US companies in the same year. Similarly, SOC_EU-US is measured similarly for corporate social performance. The control variables used in the regression model are the same as those used in Section 5.3.

The variable of interest, Directive$_{i,t}$, is a dummy variable that equals 1 after the implementation of the Directive (years after 2017) and zero before the promulgation of the Directive (years before 2014). Thus, we compare firm-years before 2014 with firm-years after 2017. Transition years (2014–2017) are omitted from the analysis to minimise any transition impact. This alternative analysis can be better explained with an example. Suppose we would like to estimate the effect of the Directive in Italy in 2019 on corporate social performance. For each firm in Italy, we subtract its level of social performance from the average social performance of US companies in the same year. As economy-wide shocks may occur in Italy simultaneously and affect the social performance gap, we also control other firm-specific unobservable differences by using firm fixed effects. Thus, if the Directive improved the social performance of EU companies, the performance gap between companies in Italy and companies in the US would widen, and vice versa. Our main coefficient of interest is b_1. A positive and significant b_1 would show that the gap between the EU and US companies was greater after the implementation of the Directive, suggesting that the Directive caused improvements in performance over and above improvements in the voluntary disclosure environment.

The regression results are reported in Table 6. The results show that the Directive is not positively associated with ENV_EU-US, and SOC_EU-US. For example, as Column (1) of Table 6 shows, the coefficient of ENV_EU-US is significant and negative, providing evidence that the Directive does not improve the environmental performance of EU companies over and above their US counterparts. Overall, the results of DiD analysis and those of our alternative analysis are consistent and suggest that the Directive did not cause improvements in performance among EU companies over and above improvements in the US.

5.4.3. Alternative measures of corporate social and environmental performance

To demonstrate the robustness of our results in the face of criticism regarding the reliability and divergence of ESG databases (e.g., Berg, Koelbel, & Rigobon, 2022; Chatterji, Levine, & Toffel, 2009; Chatterji, Durand, Levine, & Touboul, 2016), we used the social and environmental scores from MSCI as an alternative source of measures of corporate social and environmental performance and re-estimate our main DiD regressions discussed in Section 5.3. In this way, we go beyond Fiechter et al. (2022), who use only Refinitiv (Asset4) in their analyses. Our results using the alternative measures are shown in Appendix B. These MSCI-based results are consistent with our main results, suggesting that the Directive has not improved European companies' social and environmental performance. Appendices C and D graph the trends in average environmental and social performance of EU and US companies using MSCI data, which are also consistent with our main analyses and interpretations.

5.5. Discussion

Globally, many stakeholders, from regulators to investors and financial analysts, evaluate businesses' social and environmental impacts (Beveridge & Diamond, 2021). Therefore, companies face increased pressure from stakeholders (coercive isomorphism) to disclose their social and environmental impact, even when the reporting is voluntary. However, given the continued criticisms of greenwashing and companies not providing consistent, balanced, and credible disclosures, some countries and regions have introduced disclosure mandates, such as the Directive, which came into effect in 2017, adding more pressure (coercive isomorphism). Given the size of the EU's population and economy, understanding the Directive's impact on social and environmental performance is important. In addition, given the current clamour for sustainability disclosure regulations, including initiatives by the IFRS/ISSB, the SEC and the EU's own EFRAG, it is important to consider whether these regulations effectively improve social and environmental performance. Therefore, our study takes a longitudinal perspective to observe social and environmental performance developments in

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[16] We clustered at the firm level as we are interested in the firm-level outcome. Our results are also robust to clustering at the country level.

Table 5

Gradient boosted regression tree (GBRT)

Table 5 presents the prediction errors for each of our outcomes, ENV and SOC. We also report t-statistics values that test for statistically significant differences in prediction errors. Specifically, we compare a model that includes company characteristics and the Directive with a model that only includes company characteristics.

Panel A: ENV		
	Root Mean Squared Error (RMSE)	t-statistic for the difference in prediction errors
Company characteristics	0.213403	
Company characteristics and The Directive	0.213396	0.705

Panel B: SOC		
	RMSE	t-statistic for the difference in prediction errors
Company characteristics	0.22795	
Company characteristics and The Directive	0.22515	1.084

Panel C. Variables selected as predictors by LASSO	
Predictor variables for ENV:	SIZE VOLAT LEV NEWNESS MTB
Predictor variables for SOC:	SIZE NEWNESS VOLAT ROA LEV

***, **, * indicate significance at the 0.01, 0.05, and 0.1 levels.

Table 6

Regression Analysis of the Differences between EU and US companies' Social and Environmental Performance

Table 6 reports the results of regression analyses to examine how the differences between the EU and US companies concerning social and environmental performance change. *ENV_EU-US* is measured as the corporate environmental performance of EU firm-years minus the average of the corporate environmental performance of US companies in the same year. *SOC_EU-US* is similarly measured for corporate social performance. The definitions of control variables are presented in Section 5.3.

	(1)	(2)
	ENV_EU-US	SOC_EU-US
DIRECTIVE	−12.335***	−1.016
	(-7.59)	(-0.61)
lnTA	3.918**	5.045***
	(2.38)	(3.00)
ROA	0.579	−1.090
	(0.09)	(-0.15)
NEWNESS	0.070	−1.480
	(0.01)	(-0.28)
CASHTA	−1.936	14.103*
	(-0.26)	(1.91)
MTB	−0.235	−0.262
	(-1.32)	(-1.50)
LEV	4.233	2.359
	(0.69)	(0.37)
CAPEXP	−13.368	9.147
	(-1.10)	(0.64)
VOLAT	−32.749**	−31.644**
	(-2.19)	(-2.20)
Constant included	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	2496	2496
R square	0.81	0.77

The t-statistics using clustered standard errors by firms are included in parentheses.

***, **, * indicate significance at the 0.01, 0.05, and 0.1 levels.

EU companies and compare those trends with other jurisdictions.

Fiechter et al. (2022) focus on the 'passage' effect of the Directive and find that the 'passage' of the Directive positively affects the regulated companies' social performance (but not their environmental performance). As Fiechter et al. (2022, p. 1542) explain, a limitation of their work is that it "presents early evidence, as we include in our analyses only one reporting year after the entry-into-force of the CSR Directive." However, our analysis, which compares the pre-passage period to a longer period of the post-implementation of the Directive, does not reveal any evidence that the social and environmental performance of EU companies dramatically improved after the Directive's mandatory disclosure requirements were implemented.[17] Nor did performance improve over and above that of US companies. Unlike the expectations derived from institutional theory (de Villiers et al., 2014), the new disclosure rules do not appear to have changed corporate social and environmental behaviours through coercive or normative isomorphism. Thus, we provide broad-based evidence that the Directive has not greatly impacted social and environmental performance, and this legislation has not played a key role in advancing social and environmental performance.

According to the literature, social and environmental performance in the US is influenced by political ideology (Antonini, Olczak, & Patten, 2021; Di Giuli & Kostovetsky, 2014). For example, companies that are more affected by Republican political ideologies have lower environmental performance (Di Giuli & Kostovetsky, 2014), and companies headquartered in states strongly supporting Trump in the 2016 election were more likely to reduce their climate change disclosure (Antonini et al., 2021). Given the Republicans' political dominance from 2014 to 2018, when they controlled the House and the Senate[18], along with Trump's 2016 election victory, US companies had relatively lower institutional pressure on their social and environmental performance and were, therefore, less likely to dramatically improve their social and environmental performance. At the same time, companies in the EU were facing increased pressure with disclosure requirements such as the Directive (Beveridge & Diamon, 2021). Yet despite optimum conditions to see the gap between the two regions widen – less pressure in the US and more pressure in the EU – our results show that the opposite happened.

Our results are consistent with prior single-country studies, including Arvidsson and Dumay (2022), whose analysis involves 27 Swedish companies and Doni, Bianchi Martini, Corvino, and Mazzoni (2020), based on 60 Italian organisations. However, our findings are based on more comprehensive and generalisable data. Theoretically, the results reinforce Leong and Hazelton's (2019) analysis that, to initiate isomorphic pressure, mandates on non-financial disclosure need to have several characteristics, including providing clear and specific guidelines for disclosure, forcing audit or assurance to improve data quality, and having effective sanctions that reduce the occurrence of non-compliance.

Consistent with our findings, we argue that the slight improvement in social and environmental performance in EU companies may not be because disclosures have now been regulated, as the increases in performance scores did not outstrip that of US companies. Instead, the improvements may be driven by managers' assessment that societal norms have changed and that stock market performance and investor demands drive corporate decisions (Shackleton et al., 2022). These are forms of coercive institutional pressure – the perceived need of managers to strive for legitimacy – and perhaps of normative isomorphism, where managers believe that enhancing social and environmental performance is doing the right thing.

Our results show that the Directive mandating non-financial disclosure has not improved corporate social and environmental performance. Therefore, future mandatory disclosure regulation must incorporate different characteristics to improve corporate social and environmental performance. Following the prior research, these characteristics should include specific disclosure guidelines, mandatory assurance, and significant sanctions for non-compliance (Leong & Hazelton, 2019). Policymakers need to review the characteristics of any future social and environmental disclosure requirements in line with these suggestions.

6. Conclusions

Business cannot prosper in a world of "poverty, inequality, unrest and environmental stress, and so it has a vital interest in ensuring that the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals" are pursued (UNGC, 2018, p. 4). Disclosing these pressing issues can be guided by mandatory requirements. For this reason, our study aims to answer whether the Directive has influenced the social and environmental performance of EU companies. Analysing a cross-country sample from 2009 to 2020, we find that social and environmental performance has not meaningfully improved since the Directive was enacted, and instead of EU companies increasing their performance more than US companies, there was either no difference (for social performance) or US companies improved more than EU companies (for environmental performance). Thus, the results suggest that the Directive did not have the intended impact on the social and environmental performance of EU companies. Our results are supported by a number of important robustness tests, including machine learning methods (i.e., GBRT and LASSO) and the use of an alternative ESG database.

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[17] UK companies make up almost a third (31.77%) of Fiechter et al.'s (2022) EU sample. However, since the UK passed several regulations of a social nature within the sample period, e.g. the 2015 Modern Slavery Act, this design choice does not yield a clean sample of treatment companies. Therefore, we exclude UK companies from our treatment group throughout this paper. When we include UK companies in additional untabulated analyses similar to our main analyses in Table 4, our results for social performance become significant at the 10% level, indicating that social performance of the treatment group is higher than the control group after the Directive, while our results for environmental performance remain qualitatively similar to our main results. Thus, we are able to replicate Fiechter et al.'s (2022) results with our data, but this may lead to the conclusion that EU companies improved their social performance, while the result is due to improved UK corporate social performance, which was influenced by additional factors over and above the Directive.

[18] https://www.theguardian.com/us-news/2014/nov/04/us-midterm-elections-republican-wins-senate-takeover; https://www.theguardian.com/us-news/2018/nov/08/democrats-republicans-senate-majority-minority-rule (accessed on 11 March 2022).

Our study contributes to the literature on mandatory non-financial disclosure from three perspectives. First, distinct from Grewal et al. (2019), who examine how the markets react to the Directive, our study investigates how the Directive affects social and environmental performance. Differentiating from Fiechter et al. (2022) who are interested in the 'passage' effect of the Directive and who includes UK data in their EU sample, our work examines the 'entry-into-force' effect of the Directive while using a clean EU dataset excluding UK companies that were subject to additional regulations, e.g. the 2015 Modern Slavery Act. Second, distinct from Arvidsson and Dumay (2022), who only examine the effect of the Directive on 27 Swedish companies, and Jackson et al. (2020), who investigate mandates on non-financial disclosure before the Directive, our study provides broad-based evidence on the effectiveness of the Directive to enhance social and environmental performance. Third, we contribute to the debate over the effectiveness of mandatory non-financial disclosure by providing cross-country evidence on a mandate that affects a large economic block, namely the EU. Theoretically, our study supports Leong and Hazelton's (2019) framework that specific guidelines for disclosure, assurance requirements, and effective sanctions are important for a mandate on non-financial disclosure to drive changes in corporate social and environmental performance.

Whether or not mandating non-financial disclosures is effective at driving improvements in corporate social and environmental performance is currently a prominent and important topic. Hence, our results should interest policymakers, investors, directors, and other stakeholders. Nevertheless, our results should be assessed after considering two potential limitations which could inspire future research. First, due to the limitations of Refinitiv, our sample focuses on relatively large EU companies. Thus, whether and how the Directive impacts medium-to-small EU companies is not covered. However, note that the Directive was meant to improve large EU companies' social and environmental performance, which it does not appear to have done. Future studies might examine medium-to-small companies to provide more comprehensive evidence of the Directive's impact. Second, Refinitiv's data can be criticised for being a noisy proxy for social and environmental performance. Therefore, we used an alternative dataset, MSCI, and found similar results. Nevertheless, future studies could shed more light by relying on better social and environmental performance measures once these become available.

Data availability

Data will be made available on request.

Appendix A

This appendix provides more information on Refinitiv (Asset4) data. This appendix is based on Refinitiv (2021).

Components of Environmental and Social Performance	Description
Resource Use	Measures a company's performance in reducing the use of raw materials, energy, and water and in identifying more eco-efficiency solutions.
Emissions Reduction	Measures a company's commitment to and performance in reducing environmental emissions.
Environmental Innovation	Measures a company's performance in developing new environmental technologies and processes and using eco-designed products.
Workforce	Measures a company's performance regarding employees from different aspects, including job satisfaction, workplace, diversity and equal opportunities, and career development opportunities.
Human Rights	Measures a company's performance in respecting human rights in its operation.
Community	Measures a company's performance as a good corporate citizen, protecting public health and respecting business ethics.
Product Responsibility	Measures a company's performance regarding customers, including providing quality goods and services, considering customers' health and safety, and integrity and data privacy.

Appendix B

This appendix provides the results based on MSCI data and corresponds to Section 5.4.3. Panel A shows the DiD results using MSCI data to measure corporate social and environmental performance. Panel B shows whether there are any pre-treatment trends in corporate social and environmental performance. Panel C shows regression results of performance gaps (corresponding to Section 5.4.2) using MSCI data.

Panel A: DiD Analysis	(1)	(2)
	ENV	SOC
POST × TREAT	0.016	−0.292
	(0.19)	(-1.52)

(continued on next page)

(*continued*)

Panel A: DiD Analysis	(1)	(2)
	ENV	SOC
Controls and Constant included	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	5112	5112
R square	0.91	0.91

Panel B: Parallel trend analysis	(1)	(2)
	ENV	SOC
Year-3 × TREAT	−0.933	0.040
	(-1.50)	(0.73)
Year-2 × TREAT	−0.063	0.036
	(-1.08)	(0.69)
Year-1 × TREAT	−0.051	0.058
	(-0.99)	(1.32)
Year1 and after × TREAT	−0.021	−0.126
	(-0.51)	(-1.56)
Controls and Constant included	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	5112	5112
R square	0.91	0.91

Panel C: Alternative Analysis	(1)	(2)
	ENV_EU-US	SOC_EU-US
DIRECTIVE	0.036	−0.461
	(0.20)	(-1.20)
Controls and Constant included	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	1406	1406
R square	0.81	0.78

The t-statistics using clustered standard errors by firms are included in parentheses.
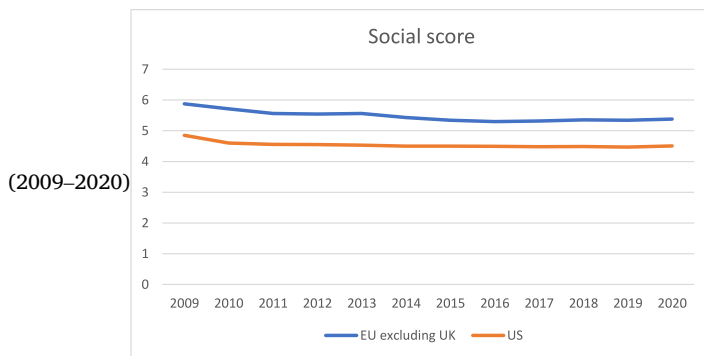
***, **, * indicate significance at the 0.01, 0.05, and 0.1 levels.

Appendix C

MSCI   -   Average   Environmental   Performance   of   Companies   in   the   EU   and   the   US

(2009–2020)

Environmental score

EU excluding UK   US
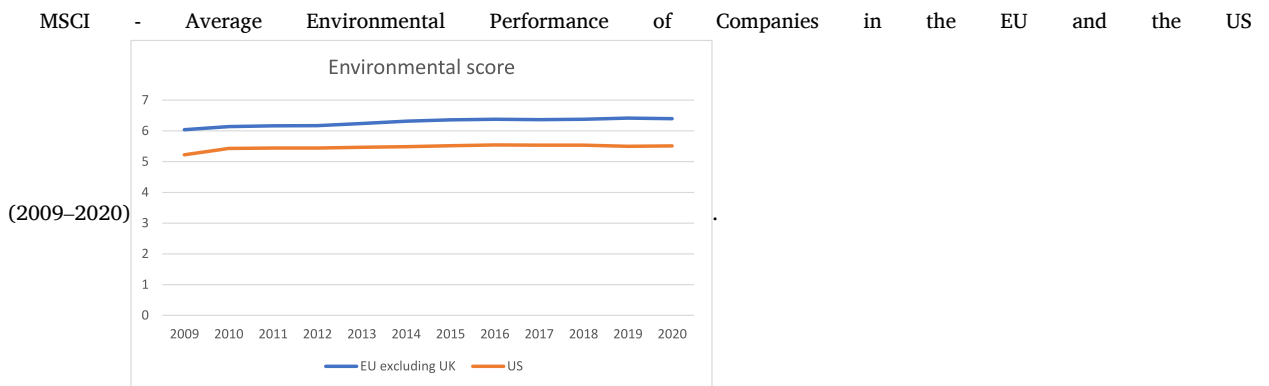
Appendix D

MSCI   -   Average   Social   Performance   of   Companies   in   the   EU   and   the   US

(2009–2020)

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