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Corporate sustainability in green FinTech: Impacts on performance and corporate governance

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Purpose: This study aims to evaluate the impact of FinTech companies' corporate sustainability reports on corporate performance in the United Kingdom (UK). Additionally, the study examines the effect of corporate governance on this association. Moreover, it investigates whether there is a relationship between a FinTech company's performance and the number of green certificates it holds, as well as its position in the 'Green Ranking'.

Design/methodology/approach: The study uses a sample of the UK FinTech firms from 2010 to 2022. The dynamic System Generalised Method of Moments technique is employed in the methodological approach to examine the main hypotheses.

Findings/results: The study findings indicate a positive relationship between the disclosure of corporate sustainability reporting and the corporate performance of FinTech companies. This relationship is further strengthened by corporate governance, which enhances firm performance. Contrary to expectations, the number of green certificates and the 'Green Ranking' exhibit an inverse relationship with the firm's performance.

Practical implications: The study offers valuable insights into the FinTech industry, aiding policymakers and investors in enhancing transparency among FinTech firms. This enhancement is crucial for the growth of the real economy and financial markets, particularly in understanding the relationship between FinTech characteristics and firm performance.

Originality/value: This study addresses gaps in the existing literature by examining the impact of corporate sustainability on the UK FinTech companies. It also considers the influence of corporate governance, aiming to enhance our understanding of the FinTech sector and provide valuable insights for decision-makers and investors.

Keywords: green FinTech; corporate sustainability; corporate performance; corporate governance; green ranking; United Kingdom.

Introduction

Sustainability has gained significant attention because of the environmental harm resulting from economic activities. In this context, 'FinTech' can enhance resource utilisation and promote sustainable economic growth (Pizzi et al., 2021). Moreover, 'FinTech' describes enterprises that employ information technology (IT) to deliver or enable financial services (Basole & Patel, 2018). This sector is dominated by tech firms that bypass traditional financial entities to offer products and services directly to consumers, primarily via digital and mobile platforms (World Economic Forum, 2015). The FinTech industry is poised for permanence, bolstered by rapidly advancing technologies such as machine learning, smart contracts, blockchain and artificial intelligence (AI) (Riemer & Johnston, 2019). Observing patterns from other sectors that have undergone technological upheavals, such as the music and mobile phone sectors, it is clear that a similar tech-driven transformation is in progress within the realm of financial services, as discussed by Pereira and Romero (2017) and Riemer and Johnston (2019). These technological advancements have significantly transformed the financial services industry, leading to the emergence of the FinTech service companies.

In line with the other business sectors, the financial services industry unprecedentedly transformed because of technological innovation. The penetration of technological advancements into the financial industry modified its key features and activities, and, hence, the new term 'FinTech service companies' was introduced for the current financial industry (Gomber et al., 2018). The essential characteristics embedded with the FinTech industry involve Internet usage, mobile

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devices, modern software and cloud activities to provide financial services at the advanced level, which ultimately provides the consumers with a central position in the new business models (Aquilani et al., 2020; Basole & Patel, 2018; Gao & Bai, 2014; Margulis et al., 2020).

The main advantage of FinTech technology is to enhance customer satisfaction by providing them with user-friendly services at lower cost, at any time and in any location by using the advanced tools of AI, in essence, blockchain, big data and cloud computing (Liu et al., 2020). The FinTech industry not only allows the new smaller companies to start a business but also opens the way for growing companies, e-retailers and other non-financial companies to conduct business using the advanced techniques of FinTech (OECD, 2020). The FinTech industry is highly dynamic and subject to rapid enhancements, as noted by Li et al. (2017) and Cao et al. (2020). Thus, the FinTech revolution increased the power of customers, who became more aware of the cost and efficiency of several online products and services. Therefore, financial services providers must enhance their efforts to build their image and reputation to gain advantageous customer trust. AlNawayseh et al. (2020) claimed that after coronavirus disease 2019 (COVID-19), customers would prefer the FinTech services because of the increased trust, value, benefits and lower relevant risks.

The United Nations declared FinTech technology advancement a key player in assisting and supporting the achievement of long-term sustainable development goals (SDGs) (Pizzi et al., 2021). More specifically, as Zetzsche et al. (2021) highlighted the FinTech serves as a crucial mechanism for financial drivers, underlining the role of government support and regulatory backing in realising the SDGs. However, research on sustainability disclosure in the FinTech sector is limited. Merello et al. (2022) found that Corporate Social Responsibility (CSR) reporting enhances the market value of the US FinTech companies. Furthermore, Atayah et al. (2024) found that non-FinTech firms often outperform their FinTech counterparts in sustainability and stock performance, indicating a need for actual Environmental, Social and Governance (ESG) disclosure to protect shareholder interests. Additionally, Giakoumelou et al. (2024) found a positive link between ESG reporting and capital raised in the European Union (EU) FinTech firms, showing that investors prioritise environmental risks. Similarly, Udeagha and Ngepah (2023) and Lisha et al. (2023) found that green finance and FinTech positively promote environmental sustainability in the BRICS countries.

Given the anticipated effect of FinTech firms on sustainability, it has become more relevant to explore whether these firms are sustainable or not. Further, what is the influence of FinTech businesses on sustainability and how does this influence enhance the performance of the FinTech industry itself? Thus, the current study aims to scrutinise the sustainability prospects of FinTech organisations and investigate their impact on value addition, specifically in terms of corporate performance indicators such as return on assets (ROA) and return on equity (ROE). The study analysis concentrates on the aggregate effect of all the FinTech firms, irrespective of the nature of their services. To be more precise, this study delves into the examination of the UK-based FinTech firms from 2010 to 2022. This study utilises the System Generalised Method of Moments (GMM-SYS) to examine the main hypotheses, the two-stage Heckman model to address the endogeneity concerns and the Difference-in-Difference (DID) method to assess the effect of the 2008 financial crisis (FCRS) on the results. The data for this study are sourced from Thomson Reuters Eikon, FAME databases and manually collected sustainability indices, such as green rankings and certifications.

This study offers several significant contributions. Firstly, to our knowledge, it is the inaugural research that assesses the effects of sustainability indicators of the UK FinTech companies on their corporate performance. It provides the FinTech firms at various stages of maturity with clear and tangible support for the financial implications of their corporate sustainability report. The findings of this study suggest that the disclosure of corporate sustainability reporting is positively correlated with the corporate performance of FinTech companies and the presence of a CSR Committee at the board level further strengthens this relationship. Interestingly, the number of green certificates a FinTech company holds and its position in the 'Green Ranking' are inversely related to its performance.

This study focuses on the UK as a developed market with unique institutional characteristics and capital market features. Institutional investors in the UK rely on CSR reports from firms to guide their investment decisions (Solomon & Solomon, 2006). Additionally, the activity and size of FinTech organisations vary significantly across countries, creating diverse ecosystems for these firms. According to the 2022 edition of Klynveld Peat Marwick Goerdeler's (KPMG's) Pulse of FinTech report, the UK remains a leading hub for FinTech innovation in Europe (KPMG, 2022).

Secondly, previous research has investigated how corporate governance (CG) and oversight influence decisions regarding corporate sustainability initiatives and the valuation of companies participating in CSR endeavours. These studies have established a positive relationship between the selection of CSR activities and the presence of robust internal and external governance and oversight structures. Moreover, Jo and Harjoto (2011, 2012) found a positive link between CSR involvement and the valuation of companies. Consequently, this research seeks to bridge the existing knowledge gap by exploring how CG affects the relationship between corporate sustainability and performance within FinTech companies. Aligning with the findings of Lu (2021), the study analysis documents that companies with more stringent CG are inclined to exhibit higher levels of corporate sustainability, thereby enhancing their overall performance. Thirdly, this study offers a significant understanding of the FinTech sector, assisting decision-makers and investors in improving openness within FinTech companies.

The rest of the research study has the following sections. The second part establishes the sound footing of the study by proposing background from the literature and developing hypotheses. The third part explains the sample selection and analytical techniques used. The fourth part expresses the results. The final part concludes the whole study along with recommendations and future directions.

Theoretical perspectives, literature review and development of hypotheses

An overview of a FinTech company

The emergence of financial technology innovations was catalysed by the evolution of electronic finance and mobile solutions within the financial sector amid the 2008 worldwide economic downturn (Gomber et al., 2018). This movement has been defined by the amalgamation of electronic finance breakthroughs, extensive data analytics, digital networking platforms, social media, machine intelligence and cyberspace advancements (Lee & Shin, 2018). Owing to these progressive developments in FinTech, numerous established financial entities, including banks, have been compelled to re-evaluate their operational frameworks (Davis et al., 2017). Consequently, 'FinTech' denotes enterprises that deliver or enable financial services leveraging digital technology. The FinTech landscape is dominated by tech firms that bypass conventional financial intermediaries, offering direct products and services to consumers primarily via Internet-based and mobile pathways (World Economic Forum, 2015).

Furthermore, Kim (2018) describes:

> Financial technology, also known as 'FinTech', as a burgeoning concept that acts as a fundamental disruptor to every facet of the contemporary financial ecosystem. FinTech encompasses a wide range from mobile payment systems to High-Frequency Trading (HFT) and includes crowdfunding, digital currencies and blockchain technology. (p. 200)

Additionally, Leong and Sung (2018, p. 75) characterise FinTech as 'any innovative ideas that enhance the functioning of financial services through the application of technology solutions designed for particular business scenarios'.

FinTech represents those organisations that utilise technology-oriented systems to offer cheaper and innovative financial services to transform a conventional financial business relatively more effectively (Gimpel et al., 2018; Gomber et al., 2017, 2018; Liu et al., 2020; Lee & Shin, 2018; Riemer & Johnston, 2019; Schueffel, 2016). Following the Fourth Industrial Revolution, the intensified rivalry among financial institutions has continued to escalate. Therefore, these dynamic organisations continuously change, and their rapid development makes it hard to quantify their potential and size. As per the composition of the industry, financial service providers can be divided into three main categories: (1) emerging entities like start-ups that offer new products or services, (2) incumbents or conventional financial services suppliers and finally (3) technological organisations that provide products, service and tool in that field.

The activity and size of FinTech organisations significantly change among different countries, providing different ecosystems for the FinTech organisations. In the 2022 edition of KPMG's Pulse of FinTech report (KPMG, 2022), it is noted that:

> 'Despite a slowdown in UK FinTech investment compared to last year, the UK continues to be a hub of FinTech innovation within Europe, with British FinTech firms securing more investments than their counterparts in France, Germany, China, Brazil, and Canada combined.' (p. 35)

The FinTech ecosystem is anchored by five pivotal components: (1) established financial institutions, which serve as the traditional backbone; (2) financial service consumers, who drive demand; (3) governmental agencies, which provide oversight and regulation; (4) technology innovators, who push the boundaries of what is possible and (5) FinTech start-ups, known for their agility and disruptive potential (Lee & Shin, 2018). The consensus is that a high concentration of these elements within a specific geographic area significantly boosts the ecosystem's socio-economic influence within that country.

A high concentration corresponds to fewer conventional financial entities, leading to several technological advancements as it is convenient to share useful knowledge. When the financial landscape is more dispersed, it leads to the formation of smaller entities. Despite this fragmentation, competition is intensified. Resources are allocated more broadly, yet these organisations' worldwide influence and extent are reduced (Lee & Shin, 2018). Financial inclusion represents a singular advantage of FinTech, as it offers customers affordability and accessibility to financial services. Such elements improve the market dynamics from the perspective of invested capital and transactions, which is normal in less-regulated countries (Cumming & Schwienbacher, 2018). This results in developing services and products far from the financial regulatory bodies' domain, like substituted payment systems and crowdfunding platforms. A less-regulated scenario reduces costs, improving the cost-effectiveness of financial services and promoting technological advancements (Hornuf & Schwienbacher, 2017).

The security and trust of consumers are essential elements in ensuring the future sustainability of an organisation and are primarily acquired through regulation (Senyo & Osabutey, 2020). In contemporary society, increased state involvement raises citizens' expectations regarding their rights, leading to a decline in trust in market mechanisms. Consequently, a paternalistic climate is fostered within the state-individual relationship, heightening the demand for competent authorities to develop systems with investor confidence and security in the intermediary agents. However, this also increases costs and reduces process efficiency (Cobla & Osei-Assibey, 2018; Mugambi et al., 2014). Insufficient knowledge and confidence are the primary factors that lead individuals to favour established financial institutions over FinTech companies (EY, 2019). These challenges can be mitigated by establishing regulatory sandboxes, often protected environments, where firms can experiment with new services, products and business models without facing the typical regulatory consequences (Financial Conduct Authority, 2016).

A wide range of business models constitutes the FinTech companies, and these models are customer-oriented and yield innovative services and products. In their exploration of the FinTech landscape, Lee and Shin (2018) delineated the diverse business models into six distinct categories, each defined by its core value proposition: (1) Payment systems: This category encompasses a range of services, including online currency exchange, cross-border money transfers, virtual branch banking, direct peer-to-peer transactions and mobile payments within retail environments. (2) Asset management: Encompassing digital platforms that offer investment guidance, manage investment portfolios and provide tools for retirement planning and financial organisation. (3) Collective funding: Platforms that facilitate the pooling of funds for ventures and projects through a collective investment approach. (4) Digital lending: Comprising solely web-based loan providers, loan marketplace platforms and digital intermediaries that connect borrowers with lenders. (5) Financial markets: Business models catering to capital markets. (6) Digital insurance (Insurtech): This includes comparative platforms for insurance rates, integration of insurance services with smart technology and mobile-exclusive insurance offerings.

Theoretical perspectives

The research study utilises stakeholder and institutional theories to explore how CSR reporting enhances legitimacy and financial performance in FinTech companies. The study begins by employing stakeholder theory, as outlined by Freeman (1984), whose work reshaped the understanding of firms by advocating for the consideration of external stakeholders beyond the typical groups like shareholders, customers, employees and suppliers. This shift gave rise to new forms of managerial thinking and action (Jonker & Foster, 2002). In this view, organisations are tasked with responsibly addressing a more comprehensive array of stakeholder interests, crossing more fluid organisational boundaries and recognising their responsibility to traditional interest groups and silent stakeholders, such as the environment and local communities (Simmons, 2004).

Stakeholder theory redefined organisational responsibilities by proposing that shareholders' needs can only be fully met while also addressing the interests of other stakeholders. This shift moved the focus beyond direct profit maximisation. Even when a firm prioritises shareholder interests, its overall success depends on how it engages with other stakeholders (Hawkins, 2006). Many argue that a broader, more inclusive stakeholder approach enhances shareholder wealth and increases the total value generated by the firm (Phillips et al., 2003).

According to stakeholder theory, a firm's value and performance are influenced by its strategic actions to meet various stakeholders' expectations and interests (Freeman, 1984). Specifically, implementing a CSR strategy focusing on the well-being of internal stakeholders, such as employees, managers and directors, can boost employee productivity and loyalty, ultimately improving the firm's financial performance (Cho et al., 2006; Frank & Obloj, 2014). While CSR efforts aimed at external stakeholders might not yield immediate gains in profitability or operational efficiency, they can help build a strong reputation and increase customer satisfaction, enhancing the firm's future performance (Kang et al., 2010).

Next, the study incorporates institutional theory, which clarifies how organisations conform to the expectations and norms of their institutional environment to gain legitimacy and ensure survival (DiMaggio & Powell, 1983). These externally imposed rules shape corporate activities, becoming widely accepted practices within specific contexts (DiMaggio & Powell, 1983), as evidenced by the global focus on environmental and social issues. In the context of FinTech companies, this theory can be used to understand how external pressures, such as environmental regulations and societal expectations for sustainability, influence their strategic decisions (Bansal & Clelland, 2004; Eccles et al., 2014).

Corporate sustainability and financial outcomes

The meaning of sustainability in the financial organisation is the delivery of services and products designed to fulfil the needs of the general population and safeguard the environment, all while generating profit (Sannino et al., 2020). Hence, organisations providing financial services are increasingly committed to promoting sustainable development with varying activities; such firms impact borrowing organisations with lending decisions, contributing towards economic growth and sustainability (Nguyen & Nguyen, 2020). There is an increasing demand from investors for crucial information about protecting the environment and corporate and social governance risks (Traxler et al., 2020). Consequently, companies will focus on sustainable performance to achieve organisational aims such as maximising profits and market value (Traxler et al., 2020). Lee and Maxfield (2015) asserted that by reporting on sustainability performance, organisations can reduce agency costs and facilitate more accessible access to capital markets. Organisations widely link the creation of value for various stakeholders with CSR (Adams, 2017).

Nevertheless, the challenge of generating value over the long term arises from shareholders' short-term investments and a limited grasp of the company's strategic direction (Cho et al., 2015). Flammer and Ioannou (2021) believe that organisations that retain their investments in CSR have demonstrated high efficiency after crisis years because such investments play an essential role in the crisis time of an organisation. Communicating the actions of CSR not only impacts the organisation itself or shareholders, but it also influences the investors, customers and competition and, broadly, the entire society. Credit is given to organisations that communicate their CSR efforts. As Alcaide et al. (2019), Alcaide González et al. (2020) noted, this enables stakeholder groups to gain a new understanding of the organisation and its adopted policies.

Many studies have found a positive link between CSR and organisational performance (Cherian et al., 2019; Cupertino et al., 2019; Ok & Kim, 2019; Orlitzky et al., 2003). Miralles-Quiros et al. (2017) also demonstrated that the CSR information disclosed by the listed firms is useful for the European Stock Market investors in making decisions, but this usefulness differs among markets. The CSR reports positively and significantly affect the firm valuations in the German and the UK markets, but not in other markets, except for the Swedish market, where the CSR reports negatively influence the firm share value (Miralles-Quiros et al., 2017). However, this link is not definitive, as different studies have obtained different outcomes. For instance, Sheikh (2019) identified a negative relationship between CSR and firm leverage, which varies based on market competition. Conversely, Margolis and Walsh (2003) contended that the connection is not substantial.

Moreover, a Pricewaterhouse Coopers (PwC) survey in 2019 revealed that 56% of over 700 public company directors felt that boards overemphasised sustainability. The CSR Committee on the board are essential for CG, as they help prevent corruption, protect stakeholders, generate long-term value and minimise the risk of responsibility failures (Gennari & Salvioni, 2019). CSR boards are especially vital for financial services providers in developed markets, as they ensure economic stability and protect the firm's reputation (Scholtens & Van't Klooster, 2019).

FinTech companies possess crucial tools to enhance customer transparency and reduce costs, thereby bolstering the sustainability of the financial sector. Several studies have assessed sustainability practices within well-established financial institutions, including banks (Costa-Climent & Martínez-Climent, 2018; Galletta et al., 2021). In a study conducted by Almaqtari (2024), the researchers investigated the influence of IT governance on the connection between FinTech adoption and sustainability performance in Indian commercial banks. The findings highlighted the pivotal role of IT governance in shaping banks' strategic planning for sustainable initiatives, FinTech development and technological advancements. These factors collectively contribute to a positive and significant impact on sustainability performance (Almaqtari, 2024).

Existing literature indicates limited research on sustainability disclosure within the FinTech sector. Notably, Merello et al. (2022) investigated the relationship between sustainability practices and company performance, finding that issuing CSR reports positively impacts the market value of FinTech companies. Furthermore, Atayah et al. (2024) investigated the relative sustainability and stock performance of non-FinTech companies compared to FinTech firms in the United States. Surprisingly, the findings indicated that non-FinTech enterprises performed better than their FinTech counterparts. Their findings highlight the significance of robust ESG disclosure practices in mitigating agency problems and protecting shareholders' interests.

The existing body of research on ESG disclosure predominantly centres around EU entities, which are currently the sole subjects of formal regulations in this domain. Giakoumelou et al. (2024) analysed EU FinTech firms to explore the relationship between sustainability profiles and valuations. Their findings suggest a positive relationship between ESG reporting and the amount of capital raised. Investors pay particular attention to physical and transition risks, especially given the context of information asymmetry. Interestingly, the relatively nascent FinTech sector faces lower levels of trust, as evidenced by the signalling effect of mere ESG disclosure (Giakoumelou et al., 2024).

Moreover, Udeagha and Ngepah (2023) and Lisha et al. (2023) investigated the potential effects of green finance[1] and FinTech in BRICS countries on environmental sustainability. Their research underscores the positive contributions of FinTech, green finance and energy innovation to environmental well-being. However, it is essential also to consider the adverse impact of natural resources and economic expansion. Despite this, empirical research on the relationship between ESG disclosure and its influence on the UK FinTech firms' performance still needs to be explored. Building upon the above arguments, the present study proposes the following hypothesis:

H1: The disclosure of CSR reporting is positively associated with the financial performance of FinTech companies, and the existence of a dedicated CSR Board Committee amplifies this association.

Sustainability reporting creates a transparent account of a company's initiatives and performance that contribute to sustainable development. A report related to sustainability must reveal the governance models and values of organisations to bring change and promote sustainable business activities (GRI, 2019). To attain sustainable goals in a company, systematic reporting mechanisms and sustainability indicators must be adopted through sustainability reports to improve the reporting quality corresponding to the instrumental context (Traxler et al., 2020). Corporate management also wants to find the environmental impacts on a company's finances.

Increasing awareness about the ESG challenges has recently led to the development of agencies that supply scores and standards for organisations' sustainability performance. As discussed in the previous sections, limited research studies demonstrate the positive relationship between green certificates of listed organisations and improvement in financial performance (De Jong et al., 2014).

1. Green finance, as defined by Lindenberg (2014, p. 1), involves 'financial investments flowing into sustainable development projects and initiatives, environmental products and policies that encourage the development of a more sustainable economy'.

Nevertheless, these research studies investigated the effect of one CSR initiative. In their study, Orzes et al. (2017) examined the impact of the United Nations Global Compact (UNGC) on firm performance. The UNGC is a significant CSR initiative that aligns companies' strategies and operations with human rights, labour, environment and anti-corruption principles. Wu et al. (2020), Arocena Garro et al. (2021) and Ojiako et al. (2024) also explored similar themes using the International Organization for Standardization (ISO) 14001 certification.

To achieve all greenhouse gas emissions to net zero by 2050, the UK government has enacted new laws under the Climate Change Act 2008 that will affect all organisations across different sectors and sizes. This follows the G7 agreement in June 2021 to require climate reporting based on the recommendations of the Global Taskforce on Climate-related Financial Disclosures (TCFD). The initial phase of this mandate will impact companies with over 500 employees and an annual turnover exceeding £500 million. However, it is anticipated that, eventually, all businesses will be required to establish and disclose their sustainability goals. Unfortunately, many of the UK's 6m small- to medium-sized enterprises (SMEs) face difficulties achieving sustainability because of limited resources, time or expertise to address their social and environmental impacts, including carbon emissions.

Several studies have employed sustainability indices that are not publicly available, such as Kinder, Lydenberg, Domini (KLD), Southern Weekend, FTSE4 Good or the Dow Jones Sustainability Index (DJSI). These indices measure and track companies' ESG performance across various sectors and regions (Ding et al., 2016; Duran & Bajo, 2014; Kao et al., 2018; Kutay &Tektüfekçi, 2016). However, RE 100 was developed in 2014 by Climate Group in the integration with the carbon disclosure project (CDP), which aims to provide a bridge between the most impactful companies dedicated to 100% renewable energy. Four different agencies in this century started to develop free-access rankings of sustainability. These agencies are: Yahoo Finance Server, Reputation Institute, Corporate Knight and Newsweek. Except for the Reputation Institute, all others are in press. They score organisations between 1% and 100%, the CSR level of the largest organisations in the world annually, and the scores are incorporated in different rankings such as 'Finance Yahoo Sustainability', 'Global 100 most sustainable corporations', 'RepTrack' and 'Green Ranking'[2] (Alcaide González et al., 2020; Merello et al., 2022).

From an institutional theory perspective, companies may seek green certifications to comply with regulatory requirements and align with stakeholders' expectations (Delmas & Toffel, 2008). However, obtaining and maintaining these certifications can be costly and resource intensive, potentially diverting resources from core business activities and negatively impacting financial performance (Delmas & Toffel, 2008). High positions in Green Rankings can also enhance a company's reputation and attract environmentally conscious investors and customers (Abdelzaher & Newburry, 2016; Lyon & Shimshack, 2015). Nevertheless, the efforts required to achieve and maintain high rankings may involve significant investments in sustainable practices. These practices might not yield immediate financial returns and could negatively affect short-term performance (Eccles et al., 2014). In line with the above argument, the following hypothesis is proposed:

H2: The FinTech company's performance is negatively related to its number of green certificates and its position in the Green Ranking.

Research design

In the next section, this study presents the research design, detailed description and measurement of the data and variables and the empirical methodology employed.

Data and sample selection

The sample used in this study encompasses the UK FinTech firms and covers the period from 2010 to 2022. We obtained economic and financial performance, CG and sustainability variables from the Thomson Reuters Eikon and FAME databases. In contrast, data about sustainability indices, in essence, 'Green Ranking' and green certificates, were manually collected from annual company website reports. After excluding missing data and firms that appeared only for 1 year, we were left with 645 observations. However, complete data were unavailable for specific variables and years, resulting in an unbalanced panel sample.

Variables description and measurements

The description and the measurements of the dependent, independent and control variables used in this study are provided in Table 1.

Empirical model

This study aims to examine how the CSR reporting affects the financial performance of FinTech firms and whether this effect is enhanced by having a CSR Board Committee (H1). Moreover, the study explores the connection between the number of green certificates a FinTech firm holds, their positions in the 'Green Ranking' and the firm's performance (H2). The following model was employed to evaluate the proposed hypotheses by utilising the GMM-SYS:

2.The 'Green ranking' lists the top 500 companies based on environmental performance. It uses eight criteria to measure their impact: how much energy, greenhouse gases, water and waste they produce; how much revenue they generate from green products or services; how they link executive pay to environmental goals; how they have a board committee dedicated to sustainability and how they verify their environmental data. Alcaide González et al. (2020) and Merello et al. (2022) use the Green Ranking measures in their studies. This study uses the 'Green Ranking' as a source of data, which has been available since 2010.

TABLE 1: Variable description and measurements.

Variables	Abbreviation	Description and measurements
Part A: Dependent variables		
Return on assets	ROA	Return on assets measures the returns generated by the assets of the company and is calculated by dividing net income before extraordinary items by total assets in year *t*
Return on equity	ROE	Return on equity measures the returns generated by the equity of the company and is calculated by dividing a company's net income by total equity in year *t*
Part B: Independent variables		
CSR reporting	CSR_REPG	A binary variable that indicates whether the firm publishes a CSR report in year *t*, with 1 for yes and 0 for no.
Green Ranking	G_RAKG	A binary variable represents whether the firm belongs to Green Ranking in year *t*, with 1 for yes and 0 for no.
Green certificates	G_CRTF	The number of green certificates obtained by a firm in year *t*. The following certificates were considered in this study: 'B Corp, The Ethical Company Organisation, Planet Mark, Future-Fit Business, Social Value of the UK, Good Business Charter, Impact Group, GHG Protocol, SDG Compass, ISO 14001, UN Global Compact, Responsible 100'.
Part C: Control variables		
Dummy of the total carbon dioxide	CO_2_DUM	A binary variable that has value = 1 if the firm provides information about its entire carbon dioxide in year *t*, and if it does not provide, then 0 will be awarded. The amount of carbon dioxide, measured in tonnes, emitted into the atmosphere during the year.
CSR Committee	CSR_CMMT	A binary variable indicates whether the firm has a CSR Committee in year *t*, with 1 for Yes and 0 for No.
Board size	BORD	The number of board members that sit on each of the company's boards in year *t*.
Firm size	SIZE	The natural logarithm of the total assets in year *t*.
Firm leverage	LEVG	Leverage measures the economic-financial structure of a firm and is computed by dividing total debt by total equity in year *t*.
Net income per employee[3]	NIEMP	Net income per employee for a firm is calculated by dividing the firm's net income by the number of employees in year *t*.
Price-to-earnings	PTE	The price-to-earnings ratio indicates the amount investors are ready to pay for a single unit of a company's earnings. This metric is obtained by dividing the firm's current share market price by its earnings per share in year *t*.

ISO, International Organization for Standardization; CSR, Corporate social responsibility; UK, United Kingdom; GHG, Greenhouse Gas; SDG, sustainable development goals; UN, United Nations.

$$\begin{aligned}\mathrm{PERF}_{i,t} &= \alpha_0 + \mathrm{PERF}_{i,t-1} + \alpha_2\mathrm{CSR\_REPG}_{i,t} \\ &+ \alpha_3\mathrm{CO2\_DUM}_{i,t} + \alpha_4\mathrm{G\_RAKG}_{i,t} \\ &+ \alpha_5\mathrm{G\_CRTF}_{i,t} + \alpha_6\mathrm{CSR\_CMTT}_{i,t} \\ &+ \alpha_7\mathrm{BORD}_{i,t} + \alpha_8\mathrm{SIZE}_{i,t} + \alpha_9\mathrm{LEVG}_{i,t} \\ &+ \alpha_{10}\mathrm{NIEMP}_{i,t} + \alpha_{11}\mathrm{PTE}_{i,t} + \sum \mathrm{Year} + \alpha_{i,t} \qquad \text{[Eqn 1]}\end{aligned}$$

where:

PERF represents a dependent variable in year *t* for a firm *i*. In the present study, there were two definitions of dependent variable: (ROA, Model_1) and (ROE, Model_2). The lagged PERF is included as an explanatory variable to account for the persistence of performance over time (Al-Shattarat et al., 2022; Qiu et al., 2016).

Results

Descriptive statistics

Table 2 displays the summary statistical data for all variables examined in this study. The average ROA is 0.012, indicating low but positive profitability for the average FinTech company. In contrast, the average ROE is –0.193, accompanied by a high standard deviation of 6.952, suggesting significant variability and that many firms may be unprofitable. The average firm size is 11.160, with a standard deviation of 2.318, indicating moderate variation among the sample. Additionally, the average leverage ratio of 0.194 suggests that these companies maintain a relatively low level of debt, indicating a conservative approach to financing.

Furthermore, 51% of organisations have a CSR Committee, and approximately, 86% release a CSR report, providing comprehensive information in their annual reports. Additionally, over 2% of organisations are recognised in Green Ranking sustainability indices, and nearly 43% hold at least one green certificate. Notably, 61% of firms have CO_2 emission data available. The average board size is 7.460 members, with a range from 1 to 16 members, indicating diversity in governance structures.

This research initiated the empirical analysis by estimating pairwise Pearson correlations between all dependent and independent variables as shown in Table 3. Consistent with H1, CSR_REPG has a significant positive correlation with ROA, with a coefficient of 0.401 at the 1% significance level. CSR_CMMT and BORD have significant correlations of 0.236 and 0.204 at the 1% and 5% significance levels, respectively, with ROA.G_CRTF and G_RAKG having negative coefficients of 0.581 at the 1% significance level and 0.206 at the 5% significance level with ROA, respectively, consistent with H2.[3]

Moreover, none of the correlation coefficients in Table 3 exceed 0.80, a threshold considered acceptable according to Gujarati (1995). Consequently, multicollinearity is irrelevant to this analysis. Additionally, the variance inflation factors for all regressions are, on average, 2.13.

Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

3. Both sales per employee (SEMP) and net income per employee (NIEMP) are recognised as valid proxies for measuring employee performance (Sun & Yu, 2015). NIEMP provides a profitability-based perspective, offering a broader reflection of employees' contributions to firm performance beyond revenue generation. Therefore, NIEMP is considered a more suitable measure of employee performance. However, in the untabulated results, this study adopted SEMP as an alternative measure. The main results remain consistent, as both proxies produced similar outcomes with only minimal variations. Please note that the untabulated results for SEMP are available upon request.

TABLE 2: Descriptive statistics.

Variables	Mean	Standard deviation	Minimum	Maximum
ROA	0.012	0.046	-0.991	0.181
ROE	-0.193	6.952	-199.883	7.154
CSR_REPG	0.861	0.346	0.000	1.000
CO_2_DUM	0.612	0.445	0.000	1.000
G_RAKG	0.021	0.116	0.000	1.000
G_CRTF	0.433	1.159	0.000	9.000
CSR_CMMT	0.511	0.374	0.000	1.000
BORD	7.460	3.052	1.000	16.000
SIZE	11.160	2.318	1.275	17.701
LEVG	0.194	0.131	0.000	0.472
NIEMP	3.004	2.875	0.010	30.236
PTE	88.011	1290.910	-461.831	35686.120

ROA, return on assets; ROE, return on equity; CSR_REPG, CSR reporting; G_RAKG, Green Ranking; G_CRTF, green certificates; CO_2_DUM, Dummy of the total carbon dioxide; CSR_CMMT, CSR Committee; BORD, Board size; SIZE, firm size; LEVG, firm leverage; NIEMP, net income per employee; PTE, price-to-earnings.

TABLE 3: Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. ROA	1.000	-	-	-	-	-	-	-	-	-	-	-
2. ROE	0.031	1.000	-	-	-	-	-	-	-	-	-	-
3. CSR_REPG	0.401***	-0.065	1.000	-	-	-	-	-	-	-	-	-
4 CO_2_Dum	-0.006	0.072	0.185*	1.000	-	-	-	-	-	-	-	-
5. G_RAKG	-0.206**	-0.028	-0.012	-0.044	1.000	-	-	-	-	-	-	-
6. G_CRTF	-0.581***	-0.100	0.558***	-0.142	0.118	1.000	-	-	-	-	-	-
7. CSR_CMMT	0.263***	-0.091	0.506***	0.207**	0.074	0.421***	1.000	-	-	-	-	-
8. BORD	0.204**	0.062	0.204**	0.336***	0.007	0.176*	0.263***	1.000	-	-	-	-
9. SIZE	0.397***	0.206**	0.305***	0.281***	0.091	0.406***	0.307***	0.403***	1.000	-	-	-
10. LEVG	-0.016	0.043	0.116	-0.115	-0.019	-0.003	0.001	0.047	-0.015	1.000	-	-
11. NIEMP	-0.113	0.081	-0.115	-0.288***	-0.011	0.117	0.099	0.174*	0.015	0.041	1.000	-
12. PTE	-0.045	-0.002	-0.036	0.177*	-0.004	-0.028	-0.026	-0.063	-0.002	-0.001	-0.001	1.000

ROA, return on assets; ROE, return on equity; CSR_REPG, CSR reporting; G_RAKG, Green Ranking; G_CRTF, green certificates; CO_2_DUM, Dummy of the total carbon dioxide; CSR_CMMT, CSR Committee; BORD, board size; SIZE, firm size; LEVG, firm leverage; NIEMP, net income per employee; PTE, price-to-earnings.
*, Indicates significant correlation at 10% levels; **, Indicates significant correlation at 5% levels; ***, Indicates significant correlation at 1% levels.

Empirical results

The applied methodology is based on a dynamic linear panel data model (GMM-SYS). It also addresses endogenous variables by employing their levels and variances as instrumental variables[4]. This study included the first lag in the dependent variable as an explanatory variable. The Sargan test assesses the instruments' validity and confirms the over-identification restrictions. These constraints are imposed for all circumstances. The estimation outcomes utilising the GMM-SYS for ROA and ROE (corresponding to Model_1 and Model_2, respectively) are shown in Table 4. Notably, both ROA and ROE exhibited significant positive values in both models. This finding suggests a direct association between the financial performance metrics of FinTech companies and their corresponding values from the previous year. Considering this factor alongside the relevant variable enhances the credibility of our study.

Considering the sustainability variable, we find that CSR_REPG positively and significantly impacts both ROA (Model_1) and ROE (Model_2) at a 1% significance level. This suggests that CSR reporting contributes to better financial performance. Besides, regarding CG variables – specifically, CSR_CMMT and BORD – both were found to have a positive and significant association at levels of 5%, with both ROA (Model_1) and ROE (Model_2). These results indicate that these variables are associated with improved financial performance for the firm.

Overall, our results are consistent with prior research (Krishnamurti & Velayuthaman, 2017; Merello et al., 2022), indicating that firms with CSR disclosures achieve higher sustainability performance and improve their financial outcomes. Additionally, our results support stakeholder theory, highlighting the significance of stakeholders' interests in the social impact and sustainability practices of the FinTech companies.

Table 4 reveals that the number of green certificates obtained by a company, specifically its position in the Green Ranking, is negatively associated with ROA (Model 1) and ROE (Model 2). Therefore, the findings align with institutional theory (DiMaggio & Powell, 1983), suggesting that the negative impact on ROA and ROE could stem from the significant costs associated with these sustainability efforts (Delmas & Toffel, 2008; Eccles et al., 2014).

Regarding the control variables, specifically, firm size (SIZE) was a significant positive element in both ROA

4.The results of the Durbin-Wu-Hausman test confirmed the presence of endogeneity (Davidson & MacKinnon, 1993). With an F-value of 5.78 and a p-value of 0.017, the result is significant. Hence, the study utilised the GMM-SYS.

(Model_1) and ROE (Model_2). This positive association shows that the larger firms possess high profitability. The present study's results support that larger firms have a relatively strong sustainable profile (Alberici & Querci, 2016; Iatridis, 2013; Merello et al., 2022). In addition, leverage (LEVG) exhibits a negative relationship with ROA and ROE. This implies that firms with lower debt tend to achieve higher profitability, thereby contributing positively to the financial performance of the firms (Merello et al., 2022; Ok & Kim, 2019).

Endogeneity issue and additional test

Endogeneity issue

To address endogeneity concerns, this study employed a two-stage Heckman model. In the first stage, a probit model regressed a binary variable – indicating high (above the median) or low (below or equal to the median) CSR levels – on firm performance and control variables. The probit model demonstrated a good fit (Wald Chi-square = 345.53, $p < 0.001$), allowing the calculation of the inverse Mills ratio (Lambda). In the second stage, the inverse Mills ratio was added as an extra control in the hypothesis model. As a result, this additional analysis confirmed and supported our hypotheses.

Financial crisis 2008

This study applied a DID method to examine the influence of the 2008 FCRS on the estimation outcomes. The method assessed whether the FCRS significantly affected financial performance. By choosing 2008 and 2009 as the two breakpoints of the crisis, both outcomes indicated that the FCRS did not have a notable impact on financial performance (p-values of 0.231 and 0.247, respectively). Moreover, in line with existing literature (Jahmane & Gaies, 2020), this study introduced a dummy variable, FCRS, which takes a value of one during crisis years (specifically, 2008 and 2009 in this study). Thus, the results remained consistent even after incorporating this variable into the primary analyses.

Alternative measurement for firm performance

To test the sensitivity of the benchmark results to different measures of firm performance, this study employed various alternative measures of the main variables. For the dependent variables, this study used Tobin's Q and adjusted industry ROA to replace ROA, Model_1 and ROE and Model_2 used in the primary analysis. The results of the GMM-SYS regressions in Table 5 confirm the robustness and consistency of the previous models. Furthermore, this study followed the earlier research by Merello et al. (2022) and used different proxies for firm value such as market capitalisation and book value per share. The findings (omitted for brevity) align with those reported by Merello et al. (2022), but with some variations.

The moderating effect of the corporate governance index on the corporate sustainability reporting and corporate performance of the FinTech companies

The study also explores the moderating role of the CG index on the relationship between corporate sustainability and corporate performance in the FinTech companies. It addresses a gap in existing empirical research related to the CG index. Corporate governance plays a crucial role in enhancing the relationship between corporate sustainability and corporate performance. It is anticipated that CG will strengthen this relationship. Consequently, if the level of CG enhances this relationship, we expect a positive coefficient (Lu, 2021).

The composite score for CG is based on four board characteristics: board size, the dual role of chief executive officers, board independence and the presence of female directors (Lu, 2021). For each CG provision in the index, 1 is assigned if the disclosure is made in firms' accounts or reports and 0 otherwise. This value is then scaled from 0% to 100%, with an average of around 43%. Notably, both Gompers et al. (2003) and Karpoff et al. (2016) validate the reliability of this index. The study examines the moderating effect of the CG index on corporate sustainability and

TABLE 4: Empirical results for H1 and H2.

Variables	ROA, Model_1		ROE, Model_2	
	Coefficient	*t*-test	Coefficient	*t*-test
PERF	1.02	30.11***	0.89	25.07***
CSR_REPG	1.52	2.99***	1.01	2.67***
CO_2_DUM	-1.21	1.05	-1.49	1.31
G_RAKG	-0.81	-2.05**	-1.04	-1.91*
G_CRTF	-0.86	-1.92*	-1.11	-1.83*
CSR_CMTT	0.42	2.55**	0.63	1.97**
BORD	1.52	2.36**	1.09	2.06**
SIZE	7.15	3.08***	6.13	3.98***
LEVG	-0.89	-2.22**	-0.78	-2.04**
NIEMP	0.33	1.36	0.45	1.08
PTE	-0.04	-0.19	-0.01	-0.39

Note: PERF = dependent variable in year t for firm i. ROA, Model_1: Year = yes, Wald (Chi^2) = 699.09***; ROE, Model_2: Year = yes, Wald (Chi^2) = 599.73***.

ROA, return on assets; ROE, return on equity; CSR_REPG, CSR reporting; G_RAKG, Green Ranking; G_CRTF, green certificates; CO_2_DUM, Dummy of the total carbon dioxide; CSR_CMMT, CSR Committee; BORD, board size; SIZE, firm size; LEVG, firm leverage; NIEMP, net income per employee; PTE, price-to-earnings.

*, Indicates significant correlation at 10% levels; **, Indicates significant correlation at 5% levels; ***, Indicates significant correlation at 1% levels.

TABLE 5: Empirical results for alternative measurement of firm performance.

Variables	Tobin's Q		Adjusted industry ROA	
	Coefficient	*t*-test	Coefficient	*t*-test
PERF	1.11	30.03***	1.02	29.44***
CSR_REPG	1.29	3.35***	1.04	2.68***
CO_2_DUM	-1.05	0.96	-1.21	1.34
G_RAKG	-0.94	-2.11**	-1.03	-1.99**
G_CRTF	-0.77	-2.22**	-1.05	-1.85*
CSR_CMTT	0.61	2.54**	0.69	1.92*
BORD	1.19	2.18**	1.07	2.01**
SIZE	6.98	3.39***	4.61	2.97***
LEVG	-0.53	-2.11**	-0.70	-2.18**
NIEMP	1.04	1.44	1.02	1.61
PTE	-0.07	-0.67	-0.03	-0.22

Note: PERF = dependent variable in year t for firm i. Tobin's Q: Year = yes, Wald (Chi^2) = 609.05***; Adjusted industry ROA: Year = yes; Wald (Chi^2) = 577.09***.

ROA, return on assets; CSR_REPG, CSR reporting; G_RAKG, Green Ranking; G_CRTF, green certificates; CO_2_DUM, Dummy of the total carbon dioxide; CSR_CMMT, CSR Committee; BORD, board size; SIZE, firm size; LEVG, firm leverage; NIEMP, net income per employee; PTE, price-to-earnings.

*, Indicates significant correlation at 10% levels; **, Indicates significant correlation at 5% levels; ***, Indicates significant correlation at 1% levels.

performance. The untabulated results[5] indicate a positive and significant relationship with coefficients 0.0041 for ROA and 0.0223 for ROE at the 1% level, suggesting that CG enhances firm performance.

Limitations and directions for future research

Despite the study's notable strengths, several limitations can be viewed as opportunities for future research. Firstly, this study assessed the FinTech's success indicators in a developing country, specifically the UK. To broaden the scope, future research could extend this methodology to financial and non-financial sectors in other emerging and developed nations. This avenue of investigation is particularly intriguing given the rapid growth and economic diversification experienced by these countries, which renders them appealing to foreign investors. One significant direction is exploring the potential link between the sustainability profile and the business models of the FinTech firms. This involves understanding how different business models may influence a firm's approach to sustainability and how sustainability considerations may, in turn, shape these models.

Furthermore, it would be interesting to evaluate sustainability in terms of the level of regulations operating in a country. This could provide insights into how regulatory frameworks can promote sustainability in the FinTech industry. It would be beneficial to examine the role of these frameworks in encouraging sustainable practices and whether they facilitate or hinder the adoption of such practices.

Secondly, the study predominantly employed a quantitative approach to evaluate the success indicators in sustainable FinTechs. Integrating qualitative and quantitative research would enhance the study's findings and better understand how key success factors impact sustainable business development. Another promising area of research is analysing how the FinTech's rise influences sustainability practices in traditional banking. This could involve a comparative study of sustainability practices in the FinTech firms and the traditional banks as well as investigating whether and how the FinTech's growth drives changes in these practices.

Conclusion

The Fourth Industrial Revolution, initiated by the German government in 2013, has profoundly transformed the business environment, revolutionising management practices, operational processes and marketing strategies. This transformation is fuelled by advanced technologies, including AI, big data, machine learning and blockchain (Atayah & Alshater, 2021). A crucial component of this revolution is the FinTechs, which have been rapidly embraced by millennials, a generation exceptionally skilled at adopting new technological innovations. As technological advancements progress, the FinTech organisations' significance in individuals' lives and broader economies has grown substantially.

This research study makes several significant contributions. Firstly, it is the first study to assess the impact of sustainability indicators on the corporate performance of the UK FinTech companies. Doing so provides clear and tangible support for the financial implications of their corporate sustainability reports across different stages of maturity. Secondly, prior research has explored how CG and oversight influence decisions related to corporate sustainability initiatives and the valuation of companies engaged in CSR efforts. This study aims to fill an existing knowledge gap by examining how CG influences the relationship between corporate sustainability and performance within the FinTech sector. Thirdly, this study enhances our understanding of the FinTech industry, providing valuable insights for decision-makers and investors seeking to promote transparency within the FinTech companies.

The current study is based on stakeholders' theory and explains stakeholders' curiosity in getting knowledge about the social effects and sustainability perspectives of the FinTech firm. This study utilises the GMM-SYS approach to examine the impact of FinTech companies' corporate sustainability reports on corporate performance in the UK FinTech firms from 2010 to 2022. The findings of this study establish a positive relationship between the FinTech firms' CSR disclosure and their firm financial performance. The existence of a CSR Board Committee further strengthens this connection. Intriguingly, an inverse relationship is observed between the number of green certificates a FinTech company possesses, its standing in the 'Green Ranking' and the firm's performance. According to institutional theory, this could imply that the negative impact on ROA and ROE may result from the substantial costs of engaging in these sustainability initiatives. Furthermore, the current study is valuable for the FinTech industry, policymakers and investors. It enhances the transparency of FinTech firms, contributing to the growth of the real economy and financial markets.

The study confirms its strength by employing further tests, such as the two-stage Heckman model, different measures of firm performance (such as Tobin's *Q* and adjusted industry ROA) and consistent outcomes even when considering the FCRS in the primary analysis. Additionally, the study contributes to the body of knowledge on CG by exploring its role in influencing the connection between corporate sustainability and the FinTech companies' performance. The results emphasise that CG reinforces the association between corporate sustainability and the FinTech companies' performance metrics.

5.Untabulated results for this section are available upon request.

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Author's contributions

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Data availability

The datasets generated during and/or analysed during the current study are available from the corresponding author, R.S.H., upon reasonable request.

Disclaimer

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