

Kaupke, Katharina; zu Knyphausen-Aufseß, Dodo

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## RESEARCH ARTICLE

# Sustainability and firm value in the oil and gas industry—A vicious circle?

Katharina Kaupke | Dodo zu Knyphausen-Aufseß 

Technische Universität Berlin, Berlin

**Correspondence**

Dodo zu Knyphausen-Aufseß, Technische Universität Berlin, Strasse des 17. Juni 135, Berlin 10623, Germany.  
Email: [knyphausen@strategie.tu-berlin.de](mailto:knyphausen@strategie.tu-berlin.de)

**Abstract**

The relationship between sustainability (or CSR) and company value has been intensively researched in recent times. However, the specifics of individual industries have not been sufficiently taken into account. Our study aims to fill this research gap. We focus on the oil and gas industry as a particularly powerful and controversial industry. Based on legitimacy theory and institutional theory, we argue that the relationship between firm value and sustainability is negative in this industry. Our sample consists of 205 firms with 1515 observations. Using a simultaneous equation system (3SLS) to determine its direction, we find the two to be negatively interrelated in a vicious circle. Furthermore, we find evidence for a moderating role of the renewable energy share of a company's headquarter country as well as the company's industry segment. The explanatory power continues to hold with consideration of a profitability measure (Return on Sales) instead of firm value.

**KEYWORDS**

3SLS, corporate social responsibility, firm value, oil and gas industry, sustainability

**JEL CLASSIFICATION**

M10, M14

## 1 | INTRODUCTION

Since the 1960s, companies have shown increasing interest in sustainability measures, and so has management research (Mura et al., 2018; Wang, Dou, et al., 2016; Wang, Tong, et al., 2016). The relationship between a company's sustainability efforts and its financial performance has emerged as a vast research field (for literature reviews and meta-studies see, e.g., Hang et al., 2019; Malik, 2015; van Beurden & Gössling, 2008; Vishwanathan et al., 2020; Whelan et al., 2021).

However, industry-specific research is rather limited, even though sustainability concerns differ largely by industry (Carroll, 1979; Frynas, 2007, p. 39). Several studies (e.g., Makni et al., 2008; Marti et al. 2015; Walker & Wan, 2012) show that controlling for industry while empirically exploring the sustainability–financial performance

relationship is significant, and hence results differ depending on industry (or industry characteristics such as munificence; Hartmann & Vachon, 2018). Chand (2006) even states that “the inherent differences in stakeholder interests and activities across different industries make comparison among industries almost impossible. Thus, research on the link between corporate social performance (CSP) and corporate financial performance (CFP) will have greater validity and accuracy if the focus is on a single industry” (p. 244). This approach fits the classic structure–conduct–performance paradigm of industrial economics (see, e.g., Bain, 1968; Scherer, 1990).

When discussing sustainability, the oil and gas industry proves to be a particularly appealing research subject for several reasons: It has huge economic power; out of the top 10 Fortune Global 500 list in 2020, four companies are integrated oil and gas companies, and one is

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a large Chinese petroleum refining company (Fortune, 2020). In this extractive industry, the pure nature of operations involves several social and ecological sustainability concerns, leading it to face sustainability issues particularly often (Frynas, 2007, p. 62). Some even go as far as saying that “the real reason we are failing to rise to the climate moment is because the actions required directly challenge our reigning economic paradigm [...and could lead to] extinction for the richest and most powerful industry the world has ever known—the oil and gas industry...” (Klein, 2014, p. 63). Indeed, when thinking about oil and gas companies, numerous high-profile spills, accidents, and other scandals come to mind, such as the Exxon Valdez tanker that spilled 11 million gallons of crude oil into the Gulf of Alaska in 1989 (EPA, 2017) or BP's burning oil platform after the 2010 Deepwater Horizon explosion that resulted in the deaths of 11 workers and the spill of 134 million gallons of oil (NOAA, 2018) (for a comprehensive list, see, for example, Wikipedia, 2021). Those accidents, along with scandals like Shell's 1995 Brent Spar oil storage and tanker loading buoy disposal that dominated the media for almost two months (Frynas, 2007, p. 22), marked the perception of the entire industry as “sinful”. This goes hand-in-hand with the critique that oil and gas firms are making large profits and receiving subsidies while hurting the environment. To cite Naomi Klein again (2014, p. 70): “Not only do fossil fuel companies receive \$775 billion to \$1 trillion in annual global subsidies, but they pay nothing for the privilege of treating our shared atmosphere as a free waste dump.”

Because of the heightened criticism, oil and gas companies have increasingly embraced sustainability actions to counter negative public sentiments (e.g., Berkowitz et al., 2017; Du & Vieira, 2012). However, because they are part of a controversial industry, their actions might not always be perceived as sincere (Walker & Wan, 2012; Yoon et al., 2006). Woolfson and Beck (2005) even argue that the oil and gas industry's sustainability efforts are purely a facade that enables them to continue with their daily business. Ferns et al. (2019) show how European oil and gas supermajors create their own myths to facilitate the disregarding, diverting, and/or displacing of tensions between economic growth and sustainability; and Scanlan (2017) elaborates in detail how corporate environmental communication in the oil and gas industry is used to downplay the environmental risks of hydraulic fracturing, or fracking, and convince the public about the benefits of this emerging technology.

Against this background, this paper investigates the relationship between sustainability and firm value in the global oil and gas industry. It thereby contributes to the literature by closing four research gaps. First, it addresses the need for more industry-specific analyses pointed out by several authors (Chand, 2006; Griffin & Mahon, 1997; Malik, 2015) by focusing on the oil and gas industry with a substantial sample size (1515 observations). While extant research often finds a positive relationship between sustainable and firm value (see, e.g., Whelan et al., 2021), we show for the oil and gas industry that there is a negative relationship, and that the two are negatively inter-related in a vicious cycle. Second, our study analyses often under-researched and industry-specific moderating effects within this industry to better understand the relationship between sustainability

and firm value/financial performance (e.g., Aouadi & Marsat, 2016; Zhao & Murrell, 2016). Third, this paper considers firms on a global level instead of focusing on North America only. Finally, by using a simultaneous regression model (3SLS), this paper addresses the endogeneity problem often left unattended (Awaysheh et al., 2020; Hawn et al., 2018; Margolis & Walsh, 2003).

The remainder of this paper is structured as follows: The next section reviews literature pertaining to the link between sustainability and financial performance, and develops hypotheses based on the literature reviewed. The third section describes the data and the methodology used in the empirical model. The fourth section presents the results of the analysis, while the fifth section discusses the results and puts them into context. The last section concludes, identifies this work's limitations, and provides suggestions for future research.

## 2 | LITERATURE REVIEW AND DEVELOPMENT OF HYPOTHESES

Within the oil and gas industry, sustainability<sup>1</sup> concerns exist along the entire value chain, from the negative effects of seismic studies before drilling begins, including spills during exploration (Upstream) or transportation (Midstream), to accidents in refineries (Downstream) (Frynas, 2007, pp. 43–63; Salzmann, 2006, pp. 70–75; Woolfson & Beck, 2005). Environmental concerns include dust and waste during construction of infrastructure, clearance of land, and release of drilling fluids during exploration; spills from leaking pipes and atmospheric emissions from gas flaring during production; tanker spills during transportation; and the release of contaminated waste water during refining (Frynas, 2007, pp. 64–65; Klein, 2014). Oil and gas companies operate in many countries that are without basic infrastructure, education, and health facilities (Frynas, 2007, p. 102). The largest social concern is to confront such challenges, for example through community development programs (Eweje, 2006), along with other concerns such as human rights issues, changing employment levels (Salzmann, 2006, pp. 70–71), loss of local drinking water (Idemudia, 2009), the destruction of property, and means of livelihood through agriculture or fishing (Frynas, 2005). Many oil producing countries further suffer from the so-called resource curse: Even though they are rich in natural resources, those countries suffer from economic underdevelopment, political mismanagement and corruption, and armed conflicts (Frynas, 2005; Frynas & Buur, 2020).

Regarding the relationship between sustainability and firm performance, it can generally be stated that researchers have analyzed this relationship based on a large variety of firm performance measurements (Lu & Taylor, 2016; Wang, Dou, et al., 2016; Wang, Tong, et al., 2016; Whelan et al., 2021). On the one hand, direct financial

<sup>1</sup>Note that our literature review also considers studies that draw on the concept of corporate social responsibility (CSR), and that we use the two terms largely interchangeably, as is often done in academic contexts (Bansal & Song, 2017). Both concepts typically emphasize primarily the environmental and social dimensions, which need to be related to the economic dimension. Our empirical work (see below) is based on the ESG concept, which additionally emphasizes the governance aspect. However, this aspect does play only a minor role in our study.

measurements like firm value and other capital market benefits (e.g., Cai et al., 2012), profitability (e.g., Waddock & Graves, 1997), or access to finance (e.g., Cheng et al., 2013) were analyzed. On the other hand, researchers considered indirect measurements such as risk management (e.g., Husted, 2005), quality management/operational performance (e.g., Parast & Adams, 2012), market and consumer behavior (e.g., Singh et al., 2008), or employee satisfaction and identification (e.g., Roeck & Delobbe, 2012; Valentine & Fleischman, 2008). Authors performed their analyses for environmental sustainability (Clarkson et al., 2011; Klassen & McLaughlin, 1996), social sustainability (Waddock & Graves, 1997), or both (Cai et al., 2012; Lu & Taylor, 2016). Event studies in the sustainability literature evaluate sustainability events such as corporate illegalities, discrimination (McWilliams & Siegel, 1997), accidents, explosions, or oil spills (Hirata & Claro, 2009). These events can lead to a decline in the stock price of the affected firm (Klassen & McLaughlin, 1996), which in turn can be counteracted by insurance-like effects from long-term CSR engagement (Shiu & Yang, 2017).

However, industry-specific research in this field is rather limited (Griffin & Mahon, 1997; Malik, 2015). Furthermore, existing sustainability research covering the oil and gas industry is often purely qualitative, with the predominant focus on case studies (Arora & Lodhia, 2017; Balmer et al., 2011; Berkowitz et al., 2017; Du & Vieira, 2012; Eweje, 2006; George et al., 2016; Hamilton III & Berken, 2005; Ihlen, 2009; Matejek & Gössling, 2014; Schmitt, 2010; Våland & Heide, 2005), interviews (Abdalla & Siti-Nabiha, 2015; Idemudia, 2009), and content analysis (Amaeshi & Amao, 2009; Dragomir, 2012; Escobar & Vredenburg, 2011; Perks et al., 2013; Raufflet et al., 2014; Valor, 2012). Only a few authors (Bansal, 2005; Binder, 2020; Cai et al., 2012; Clarkson et al., 2011; Gonenc & Scholtens, 2017; Parast & Adams, 2012; Post et al., 2015; Roeck & Delobbe, 2012; Sharma, 2000; Walker & Wan, 2012) conducted their empirical analysis on the oil and gas industry in a quantitative manner. We will refer to these studies in the following sections.

## 2.1 | Sign of the relationship

Studies focusing on the relationship between sustainability and financial performance delivered mixed results as to the sign before that relationship. Researchers have found a positive link, no link, and a negative link (Malik, 2015). The large variation is due to multiple factors, for example different sustainability indices, geographical coverage (heavy focus on North America for oil and gas studies), differences in industries analyzed, and calculation methods (Lu & Taylor 2016). However, the larger share of the literature acknowledges that superior quality sustainability initiatives lead to a higher firm value across industries (Whelan et al., 2021).

Specific to the oil and gas industry, some researchers did find a positive relationship between both social and environmental sustainability and a firm's market value or performance (Cai et al., 2012; Clarkson et al., 2011; Cowan et al., 2012; Lee et al., 2011). However, all of these papers, except for Lee et al. (2011), only considered North

America. This focus might lead to biased results as it has been shown that the attitude of United States residents toward oil and gas can differ from that of residents of European countries (Stedman et al., 2016). Based on a sample of oil and gas companies from the Global Fortune list and using dynamic panel generalized method of moments (GMM), Brahmana and Kontesa (2021) find that higher environmental performance leads to higher financial performance, but that these firms have to go way beyond the mere use of clean technologies to achieve positive financial effects.

The most prominent voice of a negative relationship between sustainability and firm value is arguably that of Friedman (1970), according to whom investing in sustainability would result in a competitive disadvantage and hence in financial shortcomings. His line of thinking states that there are few economic benefits to sustainability, while there are costs that directly affect the bottom line. Vance (1975) supports this view by finding that firms that display higher social responsibility face declining stock market value. In addition, Aupperle et al. (1985) find a negative relationship between a firm's emphasis on its economic responsibilities and its ethical responsibilities, and vice versa.

Furthermore, there is extensive literature on how the nature of a firm (e.g., its being part of a controversial industry) and the nature of its sustainability actions can influence how sustainability efforts are perceived, and whether they pay off financially (Oh et al., 2017; Palazzo & Richter, 2005; Yoon et al., 2006). Related to legitimacy theory (Suchman, 1995), the concept of greenwashing means that a company that is not very sustainable promotes itself as being sustainable (Laufer, 2003; Walker & Wan, 2012; for an overview see Gatti et al., 2019). Some authors have argued that sustainability can have a negative effect on financial performance if perceived by stakeholders as greenwashing. This is because, opposed to other substantive sustainability actions, greenwashing does not lead to gaining legitimacy (Barnett, 2007; Del Mar Miras-Rodríguez et al., 2015; Walker & Wan, 2012). Along these lines, Barnett and Salomon (2012) argue that a firm's potential to profit financially from their sustainability efforts depends on its ability to convey credibility regarding its acts of social responsibility. Barnett (2007) defined this credibility as Stakeholder Influence Capacity (SIC). Barnett and Salomon (2012) further argue that the relationship between CSP and CFP is U-shaped: Negative until reaching moderate levels of social performance and positive thereafter.

Further, research on other controversial or sin industries can reveal interesting insights that may also be applicable on the oil and gas industry. Palazzo and Richter (2005) analyzed the tobacco industry and argue that tobacco companies are "fighting on a different legitimacy battlefield" (p. 396) and mainstream CSR theory and practice can be misleading. Yoon et al. (2006) argue that the effectiveness of a company's CSR activities depends on consumer perception. If consumers attribute insincere motives to CSR activities, those activities will hurt the company's image. One of the variables affecting perceived sincerity is the relationship between money spent on CSR actions and on advertisement to promote those actions. When advertisement expenses exceed the contributions for the cause, this adds to the perceived insincerity. Oh et al. (2017) added to that by demonstrating that if sinful industries advertise their CSR engagement, this

fails financially via an increase in performance vulnerability. In summary, sustainability measures of firms in controversial industries, and especially the advertising of such, are perceived differently by the public than for other companies. Gaining legitimacy and enhancing their reputation is more difficult for such companies, and this might ultimately result in decreased financial performance.

These views are also reflected in oil-and-gas-specific research. Gonenc and Scholtens (2017) focused on fossil fuel firms and performed a simultaneous equation system to find that financial performance has a negative impact on environmental performance, and that environmental performance has a mixed impact on returns for oil and gas firms. Furthermore, Walker and Wan (2012) find that for polluting industries in Canada (40% of sample oil and gas), substantive environmental actions have a neutral impact on financial performance, while symbolic environmental actions and greenwashing have a negative impact on financial performance. Binder (2020), while investigating the effect of environmental, social, and governance bad events on oil and gas companies' stock price, moreover finds that for environmental bad events, there are no insurance-like effects of previous sustainable behavior.

In summary, previous research on the link between sustainability and firm value across industries has come to mixed conclusions as to whether this relationship is positive or negative. While the larger share of literature across industries proposes a positive relationship (Whelan et al., 2021), the oil and gas industry's particularities call for a deeper analysis. While there are studies (e.g., Cai et al., 2012; Cowan et al., 2012; Lee et al., 2011) that find a positive link between financial performance and sustainability performance in the oil and gas industry, most of these focus on North America alone. Furthermore, some also include other industries; within Clarkson et al. (2011) sample, only 12% of the firms are oil and gas companies; for Cai et al. (2012) sample, oil and gas companies comprise 38%. The concepts of greenwashing (e.g., Laufer, 2003; Walker & Wan, 2012) and SIC (Barnett, 2007) further suggest that it might prove difficult for an oil and gas company to gain legitimacy and accrue stakeholder credibility with their sustainability actions. In addition, we can draw parallels from studies focusing on other controversial industries. Being a controversial industry, the oil and gas industry's sustainability concerns might not be met by mainstream CSR theory and practice; they might even prove to be counter-productive (Palazzo & Richter, 2005). Oil and gas companies' motives might be questioned or even perceived as an insincere end, hence their sustainability actions might be ineffective (Yoon et al., 2006) Based on these arguments, we propose the following for the oil and gas industry, contrary to the prevailing findings in cross-industry research:

**Hypothesis 1.** Sustainability performance and firm value are significantly negatively related in the oil and gas industry.

## 2.2 | Direction of the relationship

As already criticized by Margolis and Walsh (2003), not many researchers determine the direction of the relationship that they

find between sustainability performance and financial performance; they simply establish a connection without determining its previous direction and the nature of the causal link (Wang, Dou, et al., 2016; Wang, Tong, et al., 2016). In a similar spirit to work by Cai et al. (2012), Clarkson et al. (2011) and Hawn et al. (2018), our paper addresses this concern and the associated endogeneity problem by examining the direction of the association with a simultaneous regression model (3SLS) model (Zellner & Theil, 1992).

Theory supports both sustainability performance preceding financial performance and financial performance preceding sustainability performance in a negative relationship. As mentioned, Friedman (1970) sees the engagement in CSR as against shareholders' interests. He sees profit and CSR as a tradeoff, since the latter involves costs that affect the bottom line. Thus, according to his view, sustainability performance would precede financial performance. The same holds for greenwashing, where it can be argued that if sustainability actions are perceived as greenwashing, they do not pay off (Walker & Wan, 2012).

To argue that financial performance precedes sustainability in a negative relationship, Preston and O'Bannon (1997) propose the managerial opportunism hypothesis by stating that in times of strong financial performance, managers with financial incentives attempt to increase their own short-term private gains by reducing investment in sustainability. Furthermore, institutional theory (Meyer & Rowan, 1977) can be interpreted as arguing that in times of solid financial performance, companies do not feel the need to invest in sustainability. This might be because their competitors do not do it, are less of a threat in such times, or because there is simply no mimetic pressure due to a lack of uncertainty (DiMaggio & Powell, 1983).

The few authors that have examined the relationship's direction come to different conclusions: Cai et al. (2012) and Jo and Harjoto (2011b) find sustainability to be preceding firm value. Waddock and Graves (1997) find the relationship to be a virtuous circle with both variables affecting each other, and so do Orlitzky et al. (2003) when performing a meta-analysis of 52 prior studies. However, Zhao and Murrell (2016), when replicating Waddock and Graves's (1997) model with a larger sample, only find a positive unidirectional impact of CFP on CSP and not the other way around. Gonenc and Scholtens (2017) confirm Preston and O'Bannon's (1997) managerial opportunism hypothesis for oil and gas firms as they find financial performance to negatively impact environmental performance for those firms. Furthermore, they find environmental performance to have a mixed impact on financial performance. Based on a meta-analysis of 142 studies, Hang et al. (2019) suggest that the relationship is a matter of time: In the short run (1 year), financial resources can increase a firm's environmental performance, whereas in the long run it is the other way round.

In summary, as outlined above, theory and existing empirical research (although not exclusively focusing on the oil and gas industry) support both directions. Furthermore, the few researchers that have looked at the direction of the relationship came to inconclusive

results. Considering these findings, we arrive at the following three hypotheses:

**Hypothesis 2a.** Sustainability performance precedes firm value in that relationship.

**Hypothesis 2b.** Firm value precedes sustainability performance in that relationship.

**Hypothesis 2c.** The relationship between sustainability performance and firm value is a bidirectional one.

## 2.3 | Moderators of the relationship

This paper examines some of the oil and gas industry's specificities to determine their influence on the relationship between sustainability and firm value. It thereby addresses Griffin and Mahon's (1997) criticism that research in this area should focus on one industry only while addressing that industry's particularities. Furthermore, it answers Malik's (2015) quest for the influence of firm-specific criteria on the value-enhancing capabilities of CSR. In addition, it implements the suggestion by Aouadi and Marsat (2016), Lu and Taylor (2016), Wang, Dou, et al., (2016); Wang, Tong, et al. (2016) and Zhao and Murrell (2016) that future research should put more weight on examining the moderating effects on and mediating effects between CSP and CSF.

As reflected by these calls for an analysis of potential moderators, studies on the relationship between CSP and CFP only scarcely address that topic. In cross-industry research, attention-related factors such as advertising expenses, consumer awareness, consumer satisfaction, and reputation have been identified to be influencing the relationship (Luo & Bhattacharya, 2006; Servaes & Tamayo, 2013; Surroca et al., 2010). Further, intangible resources such as innovation, human capital, and culture (Surroca et al., 2010), as well as environmental munificence, complexity and dynamism (Goll & Rasheed, 2004; Hartmann & Vachon, 2018), have served as candidates for possible contextual impact factors. As indicated above, Brahmana and Kontesa (2021) have also introduced the adoption of clean technologies as a moderating variable. We will now argue for two potential moderators that are oil-and-gas-specific.

### 2.3.1 | Within-industry segment

The industry within which a company operates makes a significant difference when it comes to sustainability concerns. As we have seen above, there are many different sustainability concerns along the value chain of the oil and gas industry. We therefore argue that this relationship could also differ based on the within-industry segment. Out of the different within-industry segments or vertical integration steps of the oil and gas industry, upstream (vs. midstream or downstream) is the segment with the largest

potential environmental impact and hence the biggest environmental sustainability concerns due to its extractive nature (Frynas, 2007, p. 65). Further, in the upstream segment, social issues such as destruction of property and deprivation of means of livelihood due to construction of infrastructure for exploration are a big concern (Frynas, 2005). This might lead to a stronger relationship due to multiple reasons: Markets might be more sensitive to the sustainability performance of those firms; the firms might put more emphasis on sustainability or be more careful of potential reactions to an adaptation of sustainability policies; and stakeholders might put more pressure on those firms. We therefore arrive at the following hypothesis:

**Hypothesis 3.** For firms that exclusively operate in the upstream segment, the relationship between sustainability and firm value becomes more positive.

### 2.3.2 | Renewable share of headquarter country

Next, we examine the country in which the company is headquartered. Although the sustainability topic more and more seems to be a worldwide concern, promoted, inter alia, by the United Nations' Sustainable Development Goals, there are still considerable differences in how people in different countries and cultures perceive the severity of this topic (see, e.g., Bain et al., 2019). Specific to the context of this study, the share of renewables within the country's total electricity output<sup>2</sup> can give an indication of substitution possibilities for oil and gas, as well as the country's general attitude toward energy. As demonstrated above, it has been shown at firm level that different attention-related factors moderate or mediate the relationship between sustainability and financial performance (Luo & Bhattacharya, 2006; Servaes & Tamayo, 2013; Surroca et al., 2010). In the special case of oil and gas, and in a similar spirit to Hartmann et al. recent article Hartmann et al. (2021), we will test the transferability of these results to a country level. The general attitude toward sustainability in an energy context could serve as a measure of attention toward sustainability in energy. We argue that the higher a country's renewable share, the more attention on an oil and gas firm's sustainability efforts; further, the more important sustainability is for the country, the more the markets will value sustainability and the stronger the market reaction will be.

**Hypothesis 4.** As the share of renewable electricity output of total electricity output in the company's headquarter country increases, the relationship between sustainability and firm value becomes more positive.

<sup>2</sup>In absence of an index specifying the general sentiment toward sustainability within a country, the renewable share of the total electricity output within a country serves as a proxy for such.

### 3 | DATA AND METHODOLOGY

#### 3.1 | Sample and data sources

The sample used in this study covered a time span of 14 years (2003–2016). Sample companies were chosen based on the Thomson Reuters ESG score constituent list “global oil and gas” (LA43GLOG), which comprises 222 companies, of which 205 were included in the final sample based on data availability. Due to some missing values and outliers<sup>3</sup>, the final sample comprised 1515 observations. The Thomson Reuters environmental, social, and governance (ESG) score<sup>4</sup> (formerly Asset4), which was retrieved via Thomson Reuters Eikon, served as a measure of sustainability. ESG refers to the Environmental, Social, and Governance criteria that were largely developed and popularized by the Global Reporting Initiative (GRI) to promote the standardization of sustainability criteria. ESG criteria are further employed in investment decision-making by professionals specialized in Socially Responsible Investing (SRI) (Beckmann et al., 2012; Berry & Junkus, 2013). The Thomson Reuters combined ESG score measures a company's relative performance across 10 ESG topics, and is then discounted for impactful ESG controversies (Thomson Reuters, 2017). The beginning of our time span was chosen because Asset 4 was founded in 2003 and later acquired by Thomson Reuters in 2009 (Thomson Reuters, 2013). All financial data were taken from Thomson Reuters Datastream via Thomson Reuters Eikon. Data on a country's renewable energy share stem from the World Bank's database (The World Bank, 2018).

#### 3.2 | Model specification

As criticized by Margolis and Walsh (2003), some prior research neglected endogeneity by establishing a connection without determining its direction and the nature of the causal link (Awaysheh et al., 2020). We will hence use a simultaneous equation model (3SLS) to counter this critique. 3SLS proposed by Zellner and Theil (1992) is a combination of 2SLS and SUR (Seemingly Unrelated Regression). 3SLS performs three steps: First it calculates a 2SLS estimation of the model system, second it computes residuals based on the 2SLS estimates to identify cross-equation correlations, and third it estimates the model parameters via generalized least squares (GLS). The dependent variables of the equations are considered as being endogenous to the system and are treated as correlated with the disturbances in the equation, meaning that a variable cannot be exogenous to one equation and endogenous to another (The National Bureau of Economic Research, 2018). It has been shown that 3SLS can result in more efficient systems estimates than 2SLS (Belsley, 1991; Cameron & Trivedi, 2005). However, to test all hypotheses, we started out by considering both equations separately, first with a simple correlation matrix, and then with a panel regression and a

Hausman Taylor estimation. Afterwards we followed Jo and Harjoto (2011b) and Cai et al. (2012) in combining both equations in a simultaneous equation model (3SLS). Lastly, we conducted a robustness test by replacing Tobin's Q with a profitability measure—Return on Sales (ROS)—in both equations.

In our equations, we controlled for a number of factors that could affect the relationship between Tobin's Q and sustainability. We controlled for firm size via total assets because smaller firms might not engage as much in sustainability as larger firms (Waddock & Graves, 1997). Furthermore, we controlled for risk via leverage because firms with lower risks might invest more in sustainability due to their stable return model (McGuire et al., 1988; Roberts, 1992). In addition, we included sales growth and capital expenditure as measures of growth (Jo & Harjoto, 2011a). Based on Cai et al. (2012), the value equation further controlled for profitability via Return on Total Assets (ROTA), while the sustainability equation controlled for the number of analysts that follow a company. The more analysts follow a company, the bigger the public attention it receives. Companies that receive more public attention might be more likely to engage in sustainability efforts (Cai et al., 2012). McWilliams and Siegel (2000) recommend controlling for research and development (R&D) as they see a positive impact of R&D on firm performance, and hence feel that excluding R&D would lead to upwardly biased results of the impact of CSR on firm performance. However, we did not control for R&D expense as this variable was only available for 57 of the sample companies, and could hence not be included as a control variable as the sample would have become too small. Furthermore, as will be shown in the following section, this argument is not equally valid in our model. The equations were specified as the following:

$$\begin{aligned} \text{TobinsQ} = & \\ & \alpha + \beta_1 \times \text{ESGScore} + \beta_2 \times (\text{Upstream} \times \text{ESGScore}) + \beta_3 \\ & \times (\text{Renewable share} \times \text{ESGScore}) + \beta_4 \times \text{Upstream} + \beta_5 \\ & \times \text{Renewable share} + \beta_6 \times \text{LN}(\text{total liabilities}) + \beta_7 \\ & \times \text{LN}(\text{CAPEX}) + \beta_8 \times \text{LN}(\text{total assets}) + \beta_9 \\ & \times \text{sales growth} + \beta_{10} \times \text{ROTA} \end{aligned}$$

$$\begin{aligned} \text{ESGScore} = & \\ & \alpha + \beta_1 \times \text{TobinsQ} + \beta_2 \times (\text{Upstream} \times \text{TobinsQ}) + \beta_3 \\ & \times (\text{Renewable share} \times \text{TobinsQ}) + \beta_4 \times \text{Upstream} + \beta_5 \\ & \times \text{Renewable share} + \beta_6 \times \text{LN}(\text{total liabilities}) + \beta_7 \\ & \times \text{LN}(\text{CAPEX}) + \beta_8 \times \text{LN}(\text{total assets}) + \beta_9 \\ & \times \text{sales growth} + \beta_{10} \times \text{analysts following} \end{aligned}$$

We used Tobin's Q as a measure of firm value. Tobin's Q calculates the market value of assets divided by the replacement value of assets (Tobin, 1969). Even though it is a hypothetical measure, as the replacement value of assets can never be precisely defined, it is widely used to measure firm value and gives an approximation of investors' view of firm value.<sup>5</sup> The description and source of all

<sup>3</sup>See Appendix B for description of outliers (Table B1) and other modification of data (Table B2); information is provided to fulfill Bergh et al. (2017) reproducibility suggestions.

<sup>4</sup>See Appendix C for the Thomson Reuters ESG score calculation method (Table C1).

<sup>5</sup>For a critical evaluation of the use of Tobin's q in empirical research, see Bartlett and Partnoy (2020).

**TABLE 1** Description and source of variables

Variable	Description	Source
Tobin's Q	The sum of Equity Market Value and Liabilities Book Value divided by the sum of Equity Book Value and Liabilities Book Value	Thomson Reuters Eikon
ESG Score	The Thomson Reuters environmental, social and governance (ESG) combined score	Thomson Reuters Eikon
Vertical Integration (Upstream)	Upstream refers to the Vertical integration segment of the company; we compare upstream firms (48% of sample) to all other firms (midstream, downstream, integrated, or mixed forms)	SIC code in Thomson Reuters Eikon
Renewable Energy Share	The share of electricity generated by renewable power plants in total electricity generated by all types of plants in the country the company has its headquarter in.	(The World Bank, 2018)
LOG Total liabilities	The natural logarithm of the company's total liabilities	Thomson Reuters Eikon
LOG CAPEX	The natural logarithm of the company's Capital Expenditures	Thomson Reuters Eikon
LOG Total Assets	The natural logarithm of the company's total assets	Thomson Reuters Eikon
Sales Growth	The growth rate between a previous year's sales and the following year's sales	Thomson Reuters Eikon
Analysts following	The number of analysts following the company	Thomson Reuters Eikon
ROTA	Return on Total Assets, so the Earnings before Interest and Taxes divided by the company's Total Assets	Thomson Reuters Eikon
ROS	Return on Sales, the Earnings before Interest and Taxes divided by the company's net sales	Thomson Reuters Eikon

Source: Own compilation.

variables are listed in Table 1; descriptive statistics can be found in Appendix A (Table A1).

## 4 | RESULTS

First, we considered a pairwise correlation (see Table 2) in which Tobin's Q and the ESG score were correlated by a negative coefficient of  $-0.188$ . This shows a generally negative correlation; nevertheless, we still needed to perform our set of regressions to control for diverse effects.

When performing both equations as a pooled Ordinary Least Squares (OLS) regression, the Lagrange Multiplier test suggested that we should use a panel regression. Since our equations include a time-invariant variable, Vertical Integration, we could not perform a Fixed Effects (FE) Panel regression without omitting this variable (Schmidheiny, 2016). However, when we conducted a Mundlak test (Mundlak, 1978), we found that a FE regression is the better option for both equations than a Random Effects (RE) Panel regression. Consequently, and to keep the very interesting Vertical Integration variable, we performed a Hausman Taylor estimation (Hausman & Taylor, 1981). Table 3 shows the results of this Hausman Taylor estimation, along with the results of the FE panel regression (and, for comparison, also the RE panel regression).<sup>6</sup>

Across all three estimation methods, the value equation (Tobin's Q equation) does show a slightly negative correlation between firm value and the sustainability score; however, this correlation is not significant, and neither are the moderators Vertical Integration and Renewable Share, except for the RE panel, in which they are

significant at the 10% level. The within- $R^2$  for the FE panel is 0.289. The control variables, except for the natural logarithm of a firm's total liabilities, were all significant in the Hausman Taylor estimation.

The sustainability equation (ESG score equation) demonstrates a negative impact of Tobin's Q on sustainability with a coefficient of  $-2.883$ , which is significant at the 1% level in the Hausman Taylor estimation. The same applies to the FE and RE panels, where we see negative coefficients of  $-2.779$  and  $-3.033$ , respectively, both significant at the 1% level. Furthermore, the effect of Tobin's Q on sustainability is higher for upstream firms with a coefficient of 1.895, meaning that the effect is less negative for these firms, significant at the 1% level. The FE and RE panels also found this moderator to be significant with 1.872 (at the 5% level) and 1.923 (at the 1% level) coefficients, respectively. The renewable share of the country in which the firm is listed makes the relationship between Tobin's Q and sustainability more positive; with a 0.0205 coefficient at the 10% level in the Hausman Taylor estimation and with a 0.0225 coefficient at the 10% level in the RE panel, it is not significant in the FE panel. All control variables—except for the natural logarithm of a firm's CAPEX that is not significant, and the natural logarithm of a firm's total liabilities that is significant at the 5% level—are significant at the 1% level in the Hausman Taylor estimation. The FE panel shows a within- $R^2$  of 0.212.

Based on these findings, we can confirm Hypothesis 1: Sustainability performance and firm value are significantly negatively related in the oil and gas industry. Furthermore, we can now address McWilliams and Siegel's (2000) argument that R&D needs to be controlled for, as the relationship between CSR and a firm's financial performance otherwise becomes more positive than it actually is. McWilliams and Siegel argue that the positive influence of R&D on firm value skews results. However, since we are focusing on the oil and gas industry and found the relationship for this particular industry to be negative, this argument no longer holds. The relationship could

<sup>6</sup>This table as well as Tables 4 and 5 also indicate exact  $p$ -values instead of significance levels to fulfill Bergh et al. (2017) reproducibility suggestions.



TABLE 2 Pairwise correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Tobin's Q	1.000									
(2) ESG Score	-0.188	1.000								
(3) LOG Total Assets	-0.203	0.672	1.000							
(4) LOG Liabilities	-0.194	0.662	0.967	1.000						
(5) LOG CAPEX	-0.099	0.566	0.879	0.857	1.000					
(6) ROTA	0.310	0.138	0.210	0.171	0.169	1.000				
(7) Sales growth	0.213	-0.117	-0.048	-0.050	0.020	0.311	1.000			
(8) Analysts following	-0.022	0.424	0.507	0.506	0.530	0.056	-0.029	1.000		
(9) Renewable output	0.012	-0.087	-0.187	-0.154	-0.144	-0.087	-0.008	-0.281	1.000	
(10) Vert. Integration	0.079	-0.457	-0.572	-0.578	-0.387	-0.226	0.076	-0.225	0.191	1.000

Source: Own compilation.

be even more negative, if R&D really had a substantial positive effect on financial performance or firm value.

We then combined the two equations in a simultaneous equation system (3SLS), which were pooled by year; results are shown in Table 4.

It became clear that Tobin's Q and the ESG score are both endogenous variables that are interrelated and affect each other negatively. While a firm's ESG score influences its Tobin's Q with a coefficient of  $-0.00696$ , the Tobin's Q affects its ESG score with a coefficient of  $-4.181$ . Both relationships are significant at the 1% level. Therefore, similarly to Waddock and Graves (1997) and Orlitzky et al. (2003), we found the relationship to be both ways; only, by focusing on the oil and gas industry, we found it to be a vicious rather than a virtuous circle.

Based on these findings, we can reject Hypotheses 2a and 2b and accept Hypothesis 2c, in that the relationship between sustainability performance and firm value is bidirectional. Furthermore, this reconfirms Hypothesis 1.

Interestingly, we further found that the influence of Tobin's Q on the ESG score is more positive for upstream firms (2.184 at the 5% level). Additionally, the higher the renewable share of the country in which the firm is headquartered, the more positive the relationship (0.03 at the 10% level). As for the influence of the ESG score on Tobin's Q, the relationship also becomes more positive (however, only slightly) the higher the renewable share of the country in which the firm is headquartered (0.00006 at the 10% level). Whether or not the firm is a pure upstream player does not seem to have a significant effect on this relationship.

The results of the ESG score equation support Hypothesis 3, as for firms that exclusively operate in the upstream segment, the relationship between sustainability and firm value does become more positive.

Furthermore, both equations support Hypothesis 4: As renewable electricity output as share of the total electricity output in the company's headquarter country increases, the relationship between sustainability and firm value becomes more positive.

The within- $R^2$  of the ESG score equation is 0.493, indicating that the model explains 49% of the dependent variable; the within- $R^2$  of the Tobin's Q amounts to 0.284. As for the control variables, the natural logarithm of total assets, sales growth, and the number of analysts emerge as statistically significant at the 1% level within the ESG score equation. However, the natural logarithms of total liabilities and CAPEX do not prove to be statistically significant. In Tobin's Q equation, the natural logarithms of CAPEX and total assets, as well as the ROTA, are significant at the 1% level, while sales growth proves to be significant at the 5% level. However, the natural logarithm of total liabilities does not emerge as statistically significant.

As a robustness test, we constructed the same 3SLS model using a profitability measure instead of Tobin's Q, namely Return on Sales (ROS)—a firm's Earnings before Interest and Taxes divided by its Net Sales. We excluded the control variable ROTA so as not to consider two measures of profitability, arriving at the following set of equations:

$$\begin{aligned} \text{ROS} = & \alpha + \beta_1 \times \text{ESGScore} + \beta_2 \times (\text{Upstream} \times \text{ESGScore}) + \beta_3 \\ & \times (\text{Renewable share} \times \text{ESGScore}) + \beta_4 \times \text{Upstream} + \beta_5 \\ & \times \text{Renewable share} + \beta_6 \times \text{LN}(\text{total liabilities}) + \beta_7 \\ & \times \text{LN}(\text{CAPEX}) + \beta_8 \times \text{LN}(\text{total assets}) + \beta_9 \times \text{sales growth} \end{aligned}$$

$$\begin{aligned} \text{ESGScore} = & \alpha + \beta_1 \times \text{ROS} + \beta_2 \times (\text{Upstream} \times \text{ROS}) + \beta_3 \\ & \times (\text{Renewable share} \times \text{ROS}) + \beta_4 \times \text{Upstream} + \beta_5 \\ & \times \text{Renewable share} + \beta_6 \times \text{LN}(\text{total liabilities}) + \beta_7 \\ & \times \text{LN}(\text{CAPEX}) + \beta_8 \times \text{LN}(\text{total assets}) + \beta_9 \\ & \times \text{sales growth} + \beta_{10} \times \text{analysts following} \end{aligned}$$

Table 5 shows the results of the 3SLS regression with ROS, and paints a similar picture for profitability: Return on Sales and the ESG score are both endogenous variables that are interrelated and affect each other negatively. A firm's ESG score influences its ROS with a coefficient of  $-0.00392$ ; the ROS affects its ESG score with a coefficient of  $-7.179$ . Both relationships are significant at the 1% level. As for the moderators, the influence of ROS on a firm's ESG score is

**TABLE 3** Hausman Taylor, FE panel, and RE panel regression results

	(1) TobinsQ	(2) TobinsQ	(3) TobinsQ	(4) ESGScore	(5) ESGScore	(6) ESGScore
ESGScore	−0.00138 (−0.57; 0.567)	−0.000935 (−0.35; 0.725)	−0.00255 (−1.13; 0.257)			
c.ESGScore#c.Upstream	−0.00513 (−1.59; 0.112)	−0.00559 (−1.59; 0.112)	−0.00564* (−1.84; 0.066)			
c.ESGScore#c.Renewableoutput	0.0000719 (1.17; 0.241)	0.0000530 (0.74; 0.457)	0.0000946* (1.74; 0.082)			
Renewableoutput	−0.00953** (−2.41; 0.016)	−0.0139** (−2.12; 0.035)	−0.00840*** (−2.72; 0.007)	0.145*** (3.17; 0.002)	0.353*** (4.94; 0.000)	0.0774** (2.11; 0.035)
LOGTotalliabilities	0.0237 (0.51; 0.611)	−0.0274 (−0.53; 0.596)	0.0571 (1.32; 0.186)	1.711** (2.46; 0.014)	1.770** (2.35; 0.019)	1.452** (2.13; 0.033)
LOGCapitalexpenditures	0.155*** (7.86; 0.000)	0.147*** (7.03; 0.000)	0.146*** (7.51; 0.000)	−0.488 (−1.62; 0.105)	−0.448 (−1.42; 0.157)	−0.460 (−1.51; 0.130)
LOGTotalAssets	−1.261*** (−8.97; 0.000)	−1.243*** (−8.21; 0.000)	−1.015*** (−8.06; 0.000)	8.702*** (4.00; 0.000)	6.954*** (3.00; 0.003)	9.043*** (4.38; 0.000)
Salesgrowth	0.240*** (6.42; 0.000)	0.247*** (6.30; 0.000)	0.222*** (5.73; 0.000)	−2.278*** (−4.29; 0.000)	−1.931*** (−3.45; 0.001)	−2.310*** (−4.23; 0.000)
ROTA	0.925*** (8.32; 0.000)	0.791*** (6.73; 0.000)	1.070*** (9.45; 0.000)			
Upstream	−0.486** (−2.27; 0.023)	0 (; .)	−0.104 (−0.61; 0.542)	−9.200*** (−2.95; 0.003)	0 (; .)	−8.319*** (−3.67; 0.000)
TobinsQ				−2.883*** (−4.19; 0.000)	−2.779*** (−3.83; 0.000)	−3.033*** (−4.41; 0.000)
c.TobinsQ#c.Upstream				1.895*** (2.62; 0.009)	1.872** (2.47; 0.014)	1.923*** (2.61; 0.009)
c.TobinsQ#c.Renewableoutput				0.0205* (1.79; 0.074)	0.0183 (1.52; 0.128)	0.0225* (1.91; 0.056)
Analystsfollowing				0.216*** (4.85; 0.000)	0.208*** (4.40; 0.000)	0.229*** (5.18; 0.000)
_cons	8.083*** (16.33; 0.000)	8.877*** (17.26; 0.000)	5.889*** (15.66; 0.000)	−28.71*** (−3.32; 0.001)	−26.25*** (−2.97; 0.003)	−26.14*** (−3.53; 0.000)
r2		0.289			0.212	
P		2.06e-90	5.78e-93		1.33e-61	2.29e-105
N	1515	1515	1515	1515	1515	1515

Note: (1) Tobin's Q Hausman Taylor estimation, (2) Tobin's Q FE panel, (3) Tobin's Q RE panel, (4) ESG score Hausman Taylor estimation, (5) ESG score FE panel, (6) ESG score RE panel.

t-statistics and p-values in parentheses.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ . Source: Own compilation.

more positive (5.146 at the 1% level) if the firm is an upstream-only player. However, the renewable energy share of the headquarter country does not moderate significantly. The influence of a firm's ESG score on its Return on Sales, on the other hand, is only slightly more positive for upstream firms (0.00428 at the 1% level). All control variables are significant at the 1% or 5% level, except for the natural logarithm of a firm's total liabilities in the ESG score equation.

## 5 | DISCUSSION

Our findings support legitimacy theory (Suchman, 1995), the concept of greenwashing (Walker & Wan, 2012), and Barnett's (2007) SIC concept on the one hand, and institutional theory (Meyer &

Rowan, 1977) as well as Preston and O'Bannon's (1997) managerial opportunism hypothesis on the other.

It seems that oil and gas firms' investment in sustainability does not lead to a higher firm value or increased profitability, because they do not manage to gain legitimacy and accumulate SIC. Hence, their sustainability efforts do not seem to offset their investment costs, as demonstrated by the ROS equation, and are not valued by investors, as measured by Tobin's Q. Their actions might even be perceived as greenwashing. That is also why, for firm value, the relationship does not become more positive for firms that exclusively operate in the upstream segment. Oil and gas firms seem to lack the ability to convert their investment in sustainability into financial benefits. The higher the firm's headquarter country's renewable energy share, the slightly more positive the relationship becomes for firm value.



TABLE 4 3SLS regression results

	ESGScore	TobinsQ
TobinsQ	-4.181*** (-5.30; 0.000)	
Upstream	-7.765*** (-4.29; 0.000)	-0.174 (-1.44; 0.151)
c.TobinsQ#c.Upstream	2.184** (2.22; 0.026)	
Renewableoutput	0.0109 (0.36; 0.720)	-0.00317* (-1.71; 0.088)
c.TobinsQ#c.Renewableoutput	0.0300* (1.77; 0.077)	
LOGTotalliabilities	0.441 (0.65; 0.517)	0.0459 (1.39; 0.163)
LOGCapitalexpenditures	-0.614 (-1.51; 0.131)	0.139*** (7.37; 0.000)
LOGTotalAssets	12.56*** (6.41; 0.000)	-0.650*** (-6.76; 0.000)
Salesgrowth	-3.753*** (-3.46; 0.001)	0.120** (2.29; 0.022)
Analystsfollowing	0.313*** (6.91; 0.000)	
ESGScore		-0.00696*** (-4.55; 0.000)
c.ESGScore#c.Upstream		0.00157 (0.68; 0.498)
c.ESGScore#c.Renewableoutput		0.0000624* (1.89; 0.058)
ROTA		1.621*** (11.95; 0.000)
_cons	-24.97*** (-4.64; 0.000)	3.732*** (15.59; 0.000)
r2	0.493	0.284
P	8.11e-301	1.19e-115
N	1515	1515

Note: *t*-statistics and *p*-values in parentheses.

\**p* < 0.10; \*\**p* < 0.05; \*\*\**p* < 0.01. Source: Own compilation.

Apparently, in those countries with a generally more positive attitude toward sustainability, firms manage to gain legitimacy and accumulate SIC more easily.

Furthermore, as for the influence of firm value and profitability on sustainability performance, we confirm both institutional theory and the managerial opportunism hypothesis. When financial performance is good in terms of profitability as well as firm value or market prediction, firms do not feel the need to invest in sustainability measures. This follows because institutional theory indicates that there is no need for firms to invest if their competitors do not do so either (Meyer & Rowan, 1977); they do not feel mimetic pressure to change, especially since mimetic pressure mostly applies to times of uncertainty (DiMaggio & Powell, 1983). Consequently, in times of uncertainty associated with declining financial performance, oil and gas firms might invest more in sustainability if one or more competitors

TABLE 5 3SLS regression results with ROS

	ESGScore	ROS
ROS	-7.179*** (-4.05; 0.000)	
Upstream	-4.428*** (-4.72; 0.000)	-0.284*** (-3.53; 0.000)
c.ROS#c.Upstream	5.146*** (2.86; 0.004)	
Renewableoutput	0.0604*** (4.11; 0.000)	-0.000475 (-0.38; 0.701)
c.ROSQ#c.Renewableoutput	0.0207 (0.69; 0.493)	
LOGTotalliabilities	0.736 (0.95; 0.344)	-0.0385 (-1.62; 0.105)
LOGCapitalexpenditures	-1.093*** (-2.64; 0.008)	-0.0271*** (-2.15; 0.032)
LOGTotalAssets	14.07*** (6.58; 0.000)	0.258*** (3.90; 0.000)
Salesgrowth	-4.003*** (-3.45; 0.001)	0.217*** (6.11; 0.000)
Analystsfollowing	0.302*** (6.61; 0.000)	
ESGScore		-0.00392*** (-3.91; 0.000)
c.ESGScore#c.Upstream		0.00428*** (2.77; 0.006)
c.ESGScore#c.Renewableoutput		0.00000527 (0.24; 0.809)
_cons	-38.68*** (-7.86; 0.000)	-0.352*** (-2.23; 0.026)
r2	0.487	0.233
P	1.11e-286	1.81e-84
N	1483	1483

Note: *N* = 1481 instead of 1515, as the ROS variable was only available for fewer observations.

*t*-statistics and *p*-values in parentheses.

\**p* < 0.10;

\*\**p* < 0.05; \*\*\**p* < 0.01. Source: Own compilation.

start doing so in response to their financial problems. Now, why do some firms stop investing in sustainability in times of good financial performance and start investing in times of worse financial performance? Here, Preston and O'Bannon's (1997) managerial opportunism hypothesis comes into play. Some managers, whose compensation is linked to financial as well as stock price performance, might stop investing in sustainability in times of good financial performance to get a share of the pie, or simply to report an even better financial performance. Consequently, in times of worse financial performance, those managers might want to offset those results or purely justify their results by engaging in more sustainability measures. This, in return, explains the vicious circle and why they are not able to build legitimacy.

In line with these findings, this relationship is more positive, yet overall still negative, for players exclusively operating in the upstream

segment. Those firms are particularly exposed to environmental risks (Frynas, 2007, p. 65). Hence, they are more careful in how they change their sustainability performance. For firm value, the same applies to firms that are headquartered in countries with a higher renewable energy share, which serves as proxy of the general attitude toward sustainability within the country. Those firms are likely to face more opposition and a stronger market response, and are therefore less likely to adapt sustainability performance based on financial performance.

These results go against the dominating opinion that the better a firm's sustainability actions, the higher its firm value and/or its profitability (e.g., Lu & Taylor 2016; Malik, 2015; Vishwanathan et al., 2020; Wang, Dou, et al., 2016; Wang, Tong, et al., 2016; Whelan et al., 2021). However, this does not come as a surprise. Our findings confirm Chand's (2006) view that the differences between industries do not allow for cross-industry research, and that industry-specific analyses would provide more accurate and valid results. The results are also in line with other authors (Makni et al., 2008; Marti et al., 2015; Walker & Wan, 2012) who have demonstrated that the relationship between sustainability performance and financial performance does in fact differ by industry.

## 6 | CONCLUSION

This paper provides insight into the complex relationship between sustainability and firm value in the oil and gas industry. It has been shown that firm value and sustainability are negatively interrelated in a vicious circle. Sustainability performance has a negative impact on firm value; however, this relationship becomes more positive the better the firm's headquarter country's attitude toward sustainability, as measured by renewable energy share. Furthermore, firm value has a negative influence on sustainability performance; this relationship is more positive for pure upstream players, and further becomes more positive the better the attitude toward sustainability in the country in which the firm is headquartered in, also measured by renewable energy share.

The explanatory power continues to hold under consideration of a profitability measure, Return on Sales, instead of Tobin's Q. Therefore, it seems that oil and gas firms' investment in sustainability does not pay off, because they do not manage to gain legitimacy and accumulate Shareholder Influence Capacity. Furthermore, increased firm value and profitability do not result in mimetic pressure while, in times of financial uncertainty, firms do engage in mimetic isomorphism. This goes hand in hand with some managers choosing to pull back sustainability efforts in times of financial wellbeing to increase own profits, or simply to report even better financial results. At the same time, those managers would try to offset decreased firm value or profitability by investing in sustainability. This partly confirms what Gonenc and Scholtens (2017) found for oil and gas firms, when only considering environmental sustainability.

This paper does not only make several contributions to the academic literature, as mentioned in the introduction above. Our findings

are also of importance to various stakeholders. Naturally, practicing managers should not use the findings to argue that all investment in sustainability beyond the mere legal requirements in the oil and gas industry is useless and should be discontinued. Rather, practitioners could consider these findings while developing a sustainability strategy. Addressing the negative influence of sustainability performance on Tobin's Q and profitability, practitioners could find ways to gain legitimacy and invest in sustainable endeavors that will not be perceived as greenwashing. As for the presentation of their initiatives, Walker and Wan (2012, p. 238) suggest "to discuss actions completed instead of future plans and potential environmental commitments [as] in fact, the discussion of future plans and potential commitments may harm the firm financially."

Regarding the negative influence of Tobin's Q and profitability on sustainability, the timing of sustainability investments should be carefully considered. Oil and gas companies should consider sustainability from a long-term perspective instead of purely focusing on the business case and treating it as a public relations strategy (Du & Vieira, 2012). Since our findings indicate that upstream players currently perform better along this dimension, integrated oil and gas players as well as mixed players could study upstream players' sustainability strategies and identify success factors (Beck et al., 2020). All of these elements can be combined in a holistic sustainability strategy tailored to the company's needs. Ensuring the right company fit is essential, as sustainability is very company-specific and generic strategies often do not prove fruitful (Porter & Kramer, 2006). Such a strategy should aim to address all elements of sustainability: environmental, social, and governance issues. For oil and gas firms, it is especially difficult to tackle social and governance issues as the business case, for those initiatives are much more difficult and especially multinational oil and gas companies often do not acknowledge the full extent of their interactions with politics and society in the diverse countries in which they operate (Frynas, 2007, p. 166).

Our results indicate that oil and gas companies are under considerable pressure from the capital markets. Discussions within the European Union regarding whether investments in gas production should also be covered by the sustainable investment taxonomy may at first glance provide relief for some companies within this industry, but "green" investment funds and activist shareholders and organizations such as Greenpeace will continue to ensure that the oil and gas industry cannot shirk its responsibility to reduce its emissions and move toward renewable energy. The Russian invasion of Ukraine has highlighted the importance that fossil fuels continue to play, but this may make it all the more tempting for governments to step up the pressure toward a sustainable energy transition, especially if, beyond direct regulation, they can rely on the capital markets to support them. A recent study by KPMG (Alkadiri et al., 2022) provides guidance on what companies may face and how they can address the demands of these and other stakeholder groups.

Naturally, this study is not without limitations. First, the companies' sustainability performance has been measured by the Thomson Reuters ESG score. As with all ratings, there is a possibility that companies have influenced them. However, company information is only

one of many sources for the Thomson Reuters ESG rating (Thomson Reuters, 2017). Chatterji et al. (2015) further criticize such ratings in general. They argue that the most often used CSR ratings, namely Thomson Reuters ESG ratings, KLD, Calvert, Innovest, FTSE4Good, and DJSI, differ significantly in their outcome for overlapping universes, and one should hence use caution when using such ratings. Second, because we used the Thomson Reuters ESG score as a measure of sustainability performance, only publicly listed companies were included in the sample. Companies that are not publicly listed do not receive Thomson Reuters ESG ratings. Third, the measure of firm value adopted in this paper, Tobin's Q, can only be approximated, as the replacement value of assets is a purely hypothetical measure. Because of that, we have conducted a robustness check with a profitability measure and came to very similar results.

Interesting avenues for future research might be to deepen the concept of a country's or society's general attitude toward sustainability. An index could be developed that goes beyond the proxy of renewable energy share that this paper used. Furthermore, future research could consider the short-term effects of sustainable and unsustainable behavior in the oil and gas industry. It might prove fruitful to discover if and how these effects differ from other industries.

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## ORCID

Dodo zu Knyphausen-Aufseß  <https://orcid.org/0000-0001-7121-3124>

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## APPENDIX A

TABLE A1 Descriptive statistics

Variable	Obs	Mean	SD	Min	Max
Tobin's Q	1515	1.496	0.745	0.237	5.878
ESG Score	1515	52.703	18.527	12.03	92.29
LOG Total Assets	1515	6.902	0.773	4.818	8.614
LOG Liabilities	1515	15.059	2.034	6.547	19.171
LOG CAPEX	1515	13.603	1.961	0	17.745
ROTA	1515	0.059	0.143	−0.906	0.842
Sales growth	1515	0.071	0.377	−1	2.844
Analysts following	1515	14.057	9.275	1	46
Renewable output	1515	27.822	25.403	0	99.472
Vert. Integration <sup>a</sup>	1515	0.397	0.49	0	1
ROS	1481	0.061	0.467	−2.93	0.973

<sup>a</sup>Vertical Integration is a categorical variable with 1 being «upstream» and 0 being “all other firms”; Renewable output means the share of renewable electricity of total electricity output, a value of 100 means 100%.

Source: Own compilation.

## APPENDIX B

## B.1 | OUTLIERS AND MODIFICATIONS

TABLE B1 Outliers

Variable	Outliers excluded	Share of data (total sample) <sup>a</sup>
Tobin's Q	Values bigger than 6	1%
Sales growth	Values bigger than 3	2.5%
ROTA	Values smaller than −1	1%
ROS	Values smaller than −3 and bigger than 1	2.5%

<sup>a</sup>Note that some of this data is already excluded due to missing observations or the identification as outlier for a different variable.

Source: Own compilation.

TABLE B2 Data modifications

Variable	Modification	Reasoning
Renewable output	Data for 2015 and 2016 assumed to be the same as 2014	No data available for 2015 and 2016

Source: Own compilation.

## APPENDIX C

TABLE C1 Thomson Reuters ESG score calculation method

Pillar	Category	Weights
Environmental	Resource Use	11%
	Emissions	12%
	Innovation	11%
Social	Workforce	16%
	Human Rights	4.5%
	Community	8%
	Product Responsibility	7%
Governance	Management	19%
	Shareholders	7%
	CSR Strategy	4.5%
Total		100%

Source: Thomson Reuters (2017).