

The relationship between corporate social responsibility expenditures and firm value: The moderating role of integrated reporting

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ABSTRACT

For decades, research has debated whether a firm's corporate social responsibility (CSR) activities increase its firm value. Whereas the cost-concerned school proposes a detrimental effect, the value-creation school suggests a positive relationship. To date, empirical results are still inconclusive. One explanation might be that the relationship is not linear but U-shaped. Thus, both schools could coexist. Additionally, the disclosure of an integrated report might positively moderate the relationship, as integrated reporting (IR) should enhance investors' information environment. This study applies the Ohlson model for a global and listed sample of 8,992 firm-year observations between 2012 and 2017 and provides evidence that environmental expenditures follow a U-shaped relationship, and that social expenditures follow an inverted U-shaped relationship with firm value. Based on these findings, IR positively moderates the association between environmental expenditures and firm value for firms with either a low or a high level of environmental expenditures. However, for firms that are "stuck in the middle" with regard to their environmental expenditures, the moderating effect of IR appears negative. The results show no indication of a moderating effect of IR for the inverted U-shaped relationship between social expenditures and firm value.

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1. Introduction

"Across the world investors say to us that some companies continue to tell them there is no demand for information [...] not recognized by financial statements." (IIRC, 2017b)

"We believe that all investors [...] need a clearer picture of how companies are managing sustainability-related questions. Each company's prospects for growth are inextricable from its ability to operate sustainably [...]." (Fink, 2020)

From the perspective of corporate practice, the above two statements indicate that there is still ambiguity with regard to the relevance of corporate social responsibility (CSR) information¹ for investors.² The importance of CSR information for investment

decisions is often highlighted, although whether a business case for CSR activities exists is still debated by research and practice (Brooks and Oikonomou, 2018).

Following the cost-concerned school, CSR activities are expected to have a detrimental effect on corporate financial performance (CFP),³ as they may represent only cash outflows by consuming corporate resources (Mervelskemper and Streit, 2016; Sun et al., 2019). The quote above from a statement of investors disclosed by the International Integrated Reporting Council (IIRC) exemplifies the view of the cost-concerned school. The quote suggests that investors do not demand CSR information to value a firm, as all necessary information might already be included within the financial statements (IIRC, 2017b).

However, the overarching opinion from research and practice is the opposite (Brooks and Oikonomou, 2018; Fink, 2020; Orlitzky

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¹ The term "CSR" is used in this paper to represent the environmental and social dimensions of CSR. Furthermore, the terms "CSR information", "ESG information", and "non-financial information" may be used interchangeably.

² In this paper, the term "investors" refers to equity investors.

³ CFP can be distinguished using accounting-based indicators (e.g., return on assets [ROA]) or return on equity [ROE]) and stock market-based indicators (e.g., firm value) (Plewnia and Guenther, 2017). Herein, the focus will be on firm value. Refer to Section 3.2 for a more detailed explanation of the choice of a stock market-based financial indicator.

et al., 2003). The value-creation school proposes that CSR activities have a beneficial effect on CFP and argues that a firm can “do well by doing good” (Hassel et al., 2005; Sun et al., 2019). Hence, prevailing research studies are convinced that CSR activities generate competitive advantages, address the needs of stakeholders, and ensure corporate legitimacy, which may also result in an increase in firm value (Malik, 2015; Orlitzky et al., 2003). This is underlined by the fact that approximately 50% of all professionally managed assets in Canada, Australia and New Zealand, and Europe are already considered sustainable investments (GSIA, 2018). Indeed, Larry Fink (2020), chief executive officer (CEO) of the global asset management firm BlackRock, emphasized in his recent letter to CEOs that CSR information is crucial for investors to evaluate the long-term success of a company, as financial performance depends on CSR performance.

Nevertheless, empirical results on the financial advantage-ness of CSR for companies are still inconclusive (Brooks and Oikonomou, 2018; Orlitzky et al., 2003; Zhang, Lin, et al., 2020), and the reason for this may be that the value-creation and cost-concerned schools are not polar opposites, but they can coexist (Brammer and Millington, 2008; Hahn et al., 2010). Thus, the relationship might not be explained by only one school of thought. However, the majority of research still assumes a simple linear relationship (Sun et al., 2019). Against this trend, first empirical studies have shown a quadratic relationship between CSR and CFP (e.g., Brooks and Oikonomou, 2018; Busch et al., 2020; Fujii et al., 2013; Trumpp and Guenther, 2017; Zhang, Wei, et al., 2020). Quadratic or U-shaped functions assume an area where the relationship between CSR activities and CFP is positive, as well as an area where the relationship is negative. Thus, from a theoretical perspective, these U-shaped functions include areas where the value-creation school outweighs the cost-concerned school and vice versa. Thereby, the relationship can either be U-shaped or inverted U-shaped (Trumpp and Guenther, 2017).

In addition, moderating effects may play a crucial role in answering the question of the circumstances under which CSR activities are (positively or negatively) associated with CFP (Franco et al., 2020; Grewatsch and Kleindienst, 2017; Sun et al., 2019). CSR activities are associated with both economic benefits and costs, which investors might only be able to disentangle with the help of voluntary disclosures (Baboukardos, 2018). According to voluntary disclosure theory, in order to decrease information asymmetries and enhance company valuations, firms should have incentives to inform their investors of the value-creation ability of their CSR activities (Fuhrmann, 2019; Wahl et al., 2020). Both the omission of moderating variables and a narrow focus on a linear relationship could have led to inconclusive empirical results (Grewatsch and Kleindienst, 2017; Sun et al., 2019). To enhance the understanding of this debate, this paper investigates the research question of whether integrated reporting (IR) positively moderates the association between CSR expenditures (environmental and social expenditures) and firm value. As the relationship between both environmental and social expenditures and firm value might depend on the level of expenditures, a test of quadratic relationships is conducted before examining the moderating effect of IR.

Prior to IR, companies published isolated voluntary reports (e.g., sustainability reports or intellectual capital statements) besides the mandatory financial report in order to inform their stakeholders of their value-creation processes (Frías-Aceituno et al., 2013; Wang et al., 2020). The result was often an information-overload effect (de Villiers et al., 2014). IR is the latest attempt to remove the silo reporting of firms by providing only one report that connects all material financial and non-financial information of a firm (Cortesi and Vena, 2019; Di Vaio et al., 2020; Eccles and Krzus, 2010). By having insights into the interdependencies of the financial and

non-financial value-creation⁴ aspects, investors as the target group of IR are likely to benefit from both decreased information asymmetries and the enhanced incorporation of non-financial information into their valuation models (Barth et al., 2017; Lee and Yeo, 2016; Vitolla et al., 2020). Thus, IR aims to present a holistic picture to investors of how non-financial capitals relate to financial value creation. This is considered the value-added of IR beyond, for example, CSR reports (Landau et al., 2020; Tili et al., 2019).

IR is developed by the IIRC, which released a discussion paper in 2011 (IIRC, 2011) and a principles-based framework in 2013 (IIRC, 2013) outlining the ideas of IR. IR is a voluntary reporting concept, except in South Africa, where firms listed on the Johannesburg Stock Exchange (JSE) must disclose an integrated report, although they have discretion regarding the contents of their reports (de Villiers et al., 2017; Wang et al., 2020). Despite the widely voluntary nature of IR, its adoption is growing worldwide (Green and Cheng, 2019).

IR is also an evolving research topic (Landau et al., 2020; Veltri and Silvestri, 2020). With regard to the value relevance⁵ of IR, research has shown that integrated reports can enhance the information environment of investors and positively contribute to capital markets (e.g., Barth et al., 2017; Zhou et al., 2017). To date, this positive capital market effect has remained on an aggregated level, as research has not identified the specific CSR activities for which IR is able to explain financial value creation (Veltri and Silvestri, 2020). Therefore, this paper follows Bansal et al. (2014) and Huang et al. (2019) in decomposing CSR into an environmental dimension and a social dimension, as it differentiates between environmental and social expenditures when investigating the moderating effect of IR.

The analyses in this study are carried out using the Ohlson accounting-based valuation model (Ohlson, 1995). The global and listed sample comprises 8,992 firm-year observations between 2012 and 2017. The results demonstrate a significant U-shaped relationship between environmental expenditures and firm value, while social expenditures show a significant inverted U-shaped relationship with firm value. These findings strengthen research indicating that the cost-concerned school and the value-creation school can coexist (e.g., Nuber et al., 2019; Sun et al., 2019; Wang et al., 2008).

With regard to the potential moderating effect of IR, the results show that IR moderates the U-shaped relationship between environmental expenditures and firm value but not the inverted U-shaped relationship between social expenditures and firm value. In detail, IR positively moderates the association of environmental expenditures and firm value for firms with a low or a high level of environmental expenditures but not for firms “stuck in the middle”. The findings might be attributable, on the one hand, to legitimization against stakeholder expectations by publishing an integrated report for firms with a low level of environmental expenditures. On the other hand, firms with a high level of environmental expenditures might benefit from explanations in their integrated reports of how their environmental expenditures create financial value. For firms that are “stuck in the middle” with regard to their environmental expenditures, the moderating effect of IR appears negative, as the integrated report might reveal no strategic intentions, and thus no value-creation ability of the environmental expenditures, but non-strategic cash outflows. Nevertheless, in all

⁴ According to the IIRC, value creation is put into action via the transformation of six forms of capital, namely financial, manufactured, intellectual, social and relationship, human, and natural capital (IIRC, 2013).

⁵ Value relevance is defined as the ability of accounting and non-accounting information to affect firm value (Hassel et al., 2005).

situations, IR appears to enhance the information environment for investors regarding environmental expenditures according to the intentions of the IIRC (2013), as it helps investors disentangle the economic costs and benefits of environmental expenditures. Conversely, investors may expect a certain degree of social expenditures for a firm to receive its license to operate (Bansal et al., 2014). Thus, investors do not seem to consider explanations of the value-creation contribution of social expenditures provided by integrated reports. A series of robustness analyses confirms the results.

This paper contributes to the literature by combining two research streams that focus on the association between CSR and firm value and the capital market effects of IR. First, the study investigates whether investors regard environmental and social expenditures as value relevant. A quadratic relationship is derived that takes into account both the value-creation and the cost-concerned school. Second, this study contributes to the question of whether IR can fulfill its information-enhancing purpose for investors by explaining value-creation chains between both environmental and social expenditures and firm value that are often not directly observable. Hence, this paper adds to the current literature on IR by disentangling the CSR expenditures that are associated with firm value and moderated by IR, beyond proving solely an aggregated positive capital market effect of IR.

The remainder of the paper is organized as follows: The next section discusses the theoretical background and the related literature and develops the hypotheses. Section 3 introduces the research design. Section 4 presents the empirical results and discussion, including those for robustness analyses. Concluding remarks are given in Section 5.

2. Theoretical background, related literature, and hypotheses development

2.1. The (quadratic) relationship between CSR (expenditures) and financial performance

2.1.1. Cost-concerned school versus value-creation school

Two schools of thought need to be considered when investigating the effects of CSR expenditures on firm value: the cost-concerned school and the value-creation school⁶ (Landau et al., 2020; Mervelskemper and Streit, 2016; Zhang, Lin, et al., 2020). The cost-concerned school proposes a negative relationship, as CSR engagement is assumed to cause only cash outflows, which lower firm value (Hassel et al., 2005; Zhang, Wei, et al., 2020). Thus, engaging in CSR is not in the best interest of shareholders and puts companies at an economic disadvantage, as it shifts firms' resources away from their core business (Sun et al., 2019; Trumpp and Guenther, 2017). Additionally, these CSR engagements are potentially initiated by managers to increase their own reputations at the cost of their investors (Barnea and Rubin, 2010).

CSR expenditures are a costly signal to investors, as they have a direct negative financial impact; however, they may signal the trustworthiness and performance of the firm in terms of its environmental and social responsibility (Trumpp and Guenther, 2017; Zhang, Wei, et al., 2020). Thus, the value-creation school proposes a positive relationship between CSR expenditures and firm value, as CSR activities may create competitive advantages such as improved relationships with stakeholders, improved brand reputation, or employee productivity, which may promote the creation of

shareholder value (Franco et al., 2020; Hassel et al., 2005; Malik, 2015).

Prior research provides mixed empirical evidence for the cost-concerned school and the value-creation school regarding CSR expenditures (e.g., Johnston, 2005; Plewnia and Guenther, 2017; Su et al., 2020; Tharenou et al., 2007; Wang et al., 2014). Thus, inconclusive results appear for the direction between CSR expenditures and firm value.

2.1.2. Too much of a good thing versus too little of a good thing

The variation in the results for the association of CSR expenditures with firm value may be the result of a neglected nonlinear relationship. Sun et al. (2019, p. 1004) claim in this regard, "[A] [...] linear relationship cannot realistically describe the performance implication. Instead, considering nonlinearity may be a desirable option when [...] expenditures are linked to outcomes." Thus, an increase in firm value may be dependent on the level of CSR expenditures, which denies a simple linear positive or linear negative relationship (Sun et al., 2019; Trumpp and Guenther, 2017). For example, a continuous linear increase in firm value is unlikely, as the increasing CSR expenditures are not endlessly transferable to customers in the form of higher product prices (López-Puertas Lamy et al., 2017).

Rather, the relationship can potentially be U-shaped or inverted U-shaped (Fujii et al., 2013; Trumpp and Guenther, 2017; Velte and Gerwanski, 2020). These two meta-theories involve both a positive (value-creation school) and a negative (cost-concerned school) relationship between CSR and CFP. While a U-shaped relationship assumes that a minimum level of CSR must be exceeded to increase CFP (i.e., the "too little of a good thing" effect), an inverted U-shaped relationship assumes diminishing marginal returns; thus, when a certain threshold of CSR is exceeded, the positive contribution to CFP decreases (i.e., the "too much of a good thing" effect) (Trumpp and Guenther, 2017).

Recently, studies have started to investigate a quadratic relationship between CSR and CFP (e.g., Pekovic et al., 2018; Velte et al., 2020; Zhang, Wei, et al., 2020). However, the quadratic relationship between CSR expenditures and firm value is underexplored, which is why the following literature review is expanded to the broader CSR/CFP relationship. Regarding the environmental dimension of CSR, Trumpp and Guenther (2017) report a U-shaped relationship between environmental performance (measured by carbon performance and waste intensity) and both accounting-based and stock market-based CFP measures for service and manufacturing firms. This is partially confirmed by Busch et al. (2020), who find a U-shaped relationship between carbon performance and ROA. In contrast, Misani and Pogutz (2015) reveal an inverted U-shaped relationship between environmental performance (measured by carbon emissions) and Tobin's q. This is in line with the results of Fujii et al. (2013), who examine the relationship between environmental performance (measured by CO₂ emissions and toxic chemical substances emissions) and ROA for Japanese manufacturing firms. For UK firms, Broadstock et al. (2018) find an inverted U-shaped relationship between CO₂ emissions and both accounting-based and stock market-based CFP measures. Applying a survey-based measure for firms' resources devoted to green investments, Pekovic et al. (2018) find an inverted U-shaped relationship with net profit. For a sample of Chinese industrial firms, Zhang, Wei, et al. (2020) find an inverted U-shaped relationship between environmental performance (measured through environmental disclosure) and firms' economic value added.

In terms of the social dimension of CSR, Barnett and Salomon (2012) provide evidence for a U-shaped relationship between sustainability performance (measured by the Kinder, Lyndberg and Domini (KLD) social performance criteria), and ROA. Brammer and

⁶ Both schools of thought can be assigned multiple theories (e.g., value-creation school: resource-based view; cost-concerned school: managerial opportunism). Trumpp and Guenther (2017) discuss this in detail.

Millington (2008) identify a U-shaped relationship between donations and stock market measures. In contrast, Wang et al. (2008) find an inverted U-shaped relationship between corporate philanthropy (measured by charitable giving), and both ROA and Tobin's q, reporting that the positive effect levels off due to a lack of stakeholder support and increased costs. Chen and Lin (2015) confirm an inverted U-shaped relationship between corporate charitable giving and ROE, ROA, and Tobin's q.

Furthermore, some studies investigate quadratic relationships between CSR and CFP but do not decompose CSR into its environmental and social dimensions. Nuber et al. (2019) find a U-shaped relationship between environmental, social, and governance (ESG) performance (measured by ESG Asset4 scores), and both accounting-based and stock market-based CFP measures. Nollet et al. (2016) investigate CSR performance (measured by Bloomberg ESG disclosure score), and reveal a U-shaped relationship with profitability, which is confirmed by Franco et al. (2020) for the hospitality sector. Using KLD data for CSR strengths and concerns, Sun et al. (2019) show that CSR engagement follows an inverted U-shaped relationship with shareholder value.

Overall, there appears to be no consensus on the form (either U-shaped or inverted U-shaped) of the quadratic relationship, as the findings are based on manifold operationalizations for CSR and CFP and partially on non-decomposed CSR measures. Nevertheless, the empirical literature contains strong arguments for testing the relationship between CSR expenditures and firm value by using a quadratic model rather than a linear model. Thus far, no study has examined the potential quadratic relationship between both environmental and social expenditures and firm value. Based on the findings of prior literature, the two opposing meta-theories, and by decomposing CSR expenditures into environmental and social expenditures, two undirected hypotheses are formulated:

H1a. *The association between firm value and environmental expenditures has a quadratic form.*

H1b. *The association between firm value and social expenditures has a quadratic form.*

2.2. The moderating effect of voluntary disclosure

2.2.1. Voluntary disclosure theory

Beyond the question of whether a quadratic relationship exists between CSR and CFP, the inconclusive findings regarding this relationship may be the result of omitted variables, which may moderate the relationship (Grewatsch and Kleindienst, 2017; Sun et al., 2019). If companies are convinced of the value-creation ability of their CSR activities, they should also be incentivized to inform their investors about those benefits. Thereby, companies should be able to explain to their investors how their CSR activities can contribute to financial value creation, as CSR engagement alone may not be reliably interpretable (Mervelskemper and Streit, 2016).

From an agency-theoretical lens and according to voluntary disclosure theory, managers possess more information on the firms' financial and non-financial value creation than do investors (Dhaliwal et al., 2012). Thus, the voluntary disclosure of credible and material information is beneficial in that it decreases information asymmetries between companies and their investors and prevents adverse selection problems (Verrecchia, 1983, 2001). Companies also make use of voluntary disclosures to signal favorable outcomes (signaling theory); thus, they will focus on positive information (Hughes, 1986). However, in some circumstances, firms may also reveal negative information to ensure their legitimacy to act (legitimacy theory) in line with societal expectations (Suchman, 1995).

Voluntary disclosures also relate to *direct* and *indirect costs* (Fuhrmann, 2019). Direct costs arise from the preparation and

dissemination of the voluntary information (Thorne et al., 2014). Indirect costs result from the release of proprietary information, which may be used by the competition and cause unfavorable outcomes for the disclosing firm (Wagenhofer, 1990). Managers will publish information voluntarily as long as the perceived benefits outweigh the perceived costs (Fuhrmann, 2019).

2.2.2. The economic meaning of IR

IR is intended to inform investors holistically about the organizational value-creation process. An integrated report should thereby provide connected non-financial and financial information that would not appear in isolated CSR reports or mandatory financial reports (IIRC, 2013; Tili et al., 2019). Regarding the channels of IR for explaining the value-creation contribution of CSR expenditures, prior research has revealed that IR reduces agency costs for investors and enhances the information environment of investors (e.g., Cortesi and Vena, 2019; Obeng et al., 2020; Salvi, Vitolla, Giakoumelou, et al., 2020; Salvi, Vitolla, Raimo, et al., 2020). Lee and Yeo (2016) indicate that IR leads to reduced information-processing costs in order to generate information on the firm's value-creation activities. This may lead to a higher forecast ability of investors through an enhanced understanding of how CSR activities can lead to financial value creation and how risks are countered (Barth et al., 2017; Wahl et al., 2020). Beyond the equity market, Gerwanski (2020) and Muttakin et al. (2020) confirm that IR also decreases a firm's cost of debt. Additionally, IR can also be informative to, for example, customers by making them aware of the firm's environmental and social responsibility. This could directly impact firms' financial results (Barth et al., 2017).

Overall, prior research revealed that IR improves the information environment of investors, which leads to a better evaluation of the investment risk (Barth et al., 2017; Gerwanski, 2020). However, the positive capital market effects of IR have so far mostly been examined on an aggregated level. It is therefore necessary to disentangle the CSR indicators that might be less difficult for investors to interpret when they are explained within integrated reports (McNally et al., 2017; Veltri and Silvestri, 2020).

Prior research has rarely focused on the moderating role of voluntary disclosures in the relationship between CSR and CFP. Fatemi et al. (2017) provide evidence that a firm's CSR disclosure weakens the positive market valuation of its CSR strengths. However, they also find that a firm's CSR disclosure weakens the negative market valuation of its CSR concerns. Mervelskemper and Streit (2016) find that IR enhances the market valuation of a firm's aggregated ESG performance (measured by Asset4 performance scores). The authors show that publishing an integrated report positively moderates the association between ESG performance and firm value. This seems reasonable, as an integrated report should eliminate the shortcomings of unconnected financial and non-financial information. However, the authors find no moderating effect of IR when decomposing the aggregated ESG performance into its social and an environmental dimension. Beyond the CSR/CFP relationship, Tili et al. (2019) find a positive impact of organizational capital (measured by selling, general, and administrative expenses) on firm value for companies listed on the JSE following the regulation toward IR in 2010. For a comparable setting, Baboukardos and Rimmel (2016) show that the mandatory introduction of IR for firms listed on the JSE increases the value relevance of earnings but decreases the value relevance of net assets.

Beyond the initial findings of Mervelskemper and Streit (2016) regarding the aggregated ESG performance, the question remains as to whether IR's value relevance is the result of its ability to better explain certain CSR activities to investors. Furthermore, neither Fatemi et al. (2017) nor Mervelskemper and Streit (2016) account

for a potential nonlinear relationship between CSR and firm value when investigating the moderating role of voluntary disclosures. Based on voluntary disclosure theory, following the ability of IR to enhance the information environment of investors, and decomposing CSR expenditures into an environmental and a social dimension, two positively directed hypotheses are formulated regarding the moderating effect of IR:

H2a. *The disclosure of an integrated report will positively moderate the (quadratic) association between environmental expenditures and firm value.*

H2b. *The disclosure of an integrated report will positively moderate the (quadratic) association between social expenditures and firm value.*

3. Research design

3.1. Sample selection and sample description

The initial sample is based on the Asset4 Full Universe List⁷ as of November 2018, which includes all listed companies covered by Asset4⁸ that publish at least one type of CSR information. At the time of sampling, the list included 7,379 unique listed companies worldwide. Since the analyzed time period ranges from 2012 to 2017, the final sample could potentially contain 44,274 firm-year observations. To not contradict this study's focus on IR, 2012 is the first year of analysis. Fuhrmann (2019) states that integrated reports disclosed in 2012 were the first that could be guided in its preparation by the IIRC through the IR discussion paper published on September 12, 2011 (IIRC, 2011).

Asset4 does not provide data on environmental and social expenditures for all firm-year observations. Therefore, 30,811 firm-year observations were excluded. For these firm-year observations, Asset4 did not provide any information on either environmental, environmental research and development (R&D), or training expenditures or donations,⁹ which make up the aggregated environmental and social expenditure dimensions in this study. An additional 2,225 firm-year observations were excluded, as values of other database variables needed for the multivariate analyses were missing. Also eliminated were the 2,246 firm-year observations from the financial industry, since the financial industry may differ significantly from other industries with regard to the asset and liability structure of the firms and the accounting standards used (Barth et al., 2004; Tlili et al., 2019). After removing missing values and firm-year observations from the financial industry, the final sample used for the regression analyses of Model (1) and Model (2) contains 8,992 firm-year observations, 7.10% (638) of which could be assigned an integrated report¹⁰. This percentage is in line with KPMG (2017) data on the application of IR. Table 1 summarizes the sample selection process.

⁷ The corresponding Datastream mnemonic is LAST4ESG. The Asset4 dataset is available through Datastream.

⁸ The final sample of 8,992 firm-year observations used for the regression analyses consists of 31% large-cap companies (market value greater than \$10 billion US), 44% mid-cap companies (market value between \$2 and \$10 billion US), and 25% small-cap companies (market value smaller than \$2 billion US). Thus, using the Asset4 Full Universe List ensures a diversified sample composition of companies of different sizes.

⁹ If Asset4 provides at least one of the four possible environmental or social expenditure positions (i.e., environmental expenditures, environmental R&D expenditures, donations, or training expenditures) for a firm-year observation, the firm-year observation is kept in the sample. The missing expenditure positions are set to zero in this case, following a rules-based approach (see Kotsantonis and Serafeim, 2019). Otherwise, the whole firm-year observation is excluded.

¹⁰ For the definition of the variable "integrated report", please refer to section 3.2.

Table 2 presents the industry and continent distribution of the final sample after removal of missing values and firm-year observations from the financial industry. Furthermore, it breaks down the share of integrated reports by industry and continent. The sectors with the highest share of firms are industrial (23.15%), basic materials (17.28%), and consumer services (13.86%). With regard to the continent distribution, the highest proportions of firms originate from Europe (32.51%), Asia (29.55%), and North America (22.87%). Based on the 638 disclosed integrated reports, the highest numbers of integrated reports originate from the industrial (26.33%), basic materials (21.32%), and consumer goods (10.81%) sectors, while companies in the oil and gas (5.80%), technology (5.49%), and health care (5.02%) sectors disclose the fewest integrated reports. The continental distribution shows that European companies (37.30%) disclose the most integrated reports, and Australian companies (1.88%) disclose the fewest.

3.2. Measurement of variables and development of the regression models

The extended Ohlson accounting-based valuation model¹¹ is applied to shed light on the research question. It assumes that market value is a function of a firm's opening book value of equity, net earnings, and "other information" (Baboukardos, 2018; Ohlson, 1995). Recently, Landau et al. (2020), Tlili et al. (2019), and Baboukardos and Rimmel (2016) have also applied the Ohlson model in the context of IR. Equation (1) presents the regression model used to examine hypotheses H1a and H1b, without including the interaction terms of environmental and social expenditures and IR. Model (1) should shed light on the question of whether environmental and social expenditures are value relevant and follow a quadratic relationship with firm value.

$$\begin{aligned} \frac{MV_{i,t} + DI_{i,t}}{BV_{i,t-1}} = & \beta_0 \frac{1}{BV_{i,t-1}} + \beta_1 + \beta_2 \frac{NI_{i,t}}{BV_{i,t-1}} + \beta_3 EXP_{i,t} \\ & + \beta_4 (EXP_{i,t})^2 + \beta_5 \sum_{i=1}^5 CONT_i + \beta_6 \sum_{i=1}^8 IND_i + \beta_7 \sum_{i=1}^5 YEAR_i \\ & + \varepsilon_{i,t} \end{aligned} \quad (1)$$

$MV_{i,t}$ is the market value of equity, which is calculated by multiplying the total number of outstanding shares by the share price. Following Mervelskemper and Streit (2016), a time lag is assumed between both the publication of an integrated report and the CSR expenditures and their reflection in market value. $MV_{i,t}$ is measured three months after the end of the fiscal year, in line with prior research (Carnevale et al., 2012; Cortesi and Vena, 2019; Mervelskemper and Streit, 2016). $DI_{i,t}$ is the total dividends of the fiscal year and is calculated by multiplying the dividends per share by the number of outstanding shares. Thus, $MV_{i,t} + DI_{i,t}$ is the cum-dividend adjusted market value. $NI_{i,t}$ is the net income before preferred dividends of the particular firm-year. $BV_{i,t-1}$ is the opening book value of equity of the particular firm-year. Both $BV_{i,t-1}$ and $NI_{i,t}$ are expected to be positively correlated with $MV_{i,t}$ (de Villiers and Marques, 2016). To mitigate cross-sectional size effects in line

¹¹ The Ohlson model assumes a linear, additive relationship between the market value of equity, accounting information, and non-accounting information (Mervelskemper and Streit, 2016). This study does not use non-accounting information but instead uses both environmental and social expenditures and thus also accounting information. Table 4 shows that the Ohlson model is still applicable, as environmental and social expenditures are not a linear combination of the net income. None of the correlation coefficients exceed the critical value of 0.7 (Landau et al., 2020).

Table 1
Sample selection process.

	2012	2013	2014	2015	2016	2017	Sum
Initial sample (Asset4 Full Universe List)	7,379	7,379	7,379	7,379	7,379	7,379	44,274
<i>Exclusion of missing values for environmental and social expenditure variables from Asset4</i>	5,169	5,120	5,100	4,970	4,933	5,519	30,811
<i>Exclusion of missing values for other Datastream variables</i>	209	378	364	486	433	355	2,225
<i>Exclusion of financial sector firm-year observations</i>	384	356	375	387	405	339	2,246
Final sample size after excluding missing values and financial sector firm-year observations	1,617	1,525	1,540	1,536	1,608	1,166	8,992
Thereof firm-year observations that disclosed an integrated report	125	122	89	120	117	65	638

Table 2
Sector and continent distribution.

Sector	Firm-year observations (share)	Integrated reports (share)	Continent	Firm-year observations (share)	Integrated reports (share)
Basic Materials	1,554 (17.28%)	136 (21.32%)	Africa	449 (4.99%)	206 (32.29%)
Consumer Goods	1,232 (13.70%)	69 (10.81%)	Asia	2,657 (29.55%)	97 (15.21%)
Consumer Services	1,246 (13.86%)	67 (10.50%)	Australia	467 (5.19%)	12 (1.88%)
Health Care	459 (5.10%)	32 (5.02%)	Europe	2,923 (32.51%)	238 (37.30%)
Industrials	2,082 (23.15%)	168 (26.33%)	North America	2,056 (22.87%)	39 (6.11%)
Oil and Gas	723 (8.04%)	37 (5.80%)	South America	440 (4.89%)	46 (7.21%)
Technology	551 (6.13%)	35 (5.49%)			
Telecommunication	391 (4.35%)	40 (6.27%)			
Utilities	754 (8.39%)	54 (8.46%)			
Sum	8,992 (100%)	638 (100%)	Sum	8,992 (100%)	638 (100%)

Table 2 shows the sector and continent distribution for the sample of 8992 firm-year observations included in Model (1) and Model (2) after deletion of missing values and financial sector firm-year observations as described in Table 1. Of those 8992 firm-year observations, 638 (7.10%) disclosed an integrated report.

with prior research (Hassel et al., 2005; Mervelskemper and Streit, 2016), $MV_{i,t} + DI_{i,t}$ and $NI_{i,t}$ are deflated by $BV_{i,t-1}$. The variables $MV_{i,t}$, $DI_{i,t}$, $NI_{i,t}$, and $BV_{i,t}$ are all gathered from Datastream.

This paper relies on firm value, a stock market-based CFP measure, as the dependent variable. Firm value captures the strategic profit potential of a company as perceived by investors (Guenther and Hoppe, 2014). In comparison to accounting-based CFP, stock market-based CFP captures the investors' evaluations of the firm's future CFP (Chen and Lin, 2015; Wahl et al., 2020), which are the focus of this study. Thus, this study intends to explore whether a firm's current environmental and social expenditures are associated with expected future returns and whether this association is moderated by IR. Conversely, accounting-based CFP measures focus on organizational efficiency and past financial performance (Chen and Lin, 2015). Thereby, this study follows Sun et al.'s (2019) argumentation that CSR expenditures might already be well reflected in accounting-based CFP measures. Thus, firm value may capture the strategic intentions of management for CSR expenditures more accurately than would accounting-based measures.

Operationalizations of the CSR variables within empirical studies are discussed without consensus so far, and no unified method of conceptualization exists (Chatterji et al., 2016; Guenther and Hoppe, 2014). By adapting the categorizations of Guenther and Hoppe (2014), CSR performance can be distinguished based on strategic/input CSR performance measures (e.g., CSR expenditures, descriptions of CSR policies) and operational/output CSR performance measures (e.g., amount of emissions) as well as external ratings (e.g., KLD, Asset4).

External ratings are especially criticized for lack of consensus and comparability (Boiral et al., 2020; Chatterji et al., 2016). For example, Chatterji et al. (2009) provide evidence that external ratings do not accurately predict a firm's actual environmental performance (e.g., pollution levels). Thus, ratings seem to be a rather noisy indicator for serious CSR engagement (Chatterji et al., 2009). To investigate whether IR helps investors evaluate a firm's

environmental and social activities regarding the strategic profit potential of a company, strategic CSR performance measures are used rather than operational CSR performance measures.

In analogy to Singh et al. (2016) and Lasmin and Nuzula (2012), this study focuses on firms' environmental and social expenditures, as they directly capture a firm's efforts within these CSR dimensions rather than their outcome. From an investor's perspective, a firm's CSR expenditures should be assessable from the financial statement and might already serve as leading indicators for future returns. In addition, this study follows Bansal et al. (2014) and Huang et al. (2019) by discriminating between the environmental and social dimensions of CSR,¹² because research has provided evidence for varying effects on CFP for both dimensions. As the fundamental idea of IR is to explain a firm's long-term financial value creation of non-financial capitals (Eccles and Krzus, 2010; IIRC, 2013), environmental and social expenditures can be considered relevant independent variables.

$EXP_{i,t}$ represents the aggregated environmental ($EXP_ENV_{i,t}$) and social ($EXP_SOC_{i,t}$) expenditures in Equations (1) and (2). To calculate the environmental and social expenditures, the Asset4 dataset included in Datastream is used. Four individual environmental and social expenditure positions could be identified in Asset4 and downloaded on a larger scale to generate a meaningful sample: environmental expenditures, environmental R&D expenditures,¹³ donations, and training expenditures. Environmental expenditures measure all firm expenditures on environmental

¹² Bansal et al. (2014, p. 961) provide examples of the social dimension like "philanthropy, diversity, employee relations, human rights, and product liability". Examples of the environmental dimension are "environmentally beneficial products and services, pollution prevention, recycling, clean energy, environmental management systems, and voluntary environmental programs".

¹³ Based on the collection methodology of Asset4, environmental expenditures and environmental R&D expenditures are separate in nature. Thus, there is no overlap between environmental R&D expenditures and environmental expenditures.

protection, that is, those used to prevent, reduce, and control environmental aspects, impacts, and hazards. In addition, they include disposal, treatment, sanitation, and clean-up expenditures. Environmental R&D expenditures focus instead on firm expenditures that are used for the development of environmentally friendly products and services. Donations capture a firm's monetary cash and in-kind donations, while training expenditures capture firm expenditures on all training undergone by employees. $EXP_ENV_{i,t}$ is the sum of environmental and environmental R&D expenditures, while $EXP_SOC_{i,t}$ is the sum of donations and training expenditures. Since the environmental and social expenditures may depend on firm size, they are deflated by the net sales of the particular firm-year, in line with prior research (Chen and Lin, 2015; Pekovic et al., 2018). To test quadratic associations, this study follows prior literature in using squared-power terms of environmental and social expenditures in addition to single-power terms (e.g., Fujii et al., 2013; Trumpp and Guenther, 2017).

Since the firm-year observations belong to different continents, industries, and years, the models include continent, industry, and year fixed effects. Thus, the original Ohlson model is slightly modified to control for these effects analogous to de Villiers and Marques (2016). $CONT_i$ is a continent dummy that takes a value of one for all observations of a particular continent; IND_i is an industry dummy, which is based on the industry classification benchmark (ICB); and $YEAR_i$ is a year dummy. Furthermore, all economic variables are winsorized at the 2.5% level to consider distortions from outliers. If necessary, the economic variables are denominated in euros within Datastream in order to use a common currency.

Equation (2) expands Equation (1) by including the hypothesized moderating effect of IR. To investigate whether the association between both environmental and social expenditures and firm value differs between firms that do and do not disclose an integrated report, the variable $IR_{i,t}$ and the linear-by-linear and quadratic-by-linear interaction terms [$EXP_{i,t} \times IR_{i,t}$ and $((EXP_{i,t})^2 \times IR_{i,t})$] are included.¹⁴ $IR_{i,t}$ is a dichotomous variable that takes a value of one for firms disclosing an integrated report and zero for firms not disclosing an integrated report in the corresponding year. In line with prior research, this information is hand-collected from the GRI Sustainability Disclosure Database¹⁵ and manually matched for every firm-year observation in the sample (Fuhrmann, 2019; Landau et al., 2020; Obeng et al., 2020). The appendix summarizes the definitions, measurements, and sources of all variables.

4. Empirical results and discussion

4.1. Descriptive statistics and correlation analysis

Table 3 reports the means, standard deviations, 5% and 95% quantiles, and medians for the continuous variables of the 8,992 firm-year observations used in Model (1) and Model (2). The average value of the dependent variable $(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$ is 3.00. The mean of $NI_{i,t}/BV_{i,t-1}$ is 12.63%. With regard to the environmental and social expenditures in relation to net sales, the descriptive statistics show that, on average, firms spend more on environmental expenditures (mean $EXP_ENV_{i,t}$: 0.496%) than on social expenditures (mean $EXP_SOC_{i,t}$: 0.188%). Furthermore, Table 3 presents the results from a parametric *t*-test that differentiates between IR and non-IR companies with regard to the dependent variable and the explanatory variables. The *t*-test reveals a significant difference between IR and non-IR companies only for social expenditures ($p < 0.01$). Firms that publish an integrated report have significantly higher social expenditures.

Table 4 presents the Pearson correlations and the respective *p*-values. The correlations show that the inverse of the book value $1/BV_{i,t-1}$ is significantly and positively associated with $NI_{i,t}/BV_{i,t-1}$, which is in line with Mervelskemper and Streit (2016). Environmental expenditures ($EXP_ENV_{i,t}$) are significantly and negatively correlated with $(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$. In contrast, social expenditures ($EXP_SOC_{i,t}$) are significantly and positively correlated with $(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$. $IR_{i,t}$ shows no significant correlation with $(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$. Among the independent variables, there are no signs of serious multicollinearity. The values of all correlation coefficients between explanatory variables are smaller than the threshold of 0.7 (Landau et al., 2020).

4.2. Results of the regression models

Table 5 presents the results of the regression analyses.¹⁶ In the first and second columns, Table 5 provides the output for Model (1), which examines whether the relationships between firm value and both environmental and social expenditures follow a quadratic form.¹⁷ In the third and fourth columns, Table 5 shows the results for Model (2) and the question of whether the disclosure of an integrated report positively moderates the relationship between firm value and both environmental and social expenditures. Robust

$$\begin{aligned} \frac{MV_{i,t} + DI_{i,t}}{BV_{i,t-1}} = & \beta_0 \frac{1}{BV_{i,t-1}} + \beta_1 + \beta_2 \frac{NI_{i,t}}{BV_{i,t-1}} + \beta_3 EXP_{i,t} + \beta_4 (EXP_{i,t})^2 + \beta_5 IR_{i,t} + \beta_6 (EXP_{i,t} \times IR_{i,t}) + \beta_7 (\\ & \times (EXP_{i,t})^2 \times IR_{i,t}) + \beta_8 \sum_{i=1}^5 CONT_i + \beta_9 \sum_{i=1}^8 IND_i + \beta_{10} \sum_{i=1}^5 YEAR_i + \varepsilon_{i,t} \end{aligned} \quad (2)$$

¹⁴ As hypothesized, the results of H1a and H1b point at a significant quadratic relationship between both environmental and social expenditures and firm value. Therefore, Model (2) proceeds with quadratic interaction terms.

¹⁵ Available at <http://database.globalreporting.org/>.

¹⁶ Before testing the hypotheses, the overall explanatory power of the Ohlson model was tested. Therefore, $(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$ is regressed with $1/BV_{i,t-1}$ and $NI_{i,t}/BV_{i,t-1}$. Untabulated results confirm the explanatory power, as both independent variables are significantly related ($p < 0.01$) to $(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$.

¹⁷ The opposing signs of the linear and the quadratic terms can be interpreted as a sign that the minimum of the U-shaped or inverted U-shaped function is in the first or fourth quadrant (Trumpp and Guenther, 2017). In the first and fourth quadrants, the environmental and social expenditures are greater than or equal to zero. This is reasonable, as the expenditure positions are by definition greater than or equal to zero. Since the dependent variable is the firm value, which is also greater than zero by definition, all functions lie in the first quadrant.

Table 3
Descriptive statistics.

Variable	Mean	St. Dev.	5%	Median	95%	Mean (IR = 1)	Mean (IR = 0)	t-test
$(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$	2.99842	2.99262	0.43038	1.99870	9.56468	3.13829	2.98774	
$NI_{i,t}/BV_{i,t-1}$	0.12629	0.19467	-0.19735	0.11081	0.47556	0.13157	0.12589	
$EXP_ENV_{i,t}$	0.00496	0.01039	0	0	0.03033	0.00493	0.00496	
$EXP_SOC_{i,t}$	0.00188	0.00332	0	0.00058	0.00956	0.00283	0.00181	***

N = 8,992 firm-year observations as included in Model (1) and Model (2) after deletion of missing values and financial sector firm-year observations as described in Table 1. All variables are winsorized at a 2.5% level to control for outliers. *** indicates a significant difference of means at the 0.01 level based on a parametric *t*-test between the firm-year observations with (N = 638) and without (N = 8,354) an integrated report, respectively.

For definitions and measurement of the variables, see the Appendix.

Table 4
Correlation matrix.

	$(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$	$1/BV_{i,t-1}$	$NI_{i,t}/BV_{i,t-1}$	$EXP_ENV_{i,t}$	$EXP_SOC_{i,t}$	$IR_{i,t}$
$(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$	1.000					
$1/BV_{i,t-1}$	0.376 (0.000)	1.000				
$NI_{i,t}/BV_{i,t-1}$	0.692 (0.000)	0.211 (0.000)	1.000			
$EXP_ENV_{i,t}$	-0.164 (0.000)	-0.106 (0.000)	-0.120 (0.000)	1.000		
$EXP_SOC_{i,t}$	0.070 (0.000)	0.026 (0.012)	0.047 (0.000)	-0.033 (0.002)	1.000	
$IR_{i,t}$	0.013 (0.221)	0.092 (0.000)	0.008 (0.477)	0.001 (0.957)	0.079 (0.000)	1.000

N = 8,992 firm-year observations as included in Model (1) and Model (2) after deletion of missing values and financial sector firm-year observations as described in Table 1. The coefficients shown are calculated based on Pearson correlations. The parentheses below each coefficient give the p-values.

All variables except for the binary variable $IR_{i,t}$ are winsorized at a 2.5% level to control for outliers.

For definition and measurement of the variables, see the Appendix.

ordinary least square (OLS) regressions are carried out. The F-statistics indicate an overall significance of all empirical models in this study. In addition, the adjusted R^2 values show a high explanatory power. Partial F-tests are used to compare the explanatory power of each quadratic model with the respective linear models.¹⁸ All t-statistics and significances are based on robust¹⁹ standard errors.

4.2.1. The quadratic relationship between CSR expenditures and firm value

The coefficients for the squared terms of environmental ($EXP_ENV_{i,t}^2$; $p < 0.01$) and social expenditures ($EXP_SOC_{i,t}^2$; $p < 0.01$) of Model (1) show significant associations with firm value ($(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$). First, both environmental and social expenditures are value relevant. Second, this confirms the theoretical rationales of the proposed quadratic functions and supports hypotheses H1a and H1b. Partial F-tests confirm that the explanatory power of the quadratic models is higher than that of the linear models.

In detail, the results show a significant positive coefficient for the squared environmental expenditures ($EXP_ENV_{i,t}^2$), indicating a U-shaped relationship with firm value ($(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$). Thus, there is a range of environmental expenditures below a certain threshold within which additional environmental expenditures decrease firm value. Only when this minimum is exceeded investors do value environmental expenditures by adjusting their firm valuation upwards. This finding is related to the theoretical framework of “too little of a good thing” (Fujii et al., 2013; Trumpp and Guenther, 2017). For the sample used here, this minimum²⁰ for

the environmental expenditures ($EXP_ENV_{i,t}$) is 3.1% of net sales. Thus, the majority of the firms are positioned to the left of the minimum, on the decreasing part of the U-shaped curve.²¹ With regard to environmental expenditures, extreme positions seem to be the best options for firms in the context of the association with firm value. The U-shaped relationship between environmental expenditures and firm value is also in line with the findings of Trumpp and Guenther (2017) regarding the relation between CFP and both carbon performance and waste intensity. Trumpp and Guenther (2017) recommend pursuing proactive environmental strategies (e.g., the development of new products or the adjustment of production processes) in order to exceed the threshold value when engaging in environmental activities for investors to reward the efforts of companies.

Regarding the squared social expenditures ($EXP_SOC_{i,t}^2$), the results show a significant negative coefficient, indicating an inverted U-shaped relationship with firm value ($(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$). Thus, there appears to be a maximum social expenditure above which the firm value decreases. This effect is referred to the theoretical framework of “too much of a good thing” (Fujii et al., 2013; Trumpp and Guenther, 2017). For this sample, this maximum²² for the social expenditures ($EXP_SOC_{i,t}$) is 0.9% of net sales. Thus, the strategy of “doing well by doing good” (increasing part of the inverted U-shaped curve) seems to be quickly exhausted. The firms in the sample are on average positioned to the left of this maximum, on the increasing part of the inverted U-shaped curve.²³ This inverted U-shaped relationship supports similar findings by Chen and Lin (2015), Sun et al. (2019) and Wang et al. (2008) that

¹⁸ The regression results of the linear models are available upon request.

¹⁹ The findings of Model (1) and Model (2) remain unchanged when using clustered standard errors.

²⁰ To assess the minimum, the first derivative for the following function is calculated by: $f'(x) = -24.07x + 389.22x^2 + 1.51$ (column I in Table 5).

²¹ The observable maximum in the sample for $EXP_ENV_{i,t}$ is 4.65%.

²² To assess the maximum, the first derivative for the following function is calculated by: $f'(x) = 163.92x - 9,366.81x^2 + 1.05$ (column II in Table 5).

²³ The observable maximum in the sample for $EXP_SOC_{i,t}$ is 1.59%.

Table 5
Regression results.

Variable	I Model (1)		II Model (1)		III Model (2)		IV Model (2)		V Model (2)	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
$1/BV_{i,t-1}$	5.07×10^8	21.22***	5.24×10^8	22.10***	5.08×10^8	21.29***	5.24×10^8	22.17***	5.21×10^8	21.90***
$NI_{i,t}/BV_{i,t-1}$	9.21	45.59***	9.16	45.53***	9.21	45.57***	9.16	45.51***	9.14	45.36***
$EXP_ENV_{i,t}$	−24.07	−4.58***			−21.67	−3.95***			−17.60	−3.22***
$EXP_ENV^2_{i,t}$	389.22	3.09***			334.86	2.56**			257.39	1.97**
$EXP_SOC_{i,t}$			163.92	8.12***			164.57	7.92***	160.74	7.73***
$EXP_SOC^2_{i,t}$			−9,366.81	−6.41***			−9,481.02	−6.15***	−9,260.10	−6.00***
$IR_{i,t}$					0.35	3.20***	0.22	1.92*	0.36	2.54**
$EXP_ENV_{i,t} * IR_{i,t}$					−44.91	−2.29**			−48.32	−2.38**
$EXP_ENV^2_{i,t} * IR_{i,t}$					1,067.89	2.04**			1,108.90	2.07**
$EXP_SOC_{i,t} * IR_{i,t}$							−4.39	−0.06	−20.88	−0.27
$EXP_SOC^2_{i,t} * IR_{i,t}$							1,146.45	0.23	2,311.30	0.46
Industry controls	Yes		Yes		Yes		Yes		Yes	
Continent controls	Yes		Yes		Yes		Yes		Yes	
Year controls	Yes		Yes		Yes		Yes		Yes	
Constant	1.51	8.85***	1.05	5.88***	1.36	7.64***	0.94	5.03***	0.91	4.82***
Observations	8,992		8,992		8,992		8,992		8,992	
Adjusted R ²	0.5838		0.5866		0.5842		0.5868		0.5877	
F-statistic	267.01***		270.23***		235.46***		238.39***		207.94***	
Partial F-test	5.96**		49.40***		4.57**		24.62***		13.45***	

The results are tabulated for a robust OLS regression with the dependent variable $(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$.

***, **, and * indicate that a coefficient is significantly different from zero (based on a two-tailed *t*-test for the *t*-statistics) and that the regression is significant overall (based on an *F*-test for the *F*-statistic) at the 0.01, 0.05, and 0.10 levels, respectively. The adjusted R² describes the explanatory power of each model. The partial *F*-test compares the explanatory power of a quadratic model with a linear model. A significant test statistic shows that the explanatory power of the quadratic model is higher than the explanatory power of the linear model (without quadratic terms and quadratic interaction terms).

The variables $(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$, $1/BV_{i,t-1}$, $NI_{i,t}/BV_{i,t-1}$, $EXP_ENV_{i,t}$, and $EXP_SOC_{i,t}$ are winsorized at the 2.5% level to control for outliers.

For definition and measurement of the variables, see the Appendix.

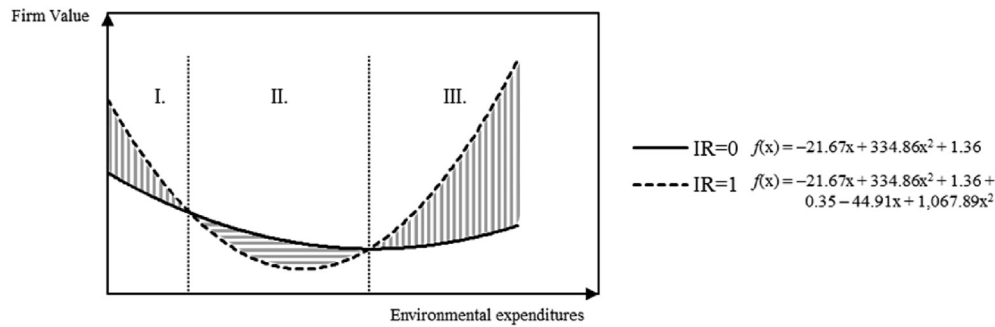


Fig. 1. The U-shaped relationship (“too little of a good thing”) between environmental expenditures and firm value for firms both with and without an integrated report.

social expenditures can lead to diminishing returns when investors observe overspending of company resources. Thus, investors seem to value only a certain level of social expenditure, as this can ensure the legitimacy of the firm given intensified stakeholder pressure or help the firm appear socially responsible (Hahn and Kühnen, 2013; Sun et al., 2019). Overall, systematically encouraging firms to spend more on social activities can also be detrimental to the economic performance of the firm. In this regard, tension might appear between the economic considerations of the firm and stakeholder expectations with regard to social expenditures.

The results for hypotheses H1a and H1b confirm that there are trade-offs between both environmental and social expenditures and firm value. Thus, both the cost-concerned and the value-creation school can coexist. This result justifies the application of quadratic models in studying the moderating effects of IR for the relationship between environmental and social expenditures and firm value.

4.2.2. The moderating effect of IR

As proposed by hypotheses H2a and H2b, the publication of an integrated report may help investors evaluate the value creation of both environmental and social expenditures (Barth et al., 2017; McNally et al., 2017). To test the moderating role of $IR_{i,t}$, an interaction term between $IR_{i,t}$ and the respective single-power and squared-power expenditure positions is added to the second regression model ($EXP_{i,t} * IR_{i,t}$ and $EXP_{i,t}^2 * IR_{i,t}$) as well as the isolated variable $IR_{i,t}$. The partial F-tests again confirm that the explanatory power of the quadratic models is higher compared to using linear models.

Based on Model (2), the results show a significant positive association with firm value ($(MV_{i,t} + DI_{i,t})/BV_{i,t-1}$) for the interaction term of the squared environmental expenditures and $IR_{i,t}$ ($EXP_ENV_{i,t}^2 * IR_{i,t}$; $p < 0.05$). However, to accurately evaluate the moderating effect of IR, the joint effect of the significant explanatory variables has to be considered. Fig. 1 plots this joint effect of environmental expenditures on firm value for the U-shaped relationship for firms both with²⁴ and without²⁵ an integrated report.

Fig. 1 exemplifies that the firm value of companies publishing an integrated report is only higher for firms with no or a low level of environmental expenditures and for those pursuing a proactive environmental strategy with a high level of environmental expenditures (vertical shaded areas I and III in Fig. 1). In these cases, IR may explain to investors why a firm invests either little to nothing or a high share of net sales in environmental activities. This confirms H2a only partially, as there appears to be no general positive

moderating effect of IR. By investing little to nothing in environmental activities (firms in this sample with environmental expenditures of 0%–1% of net sales, area I), IR may serve as a tool that allows firms to legitimize themselves regarding stakeholder expectations, as already assumed by prior research (Fuhrmann, 2019; Hahn and Kühnen, 2013; Lai et al., 2016). Additionally, in this situation firms might use the integrated report to discuss environmental expenditures which follow solely regulatory demands. Firms pursuing a proactive environmental strategy (firms in the sample with environmental expenditures of more than 3.2% of net sales, area III) may use IR to signal and explain to investors how a high level of environmental expenditures will benefit the company financially by decreasing information asymmetries (Fuhrmann, 2019; Lai et al., 2016). The latter result appears to be in line with the prior findings of Lai et al. (2016), who suggest that IR benefits firms with a high degree of non-financial performance. Additionally, following Bansal et al. (2014), technical knowledge might be required to understand the economic benefits of environmental expenditures. Thus, the financial contribution of environmental expenditures is uncertain without further explanation.

Firms that appear to be “stuck in the middle” (firms in the sample with environmental expenditures of 1%–3.2% of net sales, area II) have a smaller firm value when publishing an integrated report compared to firms that do not publish one (horizontal shaded area II in Fig. 1). In this area, the integrated report may raise doubt among investors about why the company makes environmental expenditures even though there seems to be no strategic intention of value creation behind this cash outflow. On the contrary, the integrated report may enhance the information environment of investors by explaining the value destruction of firms' environmental expenditures.

These findings might lead to the conclusion that with regard to environmental expenditures, firms should either push them proactively (move to area III) or rather do not make these expenditures, respectively only fulfill regulatory requirements (move to area I). In both situations, IR seems to increase the firm value through increased transparency according to voluntary disclosure theory, specifically legitimacy and signaling theory. Nevertheless, IR also significantly and negatively moderates the “stuck in the middle” area. Thus, IR might be helpful for investors to discriminate firms with value-creation intentions from firms that do not follow strategic intentions with regard to environmental expenditures (area II versus area III), which appears to be in line with the overarching goal of IR (IIRC, 2013).

The inverted U-shaped relationship between social expenditures and firm value is not significantly ($EXP_SOC_{i,t}^2 * IR_{i,t}$; $p > 0.10$) moderated by $IR_{i,t}$. Thus, hypothesis H2b is rejected. No additional explanations seem necessary for social expenditures, as investors may expect a firm to have a certain level of social expenditures in

²⁴ $f(x) = -21.67x + 334.86x^2 + 1.36$ (column III in Table 5).

²⁵ $f(x) = -21.67x + 334.86x^2 + 1.36 + 0.35 - 44.91x + 1,067.89x^2$ (column III in Table 5).

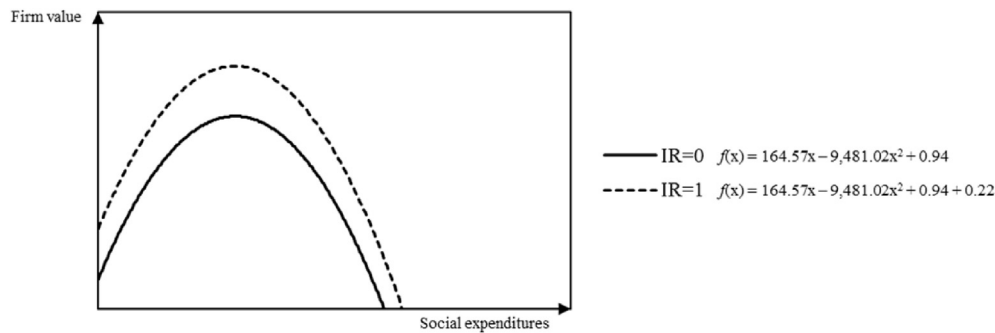


Fig. 2. The inverted U-shaped relationship (“too much of a good thing”) between social expenditures and firm value for firms both with and without an integrated report.

order to receive its license to operate. Social expenditures may be regarded as a legitimizing or reputational aspect of CSR (Du and Vieira, 2012), which can be properly interpreted by investors without considering an integrated report.

Fig. 2 plots the joint effect of the social expenditures on firm value for the inverted U-shaped relationship for firms both with²⁶ and without²⁷ an integrated report. As there is no significant moderation by $IR_{i,t}$ compared to the environmental expenditures but solely a significant positive isolated association of IR ($IR_{i,t}$; $p < 0.10$), the inverted U-shaped curve is shifted upwards. Thus, in light of an isolated evaluation of the contribution of social expenditures to firm value, all firms would benefit from publishing an integrated report. However, this parallel upward shift displayed in Fig. 2 is not dependent on the level of social expenditures as no significant moderating effect exists.

To investigate the reliability of these findings, Model (2) is re-run including the single-power and squared-power environmental and social expenditures and the respective interaction terms with $IR_{i,t}$ in one regression model. Table 5 displays the results in column V. The results confirm that $IR_{i,t}$ moderates the U-shaped relationship between environmental expenditures and firm value but not the inverted U-shaped association between social expenditures and firm value. The previous separately tested environmental and social expenditures do not influence each other when included in the same regression model.

4.3. Robustness analyses

In order to ensure the stability of the results with respect to measurement and sample adjustments as well as endogeneity concerns, robustness analyses are applied for Model (2).

4.3.1. Exclusion of South African firm-year observations

IR is de facto mandatory for firms listed on the JSE in South Africa. Despite this regulation, the content of South African integrated reports is quasi-voluntary, as report preparers can exercise significant discretion (de Villiers et al., 2017; Wang et al., 2020). This is why South African integrated reports are included within the analyses. Nevertheless, as shown by prior research, the capital market effects of mandatory and voluntary CSR disclosures can differ (Ioannou and Serafeim, 2019). To counter any bias from the inclusion of South African firm-years, Model (2) is re-run, excluding all 439 South African firm-year observations. Untabulated

regression results show that all initial findings remain unchanged.²⁸

4.3.2. Manufacturing versus service industries

Trumpp and Guenther (2017) argue that research examining the relationship between CSR and CFP is predominantly focused on the manufacturing industry, due to its greater environmental impact. Firm-year observations from both the manufacturing and service industries are included in this study for two reasons: first, the service industry may also have an environmental impact (Wolf, 2013); and second, since this paper also examines the relationship between social expenditures and firm value, the service industry may be particularly relevant.

Nevertheless, the effects of environmental and social expenditures on firm value and their moderation by IR may differ between the manufacturing and service industries, and Model (2) is therefore re-run using two subsamples – one for the manufacturing industry and one for the service industry. The subsample for the manufacturing²⁹ industry builds on 6,142 firm-year observations, while the subsample for the service³⁰ industry builds on 2,850 firm-year observations. Untabulated results show that the prior results are qualitatively confirmed.

4.3.3. Shareholder-versus stakeholder-oriented countries

Simnett et al. (2009) suggest that companies from stakeholder-oriented countries have a higher need to legitimize their actions for a broad spectrum of stakeholders. In contrast, within shareholder-oriented countries, companies are seen as an instrument to generate shareholder value. Compared to stakeholder-oriented countries, stakeholder groups other than shareholders have less influence on companies' actions in shareholder-oriented countries.

Given this difference, Model (2) is re-run to counter the potential bias that the moderation by IR varies between shareholder-oriented and stakeholder-oriented countries. This study uses the code law and common law classifications to differentiate between stakeholder-oriented and shareholder-oriented countries. Common law countries are considered to have a greater shareholder orientation, whereas code law countries are seen to have a greater

²⁶ $f(x) = 164.57x - 9,481.02x^2 + 0.94$ (column IV in Table 5).

²⁷ $f(x) = 164.57x - 9,481.02x^2 + 0.94 + 0.22$ (column IV in Table 5). The interaction terms ($EXP_SOC_{i,t} * IR_{i,t}$ and $EXP_SOC^2_{i,t} * IR_{i,t}$) are not considered as they are not significant.

²⁸ As all the robustness analyses for the re-estimation of Model (2) confirm qualitatively unchanged results, the regression results are not tabulated in the following. Tabulated results are available from the author upon request.

²⁹ Based on the ICB classification and in analogy to Trumpp and Guenther (2017), the manufacturing industry includes basic materials, consumer goods, industrials, oil and gas, and technology.

³⁰ Based on the ICB classification and in analogy to Trumpp and Guenther (2017), the service industry includes consumer services, telecommunications, health care, and utilities.

stakeholder orientation (Ball et al., 2000). Each country in the sample is manually assigned as either a code law country or a common law country, based on the studies by Ball et al. (2000), La Porta et al. (2008), and Simnett et al. (2009). This appears to give two nearly balanced subsamples. A total of 4,512 firm-year observations originate from code law countries and 4,480 originate from common law countries. The untabulated regression results show that there seems to be no difference between firms from shareholder-oriented and stakeholder-oriented countries with regard to the ability of $IR_{i,t}$ to moderate the (inverted) U-shaped relationship between both environmental and social expenditures and firm value.

4.3.4. Endogeneity concerns

The decision to publish an integrated report may not be determined completely exogenously but instead depend upon firm and institutional characteristics (Fuhrmann, 2019). To counter endogeneity concerns, a logistic regression model was first applied to obtain a possible endogenous determination of the likelihood of disclosing an integrated report. Equation (3) estimates the tendency to publish an integrated report:

$$IR_{i,t} = \alpha_0 + \alpha_1 \ln(MV_{i,t}) + \alpha_2 ESG_{i,t} + \alpha_3 CODE_i + \alpha_4 \sum_{i=1}^8 IND_i + \epsilon \quad (3)$$

The market value of equity ($MV_{i,t}$) serves as a measure of a company's size. To avoid biases arising from differences in the absolute numbers of the firm-year observations, the natural logarithm is applied. $ESG_{i,t}$ captures the firms' non-financial performance score, including the environmental, social, and corporate governance pillars as provided by Asset4. The legal framework of the country of residence is considered using a dummy variable ($CODE$). $CODE$ equals one for all firm-year observations operating in a code law country. IND_i is a dummy variable and represents the industry in which the company acts.

Second, based on this logistic regression model, a propensity score matching (PSM) is conducted (Tucker, 2010). Each firm-year observation with an integrated report is matched with one firm-year observation without an integrated report that shows the lowest difference in the predicted probability of having an integrated report (i.e., its nearest neighbor). After applying the PSM, 1,276 firm-year observations (i.e., 638 with and 638 without an integrated report) remain in the sample. Overall, untabulated results show that the prior findings are qualitatively confirmed. This strengthens the finding that the results do not suffer from serious endogeneity concerns with respect to the decision to disclose an integrated report.

4.3.5. Consideration of country fixed effects

Throughout all analyses, the study considered continent fixed effects to control for the fact that the observations originate from different continents with potentially different CSR regulations (e.g., EU directive 2014/95/EU). However, regulations regarding CSR may also be instituted on the country level. Thus, Model (2) is re-run including country fixed effects instead of continent fixed effects. In untabulated results, the robustness check provides unchanged findings.

4.3.6. Variation of the time lag between the fiscal year-end and the report publication

To account for the discretionary decision of the time lag with which corporate reports are disclosed after the fiscal year-end

(Carnevale et al., 2012; Mervelskemper and Streit, 2016; Serafeim, 2015), Model (2) is re-estimated using the market value four months and six months after fiscal year-end instead of using 3 months as in the base model. This is in line with Serafeim (2015), who proposes considering time lags between three and six months. The untabulated results confirm the prior findings.

5. Conclusion

This paper sheds light on the research question of whether IR positively moderates the association between both environmental and social expenditures and firm value. As the relationship between both environmental and social expenditures and firm value might depend on the level of CSR expenditures, a test of quadratic relationships is conducted before examining the moderating effect of IR. The analyses are carried out using the Ohlson accounting-based valuation model (Ohlson, 1995). A global listed sample of 8,992 firm-year observations between 2012 and 2017 is used.

The results show that environmental expenditures and social expenditures are value relevant. Environmental expenditures follow a U-shaped relationship with firm value, meaning that there is a certain minimum environmental expenditure that is required by a company in order to generate positive firm value effects. This association can be summarized as "too little of a good thing". In contrast, social expenditures follow an inverted U-shaped relationship with firm value, which leads to the conclusion that although investors value a certain level of social expenditures, there is a maximum that may not be exceeded in order to avoid decreasing the firm value. This relationship can be referred to as "too much of a good thing". Additionally, this study expands the IR literature by showing that IR moderates the U-shaped relationship between environmental expenditure and firm value but not the inverted U-shaped relationship between social expenditure and firm value.

The results provide the following research contributions. First, this paper finds significant quadratic relationships between both environmental and social expenditures and firm value. The majority of prior research assumes linear relationships between CSR and CFP and does not consider potential trade-offs between the value-creation and cost-concerned schools (Sun et al., 2019). Second, this study investigates the moderating effect of IR for the relationships between both environmental and social expenditures and firm value, as omitting moderating variables may have also contributed to prior inconclusive results between CSR and CFP (Grewatsch and Kleindienst, 2017). More specifically, with respect to IR research, this paper investigates whether CSR expenditures are recognized differently by investors with regard to firm value when their value-creation contribution is explained by IR. Thus far, mostly aggregated positive capital market effects of IR have been provided by prior research (Lee and Yeo, 2016; Vena et al., 2020; Zhou et al., 2017).

Beyond presenting contributions for research, this study identifies theoretical implications as well as practical implications for managers, investors, and the IIRC. From a theoretical point of view, the empirical findings support the stream of research that claims that the value-creation school and the cost-concerned school are no polar opposites when discussing the relationship between CSR and CFP (e.g., Sun et al., 2019; Trumpp and Guenther, 2017). Thus, future research should consider U-shaped relationships including both theories instead of proposing linear relationships that are based on only one school of thought. Furthermore, the analyses of the moderating effect of IR allow the conclusion that IR might be used for both legitimacy and signaling considerations. Thus, IR

cannot be explained by a single theoretical framework as suggested by prior research (Fuhrmann, 2019).

Regarding the practical implications, managers should be aware that the recommendable positions for a firm on the U-shaped curve may be either to have no or a low level of environmental expenditures or to pursue a proactive environmental strategy with a high level of environmental expenditures. The firm value in both situations can be increased by disclosing an integrated report. This finding might be attributable, on the one hand, to legitimization against stakeholder expectations by publishing an integrated report for firms with a low level of environmental expenditures. On the other hand, firms with a high level of environmental expenditures might benefit from explanations in their integrated reports about the value-creation contribution of their proactive environmental strategies. This might be required by investors to understand the economic impact of environmental expenditures. Firms that appear to be “stuck in the middle” with regard to environmental expenditures may carry out discussions to decide on either investing less in environmental issues or implementing a strategic approach to environmental issues with a higher level of environmental expenditures. Publishing an integrated report being “stuck in the middle” further decreases firm value as no value-creation ability of the environmental expenditures is revealed. Nevertheless, in all three situations, IR enhances the information environment of investors, but not always in favor of the firm, as seen for the “stuck in the middle” area. Managers should also be aware that there is a maximum level of social expenditures on the inverted U-shaped curve, and thus a point of overinvestment, above which firm value may decrease. However, there is no significant moderating effect of IR for the relationship between social expenditures and firm value.

For investors, it may be interesting to look not only at the outcome variables of CSR (especially at criticized CSR ratings) but also at the input variables of CSR, such as CSR expenditures, in order to improve investment decisions (Chatterji et al., 2016). Furthermore, investors might use integrated reports to identify firms with value-creation intentions regarding their environmental expenditures. With regard to the IIRC, the paper finds that IR is able to enhance the understanding of the value contribution of environmental expenditures. This result seems to support the chosen path of the IIRC with regard to developing the connectivity of non-financial and financial capitals in integrated reports (IIRC, 2017a, 2019). Especially, against the background that the IIRC is running a revision of the IR framework (IIRC, 2013) in 2020, the market view provided by this study might be considered useful.

Despite the inclusion of robustness analyses, the results should be considered within the confines of their limitations. However, some limitations might serve as fruitful avenues for further research. With regard to the plotted quadratic functions in Figure 1 and 2, areas are displayed that were not empirically observable in the applied sample³¹ but are due to the forecasting capabilities of regressions. For example, it could be assumed that a firm invests its total net sales in environmental activities in order to increase the firm value, which is not economically reasonable. These areas should be interpreted with caution. Furthermore, the applied Ohlson model does not indicate causality but only provides associations between the variables of interests and the dependent variable. The sample used in this study is restricted to the environmental and social expenditures offered by the Asset4. Although this is advantageous in terms of generating a large sample size, future research could manually collect other types of

CSR expenditures directly from firms' financial statements. Thereby, future studies might be able to differentiate between mandatory and voluntary CSR expenditures. This study uses a time lag of three months after fiscal year-end for corporate disclosures to be reflected in the market value of each firm in line with prior research (Carnevale et al., 2012; Cortesi and Vena, 2019). Despite robustness analyses with time lags of four and six months and unchanged results, future studies might be able to hand-collect the exact report release dates and adjust the time lags accordingly. Furthermore, IR is measured as a binary variable, which may not capture reporting quality (i.e., the heterogeneity between integrated reports) and thus future research may investigate the contents of the integrated reports through a manual or automatic content analysis. Additionally, future research could investigate other potential moderators besides IR (see Grewatsch and Kleindienst, 2017). A promising research direction might be to hand-collect the information whether the integrated reports are also internally or externally assured. Assurance might increase the credibility of integrated reports and could impact the perception of investors regarding the moderating effect of IR for the relationship between both environmental and social expenditures and firm value (Bomheuer et al., 2020; Maroun and Prinsloo, 2020; Nishitani et al., 2020).

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Declaration of competing interest

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Appendix Variable definitions and sources

³¹ Above 4.65% of net sales for the environmental expenditures and above 1.59% of net sales for the social expenditures.

Name	Variable	Definition	Source
Dependent variable			
Market value of equity	MV	Market value of equity measured three months after fiscal year-end, calculated by multiplying the share price by the number of outstanding shares	Datastream (mnemonics: P and NOSH)
Explanatory variables			
Dividends	DI	Total dividends paid, calculated by multiplying the dividends per share with the number of outstanding shares	Datastream (mnemonics: DPS and NOSH)
Book value of equity	BV	Book value of equity of the particular firm-year	Datastream (mnemonic: WC03995)
Net income	NI	Net income before preferred dividends of the particular firm-year	Datastream (mnemonic: WC01651)
Environmental expenditures	EXP_ENV	Sum of environmental expenditures and environmental R&D expenditures for the particular firm-year divided by net sales for the particular firm-year	Asset4 (mnemonics: ENERDP091 and ENPIDP023)
Social expenditures	EXP_SOC	Sum of training expenditures and donations for the particular firm-year divided by net sales for the particular firm-year	Asset4 (mnemonics: SOCODP027 and SOTDDP021)
Integrated report	IR	Binary variable: 1 if the company discloses an integrated report in the particular firm-year, and 0 otherwise	Hand-collected from the GRI sustainability database
Control variables			
Continent	CONT	Binary variable: 1 for all observations of the particular continent, and 0 otherwise	Company data
Industry	IND	Binary variable: 1 for all observations of the particular sector (based on ten-digit ICB), and 0 otherwise	Company data
Year	YEAR	Binary variable: 1 for all observations of the particular year, and 0 otherwise	Self-defined
Variables for robustness analyses			
ESG score	ESG	Environmental, social, and governance score for the particular firm-year, ranging from 1 to 100	Asset4 (Symbol: TRESGS)
Code law country	CODE	Binary variable: 1 if the company is located in a code law country, and 0 otherwise	Hand-collected from Ball et al. (2000), La Porta et al. (2008), and Simnett et al. (2009)

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