Journal of Innovation & Knowledge 7 (2022) 100267

Journal of Innovation & Knowledge

https://www.journals.elsevier.com/journal-of-innovation-and-knowledge

What drives the innovation in corporate social responsibility (CSR) disclosures? An integrated reporting perspective from China

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ARTICLE INFO

Article History:
Received 18 March 2022
Accepted 6 September 2022
Available online 14 September 2022

Keywords:
Corporate social responsibility
Integrated reporting
Content analysis
Integration level of disclosures
Firm−specific determinants
China

JEL codes:
M41
O16
Q01
Q56

ABSTRACT

Integrated reporting (IR) is an innovative approach to corporate social responsibility (CSR) reporting, that aims to enhance the integration levels of CSR disclosures. However, there is a paucity of research on the application of the IR approach to traditional CSR disclosures, with an even rarer contribution towards the determinants of CSR disclosure integration levels. Using a sample of Chinese listed companies, this study provides evidence on the integration levels of CSR disclosures from an IR perspective, and examines their firm-level drivers. The results suggest that, while board size, chief executive officer (CEO) duality, Global Reporting Initiative (GRI) adoption, and external assurance positively impact these integration levels, board independence, gender diversity, meetings, and committees have no such impact. This study is one of the first to examine the integration level of CSR disclosures, as well as the determinants of this integration level, adding to the knowledge on the innovation of CSR reporting.

Introduction

Corporate social responsibility (CSR) reporting emerged in the 1970s, with an initial emphasis on social issues, which shifted to environmental issues in the 1980s (Solomon & Maroun, 2012; Stubbs & Higgins, 2015). Since the 1990s, firms increasingly adopting CSR reporting led to the appearance of stand-alone CSR reports. The original intention of this reporting was to provide information about the impact of an organisation's activities, on economic, social, and environmental issues, allowing it to share its values, performance, and actions towards sustainable development with stakeholders (García-Sánchez et al., 2020; Hamad et al., 2020). In effect, CSR reporting is a result of stakeholders' concerns about "the social and environmental implications of a company's activities and corporate governance reform around the world" (Zainal & Zainuddin, 2013). However, in view of the increasing intractability of sustainability issues, traditional CSR reporting has failed to address the distrust among the firms' stakeholders, and thus have seems no longer adequate for informing stakeholders (Erin & Adegboye, 2022). Academics and practitioners hold a jaded view of traditional CSR reporting. First, there are concerns that the discourse within the accounts of traditional CSR reporting is constructed for "rhetorical and political purposes" (Attanayake Mudiyanselage, 2018, p. 36). Moreover, the materiality of CSR-related information is notoriously difficult to determine, as traditional reporting lacks encouraging performance reviews and misses the link between CSR issues and the core strategy of the firm (Solomon & Maroun, 2012).

Integrated reporting (IR) is an innovation in CSR reporting (Stubbs & Higgins, 2014). Many scholars believe that the shortcomings of traditional CSR reporting contribute to IR (Stubbs & Higgins, 2015). It pays particular attention to providing CSR disclosures in an integrated manner (De Villiers & Maroun, 2017). IR not only effectively includes the necessary element of CSR disclosure, but also exhibits the connection between different forms of information, which is absent in traditional CSR reporting. The novelty of IR presumably relies largely on the embedded integrated thoughts within such disclosures. In other words, the IR approach improves the value of CSR disclosures, by emphasising the interconnection of different types of information (Omran, Ramdhony, Mooneeapen & Nursimloo, 2021;

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https://doi.org/10.1016/j.jik.2022.100267

Salvi, Vitolla, Giakoumelou, Raimo & Rubino, 2020). Under the IR approach, CSR disclosures are more substantive, without being used as the "impression management" and "greenwashing" tools, but delivering higher transparency and accountability to stakeholders (Omran, Zaid & Dwekat, 2021). Many scholars recognise that, IR represents the evolution of CSR reporting (Minutiello & Tettamanzi, 2022). According to Ioana and Adriana (2013), there are three stages of evolution: (1) the emergence of non-financial disclosures, (2) the traditional CSR reporting era, and (3) the revolution of IR. IR promoting sustainable business practices (Argento et al., 2018) can create a more sustainable world. Although it coexists with traditional CSR reporting, in the current business world when companies communicate with their stakeholders about CSR information (Hamad et al., 2020), IR can ultimately replace CSR reporting as the primary vehicle of communication.

This type of reporting is gaining global momentum (Zhou et al., 2017). In South Africa, it is mandatory to disclose integrated reports for firms listed on the Johannesburg Stock Exchange (Gerwanski et al., 2019). IR has also been popularised in some Asian countries, such as India, Japan, Singapore, and Malaysia (Dilling & Caykoylu, 2019; Stone & Lodhia, 2019). Chinese firms started formally reporting CSR disclosures in 2006, thus introducing the initiatives for mandatory and voluntary disclosure of CSR-related information (Shen et al., 2020). The Chinese government has acknowledged that, IR is an innovation in CSR disclosure, believing it to be in line with the trend of reporting reform towards domestic and global sustainable development. Although it is not mandatory for companies to adopt IR, the Chinese government supports voluntary IR adoption by Chinese firms, in its recently announced five-year plan (Barth et al., 2017; IIRC, 2018).

However, although the attention on IR is growing, previous studies mainly focused on the international setting of mainstream IR especially in South Africa and Japan, irrespective of whether its adoption is mandatory or voluntary. Existing empirical literature has failed to expand to China, without mainstream IR. It would be useful to know more about the operation of this approach in China (Manes-Rossi et al., 2021). Moreover, only a few recent studies (e.g., Salvi, Vitolla et al., 2020, 2020b) have attempted to investigate disclosure levels from the IR approach's perspective. There is a paucity of research on the application of the IR approach to traditional forms of disclosure. To date, extant studies analysing CSR disclosures and drivers, have not considered using the newly developed IR approach, to measure the integration level of CSR disclosures.

Using a sample of Chinese A-share listed companies, this paper evaluates the integration level of CSR disclosures in the Chinese context, and examines the firm-level drivers of these integrations. We view IR as an approach, that emphasises the connectivity between different forms of information, for applying this approach to CSR disclosures. Higher integration levels of CSR disclosures in the corporate report, represents higher consistency with the IR approach. The results show that, the integration level of CSR disclosures is positively correlated with board size, CEO duality, GRI adoption, and the external assurance of non-financial reports, and negatively associated with the proportion of female directors.

This study makes a four-fold contribution. First, conceptually this study helps reflect on the potential implications of the IR approach, and integration levels of CSR disclosures. Our study bridges the research gap for the adherence of traditional CSR disclosures to the IR approach. Second, the study provides a measure of the integration level of disclosures, which deals with the disclosure level from the perspective of the IR approach. Third, this study contributes to the existing literature, by broadening research and identifying the determinants of the integration level of disclosures. These elements signify key factors in promoting information transparency behavior, for benefitting the stakeholders. Fourth, our research contributes to the IR disclosure literature and practices, by exploring a country without any IR regulations or voluntary initiatives. Specifically, it enhances our understanding of IR in China in two ways. First, the current study can help Chinese listed firms and their stakeholders acquire in-depth knowledge of the factors impacting the integration level of CSR disclosures, and can help decipher whether blindly increasing the "quantity" of some board attributes (e.g. the frequency of board meetings), is sufficient to promote the integration levels. Second, this study provides empirical evidence that external assurance of CSR reports, and the application of GRI guidelines, lead to a higher integration level of CSR disclosures. This study adds to the ongoing debate on innovation in CSR reporting, by suggesting adoption of GRI guidelines by Chinese firms. This helps obtain external assurance to signal their superior commitment to transparency, in CSR disclosures.

The remainder of this paper is organised as follows. Section 2 reviews the literature and develops the research hypotheses. In Section 3, the proposed method is introduced. The results are presented in Section 4. Section 5 discusses the findings of the study. Finally, Section 6 concludes the study and provides suggestions for future research.

Literature review and hypothesis development

In recent years, several studies have examined IR disclosure levels in different countries such as South Africa (Ahmed Haji & Hossain, 2016), Turkey (Kılıç & Kuzey, 2018a), France (Zinsou, 2018), and Australia (Liu et al., 2019). Content analysis is the most widely adopted method in IR studies, for directly gauging IR disclosure levels. The tools used for this analysis consisted of a disclosure index and a scoring system. The scoring system can be categorised as with or without a quality criteria. A scoring system without quality criteria, usually a two-point scale, can only measure the presence or absence of a selected disclosure (Coy & Dixon, 2004). Most IR studies have adopted scoring systems without quality criteria, such as those proposed by Zhou et al. (2017). Those studies using scoring systems with quality criteria, do not consider the integration level of disclosures. A limited number of recent studies have attempted to investigate these integration levels on specific themes, such as Environmental, Social, and Governance (ESG), intellectual capital, and human capital. For instance, Zinsou (2018) examined the integration level of ESG disclosures by French CAC 40 listed companies, to determine whether they have initiated the adoption of an IR approach. Although some studies have examined the impact factors of IR disclosure levels (Vitolla, Raimo & Rubino, 2019), there is a scarcity of studies on the determinants of disclosure integration levels.

The effect of corporate activities on society has attracted more attention to economic development, and research on CSR has become a central focus for scholars (Wenqi et al., 2022). A sizable body of literature explores the drivers of CSR disclosures (Ali et al., 2017). However, the IR approach, as the newest development of the disclosure approach, has not been considered when measuring CSR disclosures.

IR research in the Chinese setting is extremely underexplored, as it is not mainstream in China. In this study, we fill this gap by measuring the level of CSR disclosure from the IR approach, in the Chinese setting.

According to Vizcaíno-González et al., and Romero-Castro (2019), p. 2), "taking care of relationships with stakeholders becomes a critical issue, and deploying appropriate communication abilities is paramount for satisfactorily meeting stakeholders' needs and demands. Specifically, developing an adequate disclosure and reporting strategy is usually a prerequisite". CSR disclosure can be used as an important means for organisations to communicate with stakeholders (García-Sánchez et al., 2021; Singh et al., 2021). Corporate governance is a mechanism that can manage CSR communication, leading to improved corporate transparency (Pavlopoulos et al., 2017). Several studies have recognised the influence of various internal and

external governance characteristics on CSR disclosure practices, such as board size (Lim et al., 2007), board independence (Ben-Amar & McIlkenny, 2015), board gender diversity (Ben-Amar & McIlkenny, 2015), CEO duality (Helfaya & Moussa, 2017), and CSR committee of the board (Helfaya & Moussa, 2017). Moreover, complying with GRI guidelines and adopting external assurance are regarded as mechanisms for managing CSR communication, which have been validated by several prior studies (Rankin et al., 2011; Ruiz-Blanco et al., 2021). This study examines the association between the two CSR communication management mechanisms and the integration level of CSR disclosures. Thus, we propose the following eight hypotheses.

The board of directors plays a vital role in monitoring the management of a firm (Su et al., 2019). Presumably, directors with different types of expertise, skill and competencies are more common in large boards (Nicolò et al., 2019), where they are expected to facilitate management to effectively communicate their CSR disclosures to their stakeholders. Compared to a large board, a small board deals with higher load with less diverse expertise, skills, and capabilities. These shortcomings limit the monitoring ability of the board of directors, thus negatively impacting effective superviion (Jizi et al., 2013). Thus, this study proposes the following hypotheses:

H1: There is a positive association between board size and the integration level of CSR disclosure.

Independent directors do not fulfill management roles or relationships with the firm (Ahmed Haji, 2013; Liu & Zhang, 2017). A board with a high proportion of independent directors is likely to better supervise and control management, leading to a highly transparent firm. Independent directors represent the interests of different stakeholder groups, and exert pressure on companies to undertake CSR activities, for serving the interests of non-financial stakeholders. Many studies claim that, independent directors can improve disclosure levels to reduce information asymmetry between internal and external stakeholders. Li et al., and Yeh (2010) document a positive correlation between the proportion of independent directors, and the level of CSR disclosure by Chinese firms. Based on the above discussion, the following hypothesis is proposed:

H2: There is a positive association between the proportion of independent directors and integration level of CSR disclosure.

The board of directors should arrange separate positions for the chairperson and CEO (Pavlopoulos et al., 2017). CEO duality hinders these directors' independence, and downgrades the board's capacity for corporate governance (Gul & Leung, 2004), thereby leading to low disclosure levels. Regulators and investors prefer to separate the role of the CEO from that of the chairperson of the board (Yuen et al., 2009). For example, in 2001, the China Securities Regulatory Commission advocated that large companies separate the roles of the CEO and chairman of the board. Although Yuen et al. (2009) did not find empirical evidence to support the association between CEO duality and the voluntary disclosure level of 200 Chinese companies, they believe that separating the two roles could increase company transparency. However, Pavlopoulos et al. (2017) found that, CEO duality is positively associated with the level of IR disclosure. Despite the mixture of empirical evidence, a CEO controlled board's supervisory role is likely to reduce and negatively impact corporate transparency. Thus, the following hypothesis is proposed:

H3: There is a negative association between CEO duality and the integration level of CSR disclosures.

Female directors are crucial to a firm's CSR strategy and performance (Haque & Jones, 2020). First, female board members are highly sensitive towards building relationships with stakeholders, and gaining insight into their concerns of sustainable development. Consequently, their involvement is in-depth in corporate strategies and actions involving sustainable development, focusing on long-term corporate performance indicators for a positive contribution to CSR (Haque & Jones, 2020). Second, female directors do not tend to manipulate information disclosure, disclosing information more ethically and transparently (Dilling & Caykoylu, 2019; Gul & Leung, 2004). Third, since female board members urge public discussion, information sharing, and a greater degree of participation, it reduces the level of conflict in the board's decision-making process, thus increasing the board's decision-making quality (Hollindale et al., 2019). Vitolla et al., and Rubino (2020a) and Vitolla et al., and Rubino (2020b) show a positive relationship between the presence of female directors and IR disclosure level. Haque and Jones (2020) explore the presence of a relationship between board gender diversity and the level of biodiversity disclosure in European companies. They find that, a board with a higher proportion of female directors is associated with a higher level of biodiversity disclosure.

The findings of previous studies are inconclusive. Fasan and Mio (2017) analyse the impact of company-level factors on the materiality disclosure level. Their results suggest that the proportion of women on the board plays a negative role in determining the materiality disclosure level of 65 companies in the International Integrated Reporting Council (IIRC) Pilot Program. Similarly, with reference to a sample of Italian firms, Cucari et al., and Management (2018) reported a negative relationship between women on the board and ESG disclosure levels. Although the findings of previous studies investigating the relationship between disclosure level and board gender are mixed, most studies document a positive association. Based on the above discussion, the following hypothesis is proposed:

H4: There is a positive association between board gender diversity and the integration level of CSR disclosures.

The monitoring ability of the board of directors is closely related to their activities (Frías-Aceituno et al., 2013). Board meetings are the main channel through which the board performs its management oversight function (Omran, Ramdhony et al., 2021). Higher number of board meetings conveys that the board is more diligent and can better meet the interests of stakeholders, especially their need for information (Lipton & Lorsch, 1992). It also portrays that the firm is better supervised with less profit manipulation (Xie et al., 2003). Using the IR approach to improve the disclosure level, requires board's extensive monitoring through numerable board meetings (Frías-Aceituno et al., 2013). Using a sample of 134 international companies, Vitolla et al. (2020a) found more board meetings to be conducive in releasing a higher IR disclosure level. Therefore, we propose the following hypothesis:

H5: There is a positive association between the number of board meetings and integration level of CSR disclosure.

Various committees on the board of directors monitor functions on the firm (Malola & Maroun, 2019). The audit committee's function is to assume responsibility for the accuracy and reliability of non-financial disclosures (Ahmed Haji & Anifowose, 2016). Some studies have shown a positive correlation between voluntary disclosure levels and the existence of audit committees (De Villiers & Maroun, 2017). Haji and Anifowose (2016) found that, from 2011 to 2013 the existence of sustainability committees in the top 100 South African companies had a positive impact on the IR disclosure level. Kılıç and Kuzey (2018b) reported that, the existence of a sustainability committee is positively correlated with the IR disclosure level. Pavlopoulos et al., and Iatridis (2019) found that, when a company has a corporate governance committee, it positively influences IR disclosure levels. To our knowledge, no previous studies have examined the relationship between the number of various specialised committees under the board, and the level of CSR disclosure. Based on the above discussion, the following hypothesis is proposed.

H6: There is a positive association between the number of board committees and integration level of CSR disclosure.

GRI is one of the three founding organisations of the IIRC, which provides a framework for global sustainable development and sustainability reporting (Singh et al., 2021). This framework shapes sustainable organisational practices, or becomes the foundation of organisational legitimacy. According to GoldenBee (2018), 22.36% of

1,579 Chinese companies issuing CSR reports, referred to the GRI framework. According to a survey conducted by GRI in 2013, some IR experts believe the GRI framework to be the "road map" or "reference point" in the process of using the IR approach (Liu et al., 2019). Lokuwaduge and Heenetigala (2017) found that, Australian companies' ESG reports are highly influenced by the GRI framework. Frías-Aceituno et al., and García-Sánchez (2014) found companies adopting a GRI framework, to be more likely to publish integrated reports. Therefore, the following hypothesis was developed:

H7: There is a positive association between GRI adoption and the integration level of CSR disclosure.

The credibility of corporate reports can be usually improved by external independent assurance services (Simnett et al., 2009), which reduces the likelihood of CSR disclosure misrepresentation (Bagnoli & Watts, 2017). The monitoring function of the board of directors can be supplemented by using external assurance services (Malola & Maroun, 2019), and used to supplement the existing corporate governance system of the firm (Maroun, 2017). Rivera-Arrubla et al., and García-Benau (2017) report a significant positive correlation between external assurance and IR disclosure levels. Therefore, this study proposes the following hypothesis:

H8: There is a positive association between external assurance of standalone CSR reports and the integration level of CSR disclosures.

Research design

Sample and data

This study is based on an unbalanced panel dataset of 7,783 firm-year observations of 1,179 Chinese A-share listed companies from 2006 to 2019. We manually collected data on the integration level of CSR disclosure from firms' corporate reports, such as annual reports, stand-alone CSR, sustainability, and ESG reports. All other data were obtained from the China Securities Market and Accounting Research (CSMAR) database. Table 1 shows that our sample included companies from 17 industrial sectors.

Model specification and variable measurement

To test the firm-level drivers of the integration level of CSR disclosure, we opt for the multiple linear regression approach as a statistical analysis method, whereby our hypotheses can be tested. Referring to similar studies, such as Vitolla et al., and Garzoni (2019b), our adopted estimation model (pooled OLS regression) is presented as follows, and all variables are defined in Table 2. Definitions of the variables were drawn from prior influential studies, such as Ntim et al., and Broad (2017). We do not select panel regression as it should be used when analysing "samples of the same cross-sectional units observed at multiple points in time" (Cooray et al., 2020, p. 13). The data panel is presented in ten models: the first model to the seventh model is a model where only one independent variable is considered; the ninth model is a model without control variables; and the tenth model is a complete model with control variables. The results of the first to eighth models are reported in Columns 3 to 10 of Table 6. Columns 11−12 of Table 6 report the results of the ninth and tenth models.

$$\begin{aligned} CSR\_IR_{i,t} = {} & \beta_0 + \beta_1 Boardsize_{i,t} + \beta_2 BoardInd_{i,t} + \beta_3 Duality_{i,t} \\ & + \beta_4 Female_{i,t} + \beta_5 GRI_{i,t} + \beta_5 Certification_{i,t} + \beta_6 Boardmeet_{i,t} \\ & + \beta_7 Committee_{i,t} + \beta_8 Asset_{i,t} + \beta_9 ROA_{i,t} \\ & + \beta_{10} Liability_{i,t} + \sum Industry_{i,t} + \sum Year_{i,t} + \varepsilon \end{aligned}$$

where i denotes the firm, t denotes the period, and ε denotes an error term.

Dependent variable

The integration level of CSR disclosures (*CSR_IR*) is identified as the dependent variable in our model. We focus on the level of integration of CSR disclosures for two reasons. First, there is only one firm preparing an integrated report in China, and no other firm officially declares the release of an integrated report. Although we may assess the level of alignment between Chinese firms' corporate reports and a self-constructed aggregate IR index, the difficulty of content analysis of the number of corporate reports provided by a large sample of companies limits the production of such a study [1]. Second, relying on the aggregate IR index may lead to spurious conclusions as firms may pay uneven attention to the varied disclosure categories in IR (Omran, Ramdhony et al., 2021). Management's commitment to higher integration can occur in disclosure categories that have developed over the years and can be regarded as mature. CSR disclosure is one of the most important elements of integrated

Table 1
Sample distribution by industry

Industry	Observations	Percentage (%)
Farming, Forestry, Animal Husbandry & Fishery	94	1.21
Mining and Quarrying	312	4.01
Manufacturing	4,151	53.33
Production & Supply of Power. Gas & Water	393	5.05
Construction	239	3.07
Wholesale and Retail Trades	373	4.79
Transportation. Storage	413	5.31
Catering	15	0.19
Information Technology Industry	362	4.65
Finance	553	7.11
Real Estate	454	5.83
Leasing and commercial service	69	0.89
Scientific research and technical service	32	0.41
Water conservation, environment, and public facilities management	68	0.87
Public health	29	0.37
Transmitting. Culture Industry	129	1.66
Integrated	97	1.25
A-share firms used for analysis over the period 2006−2019	7783	100

Table 2
Definitions of variables

Variables	Definitions
Dependent variable	
CSR_IR	The integration level of CSR disclosures, gained by content analysis
Independent variables	
BoardSize	Natural logarithm of the number of directors on the board
BoardInd	The proportion of independent directors on the board at the endof each fiscal year
Duality	A dummy variable equal to 1 when the same person serves as a CEO as well as the chairman and 0 otherwise
Female	The proportion of female directors on the board
GRI	A dummy variable is equal to 1 if the firm adopts GRI standards; otherwise, the variable is equal to 0
Certification	A binary variable, which is coded as 1 if a firm obtains assurance on the stand-alone CSR report and as 0 otherwise
Boardmeet	The number of meetings held during the fiscal year
Committee	The number of board committees
Control variables	
Asset	Natural logarithm of book value of total assets of a company at the end of each fiscal year
ROA	Net profit (after interest and taxation) for each fiscal year divided by book value of the total asset at the end of this fiscal year
Liability	Book value of total liabilities of a company at the end of each fiscal year divided by the book value of total assets of the company at the end of each fiscal year
Industry	Industry dummy
Year	Year dummy

reports (Hamad et al., 2020). A firm that has issued standalone CSR reports has a strong incentive to use the IR approach and is thus more likely to achieve successful implementation of its adoption (Lueg et al., 2016). CSR reporting has been developed in China over the last two decades. Thus, rather than relinquishing the opportunity to understand the development of IR in China owing to the difficulties and limitations of using an aggregate IR index, we explore the integration level of CSR disclosures.

Content analysis of corporate reports is used as a research method to assess the integration level of CSR disclosure by sample companies, as it is a common and appropriate method in this field (Liu et al., 2019; Zinsou, 2018). This study establishes a CSR disclosure index consisting of nine themes related to CSR: safety production (SP), public relations and social public welfare (PR&SPW), environmental and sustainable development (E&SD), shareholder rights' protection (SRP), client and customer rights' protection (C&CRP), employee rights' protection (ERP), debtor rights' protection (DRP), supplier rights protection (SRP), and measures for developing and improving the social responsibility system (M4D and ISRS). These nine themes are in line with the classification of CSR disclosures prescribed by CSMAR. CSMAR is a widely used financial database in China (Zuo & Lin, 2022).

A scoring system was incorporated into the CSR disclosure index to evaluate the integration level of CSR disclosure. KPMG (2014) points out that "connectivity of information" is the only critical difference between IR and CSR reporting, as their guiding principles and content elements are extremely similar. Scholars emphasise that the IR approach features connectivity between financial and non-financial forms (De Villiers & Hsiao, 2017; Zhou et al., 2017) as well as connectivity between quantitative and qualitative forms (Zinsou, 2018). Meanwhile, the connectivity of time horizons (the past, present, and future), the connectivity of news tenors of information (positive and negative), and the connectivity between CSR disclosure and strategy, governance, and dialogue with stakeholders are also emphasised (Liu et al., 2019; Salvi, Vitolla et al., 2020; Zinsou, 2018). Therefore, this study used a scoreboard to capture the connectivity of information, as shown in Table 3.

To perform this assessment, we first assigned a score of "1" each time that we noted that an item was described using qualitative, quantitative non-monetary, and monetary forms simultaneously. Second, we assigned a score of "1" each time that we noted that an item is described using forward-looking, present-looking, and backward-looking time orientations simultaneously. Third, a score of "1" is assigned each time an item is described using positive and negative tones simultaneously. Finally, if an item is described using strategy, governance, and dialogue with stakeholders' pillars simultaneously, a score of "1" is assigned. However, a note of "0" is attributed to the fact that an item does not appear in the corporate report. Therefore, the maximum score for each item is 4. The level of CSR disclosure for each sample firm is equal to the sum of the scores of the nine CSR disclosure items (CSRQ). Therefore, the highest score for each sample company is 36 (= 4×9). As a result, each sample firm received a score ranging from 0 to 36. A higher level of integration of CSR disclosures in the corporate report represents higher consistency with the IR approach. For comparison, the score of each sample firm was normalised to values ranging from 0 to 1. The integration level of a firm's CSR disclosures (CSR_IR) is mathematically represented as

$$CSR\_IR=\frac{\sum_{i=1}^{9} CSRQ_i}{36}$$

Prior to the formal content analysis of corporate reports, we were trained in data collection, based on the established CSR disclosure index and scoring system. We then randomly selected 20 corporate reports for the pilot test to improve the reliability of the content analysis. Any differences between the two researchers will be discussed until a consensus is reached. The two researchers then ran another round of the pilot test on a random sample of other 20 corporate reports and compared the results using SPSS macro to calculate the Krippendorff's α coefficient for each comparison. The untabulated results show the Krippendorff's α coefficient of each comparison to be above the minimum acceptable standard of reliability of 0.80 (Melloni, 2015). Following the pilot test, we performed a formal content analysis of all corporate reports.

Control variables

Three control variables are applied by referring to IR studies that investigate the determinants of IR disclosure levels (Kılıç & Kuzey, 2018b; Pavlopoulos et al., 2017). These variables are firm size (*assets*), financial leverage (*leverage*), and profitability (*ROA*). Prior studies have shown that firm size and profitability have a positive effect on CSR (or IR) disclosure practices (Frías-Aceituno et al., 2014; Li et al., 2013). Thus, we expect *asset* and *ROA* to have positive coefficients. Based on previous studies (Ahmed Haji & Anifowose, 2016; Kılıç & Kuzey, 2018b), we expect *leverage* to have a negative coefficient.

Results

Descriptive statistics

Table 4 presents the descriptive statistics for all variables. The integration level of CSR disclosures shows considerable variance, ranging from 0.028 to 0.722. The mean integration level of CSR disclosures was 0.306.

Table 4
Descriptive Statistics

Variable	N	Mean	p50	S.D.	Min	Max
CSR_IR	7783	0.320	0.306	0.111	0.028	0.722
BoardSize	7783	2.500	2.485	0.321	1.386	3.526
BoardInd	7783	35.73	35.29	9.087	6.670	75
Duality	7783	0.212	0	0.409	0	1
Female	7783	0.155	0.143	0.0990	0	0.556
GRI	7783	0.204	0	0.403	0	1
Certification	7783	0.0320	0	0.177	0	1
Committee	7783	4.050	4	0.667	0	8
Boardmeet	7783	10.36	9	4.798	1	58
Asset	7783	23.31	23.05	1.781	18.27	31.04
ROA	7783	0.0420	0.0340	0.109	-2.071	7.445
Liability	7783	0.508	0.513	0.217	0.00800	2.401

Table 3
CSR index and scoring system.

	CSR item								
	SP	PR&SPW	E&SD	SRP	C&CRP	ERP	DRP	SRP	M4D&ISRS
Measurement criteria [2]	An item is described using qualitative, quantitative non-monetary, and monetary forms simultaneously (Presence: 1; Absence: 0). An item is described using forward-looking, present-looking and backward-looking time orientations simultaneously (Presence: 1; Absence: 0). An item is described using positive and negative tones simultaneously (Presence: 1; Absence: 0). An item is described using strategy, governance and dialogue with stakeholders pillars simultaneously (Presence: 1; Absence: 0).								

The maximum natural logarithm of the number of directors on the board was 1.386 and the minimum was 3.526, with an average of 2.500. The maximum proportion of independent directors was 75%, and the minimum was 6.67%. The mean value of duality is 0.212, that is, 21.2% of the sample companies are CEOs at the same time. The mean percentage of female directors is 0.155, with a minimum of 0.00 and a maximum of 0.556. The number of board committees ranged from 0 to 8, with a median of four committees. The activity of the board varies between one and 58 meetings per year. In addition, 20.4 per cent of firm-year observations adopt the GRI framework, and only 3.2 per cent of firm-year observations provide external assurance on the stand-alone CSR report. It can be seen that the rate of GRI adoption is still low in China, which is in line with the findings of the investigation conducted by GoldenBee Management Consulting Company. The average total assets (logarithms) was 23.31. The profitability ratio ranges from -2.071 to 7.445, with a mean of 0.0420. Furthermore, the mean leverage is 0.508, with a minimum of 0.008 and maximum of 2.401.

Univariate analysis

Table 5 presents the correlation analysis coefficients of the variables. The lower left is the Pearson correlation coefficient, and the upper right is the Spearman's rank correlation coefficient. Among the variables involved in the above models, the absolute values of the correlation coefficients are generally lower. The findings indicate that all explanatory variables except one (BoardInd) have statistically significant associations with the integration level of CSR disclosure.

Multivariate analysis

Table 6 presents the results of the OLS regression analysis. As explained before, Columns 3-12 show the results of Models 1−10, respectively. In Models 1 and 8, we used only one independent variable. In Model 9, we omit the control variables to obtain evidence of the impact of explanatory variables on the dependent variable (*CSR_IR*) without considering the control variables. We regress the dependent variable (*CSR_IR*) on all independent and control variables in Model 10 to test for the impact of all the hypothesised variables in one model. In all models, we clustered standard errors by firm and controlled for year and industry. The variance inflation factor (VIF) test suggests that multicollinearity is not a problem (Groebner et al., 2013). All OLS models are significant at the $p< 0.01$ level.

The results of Model 10 (Column 12), with reference to the coefficients of the hypothesised variables, are consistent with the findings reported in Models 1−9. Of the independent variables, *BoardSize*, which represents the size of the board of directors, has a positive effect on the dependent variable *CSR_IR*. Therefore, Hypothesis 1 is supported. There is no significant correlation between *BoardInd* and *CSRIR*. Thus, Hypothesis 2 is rejected. A statistically significant negative correlation was found between *duality* and *CSR_IR*. These results support hypothesis 3. The variable *Female*, which represents gender diversity, has a negative effect on the integration level of CSR disclosures. These results do not provide support for hypothesis 4. The results reject Hypothesis 5, showing that the number of board meetings annually (*Boardmeet*) is not significantly associated with *CSR_IR*. There is no significant association between the number of board committees (*committees*) and *CSR_IR*. Therefore, the results do not support Hypothesis 6. The adoption of GRI (*GRI*) shows a positive and significant association with *CSR_IR*. These results verified Hypothesis 7. External assurance on the standalone CSR report (*certification*) is also positively and significantly associated with *CSR_IR*. This result supports hypothesis 8. In terms of the control variables, when starting with firm size, the results show a positive and statistically significant relationship between *asset* and *CSR_IR*. Regarding the relationship between *liability* and *CSR_IR*, there is a negative and insignificant effect on the integration level of CSR disclosure. Regarding profitability, the results show a positive and significant relationship between *return on assets (ROA*) and *CSR_IR*.

Robust analysis

To increase the consistency of the results, we conduct a series of robustness tests. The results are presented in Table 7. In model 1, the Newey and West (1987) method was modified for application to a panel dataset is conducted (Pavlopoulos et al., 2019). Year and industry fixed effects are included in the model. In Model 2, standard errors by firm and year are clustered, and year and industry fixed effects are also included in the model (Barth et al., 2017). In Model 3, a lead-lag approach of one year for the independent variable and control variables is used, as adopted by Sun et al., and Wu (2022). The lead-lag approach can mitigate potential concerns regarding reverse causality and simultaneity (De Villiers et al., 2017). We also used a random-effect regression analysis (Model 4) to deal with endogeneity concerns (Songini et al., 2021).

In addition, corporate reports in 2012 were the first to be affected by the IIRF because the prototype IR framework was published in November 2012 (Zhou et al., 2017). Thus, we reran regression model 5, where only samples between 2012 and subsequent years were selected. Model 6 shows the results of the selection of specific industries (those that are prone to pollution). To investigate the effect of the integration level of CSR disclosure on firm value from an unbiased perspective, we reassessed the integration level of CSR disclosure using a new scoring system (*CSR_IR_new*) and reran a regression model (see Model 7). Specifically, the scoring system was replaced (see Table 8). The results of the robustness tests were consistent with

Table 5
Correlation analysis.

	CSR_IR	BoardSize	BoardInd	Duality	Female	GRI	Certification	Committee	Boardmeet	Asset	ROA	Liability
CSR_IR	1	0.13***	-0.02*	-0.10***	-0.18***	0.11***	0.12***	-0.03***	-0.05***	0.03***	0.03***	0.04***
BoardSize	0.13***	1	-0.31***	-0.16***	-0.14***	0.14***	0.11***	0.13***	0.07***	0.31***	-0.20***	0.28***
BoardInd	-0.01	-0.33***	1	0.10***	0.06***	-0.04***	-0.04***	-0.02	0.00	-0.09***	0.08***	-0.13***
Duality	-0.10***	-0.16***	0.11***	1	0.12***	-0.02*	-0.05***	-0.03***	0.04***	-0.09***	0.07***	-0.09***
Female	-0.18***	-0.15***	0.05***	0.11***	1	-0.04***	-0.03**	0.00	0.06***	-0.17***	0.10***	-0.14***
GRI	0.14***	0.15***	-0.03***	-0.02*	-0.05***	1	0.29***	0.11***	0.07***	0.36***	-0.06***	0.18***
Certification	0.14***	0.14***	-0.03***	-0.05***	-0.03***	0.29***	1	0.16***	0.04***	0.22***	-0.06***	0.15***
Committee	-0.03***	0.16***	-0.02**	-0.04***	-0.00	0.12***	0.18***	1	0.08***	0.23***	-0.15***	0.23***
Boardmeet	-0.04***	0.08***	-0.01	0.03***	0.05***	0.06***	0.05***	0.05***	1	0.20***	-0.13***	0.22***
Asset	0.06***	0.35***	-0.09***	-0.09***	-0.17***	0.42***	0.34***	0.34***	0.19***	1	-0.20***	0.59***
ROA	0.04***	-0.08***	0.02**	0.04***	0.04***	-0.00	-0.01	-0.05***	-0.06***	-0.08***	1	-0.50***
Liability	0.04***	0.29***	-0.13***	-0.09***	-0.15***	0.18***	0.17***	0.27***	0.21***	0.60***	-0.24***	1

Note: Pearson correlations reported below the diagonal and Spearman correlations above the diagonal. The superscripts ***, ** and * denote significance at 1%, 5% and 10% respectively.

Table 6
Regression Results.

	Predict Sign	CSR_IR	CSR_IR	CSR_IR	CSR_IR	CSR_IR	CSR_IR	CSR_IR	CSR_IR	CSR_IR	CSR_IR	VIF
BoardSize	+	0.016***								0.020***	0.014**	1.31
		(2.77)								(3.39)	(2.38)	
BoardInd	+		-0.000							0.000	0.000	1.14
			(-0.75)							(0.53)	(0.30)	
Duality	-			-0.009**						-0.008**	-0.008**	1.04
				(-2.50)						(-2.27)	(-2.18)	
Female	+				-0.041**					-0.055***	-0.039**	1.07
					(-2.22)					(-3.09)	(-2.17)	
Boardmeet	+					-0.000				0.000	-0.000	1.07
						(-0.35)				(0.33)	(-0.30)	
Committee	+						0.001			0.000	-0.000	1.16
							(0.26)			(0.14)	(-0.08)	
GRI	+							0.039***		0.044***	0.036***	1.26
								(8.88)		(9.97)	(8.08)	
Certification	+								0.057***	0.053***	0.044***	1.18
									(5.68)	(5.45)	(4.40)	
Asset		0.013***	0.014***	0.014***	0.014***	0.010***	0.013***	0.015***	0.015***		0.007***	2.15
		(8.47)	(9.17)	(9.44)	(9.18)	(6.56)	(8.16)	(9.65)	(9.57)		(4.59)	
ROA		0.014*	0.013	0.016**	0.016**	0.013*	0.016**	0.015*	0.015*		0.014**	1.07
		(1.74)	(1.46)	(2.07)	(2.09)	(1.95)	(2.10)	(1.90)	(1.91)		(2.11)	
Liability		-0.016	-0.014	-0.017	-0.019*	-0.010	-0.013	-0.016	-0.017		-0.009	1.73
		(-1.43)	(-1.24)	(-1.56)	(-1.74)	(-0.96)	(-1.25)	(-1.50)	(-1.58)		(-0.81)	
Constant		-0.065	-0.038	-0.045	-0.032	0.042	-0.010	-0.051	-0.045	0.215***	0.083*	
		(-1.63)	(-0.97)	(-1.17)	(-0.82)	(1.10)	(-0.25)	(-1.33)	(-1.16)	(6.61)	(1.94)	
Year fixed effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Industry fixed effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Standard errors		ClusteredFirm	ClusteredFirm	ClusteredFirm	ClusteredFirm	ClusteredFirm	ClusteredFirm	ClusteredFirm	ClusteredFirm	ClusteredFirm	ClusteredFirm	
R^2		0.371	0.370	0.371	0.371	0.386	0.377	0.370	0.370	0.388	0.394	
Adj. R^2		0.369	0.367	0.369	0.369	0.384	0.375	0.368	0.368	0.385	0.391	
F		120.538***	117.215***	120.100***	123.079***	120.208***	130.557***	121.771***	121.330***	111.288***	103.724***	

Note: The superscripts ***, ** and * denote significance at 1%, 5% and 10% respectively.

Table 7
Robustness tests

	Model 1	Model 2	Model 3 Lagged model	Model 4 Random effects model	Model 5 2012 after	Model 6 Pollution-prone sector	Model 7 Change variable
	CSR_IR	CSR_IR	CSR_IR	CSR_IR	CSR_IR	CSR_IR	CSR_IR_new
BoardSize	0.014***	0.014**	0.010**	0.011***	0.013**	0.018***	0.020***
	(2.62)	(2.47)	(2.55)	(2.59)	(2.19)	(3.36)	(2.99)
BoardInd	0.000	0.000	-0.000	0.000	-0.000	-0.000	0.000
	(0.33)	(0.36)	(-0.30)	(0.39)	(-0.16)	(-0.31)	(0.27)
Duality	-0.008**	-0.008**	-0.006**	-0.005*	-0.010***	-0.007**	-0.011**
	(-2.30)	(-2.16)	(-2.23)	(-1.70)	(-2.78)	(-2.12)	(-2.55)
Female	-0.039**	-0.040**	-0.036***	-0.031**	-0.030*	-0.039***	-0.038*
	(-2.33)	(-2.15)	(-3.00)	(-2.41)	(-1.67)	(-2.60)	(-1.81)
Boardmeet	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.32)	(-0.35)	(-0.52)	(-0.64)	(-0.78)	(-0.81)	(-0.72)
Committee	-0.000	-0.000	0.001	-0.001	-0.000	-0.005	-0.002
	(-0.09)	(-0.16)	(0.82)	(-0.24)	(-0.12)	(-1.58)	(-0.48)
GRI	0.036***	0.036***	0.033***	0.024***	0.033***	0.042***	0.045***
	(8.58)	(3.45)	(10.19)	(7.49)	(7.21)	(9.75)	(7.84)
Certification	0.044***	0.044***	0.023***	0.040***	0.040***	0.061***	0.064***
	(4.65)	(5.32)	(3.25)	(6.05)	(3.75)	(3.07)	(4.79)
Asset	0.007***	0.007***	0.009***	0.008***	0.007***	0.008***	0.011***
	(5.02)	(4.12)	(8.77)	(6.66)	(4.33)	(6.42)	(6.17)
ROA	0.014**	0.014	-0.004	0.009	0.012*	0.015***	0.015**
	(2.20)	(1.31)	(-0.76)	(1.04)	(1.86)	(3.07)	(2.04)
Liability	-0.009	-0.009	-0.021***	-0.003	-0.014	-0.016**	-0.007
	(-0.88)	(-0.81)	(-3.05)	(-0.45)	(-1.17)	(-2.04)	(-0.58)
Constant	0.083**	0.084**	0.064*	0.069**	0.119***	0.122***	-0.101**
	(2.06)	(2.11)	(1.94)	(1.98)	(2.99)	(2.73)	(-2.03)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	No	Yes
Standard errors	Newey-West	ClusteredFirm & Year	ClusteredFirm	ClusteredFirm	ClusteredFirm	ClusteredFirm	ClusteredFirm
R^2	0.394	0.394	0.399		0.389	0.345	0.418
Adj. R^2	0.391	0.391	0.395		0.386	0.341	0.415
F (X^2)	112.488***	209.250***	190.961***	4999.47***	99.998***	185.647***	102.719***

Note: The superscripts ***, ** and * denote significance at 1%, 5% and 10% respectively.

the main findings. Based on the results of the robustness test, it can be argued that the main findings of this study are reliable.

Discussion

The finding for H1 shows a positive correlation between board size and the integration level of CSR disclosures, which is consistent with previous findings (Ahmed Haji, 2013; Jizi et al., 2013). Directors with different types of professional knowledge, skills, and abilities are more common on a large board; therefore, a large board is more inclined to perform their duties of supervise management (Vitolla, Raimo et al., 2020). Therefore, many directors promote transparency and accountability.

The findings for H2 show no correlation between the proportion of independent directors and the integration level of CSR disclosures, which is similar to the findings of Frías-Aceituno et al. (2013). Three reasons may explain this insignificant association (Eng & Mak, 2003). First, major shareholders can elect independent directors; thus, they can represent the interests of major shareholders. Second, independent directors can obtain information directly instead of using corporate reports. Thirdly, independent directors are a kind of supervision mechanism which can replace another supervision mechanism, namely information disclosure. Therefore, the positive role of independent directors in improving the integration level of CSR disclosures is offset.

The finding for CEO duality (H3) indicates a significant relationship between CEO duality and the integration level of CSR disclosures, analogous to the findings of Xiao and Yuan (2007). CEO duality impedes the provision of a high level of information disclosure to stakeholders because if a CEO also serves as the chairman of the board, she/he may neglect the well-being of stakeholders because of her/his overly strong power in the firm's decision-making (Cooray et al., 2020).

Regarding female directors (H4), contrary to expectations, this study finds that a high proportion of female directors is detrimental to the integration level of CSR disclosures. This finding is similar to that of Fasan and Mio (2017). The two researchers find that the proportion of women on boards has a significantly negative effect on the

Table 8
New scoring system

Measurement criteria	Score(Maximum score: 8)	Note
Both qualitative and quantitative non-monetary forms	Presence: 1; Absence: 0	A maximum score of 2 when using qualitative and quantitative non-monetary, and monetary forms simultaneously
Both qualitative and monetary forms	Presence: 1; Absence: 0	
Both quantitative non-monetary and monetary forms	Presence: 1; Absence: 0	
Both forward-looking and present-looking time orientations	Presence: 1; Absence: 0	A maximum score of 2 when using forward-looking, present-looking, and backward-looking simultaneously
Both forward-looking and backward-looking time orientations	Presence: 1; Absence: 0	
Both present-looking and backward-looking time orientations	Presence: 1; Absence: 0	
Both positive and negative tones	Presence: 1; Absence: 0	
Linkage with strategy	Presence: 1; Absence: 0	
Linkage with governance	Presence: 1; Absence: 0	
Linkage with dialogue with stakeholders	Presence: 1; Absence: 0	

materiality disclosure level. Due to the lack of consensus between genders and gender-based prejudice, a gender-diverse board may have a negative impact on the board's decision-making process (Rao & Tilt, 2016). Low et al., and Whiting (2015) point out that if the presence of women on a firm's board is a symbolic "standard", it would limit the ability of female board members. In addition, if the proportion of female board members is low, it may fail to influence the board's strategic decision-making process in terms of disclosure level (Ben-Amar et al., 2017). In our sample, female members of the board represented only 15.5% of the total members.

For H5, this study finds that the number of board meetings in a year does not improve the integration level of CSR disclosures. This is similar to the research conclusion of Fasan and Mio (2017), although mainstream corporate governance literature suggests that the number of board meetings has a positive effect on the disclosure level. However, a high frequency of board meetings may interfere with the daily work of directors and have a negative impact on resolving potential conflicts of opinion among directors, as an effective board needs to be flexible in adjusting board meetings (Jensen, 1993). In other words, an effective board has the flexibility to increase the frequency of meetings in emergency situations and reduce the frequency of meetings when there are no urgent problems to be solved.

Looking at specialised committees (H6), the number of various specialised committees under the board does not contribute to improving the integration level of CSR disclosures. Based on data on companies listed on China's Shenzhen Stock Exchange from 2002 to 2015, Gao and Song (2007) find that specialised committees have no significant impact on corporate transparency. We believe that the various specialised committees on the board have not played a significant role in significantly improving the disclosure level of Chinese listed companies. In addition, listed companies in China rarely set up a social responsibility committee (or sustainable development committee) that may affect the CSR disclosure level. This may be another reason why the number of specialised committees under the board does not materially improve the integration level of CSR disclosure.

The findings for H7 show that the adoption of the GRI framework improves the integration level of CSR disclosures, which is similar to the evidence by Haque and Jones (2020). They found that adoption of the GRI framework improves the biodiversity disclosure level. Our research confirms the importance of the GRI framework in improving the integration level of CSR disclosure. Firms familiar with the GRI framework may find it easier to improve the integration level of CSR disclosures (Manes-Rossi et al., 2021).

Finally, it can be found from the result for H8 that the external assurance on the CSR report enhances the integration level of CSR disclosures. Gerwanski et al. (2019) and Rivera-Arrubla et al. (2017) provide similar evidence. Therefore, it is understandable that CSR disclosures, whose credibility is verified by external assurance, would have a high integration level. Maroun (2019) empirically concludes that if CSR disclosures can be externally audited, they would greatly contribute to the enhancement of the IR disclosure level.

Conclusion

IR is regarded as a novel approach to CSR reporting (Vitolla, Raimo et al., 2019). In the Chinese context, little research has been conducted on IR. To fill this gap, this study uses a sample of Chinese listed companies to provide evidence on the integration level of CSR disclosures from an IR perspective and examines the firm-level drivers of the integration level of CSR disclosures. The results show that board size, separation of the CEO and chairman of the board, adoption of the GRI, and external assurance of CSR reports are factors that positively influence the integration level of CSR disclosure. However, board independence, gender diversity, meetings, and committees have not yet had such an impact.

This study has several implications for researchers, managers, and regulators. As a preliminary study of IR in the Chinese setting, this study will attract more researchers to conduct empirical studies in this field and in other developing countries, thus promoting the development of IR theory and practice. For managers, firms can consider restructuring the board of directors, as some board characteristics could represent a means to increase the integration level of the disclosure provided. Firms should appoint larger boards of directors and arrange separate positions for chairman and CEO to better perform boards' function of monitoring and support the usage of the IR approach to disclosures, which ensures the decrease of information asymmetry and agency costs in firms (Vitolla, Salvi, Raimo, Petruzzella & Rubino, 2020). Moreover, firms should not excessively indulge in increasing the proportion of independent members on the board of directors, the proportion of women on the board of directors, the frequency of board activities, and the number of board committees. These four "quantity" attributes of a board are not required to guarantee the effective conduct of its monitoring function and achievement of a high integration level of disclosures.

For regulators, they need to know which "triggers to pull" to attain their aim of reaching a higher integration level of disclosures by firms when formulating regulations, guidelines, listing rules (Omran, Ramdhony et al., 2021). This paper provides the appropriate "triggers" to be chosen by regulators. For instance, our study shows that the adoption of GRI and external assurance of CSR reports have a significant and positive effect on the integration level of CSR disclosures. Therefore, regulations, guidelines, and listing rules can include mandatory requirements for the adoption of the GRI and the external assurance of CSR reports. Based on our results, regulators may also question the effectiveness of purely increasing the proportion of independent members on the board of directors, the proportion of women on the board of directors, the frequency of board activities, and the number of board committees. Thus, regulators may consider how these board attributes improve the quality of a board when drafting administrative, regulatory, and legal documents to the integration level of disclosures. For instance, regulators can prescribe that independent directors nominated on boards must be knowledgeable of IR.

This study is exploratory in nature; therefore, it has some limitations. Further research should be conducted in the future. First, it focuses only on the integration level of CSR disclosure. Future research could investigate the integration level of different disclosure categories, such as intellectual capital disclosures, to gain a more comprehensive understanding of the development of the IR approach among Chinese companies. Second, this study examines only the internal drivers of the integration level of CSR disclosure. Therefore, future research may be extended to explore other impact factors (such as the pressure exerted by various external stakeholders on the firm). Third, this study focuses on the Chinese context. Thus, the findings of this study are applicable only in the Chinese context, and the generalisability of these findings is limited. However, future research could include other jurisdictions or use international datasets to conduct comparative studies in international contexts.

Notes

[1] Specifically, an aggregate IR index must cover a wide range of categories (such as eight content elements of IIRF), and each theme includes multiple subcategories; thus, there must be a substantial number of disclosure items involved in each content analysis. Moreover, measuring the quality of disclosures rather than their extent (the absence and presence of index items) makes the process of content analysis more difficult.

[2] An example is provided to illustrate the measurement criteria clearly: the company always adheres to the policy of combining safety production with the strategic deployment of the enterprise,

formulating a comprehensive safety production plan, and establishing a better safety production management system (***Strategy***)...The company has set up a Safety Production Leading Group and a Safety Production Leading Group Office, which are responsible for the strategy formulation and implementation and promotion of the company's safety production work, respectively, with clear responsibilities and joint efforts to effectively improve the company's safety production work (***Governance***)...The company attaches importance to communicating with stakeholders on safety production issues and has established an efficient stakeholder communication and feedback mechanism to listen to the views and suggestions of stakeholders, such as regulators, customers, partners, employees and their families, and NGOs through different channels (***stakeholder dialogue***). This year, the company held 9 safety production meetings (***Quantitative+ Present***)...The company completed the construction of a database of hazard sources and the overall risk index decreased by 28.1% on a year-on-year basis (***Quantitative+Past***)...The company firmly established the concept of safety development, strictly complied with relevant national laws and regulations, had zero tolerance for safety hazards, strictly implemented the safety production responsibility system, fully promoted the construction of a data-driven, risk-centred and performance-based safety management system, and enhanced its risk control capability (***Qualitative***)...The company held a total of 115,048 person-hours of safety production training, with 21,133 participants (***Qualitative+ Present***)...The total expenditure on safety training was 208 million Yuan (***Monetary +Present***), increasing by 59 million Yuan over last year (***Monetary +Past***)...A total of 393 million was invested in safety production management during this year and the company expects to increase its funding for safety production management by 3.55% next year (***Monetary+Future***)...Next year, we plan to hold the first Worker Safety Competition and plan to put 11 courses on safety production education online (***Quantitative+Future***)...This year, the company held an accident analysis meeting for the 7 minor accidents that occurred in the company and imposed financial penalties on the project managers respectively. A total of 271 hidden safety production hazards were identified, and 51 persons were punished to violate safety production (***Negative+Quantitative***)...17 projects of the company were committed by the government for not having major safety accidents for three consecutive years (***Positive+ Quantitative***). Therefore, the integration level of "safety production" obtains a score of four.

Declaration of Competing Interest

The authors declare no conflict of interest.

Acknowledgments

The authors thank Professor Juan Piñeiro-Chousa (editor-in-chief), and the three anonymous reviewers, for their constructive remarks and guidance. This study was supported by the National Natural Science Foundation of China (Project No. 72102017).

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