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How innovative knowledge assets and firm transparency affect sustainability-friendly practices

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ABSTRACT

Global environmental problems have arisen since some firms pursue fast growth at the expense of massive resource consumption and environmental degradation. Under such conditions, stakeholders increasingly require firms to implement sustainability-friendly practices. This paper explored whether innovative knowledge assets and firm transparency promoted sustainability-friendly practices and further investigated the moderating role of firm transparency on the relationship between innovative knowledge assets and sustainability-friendly practices. Using 1186 firm-year observations of Chinese listed firms from 2006 to 2015, the results showed that innovative knowledge assets ($\beta = 0.787$, $p < 0.001$) and firm transparency ($\beta = 0.280$, $p < 0.001$) exerted positive impacts on sustainability-friendly practices and that the interaction of innovative knowledge assets and firm transparency ($\beta = 0.274$, $p < 0.01$) also positively affected the extent to which a firm's innovative knowledge can reach its full potential for sustainability-friendly practices. The outcomes of this paper will innovate the corporate sustainability literature and offer a fresh pathway to future studies.

1. Introduction

1.1. Research problem

Firms are not separate from the natural environment but are located within it, and their activities have a significant impact on the natural environment, as some firms pursue economic performance while ignoring environmental protection (Flammer, 2013). With the rise in environmental problems, firms have been increasingly required to achieve a balance between economic profitability and environmental responsibility (Law and Gunasekaran, 2012). Under such conditions, firms are obliged to make an extra effort to include environmental responsibility in their corporate vision in an attempt to provide short-term and long-term values to stakeholders. As such, an increasingly number of firms have begun to implement sustainability-friendly practices (Maletić et al., 2016).

To deal with this emphasis on sustainability-friendly practices, a growing body of literature explores the driving factors behind sustainability-friendly practices, which can usually be divided into two categories, namely, external driving factors and internal driving factors (Lozano, 2015). Some of the most characteristic driving factors are presented in Table 1. It can be concluded that there is a tendency to transfer the focus from external to internal driving factors.

Although numerous studies have investigated the driving factors of sustainability-friendly practices from different internal perspectives, more research is required to develop an in-depth understanding of why firms take part in sustainability-friendly practices (Bai et al., 2015). From a knowledge-based view, changes in business logics have their roots in organizational knowledge (Bond et al., 2010). Innovative knowledge assets, a particular kind of organizational knowledge, have the greatest potential to nurture the transformations of business logics because they are the foundations of strategy development, performance improvement, and capability enhancement (Ferraresi et al., 2012; Mills and Smith, 2011). Following this logic, innovative knowledge assets may be the major reason why firms engage in

Abbreviations: VRIN, value, rarity, inimitability, and nonsubstitutability; CSR, corporate social responsibility; ST, special treatment; ROE, return on common stockholders' equity; SD, standard deviation.

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Table 1
Summary of studies of the antecedents of sustainability-friendly practices.

Study	Operational definition of sustainability-friendly practices	Kinds of antecedents		Main conclusions
		External	Internal	
Blum-Kusterer and Hussain (2001)	7 items, seven-point Likert scales	✓		Regulation is the most important driver for sustainability improvements.
Moffat and Auer (2006)	A voluntary initiative to accelerate sustainability innovation and improve environmental performance	✓		Government leadership and intervention to support and reward have impacts on corporate sustainability.
Abreu (2009)	Environmental management within business system	✓		Continual efforts to work with government and society contribute to improve corporate sustainability.
Collins et al. (2010)	Practices related to the eco-efficiency strategies	✓		Reputation and brand are significant drivers for sustainability practices.
Windolph et al. (2014)	Three indicators, representing an increasing level of firm engagement	✓		Seeking corporate legitimacy and market success are the motivations to deal with sustainability.
Miska et al. (2018)	Firms' activities that contribute to the domains of sustainability	✓		Globe cultural practices are related to the sustainability practices.
Wagner (2005)	SO_2 emissions, NO_x emissions, COD emissions, total energy input, and total water input		✓	Corporate strategies with regard to sustainability and environment influence sustainability-friendly practices.
Hofmann et al. (2012)	7 items, five-point ordinal scales		✓	The adoption of advanced technology, experiences with inter-firm relations and capacity for product innovation are three capabilities that support firms' efforts to become greener.
Chakrabarty and Wang (2012)	The sum of the number of positive practices across six sustainability-friendly related areas		✓	Firms with high R&D intensity and high internationalization are likely to develop more sustainability practices.
Lourenço and Branco (2013)	Bovespa Corporate Sustainability Index		✓	Financing characteristics are likely to have higher significance in determining corporate sustainability.
Pedersen et al. (2018)	10 statements, ten-point ordinal scales		✓	Firms with innovative business models are more likely to address corporate sustainability.
Johannsdottir and Mcinerney (2018)	An approach to environmental and social issues influencing companies' actions		✓	Commitment, configuration, core business, communication, and continuous improvement are related to environmental sustainability.
Masocha and Fatoki (2018)	Twenty-one items, five-point Likert scale		✓	Coercive isomorphic pressures have a significant impact on sustainability practices.
Annunziata et al. (2018)	Sixteen items, five-point Likert scale		✓	Organizational capabilities are positively associated with proactive socio-environmental practices.

sustainability-friendly practices. However, there is still a lack of research demonstrating the antecedent effect of sustainability-friendly practices from a knowledge-based view and thus on whether there is a link between innovative knowledge assets and sustainability-friendly practices remains unclear. By ignoring this important research question, firms are unable to effectively promote sustainability-friendly practices. Therefore, this paper aimed to probe a new research field, focusing on exploring the connection between innovative knowledge assets and sustainability-friendly practices.

Furthermore, as proposed by the knowledge-based view, innovative knowledge assets, because of their uniqueness, implicit nature, and firm specificity, may induce a high degree of information asymmetry between firms and their stakeholders (He and Wang, 2009). As a result, the process of transferring innovative knowledge assets into sustainability-friendly practices is potentially plagued with a firm-stakeholder relationship. Stakeholder theory argues that stakeholders are critical in terms of their power, and stakeholders' influences on firms can be both direct and indirect depending on resource dependence (Harrison and Wicks, 2013). Firm transparency, one of the most critical ways for firms to create shared interests with their stakeholders, is essential for forming strong bonds between firms and their stakeholders (Baraibar-Diez et al., 2017). This paper proposed that firm transparency had a direct positive effect on sustainability-friendly practices and also strengthened the relationship between innovative knowledge assets and sustainability-friendly practices.

To respond to the focus on sustainability research and practice, this paper has implications for the unexplored relationships among innovative knowledge assets, firm transparency and sustainability-friendly practices. Specifically, this paper addressed three research questions: (1) Were innovative knowledge assets associated with sustainability-friendly practices? (2) Was there a link between firm transparency and sustainability-friendly practices? and (3) Did the relationship between innovative knowledge assets and sustainability-friendly practices differ for firms with different levels of firm transparency? These three research questions were tested in China, which is a transition economy. Although the theoretical arguments investigated in this paper were universal, a transition economy may offer a more appropriate research context. China's market is quite diverse, which allows to obtain more variations in terms of innovative knowledge assets, firm transparency and sustainability-friendly practices.

The following section develops the hypotheses. Section 2 presents the method. Section 3 shows the analysis results, which are discussed in Section 4. Section 5 summarizes the main findings, proposes theoretical contributions and practical implications, and offers possible extensions for future research.

1.2. Research hypotheses

1.2.1. Innovative knowledge assets and sustainability-friendly practices

According to the resource-based view, variances in performance among firms can be attributed to differences in their VRIN resources, namely, value, rarity, inimitability, and nonsubstitutability (Barney et al., 2011). As organizational knowledge becomes a kind of progressive primary resource, many researchers argue that firms' successes depend on organizational knowledge, and thus, a knowledge-based view emerges (Håkanson, 2010). The knowledge-

based view is a further development of the resource-based view, and the central argument of the knowledge-based view is that the differences in organizational knowledge are the main reason for divergences in firms' performance (De Silva et al., 2018). Among various kinds of organizational knowledge, innovative knowledge assets, a type of firm-specific resource, are the most important strategic resource with the most VRIN characteristics (He and Wang, 2009). Following previous research, this paper defined innovative knowledge assets as a firm's distinctive knowledge stocks, which are essential for a firm to create competitive advantages (He and Wang, 2009; Qian et al., 2017).

Sustainability-friendly practices refer to firms' voluntary activities that incorporate social and environmental concerns into business operations (Collins et al., 2010). Sustainability-friendly practices can be seen as a type of investment that contributes to innovations in current non-sustainability-friendly products and processes, and firms can attain a certain level of sustainability-friendly practices by achieving sustainability-friendly oriented innovation (Schaltegger and Wagner, 2011). According to the knowledge-based view, innovative knowledge assets can be regarded as the basic constitutive elements that help firms increase their capabilities to introduce creative destructions aimed at improving the ecological features of their products and processes (Doyle et al., 2019; Wang et al., 2016). For instance, innovative knowledge assets can be transferred into energy-saving projects and lead to environmentally friendly products (Amores-Salvadó et al., 2014). The innovative knowledge assets embedded in the operation processes can also trigger environmentally responsible operations, such as decreasing the emissions of carbon dioxide and utilizing recyclable resources (Blum-Kusterer and Hussain, 2001; Wijethilake et al., 2018). Following this logic, innovative knowledge assets can act as an important input for implementing sustainability-friendly practices because innovative knowledge assets and sustainability-friendly practices are both associated with product and process improvement.

At the same time, the outstanding performance generated by innovative knowledge assets may attract more attention from stakeholders, which contributes to firms' sustainability-friendly practices (Rahman and Post, 2012). The prominent performance produced by innovative knowledge assets increases the recognition of community stakeholders and regulatory stakeholders, two of the most important stakeholders focusing on firms' sustainability-friendly practices (Ginesti et al., 2018; Kassinis and Vafeas, 2006). Firms with remarkable performance can receive more attention and enjoy more substantial communications with community stakeholders (Harrison and Wicks, 2013). The close correlation with their community stakeholders can help firms capture valuable knowledge, which in turn, helps them realize sustainability-friendly oriented innovation (Wolf, 2014). More importantly, firms with high performance levels can also establish more connections with regulatory stakeholders, which are helpful in acquiring preferential financial and political support, such as support funding, project investment, tax exemptions, interest-free or discount government loans, and relaxed regulatory enforcement (Wu et al., 2018). These preferential financial and political supports are pivotal for firms in implementing sustainability-friendly practices because they can help firms construct their R&D infrastructure, execute their R&D projects, and upgrade the essential skills of their R&D employees (Wei et al., 2017). Therefore, innovative knowledge assets can also link to sustainability-friendly practices through stakeholders' attentions. Based on the theoretical analysis above, a hypothesis is formulated as follows:

H1. Ceteris paribus, innovative knowledge assets have a positive impact on sustainability-friendly practices.

1.2.2. Firm transparency and sustainability-friendly practices

Firm transparency, conceptualized as the availability and validity of particular information to firms' stakeholders (Bushman et al., 2004), is one of the primary corporate governance mechanisms to minimize information asymmetry (Firth et al., 2014). High firm transparency always serves as a prerequisite for drawing stakeholders' attention, while firms that fail to maintain transparency risk suffering a non-compliance punishment (Schnackenberg and Tomlinson, 2016). Stakeholder theory argues that firms should continually meet the demands of diversity stakeholders to obtain their support (Harrison and Wicks, 2013; Crane, 2018). With the promotion of an awareness of environmental protection, stakeholders' values have increasingly changed from profit-oriented to sustainability-friendly oriented (Johnson et al., 2018; Law and Gunasekaran, 2012), and they require a substantial material disclosure of corporate information to control firms' behaviours (Orlitzky et al., 2011). It can thus be inferred that firm transparency can affect sustainability-friendly practices through the firm-stakeholder relationship, including community stakeholders and regulatory stakeholders.

First, firm transparency can affect the level of firms' behaviours that are opposite to community stakeholders' beliefs and thereby enhance firms' commitments to sustainability-friendly practices. Community stakeholders expect detailed information about how firms' efforts are leveraged to the provision of sustainability-friendly practices, such as pro-environmental programs (Chung et al., 2015). Firm transparency addresses community stakeholders' information requests (Yu et al., 2018), and the more information that is made available to community stakeholders, the more pressure from community stakeholders and the more modifications firms would be requested to make (Schnackenberg and Tomlinson, 2016). That is, firm transparency makes firms subject to greater levels of scrutiny by their community stakeholders, and community stakeholders may use the information received to put pressure on firms in terms of their sustainability-friendly practices.

Second, firm transparency is also essential for regulatory stakeholders to promote firms' sustainability-friendly practices. Firms must provide the necessary information required by regulatory stakeholders, which is conducive to better assessing and supervising firms' behaviours (Weber, 2014). High levels of firm transparency can affect the level of concern from regulatory stakeholders, and as a result of such concern, firms have been forced to reevaluate their strategic approaches towards the natural environment and embrace environmental protection as part of how they do business (Amores-Salvadó et al., 2014). In such a way, firms may implement more practices that can be identified as sustainable and friendly and shun practices that primarily benefit firms rather than the environment, given the environmental preferences of regulatory stakeholders (Cuadrado-Ballesteros et al., 2016). In other words, firms with high firm transparency may enact more sustainability-friendly practices because they are under great scrutiny from their regulatory stakeholders, which in turn helps them become better corporate citizens.

Some statements from the stakeholder's perspective are actually consistent with the resource-based view. According to the resource-based view, an excellent company philosophy is usually a precious and unique resource that is difficult for other firms to copy (Barney et al., 2011; Elsbach and Stigliani, 2018). Firm transparency has been highlighted as a type of ethical company philosophy that differentiates an organization from others (Hassan and Ibrahim, 2012), which can increase firms' responsibility for carrying out beneficial activities to fulfil stakeholders' needs (Hörisch et al., 2015; Wolf, 2014). Hence, firm transparency can be considered necessary to encourage sustainability-friendly practices. Based on the theoretical analysis presented above, a hypothesis is formulated

as follows:

H2. Ceteris paribus, firm transparency has a positive impact on sustainability-friendly practices.

1.2.3. Moderating role of firm transparency

Innovative knowledge assets can produce superior performance, which in turn, can attract stakeholders' attention (He and Wang, 2009). Firm transparency is associated with information disclosure of corporate documents related to business activities (Bernstein, 2017), and increasing firm transparency is of great significance in promoting the degree of firms' openness to their stakeholders, which is alleged to be a key factor for increasing the attention generated by innovative knowledge assets (Hörisch et al., 2015). Since transparent firms receive more concern from their stakeholders, firm transparency may enhance the effect of innovative knowledge assets, with the aim of meeting heightened stakeholder expectations and demands. Following this logic, this paper argued that firm transparency might also play a positive moderating role in the relationship between innovative knowledge assets and sustainability-friendly practices.

First, to meet the reasonable requests of community stakeholders, firm should constantly disclose information (Benlemlih et al., 2018), and increased firm transparency helps establish common values and norms between firms and community stakeholders (Bernstein, 2017). Awareness of firm transparency increases the identification of community stakeholders and further enhances the desire of community stakeholders to commit their private knowledge to firms (Dawkins and Fraas, 2013; Vaccaro and Sison, 2011). Firms showing greater transparency can thus obtain more knowledge flows, which are often heterogeneous from firms' internal knowledge. It then follows that innovative knowledge assets can recognize the value of knowledge flows, assimilate them, and apply them to achieve sustainability-friendly practices (Schaltegger and Wagner, 2011). In short, when firm transparency is high, social exchanges with community stakeholders strengthen, and these exchanges can further expand efforts in terms of innovative knowledge assets to ensure the implementation of sustainability-friendly practices using newly acquired knowledge.

Second, firms are inevitably constrained by regulatory stakeholders (Zhao et al., 2014) and always firmly seek political legitimacy to gain acceptance and approval from their regulatory stakeholders (Ball et al., 2018; Kassinis and Vafeas, 2006). In an information asymmetry context, the greater supply of firm transparency signals firms' long-range promises to maintain political legitimacy (Bushman et al., 2004), and it is more likely that high levels of firm transparency lead regulatory stakeholders to positive interpretations (Das Neves and Vaccaro, 2013). By doing so, the greater the firm transparency, the higher the extent of firms' citizenship, which helps firms enhance the high level of political legitimacy acquired from regulatory stakeholders (Bernstein, 2017). Thus, firms with high transparency can shield themselves from government disturbance and enjoy institutional support, and the tangible and intangible supports thus acquired facilitate the transfer of innovative knowledge assets to sustainability-friendly practices more efficiently and effectively (Cuadrado-Ballesteros et al., 2016). Based on the theoretical analysis presented above, a hypothesis is formulated as follows:

H3. Firm transparency positively moderates the relationship between innovative knowledge assets and sustainability-friendly practices.

Fig. 1 depicts the research model of this paper.

2. Method

2.1. Samples

The samples in this paper were selected from the Shenzhen listed firms from 2006 to 2015. Initially, the samples were acquired from the Shenzhen Stock Exchange website (http://www.szse.cn/), and then, relevant information on each firm was searched. This paper integrated the State Intellectual Property Office of the People's Republic of China and the China National Knowledge Infrastructure to obtain innovative knowledge assets data. The sustainability-friendly practices were measured by content analysis, and the content used for analysis were acquired from public sources, such as corporate websites, firms' annual reports, corporate social responsibility (CSR) reports, and green CSR reports (when available) (Kuo et al., 2012; Rahman and Post, 2012). The firm transparency data were obtained from the Shenzhen stock exchange website, and the control variables data were derived from each firm's annual report and the China Stock Market and Accounting Research (CSMAR) database, one of the largest databases of Chinese publicly listed firms containing information on Chinese stock markets.

Following previous research, this paper deleted Special Treatment (ST) firms, as they were in an abnormal financial condition and therefore unsuitable for data analysis. In addition, this paper also removed a number of observations because their data were incomplete. After merging data, the final panel dataset to be used for analysis included 123 firms and 1186 firm-observations. Table 2 shows the sample distribution divided by year and industry.

Others include those include only one type of industry, such as animal husbandry, instrumentation manufacturing, manufacturing of railways, ships, aerospace and other transport equipment, paper and paper products, etc.

2.2. Measurement

2.2.1. Innovative knowledge assets

Much of a firm's innovative knowledge assets are accumulated internally (He and Wang, 2009). Usually, firms invest in R&D and produce patent applications, which give rise to innovative

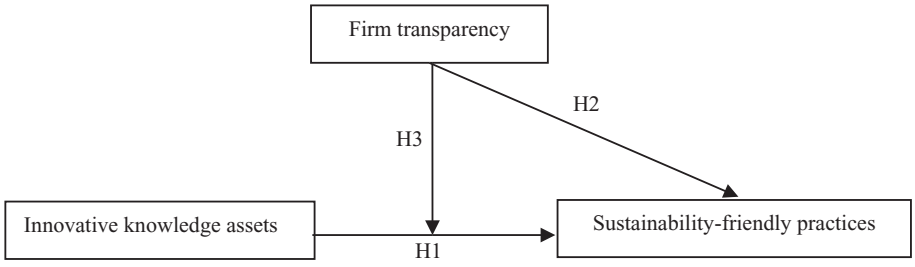

Fig. 1. The research model presented in this paper.

Table 2
Sample distribution by year and industry.

Industry type	Year										Subtotal	%
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
Forestry	1	2	1	2	2	2	2	2	2	2	18	1.52
Coal mining and dressing	3	4	4	4	4	4	3	3	3	3	35	2.95
Non-ferrous and black metals mining and dressing	4	4	4	4	4	4	4	4	4	4	40	3.37
Farm and sideline food processing	2	2	2	2	2	2	2	2	2	2	20	1.69
Wine, beverages and refined tea manufacturing	5	5	5	5	5	5	5	4	5	5	49	4.13
Textile	1	2	2	2	2	2	2	2	2	1	18	1.52
Chemical and pharmacy	10	11	11	11	11	11	11	11	11	11	109	9.19
Non-metallic mineral products	3	3	4	4	4	4	4	4	4	4	38	3.20
Metal smelting and rolling processing	10	11	11	11	10	11	11	11	11	11	108	9.11
Metal products	3	3	3	3	3	3	3	3	3	3	30	2.53
General and special equipment manufacturing	3	5	5	5	5	5	5	5	5	5	48	4.05
Auto manufacturing	5	6	7	7	7	7	7	7	7	7	67	5.65
Electrical machinery manufacturing	2	2	2	2	2	1	1	1	1	1	15	1.26
Telecommunication and IT	10	11	11	11	12	12	12	11	10	11	111	9.36
Power, thermal production and supply	5	5	5	5	5	5	4	4	4	5	47	3.96
Civil engineering construction	2	3	3	2	3	2	2	3	3	3	26	2.19
Real estate	11	13	13	13	13	12	13	13	13	13	127	10.71
Commercial service	2	2	1	2	2	2	2	2	2	2	19	1.60
Wholesale	4	4	4	4	4	4	4	4	4	4	40	3.37
Trade and retail	3	3	3	3	3	3	3	3	3	3	30	2.53
Road transport	2	2	2	2	2	2	2	2	2	2	20	1.69
Ecological protection	2	1	2	2	2	2	1	1	2	1	16	1.35
Others	17	19	16	16	16	15	14	14	14	14	155	13.07
Total by year	110	123	121	122	123	120	117	116	117	117	1186	100

knowledge assets (Qian et al., 2017). Therefore, patent applications can be used to represent innovative knowledge assets, at least in part (Wang et al., 2016).

Using patent applications as a proxy variable of innovative knowledge assets has a certain number of advantages. First, patent applications incorporate the most detailed and systematically compiled information related to innovative knowledge assets, which is preserved through a uniform and rigorous process of examination (Choi et al., 2011). Second, the number of patent applications is more difficult to manipulate by managers and thus more authentically reflects the actual situation of innovative knowledge assets (Simeth and Cincera, 2015). Third, patent applications lack hysteresis (Chen et al., 2015). For these reasons, this paper used the number of patent applications as the measurement of innovative knowledge assets (Ernst et al., 2011).

2.2.2. Firm transparency

Many researchers argue that firm transparency is achieved by information disclosure (Gaa, 2009), and if authorities rate the level of information disclosure strictly, firms may try to disclose their information faithfully. The higher the authorities' evaluation score, the more transparent the firm (Firth et al., 2014), and thus, the authorities' evaluation score can be utilized to measure firm transparency (Liao et al., 2011).

According to the Assessment of Information Disclosure of the Shenzhen Stock Exchange Listed Company (2017) (http://www.szse.cn/main/rule/bsywgz/39771615.shtml), the Shenzhen Stock Exchange assesses the information disclosure of listed firms from the following five aspects: the truthfulness, accuracy, completeness, timeliness, legal compliance and fairness of information disclosure; the penalty, punishment and regulatory measures of the listed firms received; the cooperation degree of the firms listed with the Shenzhen Stock Exchange; the management of the information disclosure of the listed firms; and others. The evaluation score is classified into four levels: excellent (the highest level), good, pass and fail (the lowest level).

This paper used the evaluation score on information disclosure of the Shenzhen Stock Exchange as the proxy index of firm transparency. Following previous research (Yeh et al., 2014), this paper set a continuous variable to represent the extent of firm transparency.

2.2.3. Sustainability-friendly practices

Content analysis is a technique for making inferences by systematically identifying and objectively assessing specific characteristics of written materials, and it is a primary method used for analysing published information. As a research method, content analysis has been widely used in corporate sustainability research (Ahi and Searcy, 2013; Ameer and Othman, 2012; Fonseca, 2010). This paper employed content analysis to measure sustainability-friendly practices (Chakrabarty and Wang, 2012; Hashmi et al., 2015).

The final sustainability-friendly practices measure comprised 17 items, which were environmental management system establishment (qualitative and quantitative), environmental investment, energy saving (qualitative and quantitative), renewable energy employment, resources recycling, water efficiency increase, emission reduction (qualitative and quantitative), garbage disposal (qualitative and quantitative), pollution prevention, beneficial products and services, sustainable package use, operation process improvement, and green innovation (Chuang and Huang, 2018; Lioui and Sharma, 2012; Rahman and Post, 2012). For each item, if a firm reported relevant information, it was given a score of 1; if a firm reported no information, it was given a score of 0. Lastly, this paper summed the total scores for all the items to establish a firm's specific value. To avoid bias as much as possible, data were collected independently by two researchers. The collected data were compared, and it was satisfied that there were no obvious differences.

2.2.4. Control variables

This paper also included seven control variables in the research model, namely, firm size, sales growth, leverage, rate of return on common stockholders' equity (ROE), ownership concentration, social responsibility sensitive industry, and mandatory disclosure. Previous research has argued that firm size plays a significant role

in the accumulation of innovative knowledge assets (Luo and Du, 2015). This paper used a natural logarithmic form of total assets to measure firm size (Przychodzen and Przychodzen, 2015). Sales growth may have links with innovative knowledge assets and sustainability-friendly practices because it is associated with innovation (Choi and Williams, 2014). Leverage is often used as a proxy variable for reflecting the risk level (Yu et al., 2016), and high leverage may restrict investment in sustainability-friendly practices (Brammer and Millington, 2008). ROE reflects the profitability of business owners (Luo et al., 2012), which may influence the resources commitment on innovative knowledge assets (Qian et al., 2017). Ownership concentration has been argued to affect the willingness to engage in sustainability-friendly practices (Kim et al., 2012). Following research by Reverte (2009), this paper designed a dummy variable to measure social responsibility sensitive industry, as some industries faced stronger legislative actions to pursue sustainability-friendly practices (Flammer, 2013). This paper also added a dummy variable of mandatory disclosure because it may affect a firm's transparency.

These control variables can also represent the antecedents of sustainability-friendly practices identified by previous research, to a certain degree. For instance, the social responsibility sensitive industry bears greater pressure from governments to implement sustainability-friendly practices (Reverte, 2009). The rate of return on common stockholders' equity can represent economic performance, which is an important antecedent of sustainability-friendly practices (Luo et al., 2012). Firm size and sales growth can reflect firm strategy and firm capability to a certain extent because they provide the resources for firm strategy development and firm capability improvement (Annunziata et al., 2018). Thus, if the effects of innovative knowledge assets and firm transparency remain significant after controlling for these variables, it can be concluded that there is incremental validity.

3. Results

Table 3 reports the descriptive statistics, including mean and standard deviation (SD), and correlations among the dependent variable, independent variables and control variables. Consistent with theoretical predictions, innovative knowledge assets and firm transparency were significantly and positively related to sustainability-friendly practices.

The paper further applied the pooled model and multivariate panel data models, including the random effect model and fixed effect model, to investigate the relationships among innovative knowledge assets, firm transparency and sustainability-friendly practices. This paper used the F-Test, Breusch-Pagan test, and Hausman test to select an appropriate model. The null hypotheses of these tests are different. The null hypothesis of the F test is that the Pooled model is better than the fixed effect. The null hypothesis of the Breusch-Pagan test is the variances across entities are zero, which means that the Pooled model is better than the random effect. The null hypothesis of the Hausman test is that compared with the Pooled model, the preferred model is the random effect. Firstly, this paper ran the F-test to compare fixed effect and Pooled model; secondly, this paper ran the Breusch-Pagan test to compare random effect and Pooled model; thirdly, this paper ran the Hausman test to compare fixed effect and random effect. The results of the Breusch-Pagan test for all models showed that the random effect model was better than the pooled model. The results of the Hausman test showed that the random effect model was more suitable for Model 1, Model 2, Model 3, and Model 4, and the fixed effect model was found to be appropriate for Model 5. The results are shown in Table 4. As Model 2 showed, innovative knowledge assets significantly and positively affected sustainability-friendly practices ($\beta = 0.777$, $p < 0.001$), which meant that the more innovative knowledge assets there were, the better firms' sustainability-friendly practices were. Hence, H1 was supported. As Model 3 showed, firm transparency had a significant positive effect on sustainability-friendly practices ($\beta = 0.539$, $p < 0.1$), which meant that the higher firm transparency was, the better firms' sustainability-friendly practices were. Hence, H2 was supported. Model 5 reported the full model, which showed similar findings as Model 3. As Model 5 showed, firm transparency ($\beta = 0.280$, $p < 0.001$) significantly and positively affected sustainability-friendly practices. Furthermore, the regression coefficient of the interaction variable involving innovative knowledge assets and firm transparency was positive and significant ($\beta = 0.274$, $p < 0.01$). Hence, H3 was supported.

To better explain the moderating effect, this paper utilized Aiken et al. (1991) approach to draw the interaction plot, shown as Fig. 2. The figure indicates that at high levels of firm transparency, the relationship between innovative knowledge assets and sustainability-friendly practices was more positive. By contrast, at low levels of firm transparency, the relationship between innovative knowledge assets and sustainability-friendly practices tended to become less positive.

To further confirm the robustness of the research results, following Zaman et al. (2001), this paper removed samples of other industries and performed the regression analysis again. As reported in Table 5, there were no substantial differences between the previous findings and the robustness regression results, which showed that the research results were robust.

4. Discussions

The result of H1, that innovative knowledge assets had a positive impact on sustainability-friendly practices, is consistent with the arguments of the resource-based view (Gold et al., 2010), an effective theory to explain why one firm can produce or offer a

Table 3
Descriptive statistics and correlations of variables used in this paper.

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10
1 Firm size	9.881	0.612	1.000									
2 Sales growth	1.091	24.229	−0.006	1.000								
3 Leverage	0.566	0.487	−0.125***	0.005	1.000							
4 ROE	0.097	0.303	−0.021	0.039*	0.250***	1.000						
5 Ownership concentration	37.781	16.840	0.165***	0.073***	−0.067***	0.026	1.000					
6 Sensitive industry	0.440	0.496	−0.059*	−0.028	−0.156***	0.013	0.119***	1.000				
7 Mandatory disclosure	0.540	0.498	0.536***	−0.033	−0.108***	0.017	0.282***	0.282***	1.000			
8 Innovative knowledge assets	1.317	1.976	0.351***	−0.017	−0.059*	−0.011	0.019	0.011	0.189***	1.000		
9 Firm transparency	3.050	0.669	0.387***	−0.006	0.110***	0.040*	0.126***	0.031	0.306***	0.192***	1.000	
10 Sustainability-friendly practices	4.970	8.399	0.389***	−0.021	−0.026	−0.020	0.063**	0.078**	0.191***	0.271***	0.196***	1.000

N = 1186 *p < 0.05 **p < 0.01 ***p < 0.001.

Table 4
Regression results of the effects of innovative knowledge assets and firm transparency.

Variables	Sustainability-friendly practices									
	Model 1		Model 2		Model 3		Model 4		Model 5	
	Re(1)	Fe(1)	Re(2)	Fe(2)	Re(3)	Fe(3)	Re(4)	Fe(4)	Re(5)	Fe(5)
Firm size	5.574***	5.434***	4.772***	4.656***	5.409***	5.315***	4.668***	4.598***	4.748***	4.658***
Sales growth	−0.005	−0.004	−0.004	−0.004	−0.005	−0.004	−0.004	−0.004	−0.004	−0.004
Leverage	0.777	0.609	0.700	0.503	0.809	0.619	0.727	0.512	0.705	0.497
ROE	−0.393	−0.162	−0.416	−0.203	−0.449	−0.195	−0.458	−0.223	−0.461	−0.206
Ownership concentration	−0.034+	−0.077**	−0.024	−0.059**	−0.036+	−0.079**	−0.026	−0.061	−0.232	−0.062*
Sensitive industry	1.315***	1.213***	1.346	1.308	1.343	1.326	1.366+	1.358+	1.401+	1.372+
Mandatory disclosure	−0.674	−0.726	−0.766	−0.738	−0.790	−0.783	−0.849	−0.837	−0.851	−0.833
Innovative knowledge assets			0.777***	0.869***			0.759***	0.852***	0.669***	0.787***
Firm transparency					0.539+	0.391+	0.398+	0.243+	0.479***	0.280***
Innovative knowledge assets × Firm transparency									0.409**	0.274**
Hausman test		7.16		4.92		9.69		7.24		16.49*
F-test		4.35***		4.19***		4.30***		4.15***		4.04***
Breusch-Pagan test	325.36***		312.97***		312.75***		301.85***		281.23***	
Year	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	0.154	0.130	0.176	0.158	0.158	0.132	0.178	0.159	0.186	0.163

N = 1186 +p < 0.1 *p < 0.05 **p < 0.01 ***p < 0.001.

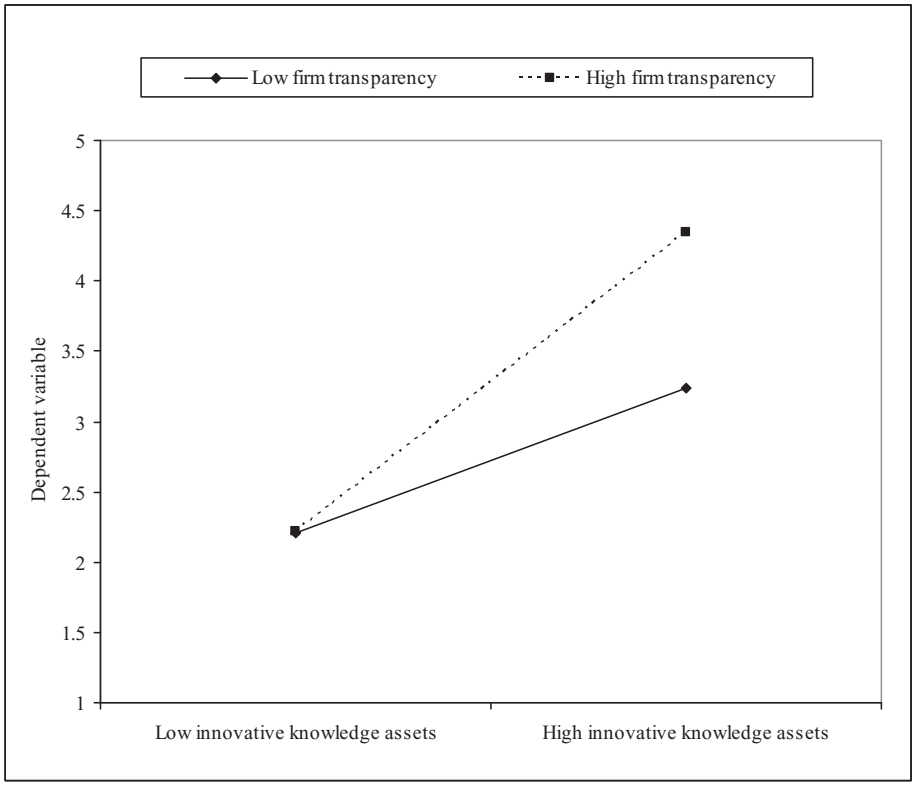

Fig. 2. The moderating effect of firm transparency on the relationship between innovative knowledge assets and sustainability-friendly practices.

performance equal to or better than another (Barney et al., 2011). According to the resource-based view, firms are obliged to develop their internal resources to generate competitive advantages. However, not all resources are equally important, and findings show that intangible resources are important determinants because they are scarce, specialized and difficult to trade, imitate, or appropriate. Stemming from the resource-based view, the knowledge-based view posits that organizational knowledge is a kind of intangible resource, and firms' environmental activities depend on their knowledge to a great extent. Following this logic, Aguilera-Caracuel et al. (2012) found that a more complex knowledge of environmental international diversification was positively related to a firm's proactive environmental strategy. Furthermore, Hörisch et al. (2015) identified knowledge as a key driver in promoting sustainability management. This paper strengthened these arguments by revealing how innovative knowledge assets, a particular kind of organizational knowledge, can affect sustainability-friendly practices. Innovative knowledge assets, which include know-how, have the same characteristics as strategic resources. Accumulating innovative knowledge assets increases a firm's absorptive capacity, placing it in a better position to take advantage of opportunities related to corporate

Table 5
Robustness test of the effects of innovative knowledge assets and firm transparency.

Variables	sustainability-friendly practices									
	Model 1		Model 2		Model 3		Model 4		Model 5	
	Re(1)	Fe(1)	Re(2)	Fe(2)	Re(3)	Fe(3)	Re(4)	Fe(4)	Re(5)	Fe(5)
Firm size	6.208***	6.402***	5.296***	5.421***	6.045***	6.287***	5.197***	5.374***	5.260***	5.432***
Sales growth	−0.003	−0.002	−0.003	−0.002	−0.003	−0.002	−0.003	−0.002	−0.003	−0.002
Leverage	1.131	1.021	1.025	0.837	1.165	1.029	1.054	0.846	1.040	0.843
ROE	−1.102	−0.893	−1.073	−0.811	−1.199	−0.939	−1.146	−0.839	−1.159	−0.837
Ownership concentration	−0.057***	−0.118***	−0.043**	−0.096**	−0.057**	−0.120**	−0.044	−0.098	−0.041	−0.098
Sensitive industry	1.414***	1.236***	1.595	1.587	1.445	1.438	1.612+	1.608+	1.654+	1.587+
Mandatory disclosure	−1.073	−1.112	−1.213	−1.87	−1.218	−1.187	−1.309	−1.296	−1.295	−1.332
Innovative knowledge assets			0.826***	0.936***			0.801***	0.919***	0.713***	0.852***
Firm transparency					0.544+	0.397+	0.396+	0.223+	0.439***	0.239***
Innovative knowledge assets × Firm transparency									0.399**	0.266**
Hausman test		8.93		7.28		8.22		10.48		18.64*
F-test		4.67***		4.51***		4.61***		4.46***		4.35***
Breusch-Pagan test	301.10***		289.50***		286.89***		275.85***		257.35***	
Year	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	0.144	0.1153	0.168	0.143	0.148	0.1172	0.171	0.145	0.178	0.148

N = 1031, +p < 0.1 *p < 0.05 **p < 0.01 ***p < 0.001.

Table 6
The main theoretical implications of this paper.

Research gap	Research hypotheses	Theoretical implications
There is still lack of research demonstrating the antecedent effect of innovative knowledge assets on sustainability-friendly practices.	H1: Ceteris paribus, innovative knowledge assets have a positive impact on sustainability-friendly practices.	This paper contributes to knowledge based view by identifying innovative knowledge assets as a new antecedent of sustainability-friendly practices.
Whether firm transparency exerts direct impact on sustainability-friendly practices and also strengthened the relationship between innovative knowledge assets and sustainability-friendly practices remain unclear.	H2: Ceteris paribus, firm transparency has a positive impact on sustainability-friendly practices.	This paper contributes to stakeholder theory by revealing the significant positive effect of firm transparency on sustainability-friendly practices.
	H3: Firm transparency positively moderates the relationship between innovative knowledge assets and sustainability-friendly practices.	Firm transparency plays a moderating role, which expands the comprehension of the boundary conditions concerning the relationship between innovative knowledge assets and sustainability-friendly practices.

sustainability (Hörisch et al., 2015). Innovative knowledge assets are thus expected to positively affect the degree of corporate sustainability considerations in firms' operating strategies, which can facilitate the implementation of sustainability-friendly practices (Johnson, 2017). Moreover, innovative knowledge assets can help a firm improve its product effectiveness and process efficiency (He and Wang, 2009), which means that firms that own more innovative knowledge assets can design or alter processes and products to voluntarily better prevent negative environmental impacts (Lozano, 2015). As a result, firms with high levels of innovative knowledge assets are more committed to implementing sustainability-friendly practices.

The results of H2 and H3, that firm transparency exerted important impacts on sustainability-friendly practices, are consistent with the arguments of stakeholder theory. One of the main premises of stakeholder theory is that externalities often cause stakeholders to increase pressures on firms to reduce negative impacts and increase positive ones (Chen et al., 2018). For this reason, corporate sustainability research extensively uses stakeholder theory to explain why firms engaged in environmental activities (Searcy, 2012). For example, Sarkis et al. (2010) found that stakeholder pressure is associated with the adoption of environmental practices. Wolf (2014) identified that stakeholder pressure determines firms' sustainability performance. This paper extended these arguments by exploring the firm-stakeholder relationship from a firm-transparency perspective, and further proposed that corporate sustainability was strongly dependent on firm transparency. Firm transparency signifies a condition of voluntary information disclosure, and when firms are more transparent, they invest a great deal of time and resources in providing much information in a timely manner (Heimstädt, 2017). Highly transparent firms are more likely to be identified by various stakeholders (Hörisch et al., 2014) and thus can receive greater resource inflows, which in turn, can promote sustainability-friendly practices. Moreover, the availability of corporate information is very important for stakeholders to develop a better understanding of firms' behaviours, and thus, information disclosure forms a vital contingent context for corporate sustainability research (Perego and Kolk, 2012). The greater the firm transparency, the closer the relationships firms can build with their stakeholders (Crane, 2018). It can then be argued that firms with high levels of firm transparency are likely to obtain more potential support, which is necessary to transfer more values from innovative knowledge assets to implement sustainability-friendly practices. Thus, firm transparency not only had a positive impact on sustainability-friendly practices but also positively moderated the relationship between innovative knowledge assets and sustainability-friendly practices.

Previous research has noted that the resource-based view and stakeholder theory are two important theories in corporate sustainability research (Lozano et al., 2015), and each of these theories has been applied for a particular purpose (Montiel and Delgado-Ceballos, 2014). Several studies have combined these two theories to investigate corporate sustainability (Lourenço and Branco, 2013; Sarkis et al., 2010). This paper steps beyond them to further construct a multi-theoretical research model using resource-based view and stakeholder theory simultaneously. This multi-theoretical

model lays a strong foundation for understanding the relationships among innovative knowledge assets, firm transparency and sustainability-friendly practices. By establishing a link between these two theories, the model is not only valuable in providing ample explanatory opportunities, but is also of significance for firms in addressing sustainability-friendly practices from multiple perspectives.

5. Conclusions and implications

5.1. Conclusions

This paper examined the relationships among innovative knowledge assets, firm transparency and sustainability-friendly practices. Overall, this paper demonstrated that innovative knowledge assets ($\beta = 0.787$, $p < 0.001$) and firm transparency ($\beta = 0.280$, $p < 0.001$) were important antecedents of sustainability-friendly practices. In addition, firm transparency ($\beta = 0.274$, $p < 0.01$) emerged as a contingency context for the links between innovative knowledge assets and sustainability-friendly practices in such a way that high levels of firm transparency enhanced the effect of innovative knowledge assets on sustainability-friendly practices.

5.2. Implications

This paper enriched the existing literature in several ways. First, this paper revealed the correlation between organizational knowledge and corporate sustainability by providing theoretical bases and empirical evidence for positing innovative knowledge assets affecting sustainability-friendly practices. Previous studies of innovative knowledge assets mainly focus on the effect on economic performance (He and Wang, 2009; Qian et al., 2017). This paper transferred this stream of literature by revealing that innovative knowledge assets can exert influences on sustainability-friendly practices. Hence this paper, on the one hand, identified a new antecedent of sustainability-friendly practices and thus offered important new directions on how firms can stimulate sustainability-friendly practices. On the other hand, this paper also extended the implications of innovative knowledge assets and shed light on the exploration of the further consequences of innovative knowledge assets.

Second, this paper deepened the understanding of the relationship between information disclosure and corporate sustainability by underlining the direct effect of firm transparency on sustainability-friendly practices. Although claims have been presented concerning the effect of firm transparency on customers' willingness to undertake sustainability programs (Orlitzky et al., 2011), there is little empirical support for the notion that firm transparency enhances corporate sustainability (Kassinis and Vafeas, 2006). The identified positive relationship between firm transparency and sustainability-friendly practices contributes to extending previous declarations in the extant literature about the effect of firm transparency and further extends the understanding of why firms are involved in sustainability-friendly practices from a stakeholder perspective. In this manner, this paper revealed an important new direction as to how stakeholders can acquire the potential value of firm transparency.

Third, this paper contributed to further interpreting the conditions under which the relationship between innovative knowledge assets and sustainability-friendly practices can be intensified or weakened from a stakeholder perspective. By examining the interaction effect of innovative knowledge assets and firm transparency on sustainability-friendly practices, the results confirmed that firm transparency not only exerted a direct impact on sustainability-friendly practices, as did innovative knowledge assets, but also moderated the relationship between innovative knowledge assets and sustainability-friendly practices. This paper thus expands the understanding of boundary conditions and further opens a research field for other moderating effects concerning the relationship between innovative knowledge assets and sustainability-friendly practices. The main theoretical implications of this paper are summarized in Table 6.

This paper also has some practical implications. First, firms should accumulate innovative knowledge assets. The result highlighted the importance of innovative knowledge assets for sustainability-friendly practices. Therefore, it is important for firms planning to implement sustainability-friendly practices to accumulate innovative knowledge assets. Firms can develop innovative knowledge assets in several ways. On the one hand, firms should use information technologies and systems to search and acquire internal and external knowledge. On the other hand, firms should employ some practices to encourage employees to share knowledge, such as encouraging teamwork, incorporating knowledge-sharing into routine performance appraisal, and informing and rewarding employees' knowledge-sharing behaviour. In addition, it is beneficial for firms to create a knowledge-sharing culture, one that aims to forge a clear connection between knowledge-sharing and business goals.

Second, to be more sustainability-friendly, firms should improve their transparency. The effects of firm transparency on sustainability-friendly practices demonstrate that increasing firm transparency is a potential means of promoting sustainability-friendly practices as well as magnifying the effect of innovative knowledge assets. Therefore, firms pursuing sustainability should try to be more transparent. Several possible ways of improving transparency are suggested, such as explicitly mentioning the role of key stakeholders, actively responding to requests for information from stakeholders, managing the interfaces between firms and stakeholders, offering multiple channels of access to information, and increasing the truthfulness, accuracy, completeness, timeliness, legal compliance and fairness of information.

5.3. Limitations and future research

Although this paper made several key contributions to the current literature, it also suffered from some limitations. First, a limitation of this paper was the measurements of some variables. For instance, although content analysis is widely used in corporate sustainability research, it cannot precisely reflect a firm's actual sustainability-friendly practices. Further research might create a more robust measurement to measure a firm's sustainability-friendly practices. In addition, even though patent applications are broadly used to measure innovative knowledge assets, not all firms apply patents to protect their innovative knowledge assets. Therefore, the results would be greatly reinforced if future research measured innovative knowledge assets directly.

Second, this paper provided insights into the effect of innovative knowledge assets on sustainability-friendly practices, but one limitation was that the internal mediating mechanism of this connection was note explicitly clarified. For the sake of obtaining greater benefits from innovative knowledge assets, future research is needed to investigate the internal mediating mechanisms in detail.

Third, this paper analysed the contingent factors of the relationship between innovative knowledge assets and sustainability-friendly practices only from the perspective of firm transparency. Future research could move forward to analyse other types of moderators, which would offer a more comprehensive understanding of how innovative knowledge assets affect sustainability-

friendly practices.

Lastly, another opportunity for future research derives from the research sample. The sample in this paper was limited to the listed firms of the Shenzhen Stock Exchange. It would be interesting to further examine the research results in different country contexts to obtain further insights into the relationships among innovative knowledge assets, firm transparency and sustainability-friendly practices.

Limitations notwithstanding, this paper found support for the positive effects of innovative knowledge assets and firm transparency on sustainability-friendly practices. It also demonstrated that innovative knowledge assets interacted with firm transparency to positively affect sustainability-friendly practices. This paper can be seen as a first step in investigating the antecedents of sustainability-friendly practices by integrating the resource-based view and stakeholder theory, and it is hoped that further research will offer a better understanding of sustainability-friendly practices.

Declarations of interest

None.

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References

Abreu, M.C.S., 2009. How to define an environmental policy to improve corporate sustainability in developing countries. Bus. Strateg. Environ. 18, 542–556. https://doi.org/10.1002/bse.625.

Aguilera-Caracuel, J., Hurtado-Torres, N.E., Aragón-Correa, J.A., 2012. Does international experience help firms to be green? A knowledge-based view of how international experience and organisational learning influence proactive environmental strategies. Int. Bus. Rev. 21, 847–861. https://doi.org/10.1016/j.ibusrev.2011.09.009.

Ahi, P., Searcy, C., 2013. A comparative literature analysis of definitions for green and sustainable supply chain management. J. Clean. Prod. 52, 329–341. https://doi.org/10.1016/j.jclepro.2013.02.018.

Aiken, L.S., West, S.G., Reno, R.R., 1991. Multiple Regression: Testing and Interpreting Interactions. Sage. https://doi.org/10.2307/2583960.

Ameer, R., Othman, R., 2012. Sustainability practices and corporate financial performance: a study based on the top global corporations. J. Bus. Ethics 108, 61–79. https://doi.org/10.1007/s10551-011-1063-y.

Amores-Salvadó, J., Martín-de Castro, G., Navas-López, J.E., 2014. Green corporate image: moderating the connection between environmental product innovation and firm performance. J. Clean. Prod. 83, 356–365. https://doi.org/10.1016/j.jclepro.2014.07.059.

Annunziata, E., Pucci, T., Frey, M., et al., 2018. The role of organizational capabilities in attaining corporate sustainability practices and economic performance: evidence from Italian wine industry. J. Clean. Prod. 171, 1300–1311. https://doi.org/10.1016/j.jclepro.2017.10.035.

Bai, C., Sarkis, J., Dou, Y., 2015. Corporate sustainability development in China: review and analysis. Ind. Manag. Data Syst. 115, 5–40. https://doi.org/10.1108/IMDS-09-2014-0258.

Ball, C., Burt, G., De Vries, F., et al., 2018. How environmental protection agencies can promote eco-innovation: the prospect of voluntary reciprocal legitimacy. Technol. Forecast. Soc. Change 129, 242–253. https://doi.org/10.1016/j.indmarman.2018.05.003.

Baraibar-Diez, E., Odriozola, M.D., Fernández Sánchez, J.L., 2017. A survey of transparency: an intrinsic aspect of business strategy. Bus. Strateg. Environ. 26, 480–489. https://doi.org/10.1002/bse.1931.

Barney, J.B., Ketchen Jr., D.J., Wright, M., 2011. The future of resource-based theory: revitalization or decline? J. Manag. 37, 1299–1315. https://doi.org/10.1177/0149206310391805.

Benlemlih, M., Shaukat, A., Qiu, Y., et al., 2018. Environmental and social disclosures and firm risk. J. Bus. Ethics 152, 613–626. https://doi.org/10.1007/s10551-016-3285-5.

Bernstein, E.S., 2017. Making transparency transparent: the evolution of observation in management theory. Acad. Manag. Ann. 11, 217–266. https://doi.org/10.5465/annals.2014.0076.

Blum-Kusterer, M., Hussain, S.S., 2001. Innovation and corporate sustainability: an investigation into the process of change in the pharmaceuticals industry. Bus. Strateg. Environ. 10, 300–316. https://doi.org/10.1002/bse.300.

Bond, A.J., Viegas, C.V., Coelho, C.C.S.R., et al., 2010. Informal knowledge processes: the underpinning for sustainability outcomes in EIA? J. Clean. Prod. 18, 6–13. https://doi.org/10.1016/j.jclepro.2009.09.002.

Brammer, S., Millington, A., 2008. Does it pay to be different? An analysis of the relationship between corporate social and financial performance. Strat. Manag. J. 29, 1325–1343. https://doi.org/10.1002/smj.714.

Bushman, R.M., Piotroski, J.D., Smith, A.J., 2004. What determines corporate transparency? J. Account. Res. 42, 207–252. https://doi.org/10.1111/j.1475-679X.2004.00136.x.

Chakrabarty, S., Wang, L., 2012. The long-term sustenance of sustainability practices in MNCs: a dynamic capabilities perspective of the role of R&D and internationalization. J. Bus. Ethics 110, 205–217. https://doi.org/10.1007/s10551-012-1422-3.

Chen, S., Bu, M., Wu, S., et al., 2015. How does TMT attention to innovation of Chinese firms influence firm innovation activities? A study on the moderating role of corporate governance. J. Bus. Res. 68, 1127–1135. https://doi.org/10.1016/j.jbusres.2014.11.002.

Chen, X.H., Yi, N., Zhang, L., et al., 2018. Does institutional pressure foster corporate green innovation? Evidence from China's top 100 companies. J. Clean. Prod. 188, 304–311. https://doi.org/10.1016/j.jclepro.2018.03.257.

Choi, S.B., Lee, S.H., Williams, C., 2011. Ownership and firm innovation in a transition economy: evidence from China. Res. Pol. 40, 441–452. https://doi.org/10.1016/j.respol.2011.01.004.

Choi, S.B., Williams, C., 2014. The impact of innovation intensity, scope, and spillovers on sales growth in Chinese firms. Asia Pac. J. Manag. 31, 25–46. https://doi.org/10.1007/s10490-012-9329-1.

Chuang, S.P., Huang, S.J., 2018. The effect of environmental corporate social responsibility on environmental performance and business competitiveness: the mediation of green information technology capital. J. Bus. Ethics 150, 991–1009. https://doi.org/10.1007/s10551-016-3167-x.

Chung, H., Judge, W.Q., Li, Y.H., 2015. Voluntary disclosure, excess executive compensation, and firm value. J. Corp. Financ. 32, 64–90. https://doi.org/10.1016/j.jcorpfin.2015.04.001.

Collins, E., Roper, J., Lawrence, S., 2010. Sustainability practices: trends in New Zealand businesses. Bus. Strateg. Environ. 19, 479–494. https://doi.org/10.1002/bse.653.

Crane, B., 2018. Revisiting who, when, and why stakeholders matter: trust and stakeholder connectedness. Bus. Soc. https://doi.org/10.1177/0007650318756983 (in press).

Cuadrado-Ballesteros, B., Garcia-Sanchez, I.M., Martinez Ferrero, J., 2016. How are corporate disclosures related to the cost of capital? The fundamental role of information asymmetry. Manag. Decis. 54, 1669–1701. https://doi.org/10.1108/MD-10-2015-0454.

Das Neves, J.C., Vaccaro, A., 2013. Corporate transparency: a perspective from Thomas Aquinas' summa theologiae. J. Bus. Ethics 113, 639–648. https://doi.org/10.1007/s10551-013-1682-6.

Dawkins, C.E., Fraas, J.W., 2013. An exploratory analysis of corporate social responsibility and disclosure. Bus. Soc. 52, 245–281. https://doi.org/10.1177/0007650308324047.

De Silva, M., Howells, J., Meyer, M., 2018. Innovation intermediaries and collaboration: knowledge-based practices and internal value creation. Res. Pol. 47, 70–87. https://doi.org/10.1016/j.respol.2017.09.011.

Doyle, E., McGovern, D., McCarthy, S., et al., 2019. Compliance-innovation: a quality-based route to sustainability. J. Clean. Prod. 210, 266–275. https://doi.org/10.1016/j.jclepro.2018.10.307.

Elsbach, K.D., Stigliani, I., 2018. Design thinking and organizational culture: a review and framework for future research. J. Manag. 44, 2274–2306. https://doi.org/10.1177/0149206317744252.

Ernst, H., Lichtenthaler, U., Vogt, C., 2011. Retracted: the impact of accumulating and reactivating technological experience on R&D alliance performance. J. Manag. Stud. 48, 1194–1216. https://doi.org/10.1111/j.1467-6486.2010.00994.x.

Ferraresi, A.A., Quandt, C.O., Dos Santos, S.A., et al., 2012. Knowledge management and strategic orientation: leveraging innovativeness and performance. J. Knowl. Manag. 16, 688–701. https://doi.org/10.1108/13673271211262754.

Firth, M., Wang, K., Wong, S.M.L., 2014. Corporate transparency and the impact of investor sentiment on stock prices. Manag. Sci. 61, 1630–1647. https://doi.org/10.1287/mnsc.2014.1911.

Flammer, C., 2013. Corporate social responsibility and shareholder reaction: the environmental awareness of investors. Acad. Manag. J. 56, 758–781. https://doi.org/10.5465/amj.2011.0744.

Fonseca, A., 2010. How credible are mining corporations' sustainability reports? A critical analysis of external assurance under the requirements of the international council on mining and metals. Corp. Soc. Responsib. Environ. Manag. 17, 355–370. https://doi.org/10.1002/csr.230.

Gaa, J.C., 2009. Corporate governance and the responsibility of the board of directors for strategic financial reporting. J. Bus. Ethics 90, 179–197. https://doi.org/10.1007/s10551-010-0381-9.

Ginesti, G., Caldarelli, A., Zampella, A., 2018. Exploring the impact of intellectual

capital on company reputation and performance. J. Intellect. Cap. 19, 915–934. https://doi.org/10.1108/JIC-01-2018-0012.
Gold, S., Seuring, S., Beske, P., 2010. Sustainable supply chain management and inter-organizational resources: a literature review. Corp. Soc. Responsib. Environ. Manag. 17, 230–245. https://doi.org/10.1002/csr.207.
Håkanson, L., 2010. The firm as an epistemic community: the knowledge-based view revisited. Ind. Corp. Chang. 19, 1801–1828. https://doi.org/10.1093/icc/dtq052.
Harrison, J.S., Wicks, A.C., 2013. Stakeholder theory, value, and firm performance. Bus. Ethics Q. 23, 97–124. https://doi.org/10.5840/beq20132314.
Hashmi, M.A., Damanhouri, A., Rana, D., 2015. Evaluation of sustainability practices in the United States and large corporations. J. Bus. Ethics 127, 673–681. https://doi.org/10.1007/s10551-014-2056-4.
Hassan, A., Ibrahim, E., 2012. Corporate environmental information disclosure: factors influencing companies' success in attaining environmental awards. Corp. Soc. Responsib. Environ. Manag. 19, 32–46. https://doi.org/10.1002/csr.278.
He, J., Wang, H.C., 2009. Innovative knowledge assets and economic performance: the asymmetric roles of incentives and monitoring. Acad. Manag. J. 52, 919–938. https://doi.org/10.5465/amj.2009.44633414.
Heimstädt, M., 2017. Openwashing: a decoupling perspective on organizational transparency. Technol. Forecast. Soc. Change 125, 77–86. https://doi.org/10.1016/j.techfore.2017.03.037.
Hofmann, K.H., Theyel, G., Wood, C.H., 2012. Identifying firm capabilities as drivers of environmental management and sustainability practices-evidence from small and medium-sized manufacturers. Bus. Strateg. Environ. 21, 530–545. https://doi.org/10.1002/bse.739.
Hörisch, J., Freeman, R.E., Schaltegger, S., 2014. Applying stakeholder theory in sustainability management: links, similarities, dissimilarities, and a conceptual framework. Organ. Environ. 27, 328–346. https://doi.org/10.1177/1086026614535786.
Hörisch, J., Johnson, M.P., Schaltegger, S., 2015. Implementation of sustainability management and company size: a knowledge-based view. Bus. Strateg. Environ. 24, 765–779. https://doi.org/10.1002/bse.1844.
Johannsdottir, L., Mcinerney, C., 2018. Developing and using a Five C framework for implementing environmental sustainability strategies: a case study of Nordic insurers. J. Clean. Prod. 183, 1252–1264. https://doi.org/10.1016/j.jclepro.2018.02.007.
Johnson, M., Redlbacher, F., Schaltegger, S., 2018. Stakeholder engagement for corporate sustainability: a comparative analysis of B2C and B2B companies. Corp. Soc. Responsib. Environ. Manag. 25, 1–14. https://doi.org/10.1002/bse.2238.
Johnson, M.P., 2017. Knowledge acquisition and development in sustainability-oriented small and medium-sized enterprises: exploring the practices, capabilities and cooperation. J. Clean. Prod. 142, 3769–3781. https://doi.org/10.1016/j.jclepro.2016.10.087.
Kassinis, G., Vafeas, N., 2006. Stakeholder pressures and environmental performance. Acad. Manag. J. 49, 145–159. https://doi.org/10.5465/amj.2006.20785799.
Kim, Y., Park, M.S., Wier, B., 2012. Is earnings quality associated with corporate social responsibility? Account. Rev. 87, 761–796. https://doi.org/10.1080/0969160X.2013.845031.
Kuo, L., Yeh, C.C., Yu, H.C., 2012. Disclosure of corporate social responsibility and environmental management: evidence from China. Corp. Soc. Responsib. Environ. Manag. 19, 273–287. https://doi.org/10.1002/csr.274.
Law, K.M.Y., Gunasekaran, A., 2012. Sustainability development in high-tech manufacturing firms in Hong Kong: motivators and readiness. Int. J. Prod. Econ. 137, 116–125. https://doi.org/10.1016/j.ijpe.2012.01.022.
Liao, L., Liu, B., Wang, H., 2011. Information discovery in share lockups: evidence from the split-share structure reform in China. Financ. Manag. 40, 1001–1027. https://doi.org/10.1111/j.1755-053X.2011.01169.x.
Lioui, A., Sharma, Z., 2012. Environmental corporate social responsibility and financial performance: disentangling direct and indirect effects. Ecol. Econ. 78, 100–111. https://doi.org/10.1016/j.ecolecon.2012.04.004.
Lourenço, I.C., Branco, M.C., 2013. Determinants of corporate sustainability performance in emerging markets: the Brazilian case. J. Clean. Prod. 57, 134–141. https://doi.org/10.1016/j.jclepro.2013.06.013.
Lozano, R., 2015. A holistic perspective on corporate sustainability drivers. Corp. Soc. Responsib. Environ. Manag. 22, 32–44. https://doi.org/10.1002/csr.1325.
Lozano, R., Carpenter, A., Huisingh, D., 2015. A review of 'theories of the firm' and their contributions to corporate sustainability. J. Clean. Prod. 106, 430–442. https://doi.org/10.1016/j.jclepro.2014.05.007.
Luo, J., Wan, D., Cai, D., 2012. The private benefits of control in Chinese listed firms: do cash flow rights always reduce controlling shareholders' tunneling? Asia Pac. J. Manag. 29, 499–518. https://doi.org/10.1007/s10490-010-9211-y.
Luo, X., Du, S., 2015. Exploring the relationship between corporate social responsibility and firm innovation. Market. Lett. 26, 703–714. https://doi.org/10.1007/s11002-014-9302-5.
Maletič, M., Maletič, D., Gomišček, B., 2016. The impact of sustainability exploration and sustainability exploitation practices on the organisational performance: a cross-country comparison. J. Clean. Prod. 138, 158–169. https://doi.org/10.1016/j.jclepro.2016.02.132.
Masocha, R., Fatoki, O., 2018. The impact of coercive pressures on sustainability practices of small businesses in South Africa. Sustainability 10, 3032–3046. https://doi.org/10.3390/su10093032.
Mills, A.M., Smith, T.A., 2011. Knowledge management and organizational performance: a decomposed view. J. Knowl. Manag. 15, 156–171. https://doi.org/10.1108/13673271111108756.
Miska, C., Szőcs, I., Schiffinger, M., 2018. Culture's effects on corporate sustainability practices: a multi-domain and multi-level view. J. World Bus. 53, 263–279. https://doi.org/10.1016/j.jwb.2017.12.001.
Moffat, A., Auer, A., 2006. Corporate Environmental Innovation (CEI): a government initiative to support corporate sustainability leadership. J. Clean. Prod. 14, 589–600. https://doi.org/10.1016/j.jclepro.2005.07.010.
Montiel, I., Delgado-Ceballos, J., 2014. Defining and measuring corporate sustainability: are we there yet? Organ. Environ. 27, 113–139. https://doi.org/10.1177/1086026614526413.
Orlitzky, M., Siegel, D.S., Waldman, D.A., 2011. Strategic corporate social responsibility and environmental sustainability. Bus. Soc. 50, 6–27. https://doi.org/10.1177/0007650310394323.
Pedersen, E.R.G., Gwozdz, W., Hvass, K.K., 2018. Exploring the relationship between business model innovation, corporate sustainability, and organisational values within the fashion industry. J. Bus. Ethics 149, 1267–18284. https://doi.org/10.1007/s10551-016-3044-7.
Perego, P., Kolk, A., 2012. Multinationals' accountability on sustainability: the evolution of third-party assurance of sustainability reports. J. Bus. Ethics 110, 173–190. https://doi.org/10.1007/s10551-012-1420-5.
Przychodzen, J., Przychodzen, W., 2015. Relationships between eco-innovation and financial performance–evidence from publicly traded companies in Poland and Hungary. J. Clean. Prod. 90, 253–263. https://doi.org/10.1016/j.jclepro.2014.11.034.
Qian, C., Wang, H.C., Geng, X., et al., 2017. Rent appropriation of knowledge-based assets and firm performance when institutions are weak: a study of Chinese publicly listed firms. Strat. Manag. J. 38, 892–911. https://doi.org/10.1002/smj.2522.
Rahman, N., Post, C., 2012. Measurement issues in environmental corporate social responsibility (ECSR): toward a transparent, reliable, and construct valid instrument. J. Bus. Ethics 105, 307–319. https://doi.org/10.1007/s10551-011-0967-x.
Reverte, C., 2009. Determinants of corporate social responsibility disclosure ratings by Spanish listed firms. J. Bus. Ethics 88, 351–366. https://doi.org/10.1007/s10551-008-9968-9.
Sarkis, J., Gonzalez-Torre, P., Adenso-Diaz, B., 2010. Stakeholder pressure and the adoption of environmental practices: the mediating effect of training. J. Oper. Manag. 28, 163–176. https://doi.org/10.1016/j.jom.2009.10.001.
Schaltegger, S., Wagner, M., 2011. Sustainable entrepreneurship and sustainability innovation: categories and interactions. Bus. Strateg. Environ. 20, 222–237. https://doi.org/10.1002/bse.682.
Schnackenberg, A.K., Tomlinson, E.C., 2016. Organizational transparency: a new perspective on managing trust in organization-stakeholder relationships. J. Manag. 42, 1784–1810. https://doi.org/10.1177/0149206314525202.
Searcy, C., 2012. Corporate sustainability performance measurement systems: a review and research agenda. J. Bus. Ethics 107, 239–253. https://doi.org/10.1007/s10551-011-1038-z.
Simeth, M., Cincera, M., 2015. Corporate science, innovation, and firm value. Manag. Sci. 62, 1970–1981. https://doi.org/10.1287/mnsc.2015.2220.
Vaccaro, A., Sison, A.J.G., 2011. Transparency in business: the perspective of Catholic social teaching and the "Caritas in Veritate". J. Bus. Ethics 100, 17–27. https://doi.org/10.1007/s10551-011-1184-3.
Wagner, M., 2005. How to reconcile environmental and economic performance to improve corporate sustainability: corporate environmental strategies in the European paper industry. J. Environ. Manag. 76, 105–118. https://doi.org/10.1016/j.jenvman.2004.11.021.
Wang, H.C., Zhao, S., He, J., 2016. Increase in takeover protection and firm knowledge accumulation strategy. Strat. Manag. J. 37, 2393–2412. https://doi.org/10.1002/smj.2443.
Weber, O., 2014. Environmental, social and governance reporting in China. Bus. Strateg. Environ. 23, 303–317. https://doi.org/10.1002/bse.1785.
Wei, Z., Shen, H., Zhou, K.Z., et al., 2017. How does environmental corporate social responsibility matter in a dysfunctional institutional environment? Evidence from China. J. Bus. Ethics 140, 209–223. https://doi.org/10.1007/s10551-015-2704-3.
Wijethilake, C., Munir, R., Appuhami, R., 2018. Environmental innovation strategy and organizational performance: enabling and controlling uses of management control systems. J. Bus. Ethics 151, 1139–1160. https://doi.org/10.1007/s10551-016-3259-7.
Windolph, S.E., Harms, D., Schaltegger, S., 2014. Motivations for corporate sustainability management: contrasting survey results and implementation. Corp. Soc. Responsib. Environ. Manag. 21, 272–285. https://doi.org/10.1002/csr.1337.
Wolf, J., 2014. The relationship between sustainable supply chain management, stakeholder pressure and corporate sustainability performance. J. Bus. Ethics 119, 317–328. https://doi.org/10.1007/s10551-012-1603-0.
Wu, W.W., Liu, Y.X., Chin, T., et al., 2018. Will green CSR enhance innovation? A perspective of public visibility and firm transparency. Int. J. Environ. Res. Public Health 15, 268–282. https://doi.org/10.3390/ijerph15020268.
Yeh, Y.M.C., Chen, H.W., Wu, M.C., 2014. Can information transparency improve earnings quality attributes? Evidence from an enhanced disclosure regime in Taiwan. Emerg. Mark. Finance Trade 50, 237–253. https://doi.org/10.2753/REE1540-496X500414.
Yu, E.P., Guo, C.Q., Luu, B.V., 2018. Environmental, social and governance

transparency and firm value. Bus. Strateg. Environ. 27, 987–1004. https://doi.org/10.1002/bse.2047.
Yu, Y., Umashankar, N., Rao, V.R., 2016. Choosing the right target: relative preferences for resource similarity and complementarity in acquisition choice. Strat. Manag. J. 37, 1808–1825. https://doi.org/10.1002/smj.2416.
Zaman, A., Rousseeuw, P.J., Orhan, M., 2001. Econometric applications of high-breakdown robust regression techniques. Econ. Lett. 71, 1–8. https://doi.org/10.1016/S0165-1765(00)00404-3.
Zhao, M., Tan, J., Park, S.H., 2014. From voids to sophistication: institutional environment and MNC CSR crisis in emerging markets. J. Bus. Ethics 122, 655–674. https://doi.org/10.1007/s10551-013-1751-x.