Legitimacy in operations: how sustainability certification announcements by Chinese listed enterprises influence their market value?

Abstract:

Sustainability certifications have been growingly adopted by enterprises with the aim to demonstrate their efforts on environmental and social operations management. Obtaining such certifications can increase enterprises' legitimacy to meet the escalating public expectation for sustainable operations. There are studies examining whether sustainability certifications can benefit adopted enterprises, but not much is known regarding how the performance gains of sustainability certifications vary among enterprises operating under different institutional legitimacy conditions. We examine if Chinese enterprises announcing sustainability certifications as a legitimate action in operations can benefit them for better market value, and how the institutional legitimacy conditions can affect such effect. The institutional legitimacy is examined in two dimensions, namely sociopolitical legitimacy and cognitive legitimacy. The former is measured in two proxy variables related to the government: *government ownership* and *political embeddedness*, while the latter is measured in a proxy variable as *sustainability communication frequency*. Using 210 announcements from publicly listed enterprises in the Chinese stock exchanges regarding their sustainability certifications, we empirically investigate market reaction to the certification announcements on their stock performance considering the role of institutional legitimacy. Findings from event study analyses and hierarchical regressions indicate that announcing sustainability certifications is favorable for their performance in stock prices with stronger effects among enterprises having government ownership but with weaker effects for those having *political embeddedness*. Moreover, cognitive legitimacy brings no performance gain due to the announcements. Managers need to understand how sustainability certification announcements influence the market value of their

enterprises and the performance implications of institutional legitimacy in obtaining the certification.

Keywords:

sustainability certifications; stock performance; legitimacy; operations; moderating effect

1. Introduction

With the growing stakeholder pressure, enterprises have undertaken environmental and social responsibilities in their operations. Thus, obtaining sustainability certification, as one type of legitimating actions, has become a popular way for enterprises to showcase sustainability efforts in improving their operations (Suchman, 1995). Obtaining a sustainability certification signals the legitimacy of an enterprise's operational activities with a sustainability focus in two ways. First, it demonstrates that the enterprise establishes a standard system (Christmann and Taylor, 2006), governing sustainable management of its operational activities. Second, it showcases the legitimacy of enterprises on sustainable management efforts to their stakeholders. Announcing sustainability certifications reduces "information asymmetries" between enterprises and their stakeholders (King et al., 2005), promoting the visibility of sustainable management efforts of the former with legitimacy and hence gaining acceptance from the latter. Moreover, some scholars have suggested that sustainability certifications bring financial performance for enterprises due to their improved legitimacy on sustainability in operations (Auld and Gulbrandsen, 2010; Cañón-de-francia and Garcés-ayerbe, 2009). Nevertheless, other scholars such as Paulraj and de Jong (2011) observed that the stock market reacts negatively to sustainability certifications, which may result from stock investors' perception in obtaining the certification. Considering these inconsistent results, we examine if the contextual factors on institutional legitimacy matter for the link between sustainability certification announcements and market value of the adopted enterprises in terms of stock performance.

Sustainability certifications involve the process in which authorized third-party organizations inspect the enterprises' environmental and social management, check whether the enterprises satisfy the standard requirements on environmental conduct or working conditions, i.e., ISO 14001 of environmental management system certification, and determine

if the “certified” status can be granted to the enterprises. Previous studies are confined to examining the direct relationship between sustainability certifications and financial performance with a focus on benefit-cost analysis. For instance, Melnyk et al. (2003) demonstrated that environmental certifications of ISO14001 are beneficial to enterprises for cost reduction and operational performance such as product quality in contributing to its economic performance. There is a dearth of studies considering the influence of institutional legitimacy on the sustainability certification-performance link. One relevant work investigated the moderating role of market supporting institutions in the relationship between certification and economic performance using samples from 59 countries (Goedhuys and Sleuwaegen, 2013). To advance knowledge in this under-explored research area, we seek to answer the following questions: 1) can sustainability certification announcements by enterprises bring them financial gains in terms of stock performance; and 2) how the institutional legitimacy factors influence the certification-performance link?

According to Aldrich and Fiol (1994), there are two types of institutional legitimacy. The first type is sociopolitical legitimacy, which refers to the extent to which key stakeholders such as government agencies accept the shared beliefs of enterprises. This research chooses the relationship to the government as the source of obtaining sociopolitical legitimacy, as the government can be the most critical player in affecting enterprises’ sustainable behaviors in our research context of China. The second type is cognitive legitimacy, which refers to the degree to which knowledge concerning enterprises’ behaviors as a group is widespread (Aldrich and Fiol, 1994). Consistent communication with the society on sustainable practices could increase the acceptance of enterprises by strengthening their cognitive legitimacy. Several studies have examined the certification–performance link. For instance, Sine et al. (2007) demonstrated that certifications can improve legitimacy for start-up enterprises, which helps to increase the likelihood of operational success and thus brings the benefit. We advance

knowledge on the certification-performance link by incorporating the influence of institutional sociopolitical and cognitive legitimacy factors. In doing so, we develop proxy variables for evaluating institutional legitimacy factors. They include government ownership (state-owned enterprises, SOEs or not) and political embeddedness (enterprises' managers being members of political councils) as two proxy measurements for evaluating sociopolitical legitimacy and sustainability communication frequency (sustainability reports continually issued by enterprises to address their conformance with social expectations) as a proxy measurement for evaluating cognitive legitimacy.

We examined the certification-performance link among Chinese enterprises by using a sample of 210 sustainability certifications that were announced between January 2003 and May 2018. By performing event study analyses with cross-sectional regression, we find that announcing sustainability certifications significantly increases market value of the enterprises by 0.43%. The influences of two sociopolitical legitimacy factors on the certification-performance link are divergent with strengthening and weakening effects for government ownership and political embeddedness, respectively.

2. The research framework and hypotheses

The research framework, shown in Figure 1, is developed to guide our investigation on the relationships between sustainability certifications' announcements (as an action demonstrating legitimacy in operations) and enterprises' financial performance considering the role of institutional legitimacy. Following a previous study (Christmann and Taylor, 2006), we include both environmental and social certifications that enterprises obtain in pursuit of sustainable management of products and processes. Financial performance is measured by market reaction to stock performance of the enterprises due to their certification announcements with the performance effect of certification assumed. Moreover, legitimacy factors influence the

certification-performance relationship with a positive (or negative) effect, indicating that a legitimacy factor can strengthen (or weaken) the relationship.

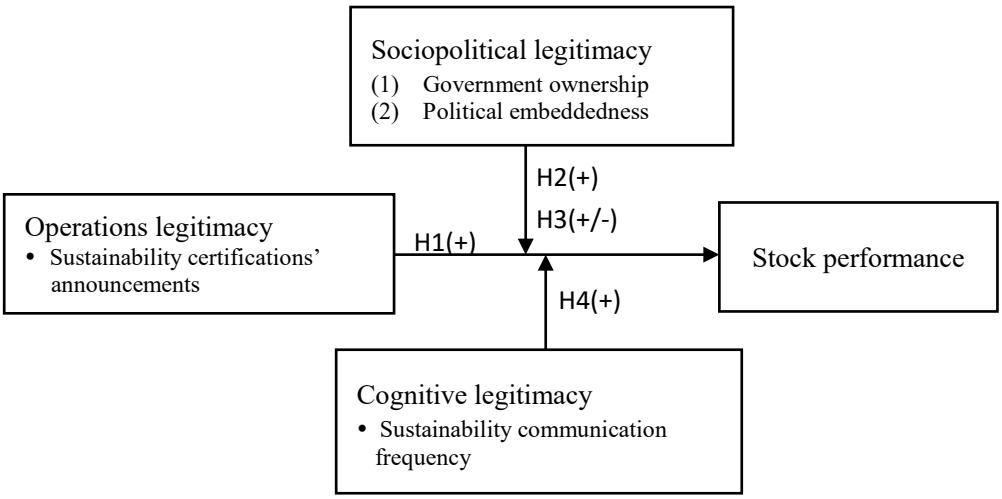

Figure 1. The research framework on sustainability certifications and stock performance considering institutional legitimacy

2.1 Stock market reaction to sustainability certifications

For legitimacy purpose, enterprises seek to convince stakeholders (e.g., stockholders and customers) of their efforts on sustainability development in operations (Morsing and Schultz, 2006). Sustainability covers both environmental and social aspects related to processes and products of an enterprise, but the implementing processes are not readily visible to outsiders. As a result, sustainability certifications have been widely adopted by enterprises to increase their operations legitimacy in sustainability, by which the invisible sustainable management processes become visible to the public, i.e., ISO14001 for certification of environmental management systems and SA8000 for certifications of social responsibility (Boiral and Gendron, 2010).

Empirical work shows a positive link between sustainability certifications as credible information on enterprises' sustainable management practices and their financial performance (Robinson et al., 2011). A Brazilian manufacturer named Bahia Sul Cellulose obtained the first

ISO14001 certification in Brazil in 1997, and subsequently won orders from customers in the European market (Thurston, 1998). Similarly, Darnall (2006) asserted that ISO 14001 certifications increase legitimacy in operations for highly polluting enterprises. Djupdal and Westhead (2013) found that endorsed environmental certifications, as a buffer against the liabilities of small enterprises, enable the enterprises to accumulate legitimacy in contributing to achieve higher profitability. Collectively, these papers highlighted certifications, as a means of legitimating enterprises' operation activities on sustainability, are beneficial for the adopters' financial performance.

Sustainability certifications can serve as a form of tangible "evidence" that the sustainability-related operational activities released by an enterprise are consistent with prevalent rules as well as norms and expectations (Schepers, 2010). Thus, sustainability certifications signal as a legitimating symbol of appropriate operations to increase stakeholders' confidence (Connelly et al 2011), and thereby boost the enterprise's sustainability legitimacy in operational activities (Berrone et al., 2017), enhancing their ability further to reap financial performance gains. Therefore, an enterprise holding a sustainability certification from an authorized institution can portray that its sustainable operations management meets the standard requirements, and the stock market is more likely to respond in a positive direction.

Hypothesis 1 (**H1**). The stock market reacts positively to enterprises' announcements on their sustainability certifications.

2.2 The moderating role of institutional legitimacy factors

Certifications help enterprises increase legitimacy on sustainable operations and trigger reaction in the stock market due to their announcements. In extending the literature, we argue that the market reactions to announcements of sustainability certifications vary under different

institutional contexts. According to Aldrich and Fiol (1994), the institutional context consists of two institutional legitimacy factors: sociopolitical and cognitive factors. The role of sociopolitical legitimacy is mainly analyzed based on the legitimacy gleaned from the government, the institution which is considered as the most critical source of legitimacy for Chinese enterprises to follow, as elaborated in Hypotheses 2 and 3. Hypothesis 4 explores the role of cognitive legitimacy, which is viewed as the extent that sustainability is accepted by the society.

2.2.1 The moderating role of sociopolitical legitimacy

Sociopolitical legitimacy addresses how key stakeholders accept enterprises and their behaviors as appropriate ones. As one of the most important stakeholders of enterprises in China, the government can greatly influence enterprises' sustainable management practices and performance in the country (Lin and Ho, 2011). There are two typical ways that Chinese enterprises could use to acquire sociopolitical legitimacy from the government: becoming SOEs (controlled by the government) and building political embeddedness (enterprises' managers being a member of political councils). Enterprises with varying degrees of *government ownership* are common worldwide, even in most market-oriented, developed economies (Porta et al., 2002), including the U.K., Germany, the U.S., etc. (Faccio and Lang, 2002). Based on an examination of 5,232 corporations in 13 Western countries, Faccio (2006) found that SOEs have greater contractual rights as well as closer ties with the government. In China, the government is not only a key regulator and policymaker but also a shareholder in many enterprises. The Chinese government maintains considerable ownership and absolute control of SOEs (Li et al., 2015). Furthermore, SOEs in China generally enjoy preferential treatment in terms of inputs and access to product and capital markets such as licenses and permits, financial subsidies, tax deductions, and project approval (Wang et al., 2008).

Accordingly, such advantages help SOEs gain better performance (Li et al., 2008).

The literature shows improved financial performance due to sustainable management practices adoption, particularly for SOEs. For example, by examining the impact of state-ownership on the relationship of environmental capital expenditures and stock performance, Li and Lu (2016) concluded that stock investors favor investment in Chinese SOEs for environmental capital expenditure. Zhu et al. (2016) found that sustainable management practices related to environmental and labor issues can bring financial performance among Chinese national SOEs. The literature has provided some explanations for better financial performance through sustainability certifications for SOEs. First, as most SOEs are leaders among their industry peers in terms of size, profit, technology, power, and influence (Omran, 2004), they are more resourceful to spend and invest in sustainable management practices, including certifications, which can substantively improve their sustainability performance (Lau et al., 2016; Lopatta et al., 2017). Thus, stock investors would view SOEs' announcements of sustainability certifications favorably and react more positively. Second, the government as an owner monitors more closely for SOEs than for non-SOEs (Marquis and Qian, 2013). Such a situation increases cost due to the higher risk of punishment by the government if SOEs are found to only make symbolic compliance rather than substantively follow what sustainability certifications claimed. This is consistent with the proposition that enterprises are more likely to operate in socially responsible ways when their behaviors are more strictly monitored. For example, stricter government monitoring leads to a higher possibility of environmental self-regulation (Short and Toffel, 2010). As a result, stock investors can trust SOEs for their performance improvement motives, especially with sustainability certifications to implement sustainable management practices, and then buy in more of their stocks. Third, government ownership may also lessen perceived risks related to sustainable operations because of government support, especially during crises (Iannotta et al., 2013). For instance, national

SOEs have been criticized for their irresponsible operational processes when they enter the international market under the Belt and Road national strategy of China. Risks from such criticism have been alleviated since the Chinese government has allocated resources supporting these SOEs to improve their sustainable operations images (Zhao, 2017). Mitigating such risk can be a convincing reason for stock buyers to invest in the SOEs.

Based on the above discussion, SOEs are likely to receive better stock performance through sustainability certifications' announcements due to their favorable institutional advantage, more resources, and better risk mitigation. Hence, we propose the second hypothesis.

Hypothesis 2 *(*H2). The positive market reaction to announcements of sustainability certifications will be stronger for certified SOEs than for other enterprises.

The second sociopolitical legitimacy factor, political embeddedness, also influences the performance value of sustainability certifications. Government policy and regulatory enforcement are identified as a major source of uncertainty for enterprises, influencing enterprises' operations (Hillman and Hitt, 1999). Enterprises cultivate political connections with government agencies to lessen risk and uncertainty, increase access to information and resources, and attain sociopolitical legitimacy to meet the government's expectation (Hillman, 2005). In China, it is quite common for the senior management of an enterprise to establish political connections through servicing as members of political councils such as the National People's Congress (NPC), the only legislative body in China, or the Chinese People's Political Consultative Conference (CPPCC), an advisory board for the Chinese government (Ma and Parish, 2006; Peng and Luo, 2000).

Building political embeddedness is one way to attain sociopolitical legitimacy, with which enterprises can gain more financial benefits associated with sustainable management practices

than those without it as observed by some scholars. For instance, Wang and Qian (2011) found that sustainable management practices such as philanthropy bring greater financial performance among more politically embedded enterprises. These enterprises may benefit more from obtaining sustainability certifications due to the following reasons. First, enterprises with political embeddedness are more accessible to first-hand information through close relationships with policymakers, and such a relationship is particularly essential for new enterprises (Li et al., 2007). Enterprises as first- hand information acquirers are convincing to stock investors that their actions of obtaining sustainability certifications are first-movers in their industries or other related fields, which can bring a promising stock return in future. Second, similar to SOEs, politically embedded enterprises are more accessible to resources such as loans and project approval (Faccio, 2006). The preferential advantage would lead investors to believe that these enterprises are empowered for sustainability development and such efforts in operations will bring better financial performance.

However, there can be unfavorable effects brought by political embeddedness through having enterprise leaders as members of NPC or CPPCC. For example, enterprises with high political embeddedness may be questioned for symbolic sustainability reporting (Marquis and Qian, 2013). Besides, political embeddedness may exert limited influence on governments' decisions related to enterprises (Li et al., 2007). For example, the NPC serves as the most important political council in China and the key means for business leaders to participate in the government. NPC representatives are welcome to make suggestions to the government but are forbidden to intervene in legislative and judicial activities (O'Brien, 2008). Although more and more NPC and CPPCC representatives are encouraged to provide recommendations on regulations related to corporate sustainability (Gu, 2018), the decision of legitimating and the legislative processes are still controlled by the government. A five-year membership in the council can be considered more as a signal for social prestige rather than an asset to deliver

immediate business benefits (O'Brien, 2008). For enterprises characterized with such symbolic political embeddedness announcing their sustainability certifications, this action may be viewed as a tool or a symbol with which to communicate in the political councils on sustainability development efforts, yet not substantively contributing to enterprises' financial performance. Second, for enterprises with such personal ties through political embeddedness, investors may believe that their sustainability certifications would essentially bring personal benefits for the senior management such as their prestige or political careers (Marquis and Qian, 2013). Given that enterprises leaders are the members of NPC or CPPCC, they are supposed to be supporters for the government and work for the latter's expectations, compromising enterprises' and their shareholders' benefits (Wang and Qian, 2011). Hence, sustainable management practice in operations as reflected by certifications can be considered as a cost-incurred rather than revenue-added corporate action for these enterprises. Third, political embeddedness is also associated with more stringent monitoring by the government. Enterprises with political embeddedness are under greater oversight through informal control (Marquis et al., 2011; Okhmatovskiy, 2010). Hence, announcing sustainability certifications by enterprises with political embeddedness can be viewed as a forced action under the government's pressure, which brings additional costs to the enterprises with limited substantive benefits.

In sum, we argue that political embeddedness will have two-sided effects on the stock performance for those enterprises announcing their sustainability certifications. Thus, we propose two competing hypotheses.

Hypothesis 3a (H3a). The positive market reaction to stock performance due to announcements of sustainability certifications is stronger for those enterprises with political embeddedness.

Hypothesis 3b (H3b). The positive market reaction to stock performance due to announcements of sustainability certifications is weaker for those enterprises with political embeddedness.

2.2.2 The moderating role of cognitive legitimacy

Cognitive legitimacy is a social judgment of appropriateness and is derived from addressing the actions of enterprises as appropriate and desirable ones by the society and are in consistency with the general acceptance of the society (Zimmerman and Zeitz, 2002). Enterprises can gain *cognitive legitimacy* by publicizing information of their past sustainability performance records to increase their acceptance by the society (Suchman, 1995), i.e., consistently communicate with outsiders to enhance public awareness of enterprises' sustainability development efforts by issuing sustainability reports with regard to operations management related to environmental practices and employee treatments.

Cognitive legitimacy can affect investors' judgment on enterprises' obtainment of sustainability certifications (Darnall, 2006). Enterprises build their cognitive legitimacy by increasing the communication frequency with investors on their sustainability efforts, usually publicizing its performance in operations management related to environmental and social issues in their annual sustainability reports (Zimmerman and Zeitz, 2002). Enterprises with a high frequency of sustainability communications are generally perceived as friendly ones to sustainability in operations, which would be given more credits of social acceptance in sustainable management practices such as certification announcements (Cheng et al., 2016). Moreover, frequent sustainability communications improve the certainty and transparency of an enterprise's sustainable management practices in operations, which can build a positive image of the enterprise's efforts on sustainability (Cho et al., 2013). Hence, enterprises communicating more frequently on sustainable operations would achieve better financial

performance due to their announcements of sustainability certifications.

Hypothesis 4 (H4). The positive market reaction to stock performance due to the announcements of sustainability certifications is stronger for those certified enterprises more frequently communicating with outsiders on their sustainability development.

3. Data and Methodology

3.1 Data collection and variables development

3.1.1 Sustainability certifications' announcements

This study identified a sample of Chinese enterprises operating with sustainability (including both environmental and social) certifications by conducting a key-word search from multiple news sources. We used Chinese keywords including "environmental management system", "occupation health safety management system", "energy management system", "green label", "ISO14001", "OHSAS", "social responsibility certifications", "SA8000", "management system certification", "green certification", "sustainability certification", and searched headlines of announcements in several news sources. First, we obtained Chinese enterprises' announcements of attaining sustainability certifications that were publicized on official websites of Shanghai Stock Exchange (SSE) (available at: http://www.sse.com.cn/) and Shenzhen Stock Exchange (SZSE) (available at: http://www.szse.cn/). Second, we searched announcements that are publicized on enterprises' official websites. We collected such announcements from a database named *JRJ.com* (available at: http://www.jrj.com.cn/), which covers announcements made by all publicly listed enterprises in China's stock markets and publicized on the enterprises' websites in real-time. Third, we also searched news and announcements from *BAIDU*, the biggest and most popular web searching engine in China, to supplement news that was possibly missing in the former sources. For duplicate

announcements, we retained the announcements with the earliest publicized dates. We excluded announcements without dates as the change of stock price cannot be evaluated. We identified confounding announcements by examining the sample enterprises' announcements one-by-one in case any other important announcements were published by the sample enterprises during the event window. Announcements such as earning or dividends releasing, a merger/acquisition, key executive appointments, a debt reconstruction were considered as confounding announcements (McWilliams and Siegel, 1997). If the enterprise made any of the above confounding announcements over the event window, we excluded the announcement of a sustainable certification from our study sample. Our initial sample consisted of 234 announcements made by publicly listed Chinese enterprises in the two stock exchange markets covering the period from January 2003 to May 2018. We read full texts of each announcement to collect detailed information. Two examples of announcements are given below.

1) NORTHEO successfully passed the on-site supervision and audit of environmental as well as the occupational health and safety management systems by the New Era Certification Center

The stock name: NORTHEO

The stock code: 600184

Time: 2017-01-10 0:00

Source: The official website of NORTHEO

On January 6, 2017, the New Era Certification Center conducted the first supervision and audit of North Electroo-Optic Co., Ltd (NORTHEO)'s environmental as well as occupational health and safety management systems. During the three-days auditing, the auditing team conducted on-site sampling inspections of 11 sub-companies, held discussions with staff representatives, and communicated with the executives. The auditing experts gave fair and objective evaluation and confirmation to the operation of NORTHEO's environment and occupational health and

safety management systems, also pointed out the problems and deficiencies. Next, NORTHEO will make careful analyses of the issues raised by the expert group and make solid reforms to achieve practical results. NORTHEO takes the auditing as an opportunity to further strengthen the management systems construction, to improve the systems' ability in self-regulation, and to promote the enterprise's management to a higher level.

2) An announcement on receiving multiple management system certifications

The stock name: SYCST

The stock code: 002401

Time: 2013-8-20 19:11

China Shipping Network Technology Co., Ltd. received the five certificates issued by the China Classification Society Certification Center (CCSC) including HSE management system certification, environmental management system certification, occupational health and safety management system certification, quality management system certification (GB/T 19001-2008/ISO 9001: 2008) and quality management system certification (GB/T 19001-2008/ISO 9001: 2008 and GB/T50430-2007).

The event study methodology (see detail justifications provided in Section 3.2) was used in this research for testing the hypotheses. We acquired stock price data from the China Stock Market and the Accounting Research (CSMAR) database to estimate abnormal stock returns. CSMAR is the primary source for information on Chinese stock trading and the financial statements of Chinese listed enterprises (Marquis and Qian, 2013). We further defined the announcement date of sustainability certifications as Day 0. After removing enterprises that had insufficient stock price data for computing abnormal returns, with less than 40 days for historical stock trading between Day -220 and Day -21 of the estimation period (the estimation periods is explained in Section 3.2), our final sample consists of 210 announcements made by

127 enterprises. Panel A of Table 1 summarizes the distribution of enterprises by years of their sustainability certification announcements. More than 96% of the announcements were made in or after the Year 2005. Panel B reports statistics for each sample enterprise based on the most recent fiscal year before the announcement. The median observation represents an enterprise with a market value of $1056.01 million, total assets of $813.96 million, and a sales revenue of $523.03 million.

To understand the industry distribution of our sample, we segmented the sample into ten industry groups using the 13 industry categories identified by the China Securities Regulatory Commission.[1] Panel C in Table 1 provides the industry distribution of our study sample. About 80% of the sample enterprises belong to the manufacturing industry.

The sample enterprises obtained a variety of standard sustainability certifications covering ISO 14001, OHSAS 18001, GB/T 24001, GB/T 28001, and GB/T 23331. By reading the full texts of each announcement, we categorized the sample certifications considering environmental or social aspects, as summarized in Table 2. Among the 210 announcements, 78 (37%) include both EMS (environmental) and OHSAS (social) certifications, 116 (55%) are environmental certifications, and 16 (8%) are social certifications. As shown in Table 2, majority of environmental certifications are about EMS adoption (139), followed by energy management systems (23), environmental labeling product (18), forest certifications (6), and others (8); Labor certifications in the sample consists of OHSAS adoption (92) and SA8000 certification (2).

[1] These categories are agriculture, forestry, livestock farming, fishery; mining; manufacturing; electric power, gas, and water production and supply; construction; transport and storage; information technology; wholesale and retail trade; finance and insurance; real estate; social service; communication and culture; and others.

Table 1 Descriptive statistics of the 210 sample announcements

Panel A: Distribution of the announcement year for the sample of 210 announcements of sustainability certifications

Year	No. of observations	Percentage
2003	5	2.38
2004	3	1.43
2005	3	1.43
2006	3	1.43
2007	6	2.86
2008	4	1.90
2009	2	0.95
2010	4	1.90
2011	14	6.67
2012	16	7.62
2013	21	10.00
2014	22	10.48
2015	28	13.33
2016	20	9.52
2017	51	24.29
2018	8	3.81
Total	210	100.00

Panel B: Descriptive statistics for the sample enterprises. Sample statistics are based on the most recent fiscal year completed before the date of announcements by enterprises on sustainability certifications

Measure	Mean	Median	SD	Minimum	Maximum
Total assets (million US$)	5,346.67	813.96	23,047.07	30.56	229,896.69
Sales (million US$)	6,530.98	523.03	43,840.01	7.43	447,624.78
R&D expense (million US$)	39.33	8.16	133.29	0.00	925.06
Market value (million US$)	3,180.57	1,056.01	11,559.66	62.36	115,291.43

Panel C: Descriptive statistics for the sample enterprises. Industry groups

Group no.	Industries	No. of observations	Percentage of observations
1	Mining	14	6.67
2	Electric power, gas, and water production and supply	2	0.95
3	Real estate	2	0.95
4	Construction	8	3.81
5	Transport and storage	3	1.43
6	Agriculture, forestry, livestock farming, fishery	2	0.95
7	Wholesale and retail trade	3	1.43
8	Information technology	8	3.81
9	Manufacturing	167	79.52
10	Others	1	0.48
	Total	210	100

Table 2. Classification of sustainability certifications

	Certifications	No.
Environmental aspect	Environmental management system (EMS)	139
	Energy management system certification	23
	Environmental labeling product	18
	Forest certification FSC	6
	Carbon footprint of products certification	3
	Organic Product	3
	Green Building Certification	1
	China GAP	1
Social aspect	Occupation Health Safety Management System (OHSAS)	92
	SA8000	2

3.1.2 Moderating and control factors

Moderating variables. Three moderating variables were included to test Hypotheses 2-4: *Government ownership.* This variable is coded 1 when an enterprise is state-owned and 0 otherwise. An enterprise is state-owned if it is ultimately controlled by the central or local governments, government-sponsored institutions, or administrative organizations[2] (Marquis and Qian, 2013). *Political embeddedness* is depicted by enterprises' chief executive officers (CEOs) being members of national political councils, which is 1 if the enterprise's current CEO is a member of NPC or CPPCC[3], and 0 otherwise (Bai et al., 2006; Li et al., 2007). As the enterprise's highest leader in the management team, the CEO ultimately makes and is responsible for all decisions including sustainable management. *Sustainability communication frequency* was measured as a quantifiable variable of the times of yearly sustainability reports that the enterprise publicized before the year of announcement for sustainability certifications.

[2] According to the definition in "Administrative rules for acquisition of listed companies", an acquirer under any of the following circumstances can ultimately control a listed firm: 1) holding the largest number of shares of the listed firm; 2) controlling more voting rights of the listed firm than the largest shareholders; 3) holding and/or controlling no less than 30% of the shares and/or voting rights of the listed firm; 4) being able to determine the election of more than half of the board members of the listed firm by exercising voting rights; 5) other circumstances as determined by the China Securities Regulatory Commission.

[3] There are generally two most important political councils in China as a key means for business leaders to participate in the government. The first is the National People's Congress (NPC), the only legislative body in China. The second is the Chinese People's Political Consultative Conference (CPPCC) as an advisory board for the Chinese government. Each council meets once a year and serves as a forum of mediating policy differences between the Chinese Communist Party and various parts of Chinese society. (From Marquis and Qian 2014)

Control variables. We included several additional variables as controls. Following previous research (Longoni and Cagliano, 2018; Xia et al., 2015), we controlled the *enterprise size* and *profitability* to avoid the effects of these two factors on the abnormal returns due to the announcement of sustainability certifications. We measured *enterprise size* as the natural log of an enterprise's total assets (*ln*_assets) and *profitability* as an enterprise's annual profits on the total return of assets (ROAs). Moreover, if an enterprise makes consumer products, there is a shorter distance between the enterprise and consumers, and thus the enterprise may experience higher *consumer pressure*. *Customer pressure* evaluating the degree of scrutiny on an enterprise from the consumers by the distance from the former to the latter was controlled. We employed a dummy variable, with input value as 1 if the certified enterprise makes consumer products and 0 if otherwise, to measure the contact distance to consumers of the certified enterprises. *Exporting* was also controlled as a continuous variable which is measured as a percentage of product export relative to total sales (Hitt et al., 1997). We lastly controlled if the certification is first-time or re-accredited for the certified enterprise. A dummy variable of *re-accreditation* was used, with the input value as 1 representing if the announced certification was re-accreditation and 0 for the first-time certification.

We collected data for evaluating the moderating and control variables from two sources. The data of government ownership, archival accounting reports, political embeddedness, sustainability reports, and exporting sales were collected from the CSMAR database. Consumer product categories data were collected from the website of the Chinese General Administration of Quality Supervision, Inspection and Quarantine (visit at http://samr.saic.gov.cn/).

3.2 Methodology for Analyses

3.2.1 Direct effect of announcements for sustainability certifications

We used the event study methodology to estimate market reaction to enterprises' announcements for their sustainability certifications. This methodology has been widely used to estimate stock market reactions to events of the focal enterprises while controlling market-wide influences on their stock prices (see Brown and Warner (1985) for a review of this methodology). Consistent with the methodology used in most event studies (Jacobs et al., 2010), we measure abnormal returns over a two-day event period. We translate calendar days into event days as follows. For announcements made before 4:00 PM, the announcement calendar day is Day 0 in event time, the next trading day is Day +1, and the trading day proceeding the announcement is Day -1. For announcements made after 4:00 PM, the announcement calendar day is Day -1, and the next trading day is Day 0, and the trading day proceeding the announcement is Day -2. Consistent with recent event studies (Jacobs et al., 2010; Lo et al., 2018; Xia et al., 2015), we used a two-day event period that includes the announcement day (Day 0) and the trading day prior to the announcement day (Day -1) to account for the potential event information leakage in the day before the announcement is published (Xia et al., 2015). We estimate abnormal returns using a market model that posits a linear relationship between the stock return and the enterprise's return over a given time period:

$$R_{it} = \beta_{0i} + \beta_{1i} R_{mt} + \varepsilon_{it}, \quad (1)$$

where R_{it} is the stock return of Enterprise i for Day t; R_{mt} is the stock return of the market index; ε_{it} is the error term; β_{0i} is the intercept of the relationship for Stock i; and β_{1i} is the slope of the relationship for Stock i with respect to the market return;

We estimate the model parameters by using ordinary least squares regression over the estimation period that begins on Day -220 and ends on Day -21 (Jacobs et al., 2010). In estimating the parameters, we require that an enterprise must have a minimum of 40 stock returns during the estimation period of 200 trading days (from Day -220 to Day -21) (Lo et al., 2018). We also estimate the variance of the error term ε_{it} over the estimation period as $\hat{S}_{\varepsilon_i}$.

The abnormal return of Enterprise *i* on Day *t* is then estimated as:

$$A_{it} = R_{it} - (\hat{\beta}_{0i} + \hat{\beta}_{1i} R_{mt}), \tag{2}$$

where $\hat{\beta}_{0i}$ and $\hat{\beta}_{1i}$ are estimated parameters.

The mean abnormal return for Day *t* is:

$$\bar{A}_t = \sum_{i-1}^{N} A_{it} / N_t, \tag{3}$$

Where *N* is the sample size (the number of announcements).

To test the statistical significance of the mean abnormal return A_{it} in Equation (3), each abnormal return is divided by its estimated standard deviation $\hat{S}_{\varepsilon_i}$ to obtain a standardized abnormal return. The abnormal returns are assumed to be independent across events with a mean of 0 and a variance of $\hat{S}^2_{\varepsilon_i}$ under the null hypothesis. Based on the central limit theorem, the sum of the *N* standardized abnormal returns is normal with a mean of 0 and variance *N*. Thus. The test statistic TS_t for Day *t* is calculated as:

$$TS_t = \sum_{i=1}^{N} \frac{A_{it} \Big/ \hat{S}_{\varepsilon_i}}{\sqrt{N}} \tag{4}$$

We used the t-test to determine the statistical significance of the mean abnormal return. The cumulative abnormal return $CAR(t_1, t_2)$, over a period $[t_1, t_2]$, is the sum of the daily mean abnormal returns:

$$CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} \bar{A}_t . \tag{5}$$

The test statistic TS_e for a multiple day period is obtained in a similar way as in a single day:

$$TS_e = \sum_{i=1}^{N} \frac{(\sum_{t=t_1}^{t_2} \bar{A}_t) \Big/ \sqrt{\sum_{t=t_1}^{t_2} \hat{S}^2_{\varepsilon_i}}}{\sqrt{N}} \tag{6}$$

To reduce the influence of outliers, we supplemented the t-tests with two non-parametric tests. We tested the statistical significance of the median abnormal return using the Wilcoxon

signed-rank test and applied the binomial sign test to determine if the percent positive of the abnormal returns during the event period is significantly greater than the null of 50%.

3.2.2 Analysis of the moderating factors

To analyze how abnormal return might be affected by various legitimacy factors discussed in Section 2 for hypotheses development, we apply hierarchical regression analysis which was developed by Jaccard et al. (1990) and adopted in the previous literature (such as Du and Boateng (2015); Groening and Kanuri (2013); Lo et al. (2018)). The two-step hierarchical analysis covers all the samples in Section 3.1.1. We employ the cumulative abnormal return on Days (-1, 0), CAR (-1, 0), as the dependent variable (Lo et al., 2018; Xia et al., 2015). In the first step, the CAR (-1, 0) is regressed with all the control variables. In the second step, the CAR (-1, 0) is regressed with three additional moderating variables (*government ownership*, *political embeddedness*, and *sustainability communication frequency*). Two evidences can show moderating effects. One evidence is that the coefficient of the moderating variable is significant. The other evidence is that the value of incremental *F* for the step is significant, which indicates an overall moderating effect for all interaction variables (Zhu and Sarkis, 2004) (The detailed identification process will be presented in Section 4).

3.2.3 Self-selection bias

Our study is based on a self-selected sample because an enterprise in our sample has chosen to announce its sustainability certification or not. Thus, our sample is nonrandom. Such a self-selected action by enterprises could lead to the self-selection bias issue in calculating abnormal returns of our study sample under the market model. To address this issue, we use the propensity score matching (PSM) method, first introduced by Rosenbaum and Rubin (1985), as an approach to estimate abnormal returns. The basic idea of this method is to use a model of

the propensity to select a group of propensity-matched firms that are similar to our sample enterprises, but which did not have sustainability certification announcements. To implement PSM, we use the matching procedure to identify matched firms that are nearest to our sample enterprises based on the propensity scores.

The propensity score $p(x)$ is the probability of the firm announcing sustainability certifications on x, i.e., $p(x) = pr(\text{Sample}=1|x)$; Where, the announcement is the indicator, i.e., Sample=1 if an enterprise announced a certification and 0 for an enterprise without such an announcement. The conditional probability is estimated using a discrete choice model such as logit (Rosenbaum and Rubin, 1985). Heckman and Navarro-Lozano (2004) suggested whether the inclusion of suitable variables may affect accuracy in estimating the propensity of the event occurrence. Following the literature (Ding et al., 2018; Modi et al., 2015), we use *ln*_assets, Tobin's *Q*, financial leverage, inventory, analyst following, and annual stock return in generating our matches. The fixed effects of industry and year are also incorporated. We apply a two-step approach suggested by Chen et al. (2018) in developing the matched sample. In the first step, the propensity scores are estimated using a pooled cross-sectional model indicated in Equation (1) (see Appendix), and then enterprises are matched with the closest propensity score in Step two (with replacement, and caliper set at 0.25∗ standard error of propensity score, see Abadie and Imbens (2006)).

After the matching is completed, for each matched enterprise, we estimate its abnormal return by using the market model. We then compare the sample enterprises' abnormal returns to the matched ones. The self-selection bias would not be a concern if there is difference between the sample and matched enterprises' abnormal returns, which indicates that the abnormal return estimated in our sample enterprises is explained by the announcements.

4. Results

This section first introduces the result for the main hypothesis on whether the stock market reacts to enterprises' announcements for their sustainability certifications. We then examine how the abnormal returns are affected by the moderating factors in our hypothesized relationships.

4.1 Results of abnormal returns and cumulative abnormal returns of enterprises' announcement for their sustainability certifications

Table 3 provides the abnormal returns of the full sample (210 announcements) for the day preceding the announcement (Day -1), the day of the announcement (Day 0), and the CARs for the two-day event period (Days -1 and 0) using the market model. The mean abnormal return for Day 0 is 0.38%, positive and significant at 5% level. The median abnormal return and percentage of positive abnormal return for Day -1 are -0.27% at 10% level, 43% at 5% level, respectively. For the two-day event period, the mean cumulative abnormal return for Days -1 and 0 are 0.27%, positive and significant at 10% level. Hence, Hypothesis 1 suggesting a positive stock market reaction to enterprises' announcement for their sustainability certifications is supported.

Some previous studies question the reliability of event study results from the non-U.S. context in plights of market efficiency in emerging markets (Bhattacharya et al., 2000; Ding et al., 2018). For instance, Bhattacharya et al. (2000) pointed out that the Mexican stock market does not react to a variety of enterprises' new announcements because that information is leaked to the market before the announcement by unrestricted insider trading. To address this concern, researchers are recommended to pay additional attention to research in emerging markets by conducting robustness tests on alternative event windows (Ding et al., 2018). Hence, we recalculate the abnormal returns over longer event windows ranging from -3 to 3 days to

verify if there is further information leakage earlier before Day -1. The insignificant results of the alternative event windows summarized in Panel B of Table 3 provide support for the model robustness.

To better understand our study sample, we classify the announcements into first-time certifications (n=85) and those announcing re-accredited certifications (n=125). The results of the subsamples and their comparisons are shown in Panel C, Table 3. There is higher and significant mean and the median cumulative abnormal return on Day (-1, 0) for the first-time certifications subsample (mean = 0.95%, p<0.05; median = 0.24%) than that for the re-accredited certifications subsample (mean difference = 1.15%, p<0.05; median difference = 0.74%, p<0.1) suggesting that the novelty for the stock market is less when a re-accredited certification is announced relative to a first-time certification.

Table 3. Event period abnormal returns for the 210 enterprises announcing sustainability certifications.

Panel A: Abnormal returns of the full sample

	N	Mean	*t*	Median	Wilcoxon test	% positive	Binomial sign test
AR (0)	210	0.38%**	2.058	-0.03%	0.808	49%	0.207
AR (-1)	210	-0.11%	-0.767	-0.27%*	-1.908	43%**	2.001
CAR (-1,0)	210	0.27%*	1.046	-0.13%	-0.083	48%	0.483

Panel B: Robust tests for the alternative event windows

	N	Mean	*t*	Median	Wilcoxon test	% positive	Binomial sign test
AR (1)	210	0.04%	0.243	-0.18%	-0.695	44%*	1.587
AR (-2)	210	0.05%	0.341	-0.29%	-1.522	42%**	2.139
AR (2)	210	-0.04%	-0.225	-0.04%	-0.848	49%	0.207
CAR (0,1)	210	0.43%*	1.545	-0.17%	0.635	48%	0.621
CAR (-1,1)	210	0.31%	0.935	-0.31%	-0.294	46%	1.173
CAR (-2,2)	210	0.33%	0.815	-0.37%	-0.341	48%	0.621
CAR (-3,3)	210	0.30%	0.619	--0.36%	-0.354	47%	0.897

Panel C: Subcategory results for the event period (Days -1 and 0)

	N	Mean	Median	%positive
First-time certifications	85	0.95%**	0.24%	55.29%
Re- accreditation	125	-0.19%	-0.50%	43.20%
Test of difference		1.15%**	0.74%*	

***, **, * denote significantly different from zero (50% in the case of positive) at the 1%, 5%, and 10% levels, respectively, for two-tailed tests.

To control for self-selection bias of our sample enterprises, we adopted the PSM method as described in Section 3.2.3 (see details for propensity matching in Appendix). After obtaining the matched enterprises, we calculated abnormal returns of them during the event period (Days (-1, 0)) by using the market model. As shown in Table 4, all abnormal returns during the event period (AR (0), AR (-1), and CAR (-1, 0)) are not significant. Given that our sample enterprises' abnormal returns during the event period are significant (shown in Panel A of Table 3), there is difference between the sample and matched enterprises' abnormal returns. Thus, the self-selection bias should not be a concern in our data and analyses.

Table 4. Abnormal returns of the PSM matched sample

	N	Mean	*t*	Median	Wilcoxon test	% positive	Binomial sign test
AR (0)	210	0.23%	0.89	0.03%	0.978	48%	-0.286
AR (-1)	210	0.03%	0.139	-0.02%	-0.53	51%	0.573
CAR (-1,0)	210	0.26%	1.296	0.21%	1.279	53%	-0.716

4.2 Results of cross-sectional analysis

Before hierarchical regression analysis, the descriptive statistics and bivariate correlations for all variables are calculated (see in Table 5). Due to inter-correlations between some variables, variance inflation factors (VIFs) are computed to investigate if there is a potential multicollinearity problem. The maximum VIF obtained in any of the models is 4.61 (*government ownership*); the mean VIF is 2.28, which are below the suggested cutoff of 10 (Ryan, 1997). Therefore, multicollinearity should not be a serious issue for our data analyses. All *F* values for the two models shown in Table 6 suggest that the models represent a good fit for our data.

Table 6 introduces the regression estimates of CAR (-1, 0) under the market model. Model 1 includes all the control variables. Model 2 tests Hypotheses 2-4 by adding two sociopolitical legitimacy variables of *government ownership* and *political embeddedness,* as well as one cognitive legitimacy variable of *sustainability communication frequency*. The incremental *F* value for the step in Model 2 is significant, which indicates an overall moderating effect for all moderating variables. The coefficient of *government ownership* is positive (0.012, $p<0.05$). Hypothesis 2 suggesting a strengthening effect of *government ownership* on the positive stock reaction to enterprises' announcements for their sustainability certifications is supported. Such a result indicates that SOEs benefit more from announcing their sustainability certifications with better stock returns than those of their non-SOEs counterparts in China. The coefficient of *political embeddedness* is negative (-0.006, $p<0.1$). Hypothesis 3b indicating a weakening effect of *political embeddedness* on the positive stock reaction to enterprises' announcements of their sustainability certifications is supported, while H3a which indicates a strengthening effect of political embeddedness is not supported. This result implies that an enterprise seeking political embeddedness through the CEO as an NPC or CPPCC representative compromises the stock performance associated with sustainability certifications' announcements. One possible reason is that such political embeddedness with the government is usually viewed as irrelevant and informal than those of the substantial and formal relations characterizing the operations by SOEs. Moreover, Model 2 also shows the insignificant coefficient of cognitive legitimacy variable (*sustainability communication frequency*), which indicates that no moderating effect of this cognitive legitimacy variable is found. H4 is therefore not supported.

As for the control variables, the coefficients of *consumer pressure* and *re-accreditation* in models are statistically significant. *Profitability*, *enterprise size*, and *exporting* are not significant predictors on the stock market reaction to enterprises' announcement of their sustainability certifications.

To check the robustness of the results, we run the regression model by employing the dependent variable of AR (0) against all explanatory variables. Results are consistent with our model, which provides further evidence that our results are robust.

Table 5. Descriptive Statistics and Correlations

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9
CAR (-1, 0)	0.003	0.037	1								
Profitability (ROA)	3.288	6.059	0.069	1							
Enterprise size (*ln*_assets)	22.619	1.590	-0.049	-0.085	1						
Government ownership	0.609	0.489	0.110*	-0.223***	0.363***	1					
Consumer pressure	0.243	0.430	-0.132*	0.095*	-0.071	-0.093	1				
Political embeddedness	0.833	0.373	-0.078*	-0.043	0.149**	0.061	0.104*	1			
Exporting	0.134	0.195	0.083	-0.034	-0.286***	0.054	0.011	0.032	1		
sustainability communication frequency	1.742	2.590	-0.087	-0.192**	0.434***	0.230***	-0.188**	0.128*	-0.055		
Re-accreditation	0.595	0.492	-0.150**	-0.126*	0.090	0.055	-0.121	0.021	-0.060	0.267***	1

***, **, * represent the significance level at p<0.001, 0.05, and 0.1, respectively.

Table 6. The hierarchical regression results

Dependent variable	CAR (-1, 0)	
Model:	1	2
Controls		
ROA	0.000	0.001
Enterprise size (*ln*_assets)	-0.001	-0.001
Consumer pressure (yes=1)	-0.014**	-0.013**
Exporting (%)	0.010	0.011
Re-accreditation (yes=1)	-0.012**	-0.011**
Moderating variables		
Government Ownership (SOE=1)		0.012**
Political embeddedness (yes=1)		-0.006*
Sustainability communication frequency		-0.001
Constant	0.034	0.030
Observations	210	210
Adjusted R-squared	0.033	0.047
F for the step	2.42**	4.077**
F for the regression	2.68**	2.22**

***, **, * represents the significance level at p<0.001, 0.05, and 0.1, respectively.

5. Discussion and implications

5.1 *Discussion*

There are several insights generated from the regression results. First, announcements of sustainability certifications can bring positive stock market reactions. Second, there are opposite moderating effects of the two sociopolitical factors on the certification-performance link, which are positive for government ownership and negative for political embeddedness, respectively. Third, there is no moderating effect of frequent communication of sustainability on the link.

H1 is supported that there exists a positive association of Chinese enterprises' announcement of sustainability certifications on their stock performance, which is consistent with the findings of a previous study (Bouslah et al., 2010). However, our research shows the varying degree of the positive abnormal returns for these enterprises' announcements with respect to first-time and re-accredited certifications. Specifically, the subsample containing first-time certifications' announcements evokes higher stock

price increases than the subsample incorporating announcements for re-accredited certifications which causes no significant stock reaction. Such a result is reasonable since investors tend to be more sensitive to an announcement containing fresh-new information on sustainability certifications than an announcement for re-accreditation. This may partially explain the results in some previous studies, for example, Paulraj and de Jong (2011) found no positive relationship when announcements for re-accredited certifications were incorporated in the sample as a whole. Furthermore, not much has been done in the literature to differentiate between the first and re-accredited certifications, not to mention the efforts to investigate and compare the financial gains from these two types, i.e., Heras-Saizarbitoria et al. (2011); Link and Naveh (2006); Wahba (2008).

The regression results support H*2* that SOEs characterized with higher sociopolitical legitimacy from the government receive greater positive stock reactions to their sustainability certifications' announcements than their private counterparts. Compared to Faccio (2006) which analyzes how the higher legitimacy that Chinese SOEs possess can benefit their resource/information access, operational preference, etc. Our study advances further with empirical evidence that SOE can gain from their higher sociopolitical legitimacy in terms of better stock performance by announcing their sustainability certifications. Such a result is reasonable as Chinese SOEs with sustainability certifications in our sample are usually perceived by the public including stock investors as more capable in substantively implementing sustainable operations because SOEs are more accessible to resources and receive greater monitoring from the government. Thus, investors react more positively to SOEs for their announcements of certified sustainable operations.

This research also examines the role of another sociopolitical legitimacy, namely

political embeddedness. Our results show that it weakens the positive relationship between sustainability certifications and stock performance, which is attributable to two reasons. First, such political embeddedness with the government is viewed as irrelevant and informal than the substantial and formal relations characterizing the operations by SOEs. For instance, according to (Marquis and Qian, 2013), Chinese investors may believe that enterprises with political embeddedness tend to behave merely symbolically rather than substantively on CSR reporting, which to some degree explains our results. However, they did not examine whether such embeddedness would affect enterprises' financial gains from adopting sustainable operations practices. Second, such embeddedness may bring fewer benefits to the enterprise than to the person who is a member of NPC or CPPCC, while at the cost of greater monitoring from the government, which is observed in the literature such as Marquis and Qian (2013).

In addition, we provide a perspective from cognitive legitimacy to explain market reactions to enterprises' stock performance regarding their announcements of sustainability certifications. We employ one dimension of cognitive legitimacy, i.e., sustainability communication frequency, to test the argument. The result finds no support for a strengthening effect, which means that boosting cognitive legitimacy by ways of frequently communicating sustainability with related reports makes no difference to the financial performance of announcing sustainability certifications. It also indicates that Chinese investors put less trust in the sustainability reports released by enterprises themselves than the sustainability certifications awarded by third-party organizations. This is actually in line with findings from existing literature such as Sun et al. (2010) that CSR disclosure brings no gain for financial return.

5.2 *Implications*

Our analyses provide several insights for practitioners. First, enterprises should publicize their first-time sustainability certifications, which will be a positive signal to the investors on their sustainable operations and benefit their stock price performance. Nevertheless, enterprises announcing sustainability reports without a certification bring no effect on their stock price. Such results implicate that continuous self-release of sustainability reports is not helpful to gain legitimacy in operations unless an enterprise attains a third-party certification. It is advisable for Chinese enterprises to gain endorsement by external third-party agencies on their sustainable operations through certifications.

Second, regarding the role of ownership, SOEs in China are subject to greater legitimacy to pursue sustainable operations once they announce their certifications, probably due to their operational background with government involvement (e.g., with the government-appointed secretary for monitoring their operations). As Chinese SOEs are required by the government to align with the missions of the latter including shouldering more social responsibility, announcements of sustainability certifications reflecting their substantial efforts are considered trustworthy by their stock investors. Hence, SOEs in China should keep high accordance with the governments' expectations on sustainable operations.

In addition, our analysis on the moderating effects of political embeddedness implicates that serving as members in the political councils by CEOs may undermine the sustainability legitimacy of enterprises, even with certifications Stock investors may question if these CEOs really care about or even understand sustainable operations since the application and implementation of sustainability certifications are usually managed by middle-level managers. These operational managers should report to the

CEOs more frequently to inform the latter about the environmental and social management in operations and for them to make appropriate policy suggestions on the political councils.

Last, from the government's view, formal government endorsement and support on enterprises (i.e., for SOEs) can help to increase enterprises' legitimacy on sustainable operations due to greater trust by stakeholders, benefiting financial performance. Beyond the ownership, the government can extend to evaluate sustainable operations among enterprises with certifications and publicize enterprises with good practices to notify stakeholders, which can help these enterprises to increase their legitimacy in operations for performance improvement. Moreover, it is helpful if the government can develop pilot and demonstration projects to support the first-movers of some proactive sustainable operations.

6. Conclusions and future research

This study advances knowledge on legitimacy in operations by Chinese enterprises for sustainability and the market reaction to their efforts. It examines enterprises' announcements of sustainability certifications to signal their improved operations for sustainability as legitimate actions and how the stock market reacts to such actions using the sample of publicly listed enterprises in China. Furthermore, the effects of institutional legitimacy factors on the market reaction are analyzed: sociopolitical and cognitive legitimacy on the stock market reaction to enterprises' announcements of their sustainability certifications, based on event study methodology together with regression analyses using objective secondary data source in the context of China.

There are several important insights useful for managers and researchers to plan and implement their sustainability practices. Managers should realize that self-publicized

sustainable reports are not helpful for promoting stock performance. Instead, they should obtain sustainability certifications endorsed by third-party organizations and more proactively announce their certifications. They should also notice that first-time certification announcements may benefit stock price, but it is not for announcing re-accredited certifications. Managers in SOEs should put more effort on improving sustainable operations, which can be considered trustworthy by stakeholders as a higher operational priority than achieving legitimacy. For non-SOEs, CEOs' personally political embeddedness, being members in the political councils of NPC or CPPCC, are irrelevant for sustainability certifications to bring stock market performance. Instead, they need to demonstrate substantive efforts for sustainability development to improve enterprises' operations, e.g. implementing sustainable practices recognized and publicized by the government.

Several issues influence the interpretation of the study results. First, the sample size of the study is relatively small. During the sample collection process, we searched multi-news databases to collect the news announcements made by the listed Chinese enterprises. Unfortunately, the sample size is restricted because most Chinese enterprises are reluctant to make announcements on sustainability certifications although they have adopted them. Future research conducted in other countries may adopt a larger sample size. Second, our study analyzes all sustainability certifications as the same tool to improve financial performance. However, sustainability certifications have different orientations. For example, ISO 14001 is a process-oriented certification that improves the enterprise's management process on environment, while environmental labeling product certification is a product-oriented certification that inspects the products' greenness. It is worthy to examine such market reaction at different product-/process- oriented types to evaluate the relative relationship strengths

among these factors. Third, from the methodological perspective, this study adopts the market model to estimate abnormal returns following previous studies in this line of research. However, to improve the robustness of the results, alternative models such as the Fama and French four-factor model can be developed and tested for further insights. Similarly, more robustness tests on the dependent and independent variables can be useful to confirm the study results. Third, future research should examine the robustness of the model, considering there might be possible factors influencing the stock market returns of sustainability certifications adoption. Alternative models such as the instrument variable should be used to test the potential effects on the results. Last, our study can be replicable in other institutional contexts with some adaptions. The conceptual model could be replicated. The independent and dependent variables, as well as the cognitive legitimacy factor which we measure as the sustainability communication frequency, could be directly used. However, two political legitimacy factors (the government ownership and political embeddedness) might be different and need to be adapted with equivalent measures in other institutional contexts. For instance in the context of the U.S., there are government-owned enterprises but with higher independence from the government than Chinese SOEs; and some enterprises build political embeddedness by political activities such as lobby and testimony (Lord, 2000).

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References

Abadie, A., Imbens, G.W., 2006. Large Sample Properties of Matching Estimators for Average Treatment Effects. Econometrica 74(1), 235-267.

Aldrich, H.E., Fiol, C.M., 1994. Fools rush in? The institutional context of industry creation. Academy of

Management Review 19(4), 645-670.
Auld, G., Gulbrandsen, L.H., 2010. Transparency in nonstate certification: Consequences for accountability and legitimacy. Global Environmental Politics 10(3), 97-119.
Bai, C.-E., Lu, J., Tao, Z., 2006. Property rights protection and access to bank loans. Economics of Transition 14(4), 611-628.
Berrone, P., Fosfuri, A., Gelabert, L., 2017. Does greenwashing pay off? Understanding the relationship between environmental actions and environmental legitimacy. Journal of Business Ethics 144(2), 363-379.
Bhattacharya, U., Daouk, H., Jorgenson, B., Kehr, C.-H., 2000. When an event is not an event: the curious case of an emerging market. Journal of Financial Economics 55(1), 69-101.
Boiral, O., Gendron, Y., 2010. Sustainable development and certification practices: Lessons learned and prospects. Business Strategy and the Environment 20(5), 331-347.
Bouslah, K., M'Zali, B., Turcotte, M.-F., Kooli, M., 2010. The Impact of Forest Certification on Firm Financial Performance in Canada and the U.S. Journal of Business Ethics 96(4), 551-572.
Brown, S.J., Warner, J.B., 1985. Using daily stock returns: The case of event studies. Journal of financial economics 14(1), 3-31.
Cañón-de-francia, J., Garcés-ayerbe, C., 2009. ISO 14001 Environmental Certification: A Sign Valued by the Market? Environmental and Resource Economics 44(2), 245-262.
Chen, Y.-C., Hung, M., Wang, Y., 2018. The effect of mandatory CSR disclosure on firm profitability and social externalities: Evidence from China. Journal of Accounting and Economics 65(1), 169-190.
Cheng, S., Lin, K.Z., Wong, W., 2016. Corporate social responsibility reporting and firm performance: evidence from China. Journal of Management & Governance 20(3), 503-523.
Cho, S.Y., Lee, C., Pfeiffer, R.J., 2013. Corporate social responsibility performance and information asymmetry. Journal of Accounting and Public Policy 32(1), 71-83.
Christmann, P., Taylor, G., 2006. Firm self-regulation through international certifiable standards: determinants of symbolic versus substantive implementation. Journal of International Business Studies 37(6), 863-878.
Darnall, N., 2006. Why Firms Mandate ISO 14001 Certification. Business & Society 45(3), 354-381.
Ding, L., Lam, H.K.S., Cheng, T.C.E., Zhou, H., 2018. A review of short-term event studies in operations and supply chain management. International Journal of Production Economics 200, 329-342.
Djupdal, K., Westhead, P., 2013. Environmental certification as a buffer against the liabilities of newness and smallness: Firm performance benefits. International Small Business Journal 33(2), 148-168.
Du, M., Boateng, A., 2015. State ownership, institutional effects and value creation in cross-border mergers & acquisitions by Chinese firms. International Business Review 24(3), 430-442.
Faccio, M., 2006. Politically connected firms. American Economic Review 96(1), 369-386.
Faccio, M., Lang, L.H.P., 2002. The ultimate ownership of Western European corporations. Journal of Financial Economics 65(3), 365-395.
Goedhuys, M., Sleuwaegen, L., 2013. The impact of international standards certification on the performance of firms in less developed countries. World Development 47, 87-101.
Groening, C., Kanuri, V.K., 2013. Investor reaction to positive and negative corporate social events. Journal of Business Research 66(10), 1852-1860.
Gu, L., 2018. Enterprises must take social responsibility. http://epaper.rmzxb.com.cn/detail.aspx?id=420640, The CPPCC Newspaper. (Accessed March 27th 2018).

Heckman, J., Navarro-Lozano, S., 2004. Using Matching, Instrumental Variables, and Control Functions to Estimate Economic Choice Models. The Review of Economics and Statistics 86(1), 30-57.

Heras-Saizarbitoria, I., Molina-Azorín, J.F., Dick, G.P.M., 2011. ISO 14001 certification and financial performance: selection-effect versus treatment-effect. Journal of Cleaner Production 19(1), 1-12.

Hillman, A.J., 2005. Politicians on the board of directors: Do connections affect the bottom line? Journal of Management 31(3), 464-481.

Hillman, A.J., Hitt, M.A., 1999. Corporate political strategy formulation: A model of approach, participation, and strategy decisions. Academy of Management Review 24(4), 825-842.

Hitt, M.A., Hoskisson, R.E., Kim, H., 1997. International diversification: Effects on innovation and firm performance in product-diversified firms. Academy of Management Journal 40(4), 767-798.

Iannotta, G., Nocera, G., Sironi, A., 2013. The impact of government ownership on bank risk. Journal of Financial Intermediation 22(2), 152-176.

Jaccard, J., Wan, C.K., Turrisi, R., 1990. The Detection and Interpretation of Interaction Effects Between Continuous Variables in Multiple Regression. Multivariate Behavioral Research 25(4), 467-478.

Jacobs, B.W., Singhal, V.R., Subramanian, R., 2010. An empirical investigation of environmental performance and the market value of the firm. Journal of Operations Management 28(5), 430-441.

King, A.A., Lenox, M.J., Terlaak, A., 2005. The strategic use of decentralized institutions: Exploring certification with the ISO 14001 management standard. Academy of Management Journal 48(6), 1091-1106.

Lau, C., Lu, Y., Liang, Q., 2016. Corporate social responsibility in China: A corporate governance approach. Journal of Business Ethics 136(1), 73-87.

Li, H., Meng, L., Wang, Q., Zhou, L.-A., 2008. Political connections, financing and firm performance: Evidence from Chinese private firms. Journal of Development Economics 87(2), 283-299.

Li, H., Meng, L., Zhang, J., 2007. Why do entrepreneurs enter politics? Evidence from China. Economic Inquiry 44(3), 559-578.

Li, S., Xia, J., Long, C.X., Tan, J., 2015. Control modes and outcomes of transformed state-owned enterprises in China: An empirical test. Management and Organization Review 8(2), 283-309.

Li, W., Lu, X., 2016. Institutional interest, ownership yype, and environmental capital expenditures: Evidence from the most polluting Chinese listed firms. Journal of Business Ethics 138(3), 459-476.

Lin, C.-Y., Ho, Y.-H., 2011. Determinants of green practice adoption for logistics companies in China. Journal of Business Ethics 98(1), 67-83.

Link, S., Naveh, E., 2006. Standardization and discretion: Does the environmental standard ISO 14001 lead to performance benefits? IEEE Transactions on Engineering Management 53(4), 508-519.

Lo, C.K.Y., Tang, C.S., Zhou, Y., Yeung, A.C.L., Fan, D., 2018. Environmental incidents and the market value of firms: An empirical investigation in the Chinese context. Manufacturing & Service Operations Management 20(3), 422-439.

Longoni, A., Cagliano, R., 2018. Inclusive environmental disclosure practices and firm performance: The role of green supply chain management. International Journal of Operations & Production Management 38(9), 1815-1835.

Lopatta, K., Jaeschke, R., Chen, C., 2017. Stakeholder Engagement and Corporate Social Responsibility (CSR) Performance: International Evidence. Corporate Social Responsibility and Environmental Management 24(3), 199-209.

Lord, M.D., 2000. Constituency-based lobbying as corporate political strategy: Testing an agency theory perspective. Business and Politics 2(3), 289-308.

Ma, D., Parish, W.L., 2006. Tocquevillian moments: Charitable contributions by Chinese private entrepreneurs. Social Forces 85(2), 943-964.
Marquis, C., Qian, C., 2013. Corporate social responsibility reporting in China: Symbol or substance? Organization Science 25(1), 127-148.
Marquis, C., Zhang, J., Zhou, Y., 2011. Regulatory uncertainty and corporate responses to environmental protection in China. California Management Review 54(1), 39-63.
McWilliams, A., Siegel, D., 1997. Event studies in management research: Theoretical and empirical issues. Academy of Management Journal 40(3), 626-657.
Melnyk, S.A., Sroufe, R.P., Calantone, R., 2003. Assessing the impact of environmental management systems on corporate and environmental performance. Journal of Operations Management 21(3), 329-351.
Modi, S.B., Wiles, M.A., Mishra, S., 2015. Shareholder value implications of service failures in triads: The case of customer information security breaches. Journal of Operations Management 35, 21-39.
Morsing, M., Schultz, M., 2006. Corporate social responsibility communication: stakeholder information, response and involvement strategies. Business Ethics: A European Review 15(4), 323-338.
O'Brien, K.J., 2008. Reform without liberalization: China's National People's Congress and the politics of institutional change. Cambridge University Press.
Okhmatovskiy, I., 2010. Performance implications of ties to the government and SOEs: A political embeddedness perspective. Journal of Management Studies 47(6), 1020-1047.
Omran, M., 2004. The performance of state-owned enterprises and newly privatized firms: Does privatization really matter? World Development 32(6), 1019-1041.
Paulraj, A., de Jong, P., 2011. The effect of ISO 14001 certification announcements on stock performance. International Journal of Operations & Production Management 31(7), 765-788.
Peng, M.W., Luo, Y., 2000. Managerial ties and firm performance in a transition economy: The nature of a micro-macro link. Academy of Management Journal 43(3), 486-501.
Porta, R., Lopez-De-Silanes, F., Shleifer, A., 2002. Corporate ownership around the world. The Journal of Finance 54(2), 471-517.
Robinson, M., Kleffner, A., Bertels, S., 2011. Signaling sustainability leadership: Empirical evidence of the value of DJSI membership. Journal of Business Ethics 101(3), 493-505.
Rosenbaum, P.R., Rubin, D.B., 1985. Constructing a Control Group Using Multivariate Matched Sampling Methods That Incorporate the Propensity Score. The American Statistician 39(1), 33-38.
Ryan, T.P., 1997. Modern regression analysis. Wiley, New York.
Schepers, D.H., 2010. Challenges to legitimacy at the Forest Stewardship Council. Journal of Business Ethics 92(2), 279-290.
Short, J.L., Toffel, M.W., 2010. Making self-regulation more than merely symbolic: The critical role of the legal environment. Administrative Science Quarterly 55(3), 361-396.
Sine, W.D., David, R.J., Mitsuhashi, H., 2007. From plan to plant: Effects of certification on operational start-up in the emergent independent power sector. Organization Science 18(4), 578-594.
Suchman, M.C., 1995. Managing legitimacy: Strategic and institutional approaches. Academy of Management Review 20(3), 571-610.
Sun, N., Salama, A., Hussainey, K., Habbash, M., 2010. Corporate environmental disclosure, corporate governance and earnings management. Managerial Auditing Journal 25(7), 679-700.
Thurston, C.C., 1998. Latin America finds the profit in ISO 14000. Chemical Market Reporter 253(7).
Wahba, H., 2008. Does the market value corporate environmental responsibility? An empirical

examination. Corporate Social Responsibility and Environmental Management 15(2), 89-99.
Wang, H., Qian, C., 2011. Corporate philanthropy and corporate financial performance: The roles of stakeholder response and political access. Academy of Management Journal 54(6), 1159-1181.
Wang, Q., Wong, T.J., Xia, L., 2008. State ownership, the institutional environment, and auditor choice: Evidence from China. Journal of Accounting and Economics 46(1), 112-134.
Xia, Y., Singhal, V.R., Peter Zhang, G., 2015. Product design awards and the market value of the firm. Production and Operations Management 25(6), 1038-1055.
Zhao, B., 2017. The Belt and Road Initiative: Another case of "China Mode"? https://www.globalresearch.ca/the-belt-and-road-initiative-another-case-of-china-mode/5592377, (Accessed May 29th 2017).
Zhu, Q., Li, H., Zhao, S., Lun, V., 2016. Redesign of service modes for remanufactured products and its financial benefits. International Journal of Production Economics 171, 231-240.
Zhu, Q., Sarkis, J., 2004. Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. Journal of operations management 22(3), 265-289.
Zimmerman, M.A., Zeitz, G.J., 2002. Beyond survival: Achieving new venture growth by building legitimacy. Academy of Management Review 27(3), 414-431.

Appendix. Propensity score matching results for evaluating sample self-selection bias

We utilize the propensity score matching method to create a matched sample of firms, which did not have sustainability certifications' announcements. Our initial firm pool consists of all firms listed on the Shanghai and Shenzhen Stock Exchange from 2003 to 2019. We exclude B-share (foreign share) firms. A two-step approach is developed to generate the matched sample. In the first step, a logit regression is used to estimate the propensity scores. The regression equation is shown in Expression (1) below. In the second step, the firms are matched based on the closest propensity scores with the sample firms. Model estimates are presented in Table A1 and the descriptive statistics of the event firms and the matched firms are presented in Table A2.

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1(\ln(\text{assets})) + \beta_2(Tobin's\ Q) + \beta_3(financial\ levarage) + \beta_4(\text{inverntory turnover}) + \beta_5(\text{annual stock return}) + \beta_6(\text{analysist following}) + \beta_7(\text{year}) + \beta_8(\text{industry})$$

Expression (1)

Table A1. Logit regression results for estimating propensity scores

Variables	Estimates	Z value
*ln*_assets	0.249***	4.24
Tobin's *Q*	-0.004	-0.11
Financial leverage	0.000	0.2
Inventory turnover	0.004	-1.06
Annual stock return	-0.3834788**	-2.01
Analysts following	0.005441	0.58
Fixed-effects	Year, industry	
N	31,909	
Pseudo *R*2	0.0164	

Significance is reported for two-tailed tests. * p ≤ 0.1. ** p ≤ 0.05. *** p < 0.01.

Table A2. Descriptive statistics for sample and matched firms

Variables	Sample firms (N=181)		Matched firms (N=181)	
	Mean	S.D.	Mean	S.D.
Propensity for announcement	0.007	0.003	0.007	0.003
*ln*_assets	22.448	1.51	22.416	1.52
Tobin'*Q*	1.792	1.823	1.923	2.115
Financial leverage	2.196	3.26	1.599	2.561
Inventory turnover	8.168	32.839	7.633	15.145
Annual stock return	0.34	0.374	0.33	0.39
Analysts following	7.967	9.385	8.46	11.114