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What influences the climate entrepreneurship? Chinese-based evidence

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Climate change is the biggest threat to the public as it threatens water scarcity, heat waves, economic losses, and food insecurity. Consequently, the control of climate entrepreneurship is very significant to ensure business sustainability. However, the identification of controlling measures for climate entrepreneurship remained unexplored. Therefore, the purpose of this study was to examine the influence of organizational performance, carbon management practices, and attitudes toward emission trading schemes on climate entrepreneurship. The study is based on 180 respondents from large Chinese firms. Using structural equation modeling, the results report a significantly negative influence of organizational performance, carbon management practices, and attitudes toward emission trading schemes on climate entrepreneurship. This suggests to the management and policymakers that an increase in organizational performance, carbon management practices, and attitude toward emission trading schemes brings a significant decline in climate entrepreneurship and, thus, ensures a sustained business environment. One of the few studies examines variations in company responses to climate change from an entrepreneurial viewpoint. In order to advance the body of knowledge on the strategic management of climate change challenges, the study offers a theoretical foundation. Chinese policymakers are very keen to adopt an emission trading scheme and by the implication of articulate results can help them to attain their climatic goals.

KEYWORDS

Chinese firms, organizational performance, carbon management practices, attitude toward emission trading schemes, climate entrepreneurship

Introduction

Universal contribution to extinction begins when natural resources are being used abusively; this creates an imbalance in nature. Throughout the world's main integrated energy management, climate change alleviation and adaptation processes manage and reduce energy consumption. There is a need to manage climate change risks and develop carbon strategies and renewable energy projects. Innovative solutions are developed to support long-term stability, local sustainability, and sustainable economic growth.

In previous studies, focus on carbon management practice and climate change is based on opportunities and challenges (Arakawa et al., 2001). Many of the researchers address governance, policies, and accountability issues with carbon management practices and climate change effects (Marland et al., 2003; Bache et al., 2015). Concerning the research gap, this study will make important contributions. First, this study contributes to exploring how carbon management practices (CMPs) make differences in business activities, which play an important and equal role in sensing and interpreting climate change issues and integrating these issues into the managerial decision-making process. Second, this paper will examine the firm's attitude and CMP toward CE right after China launched its ETS. Third, this study will analyze the relation of performance, that is, operational and market performances, with CE in the context of the People's Republic of China. This study features the significance of climate change, and it additionally states to the organizations that their exhibition can influence the climatic issues.

The business environment is getting tougher and competitive through this climate changing issue. Climate change is one of the most emerging issues business community faces around the globe (Lash and Wellington, 2007; Howard-Grenville et al., 2014; Howard-Grenville et al., 2014). The Paris Agreement, adopted on 13 December 2015, after 14 days of rigorous negotiations at the Paris Climate Change Conference, created a global approach for tackling climate change by 2020 and beyond. On 22 April 2016, a high-level signing ceremony was held at the United Nations Headquarters in New York. On that occasion, the leaders of 175 countries signed an agreement to control climate change and sustainable development (NATION, 2016; Kong et al., 2021). China is the world's largest contributing country with 10.06 billion metric tons of greenhouse gas emissions, with a trend that has progressively risen over the years. Notably, the biggest culprit of greenhouse gas emissions for China is electricity and burning coal (Farooq et al., 2019).

The People's Republic of China has actively participated in the global carbon market since 2005 through the clean development mechanism (CDM) under the United Nations Framework Convention on Climate Change (UNFCCC) (Shin, 2010). The CDM was the world's first global carbon market, allowing developing countries who had ratified the Kyoto Protocol[1] to develop and transfer emission reductions from low-carbon projects to industrialized countries for compliance with their targets under the Kyoto Protocol. Consequently, China now has 10 years of emission trading experience through the CDM and through piloting seven carbon markets. China has slowly transitioned from being a seller of emission reduction units into the UN carbon market to establishing seven pilot carbon markets in 2011 and is now preparing for a nationwide emission trading scheme (ETS) (Zhang et al., 2014). Its experience with the CDM and subnational pilot carbon markets has given China confidence in setting a pledge of reducing carbon intensity by 60–65 percent by 2030 as its contribution to the new climate agreement (Zhang, 2021). China is committed to accelerating emissions by 2030 and net-zero emissions by 2060. By 2030, China aims to reduce its carbon emissions per unit of GDP by less than 65% from 2005 levels and increase the share of non-fossil energy in basic energy use by around 25%, like wind and solar energies to create total energy potential, more than 1200 GW of power (Fang et al., 2021). The main objectives for this study are to explore opportunities for businesses from climate sensing and to explore the difference from integrating climate change issues into the strategic decision-making process. Next is to build an understanding of the firms to adopt climatic managerial practices and ensure them to implement on different levels. The third one is to inquire the effects of organizational performance including the factors of operation, market, and environment on corporate social responsibility (CSR).

The Chinese Ministry of Ecology and Environment (MEE), after so many years of homework, announced the first round of compliance for the national ETS scheme on 5 January 2021. The Chinese energy sector now requires 2,225 companies to measure their emissions and issue emission permits for every ton of greenhouse gas they emit (Gu et al., 2022). The Chinese ETS is about 3.5 gigatonnes of greenhouse gas (GHG) per year, which places China as larger than European the ETS. In the beginning, the Chinese government will give licenses on a standard basis and will not charge any cost (Gao and Song, 2021). Some of the organizations need to purchase licenses, especially those having insufficient licenses, and these kinds of dealings or relations will work together in producing carbon emissions in China. This scheme will work for China, and this scheme is also very active in the Chinese climate policy; it puts great efforts in overcoming climate changes across the world.

As one of the key steps toward achieving the national goal, China is going to launch ETS in 2021, the first nationwide "cap and trade" scheme to operate in Asia and Europe. Experts from the China Council for International Cooperation on Environment and Development (CCICED) have confirmed that China's ETS will gradually cover eight sectors: petrochemical, chemical, building materials, steel, non-ferrous metals, paper, and domestic aviation sectors (Cui et al., 2020). Transportation, housing, agriculture, forestry and agriculture, construction, and other public sectors were excluded from the Chinese ETS as the number of entities in these sectors was so high that they were not effectively monitored and since they are a small part of the emission (Zhang and Zhang, 2020).

1 The Kyoto Protocol operationalizes the United Nations Framework Convention on Climate Change by committing industrialized countries and economies in transition to limit and reduce greenhouse gas (GHG) emissions in accordance with the agreed individual targets.

Firms have reacted differently in tackling climate change (Bibi et al., 2020). Although some companies, such as ExxonMobil, one of the largest emitters in the United States, vehemently opposed unfavorable climate regulations, others, such as Passive Gas and Electric, Ford Motors, and DuPont, adopted an active position by lobbying for tougher climate change policies in the United States (Jones and Levy, 2007; Asensio et al., 2016). Previous research has sought to better understand how firms differ in describing different responses to climate change (Reid and Toffel, 2009; Slawinski and Bansal, 2012; Lynch-Wood et al., 2014; Lee and Kim, 2015). Therefore, the literature is limited in the form of organizational responses to climate change from the managerial point of view. Environmental strategies could be different for corporates even though companies are in the same context of competitiveness (Bansal and Roth, 2000; Sharma and Vredenburg, 1998). Environmental risks and opportunities, organizational capabilities, and management's perceptions of the slow availability of resources within an organization can influence environmental management decision-making, which determines the extent and level of corporate response to climate change (López-Gamero et al., 2011; Wang et al., 2019; Yuan et al., 2022).

Few studies are conducted on the basis of managerial perspective on climate change, but when the corporate environmental strategies came, it perceived differently although in the same context (Delmas et al., 2016). Both these managerial and corporate environmental strategies are inter-connected but the management perception about environmental strategies may affect the decision-making of organizations that actually determines the range and the level of response for corporates about climate change (Bobby Banerjee, 2001; Lee and Ahn, 2019). However, the research questions, which are going to be addressed in this study, are about realizing the potential effects of climate change on their business, finding business opportunities from climate change, and integrating climate change issues into the strategic decision-making process, and how the difference is not explored. Second, there is a limited understanding of the firms' active stance on climate change, which is considered in this study as CE activity, such as whole industrial climate change management practices are adopted and implemented on different levels. Third, very limited studies have observed the effects of a firm's actual performance, including operational, market, and environmental performances, on CE as a corporate response to climate change.

Literature review

China is making great strides in tackling climate change. In this section, Chinese policies and practicalities have been discussed. In 2017, China started working on the launch of the ETS and made some regulations for the polluters who were charged to pay for harming the climate. On the other hand, some opportunities and incentives were created for those who try to reduce their carbon emissions. In 2019, China started the transition from coal to renewable energy and installed more solar panels and wind power generators, which takes China to a leading manufacturer of these technologies (Zhu et al., 2019). China decided in 2020 and started to reduce and stick to CO_2 emissions properly by implementing the ETS (Swartz, 2016). Policymakers decided to reduce this in a cost-effective manner. They decided that initially gas and coal-based power plants were included. It will allocate a plant-based production allowance (also known as a permit), with a different standard for each fuel and technology. China's ETS is poised to expand to seven other sectors, covering one-seventh of global CO_2 emissions from fossil fuel combustion, the world's largest CO_2 emissions (Zhongming and Wei, 2020). The early years of operation will be crucial for testing the ETS design and building trust. Given the dominance of coal power in China's power sector and its overall CO_2 emissions and how the country's fleet of coal-fired power plants is handled, China's climate targets for sustainable energy goals must be met (Agency, 2020).

A natural resource-based view (NRBV) builds the logic that relates to natural resources of the firms that they used for their own viability. Environmental sustainability will become a crucial component of strategic management as firms become more aware of the limitations imposed by the natural environment. This will help them in maintaining their resource-based competitive advantage.

The impact of the ETS on coal-fired power operations is worth assessing as the ETS will work closely with other policies, such as energy conservation standards, air pollution standards, electricity market reforms, and capacity appointment plans. The report weighs on the implications of the benchmark options proposed under the ETS for China's coal-fired power sector. It assesses how different options will affect the allocation of allowances to different types of plants and will consider the key factors that will determine which breeding units are in deficit or more than allowances. The report also looks at how these effects will be distributed to provinces and companies. The report explains how the ETS design can play a more central role in advancing China's energy transition (Agency, 2020).

Developments in China's energy system make great changes, and 2020 is proving a pivotal year as far as developments are concerned in the energy sectors. The important task of setting goals and priorities for the 14th Five-Year Plan (2021–25) was difficult, without thousands of implications of COVID-19 (Heggelund and Economics, 2021; Province, 2021). However, the acceptance of the widespread use of market mechanisms has become another important moment for Chinese policymakers. The introduction of a regulating and effective nationwide emission trading scheme (ETS) could be a key factor in China's recovery from the economic effects of the coronavirus

while at the same time accelerating a clean energy revolution. Climate change is the whole world's concern, and the world is mutually reliant and interrelated. If the Chinese ETS gets the success, it would create a positive impact on the rest of the world.

Coal-fired power plants emit about half the CO_2 emissions from fossil fuels in China. Reducing emissions from coal-fired power plants will be necessary to achieve China's low-carbon goals, and these plants will be key sources of ETS coverage (Xu et al., 2021). About 50% of Chinese CO_2 emissions come from the industrial sector, 40% from the power sector, and 8% from the transportation sector (Zhou et al., 2013; Suberu et al., 2014; Hao et al., 2015). Emission related to this division is much different from other countries, especially in most developed countries, like the United States have 22% of heat-trapping gas emitted from the industrial sector, 28% from the electricity sector, and 29% from the transportation sector (Harris, 1999; Zhou et al., 2013; Suberu et al., 2014; Bourne et al., 2018; Godil et al., 2021).

A previous study explored with the sample of four oil companies in Europe and the United States explored the strategic response, that is, avoidant, resistant, complaint, and proactive to climate change (Levy and Kolk, 2002). The significant relationship between the corporate carbon strategy and firm performance shows in cluster analysis with the sample of 241 Korean firms. This study focuses on six types of corporate carbon strategies: "wait-and-see observer," "cautious reducer," "product enhancer," "all-round enhancer," "emergent explorer," and "all-round explorer" (Lee, 2012). In the other study, the carbon strategy of the firms is being defined through all-rounder, compensator, substituting compensator, reducer, substituting reducer, and preserver with the cluster analysis of 91 worldwide firms from the electricity industry (Weinhofer and Hoffmann, 2010).

In collaboration with the IEA[2], the clean energy transition program examines the potential implications of the proposed ETS design for China's coal-fired power fleet. It is part of an ongoing project examining how the national ETS can contribute to China's clean energy transition. In the IEA clean energy transition program, the ETS will then be analyzed in-depth, including the impact on gas-fired power plants and the entire power sector by 2035. The ETS with other directly affected existing policies all together work for coal-fired power plants in China. The reports begin with an explanation of the institutions and policies governing coal-fired power plants and an analysis of the development trends for coal-fired power plants. It then evaluates the impact of the ETS design on coal-fired plants using subtechnology at the national, provincial, and company levels and identifies key findings and recommendations.

2 The International Energy Agency works with countries around the world to shape energy policies for a secure and sustainable future.

Climate entrepreneurship

Firms, subjected to the same set of external environmental pressures, may adopt different practices and policies (Delmas et al., 2016). The management insights of external stakeholders and their demands on environmental issues have served as a key element of the subsequent action (Sharma, 2000). Taking a proactive approach to climate change is a starting point for examining how the external competitive environment is translated into the corporate action (Lee and Ahn, 2019).

This research identifies "entrepreneurship" to visualize management's views on environmental risks, opportunities, and organizational capabilities related to climate change, which are believed to play a role in management decision-making and also determine the extent and degree of consequences related to carbon strategies of corporates. Entrepreneurship generally combines limited resources to secure value and return in new and innovative ways to solve problems under business resource constraints and the decision-making ability. By researcher's consent with the combination of entrepreneurship, organizational capabilities, and proactive environment, the "Climate Entrepreneurship" concept is characterized with the consistency of three elements, sensing, seeking, and integrating climate change issues (Lee and Ahn, 2019).

First, climate change "Sensing" is an aspect of recognizing the potential effects of climate change in a business. Sensing provides the basis for a deeper understanding of climate change issues and then responding to them. There is no need to plan carefully, considering different alternatives (Lehtonen et al., 2019).

Managers or respondents have now put some effort and tried to involve in relative processing to get information, and they try to learn the procedure to gather the climate change information. Sensing means relying on intuition, which is specifically important in the context of increasing climate change issues as it enables the firm to coordinate a wide range of stimuli in the category of usable information (Yang et al., 2013). Second, "seeking" climate change is a trend of looking for business opportunities potentially facing the challenges of climate change (Gössling et al., 2018; Lee and Ahn, 2019). The executives have their eyes on opportunities and sensing strong business values related to climate change, and they get updated with proper information and summarized results of climate change to decide in favor of the organization. They develop new products, services, and businesses using a creative approach to address climate change challenges (Koelbl et al., 2015). When it comes to business performance, the focus should be on management considerations rather than the costs or risks of actively responding to climate change. Firms may differ in implementing CMP because of how managers evaluate the consequences of their reactions to climate change.

Managers who focus on the bright side of the response to climate change (i.e., better than positive expectations) take a proactive approach to climate change issues. Third, "integration" is an aspect of organizational capacity that incorporates climate change into the strategic planning process (Cobb et al., 2012; Lee and Ahn, 2019). It is a way of giving high priority to climate change, which supports organizational measures for climate change. "Integration" can provide an opportunity to develop valuable, exceptional, and easily replicable capabilities, resulting in new competitive advantages (Barney, 1991).

Research framework

Organizational performance and climate entrepreneurship

Academia provides generous evidence to expand the relationship between the performance of the organization and CE. First, a proactive and careful environmental management can reduce manufacturing costs, reduce environmental responsibilities, and increase productivity. Second, firms can increase the revenue by accessing new markets created by climate change and enhance the environmental reputation of existing markets with the help of green products (Pinkse and Kolk, 2010; Lee, 2012). Third, organizational operational performance can lead organizations to industrial competitiveness regarding CE (Bayarçelik and Özşahin, 2014). The delivery of the targets by the manufacturers and working efficiently make the organization more competitive in the market, and all these proactive tasks and operations make the organization more vigilant for climate change and enable it to make a significant impact on the CE. In the electric vehicle e-market, Tesla, Honda, and Toyota are perfect examples of their hybrid vehicles with huge market share and advantage, experimental economies, status, and profit maximization. CE can facilitate professional technical organizational learning and innovation (Lee and Klassen, 2016), which is called "innovation equalizers" (Porter, 1995).

It emphasizes using creative approaches, regardless of whether they have sufficient resources in search of opportunities for environmental and social challenges. It also tells how to improve an organization's environmental performance by observing environmental issues locally, nationally, and internationally, also by raising environmental awareness within an organization, supporting good environmental practices and promoting environmental initiatives. Enthusiasm can be thought of as effort and activity. It can persuade and enable an organization to transform environmental concerns into effective innovative programs to make an organization successful (Silvestre and Țîrcă, 2019), providing this model with a theoretical background for dimension thrilling and integration. From this perspective, the corporate carbon strategy differs regarding its dynamic perceptions of climate change and its ability to integrate climate change issues into the managerial and strategic decision-making process. This framework differentiates between moderately shallow and more reflective approaches for each of the CE dimensions. As a result, a combination of different levels of a firm's climate of entrepreneurship indicates its particular strategy. To manage uncertain environmental issues, such as climate change, managers can seek protective measures rather than simply responding to previous events (Aragón-Correa and Sharma, 2003; Barnett, 2001). Evolution may also help shape the nature of imminent conversations with stakeholders and competitors. Management's entrepreneurial risk-taking on the climate change issues that see climate change at the center of competition would favor a "proactive" approach (Wallace, 2009).

Technical knowledge, technical methods, capabilities, and high-level expertise are required to produce low or carbon-free products. Even the processes also require these capabilities. These practices make the organizations result-oriented with high-tech innovations since these practices can promote a learning culture in the organizations. The main purpose of this article is to test hypotheses about the relationship between organizational performance (OP) and climate entrepreneurship. This study will also observe the differences in operational, market, and emission reduction environmental performances between the different dimensions of CE. This reasoning presents the following hypothesis.

H1: Climate entrepreneurship productivity related to operational, market, and emission reduction performance.

Carbon management practices and climate entrepreneurship

Proceedings have mentioned the consistent evidence of the relationship between management's pending views on environmental issues and the adoption of new methods. An active response to an emerging environmental problem may require the investment of substantive firm-level resources, which has only been performed with the consent of top management (Child and Tsai, 2005). Environmental support behaviors of individuals in environmental support positions influence others at the top level for environmental advocacy initiatives (Chen et al., 2013).

Entrepreneurship has an exclusive element to take the risk, although a long-running argument that the risk susceptibility of entrepreneurship is greater than that of organizational managers is widely supported (Vereshchagina and Hopenhayn, 2009). In production operations, CMPs emphasize waste reductions, efficient and effective input use, and control of internal processes. Progress is seen in quality, on-time delivery, cost efficiency, and quick response to customer's demand (Lee and Kim, 2015).

In many countries, regulations have been adopted unexpectedly, amid the tight public policy in favor of low-

carbon emissions and limited or no regulation. For example, many firms have lobbied vigorously to delay or avoid legislation on climate change, stressing their ability to predict the costs and competitive effects of such measures (Delmas et al., 2016; Zhang et al., 2019). Therefore, the authors presume that several managers may resist or hesitate to take precautionary measures in response to climate change and that they may implement small token adjustments if they have to take such steps. However, others who threaten CE may have a different stance and may actively encourage their organizations and policymakers to respond creatively and proactively to the challenges of climate change. This reasoning leads to the following hypothesis.

H2: Adoption and implementation of carbon management practices are significantly related to climate entrepreneurship.

Attitude toward climate change regulation and climate entrepreneurship

The stimulus argument literature suggests that psychologically defensive reactions, such as denial of risk, vary according to previous attitudes. The socio-psychological research shows that predictors affect the information on ETS regulation processes and observe polarized responses. Traditional beliefs/global ideologues (Republicans/hierarchical individualists) are more likely to accept the reality of CE after reading about the technical response, and if there would be a discussion on ETS regulatory sanctions on these solutions, it will be rejected straightly. Therefore, lower level attitudes toward climate change regulations, that is, conservative and liberal thoughts, might be risk-takers toward CE, and they are keeners to adopt regulations to protect climate rather than mitigation (Tang and Tang, 2012). Both thoughts embrace new regulations, and they are involved in minimizing emissions reduction.

Researchers need to study how firms' attitudes toward ETS regulations toward climate change are affected by adoption and mitigation while exploring the actions of responsibilities that may affect climate change productivity and CE. To date, no studies have been explored yet with this aspect in China, that is, the attitude of ETS regulations toward CE. This study will examine whether exposure to ETS regulations of China adaptation may affect the relation of attitude toward CE.

H3: Attitude toward climate change is substantively related to climate entrepreneurship.

Materials and methods

Research framework

Based on the literature and hypothesis development, the framework for this study is given as follows Figure 1:

Sample and data collection

Previously, it has been generally considered that firms are not responsible regarding their operations related to climate change. For the collection of data, a random data sampling technique is used and targeted the chemical sector, building material sector, and energy sector of China, and focused on Jiangsu province, Suzhou, Wuxi,

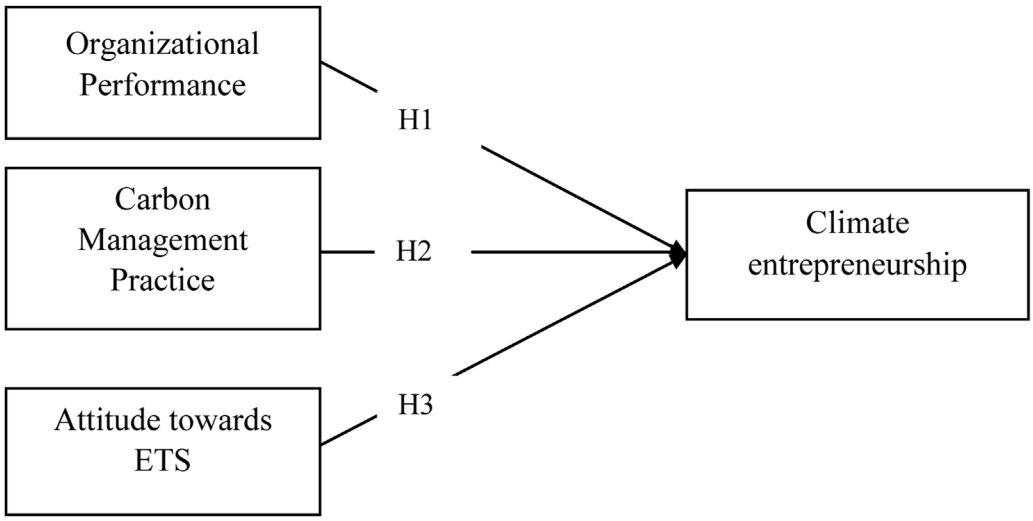

FIGURE 1
Theoretical research framework.

and Nanjing, having their industrial zones. Several reasons why this study is based on these Chinese sectors are as follows: China is an emerging economy, so this study addressed these high-tech industries because they are facing some pressure to produce eco-friendly products and satisfy the explosive needs of the market (Begum et al., 2021). Based on Hussey and Eagan (2007), Stefanelli et al. (2014), and Cheng et al. (2019), the sample size was selected. The questionnaire was adapted from Lee and Ahn (2019) and distributed physically and through emails. This study followed the way of Awan et al. (2020) for the mailed questionnaire. Researchers made follow-up calls to the organizations that had not responded in the first month mail. After 1 month of calls and follow-up, practice gets more responses. To reduce the bias, scholars clearly state that their information will not be disclosed and all the given information would be used for research purposes. The sample for analysis was conducted among 650 key informants, although their convenience and confidentiality were assured. The questionnaires which were unfilled and unanswered were removed, and in total, the authors received 180 considerable questionnaires. From this original dataset, the authors limited the samples to companies that would be exposed to a benchmark emission policy for a specific reason. This study examines the productivity of CE, which depends on the performance and management of emission reduction. The acquired data are only from those companies which followed the benchmark policy on carbon emissions, and benchmarks are settled values of carbon emissions in tons. The authors obtained data from public sources on the actual emissions of GHG and carbon emissions, which are estimated as each output or input per unit of emission.

Measurements

Three dimensions of climate entrepreneurship

Sensing, seeking, and integrating are three dimensions used to identify CE. This concept is new, which was just introduced in Lee and Ahn (2019). CE "sensing" is defined as "a firm's ability to understand the impact of climate change on the current business and future business." In "seeking," CE focuses on opportunities and is fully aware of the challenges posed by climate change. Administrative decision-making is seen as focused, and strategic planning is concerned with the challenges of climate change, which relates to the third element of CE "integration."

Operational, market, and environmental performance

This study measures the organizational performance in three dimensions, that is, operational, market, and environmental performance.

This study considers three dimensions of performance based on operations, market, and environmental performances, and nine of the total items are used to measure these performances. Four items are based on operational performance, considering industrial competitive priorities that could serve as core performance targets for manufacturing, delivery, performance, efficiency, and flexibility (Ward et al., 1998). This study is used as a proxy for market performance enhancement, and sales and market share. In general, environmental performance is measured with greenhouse gas emission reduction and the efficiency of energy.

Carbon management practices

The study explores a variety of CMPs, including low-carbon product development (LPD), low-carbon process improvement (LPI), employee engagement (EE), external initiative participation (EIP), and supply chain cooperation (SCC). The study examined these methods using a seven-point Likert scale, in which the level of adoption and implementation of these methods can be redetermined. The authors used measuring instruments adapted from prior studies (Jeswani et al., 2008; Lee, 2012; Lee and Klassen, 2016).

Attitude toward the Chinese emissions trading scheme

This study also surveyed how Chinese companies view ETS regulations regarding the company's ability to implement the Chinese ETS in the items, deferring the Chinese ETS to the extent of the mesh, and preparing for this regulation of the Chinese ETS (Lee and Ahn, 2019). This construct has been measured with items based on a seven-point Likert scale.

Methodology

Smart PLS version 3.2.7 is a statistical tool used to analyze the structural model statistically. The structural equation modeling approach is used to examine the relationships between all the constructs (Awan et al., 2020). With the help of Smart PLS, this study is used to conduct structure equation modeling, and it allows the testing of theoretically supported linear and additive causal models; structural equation modeling (SEM), a second-generation multivariate data analysis technique, is frequently utilized in management research. PLS-SEM can handle both types of measurement models, that is, reflective and formative. The proposed model for the study includes these types as well. This study is cause-and-effect; therefore, PLS-SEM effectively estimates interactions between all constructs in the structural model. First, the measurement model is analyzed separately, and several tests are performed to analyze the reliability and validity

of the data. The PLS measurement model results showed that the factor loadings of scale items were more than 0.60, and the average variance extracted (López-Gamero et al., 2011) was more than the recommended cut-off value, which supports convergent validity. The construct and discriminant validity of these data were assessed using the criteria described by Ringle et al. (2018). Scholars assessed the construction reliability using composite reliability (CR) and Cronbach's alpha (CA).

Results and discussion

Measurement model

Structural equation modeling (SEM) examines the relations among CE, attitudes toward the Chinese ETS, CMP, and OP. SEM models are effective when tests of reliability and validity of the data are consistent with the structure and up to the mark since all these tests are included in the measurement model. For evaluating the measurement model, some of the items are deleted based on the term factor, loading less than 0.40 Figure 2. The following measurements had adequate model fit data: chi-square (3,363.709), CFI (0.841), and RMSEA (0.071) (Durdyev et al., 2018). Reliability and construct validity have also been measured through Cronbach's alpha, which exposes the consistency of the whole scale and reliability of the questionnaire. This study shows that all the constructs had achieved thresholds and had values more than 0.70, which shows consistency and reliability of the questionnaire (see Table 1) (Bagozzi and Yi, 1988; Hair et al., 2014). Convergent validity has been measured by the extracted average variance (López-Gamero et al., 2011). The threshold for the convergent validity set by the academia is 0.50 (Chin, 1998), and this study showed that all the constructs had AVE values more than 0.50, and these values are mentioned in Table 1.

Discriminant validities of variables

The discriminant validity has been defined by Fornell and Larker. The standard is defined by using AVE, which should be higher than .50, and then, taking the square root of the AVE of all constructs shows a higher correlation among all constructs, as shown in Table 2 (Fornell and Larcker, 1981).

Structural measures

This study used the standard bootstrapping procedure with 500 bootstrap samples and 180 samples to determine the significance of the path coefficients (Henseler et al., 2009; Hair et al., 2014). The full results of the structural measures of this model are demonstrated in Table 3, where OP has a significant (β = −.314,

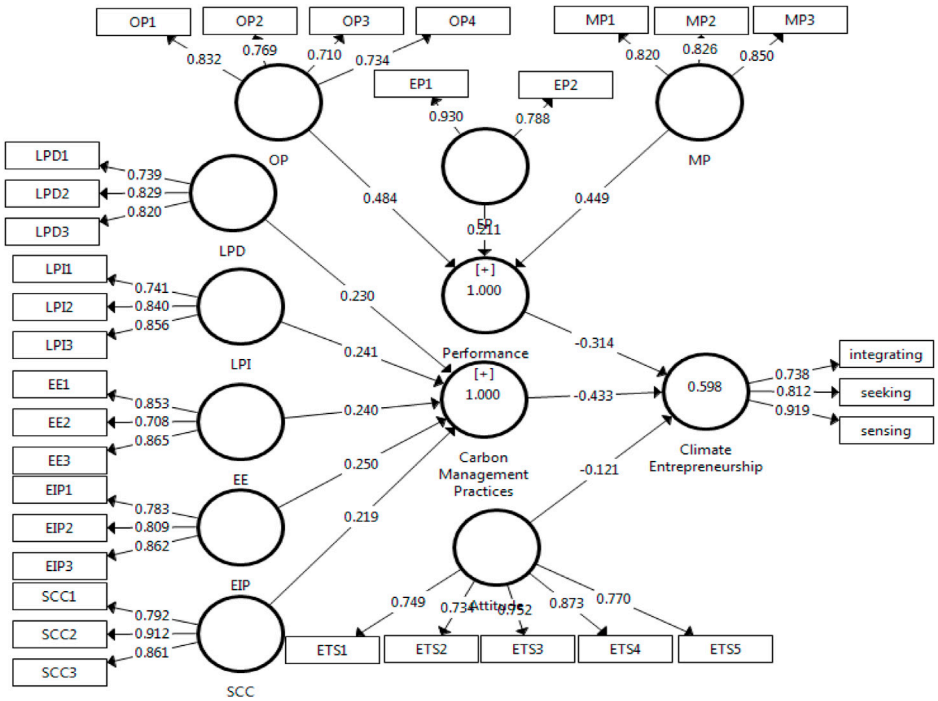

FIGURE 2
Factor loadings and structural factor influence.

TABLE 1 Reliabilities and validities.

Construct	Outer loading	AVE	CR	CA
Climate entrepreneurship		0.682	0.865	0.762
Sensing	0.738			
Seeking	0.812			
Integrating	0.919			
Organizational performance		0.545	0.878	0.841
Operational performance				
OP01	0.832			
OP02	0.769			
OP03	0.710			
OP04	0.734			
Market performance				
MP01	0.743			
MP02	0.820			
MP03	0.768			
Environmental performance				
EP01	0.788			
EP02	0.930			
Carbon management practices		0.507	0.932	0.921
Low-carbon product development (LPD)				
LPD01	0.739			
LPD02	0.829			
LPD03	0.820			
Low-carbon process improvement (LPI)				
LPI01	0.739			
LPI02	0.829			
LPI03	0.820			
Employee engagement (EE)				
EE01	0.853			
EE02	0.708			
EE03	0.865			
External initiative participation (EIP)				
EIP01	0.783			
EIP02	0.809			
EIP03	0.862			
Supply chain co-operation (SCC)				
SCC01	0.792			
SCC02	0.912			
SCC03	0.861			
Attitude toward the Chinese ETS		0.604	0.884	0.835
ETS01	0.749			
ETS02	0.734			
ETS03	0.752			
ETS04	0.873			
ETS05	0.770			

t-value = 7.777, and p-value < .000) relationship with CE, as expected. This result shows that OP is negatively associated with CE, which indicates that when the firms performs well, they can manage the climatic changes more adequately, so it supports H1. The CMP has a significant impact (β = −.433, t-value = 9.970, and p-value <.000) on CE, as expected. This also indicates that the CMP needs to be more effective to control the climate change effects, so this supports H2. The interaction between attitudes toward the

TABLE 2 Discriminant validities of variables.

	Climate entrepreneurship	Organizational performance	Carbon management practice	Attitude
Climate entrepreneurship	***.826***			
Organizational performance	−.684	***.674***		
Carbon management practices	−.727	.699	***.692***	
Attitude	−.567	.564	.623	***.777***

These are the validities which are highlighted for the constructs, normally highlighted just formatting

TABLE 3 Path coefficients.

Hypothesis relationship	Beta (β)	Standard deviation	T-statistics	*p*-values	2.5%	97.5%	Decision
Performance - > climate entrepreneurship	−.314	.009	7.777***	.000	−.386	−.228	Supported
Carbon management practices - > climate entrepreneurship	−.433	.043	9.970***	.000	−.530	−.356	Supported
Attitude - > climate entrepreneurship	−.121	.030	3.904***	.000	−.177	−.061	Supported

This is the level of significance.

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Chinese ETS and CE is negative and significant (β = −.121, t-value = 3.904, and p-value = .000). This result shows that attitude of organizations toward the ETS also controls the climatic changes as the more the attitude goes higher, the climatic effect will get more controlled, so this supports H3.

The structural equation model shows that R^2, which is known as the coefficient of determination, explains the overall explanatory power of the constructs in PLS-SEM. R2 is categorized in three forms, that is, significant, moderate, and weak, with the values of .60, .33, and .19, respectively. As shown in Figure 3, related to the t-values, R^2 is .597 for the latent constructs, that is, CE, OP, CMP, and attitude of Chinese firms. Therefore, it is explained that exogenous variables have a significant impact on the endogenous construct. This study explains that the OP, CMP, and attitude of Chinese firms toward the ETS together have 60% of the variance in CE.

Discussion

Climate entrepreneurship and performances

There are three OPs, that is, operational, market, and environmental performances are related to the CE in this study. The study reveals the linkages between OP and CE. By maintaining and considering the performances of the organization, it makes an impact on climate change issues. The organizational main stake is to satisfy their customers, and customer satisfaction and flexibility relate to climate considerations. Organizations that worked for social responsibility received more attention than the underperformers. Market performance is related to market share, profit, or revenue policies mostly related to increasing these dimensions. The selected groups of organizations reveal that statistical significance is much stronger. There is a significant relationship between the OP and CE. The positive or negative effects have been shown by firm performances on CE, which supports the assumed H1. This result is based on some previous studies that indicate the relationship between OP and CE (Barnett and Salomon, 2012; Trumpp and Guenther, 2017).

Climate entrepreneurship and carbon management practice implementation

The implementation of the CMP depends on CE, and Table 3 shows the results of H2, which describes the significant relation between these two constructs. In general, this organizational group adopts the carbon management practice with the inclusion of low-carbon product development, low-carbon process improvement, employee engagement, external initiative participation, and supply chain co-operation. The results show a negative but significant relationship between these constructs so that H2 is not properly adopted or implemented. It could be costly for the organizations to change technology and initiate innovative synergy between production and carbon emission (Nejati et al., 2017). These selected groups of organizations are well aware of the perceived impact of climate change on their businesses. They find and grab the opportunities from the scenario of climate change. Their financial investment plans are inclined toward improving the process and working efficiently for the production of low-carbon products. Explorer organizations keenly contribute to global initiatives like the carbon disclosure project. Organizations try to engage customers, suppliers, and societal factors to get involved in the reduction of carbon emissions (Ageron et al., 2012).

Companies consider the impact of climate change in their decision-making process and engage their employees to integrate carbon management issues daily that will help the workforce to increase awareness. It helps employees to be educated and trained. This will tend to lead to an improvement in carbon management practice. Some barriers exist previously, and firms faced structural, cultural, and regulatory barriers in the past, but for now, the government of China takes initiative to adopt CMPs to contribute to GHG emission reduction. China has recently managed carbon practice and established some strong measures to focus on some specific fields like the chemical industry, construction industry, and energy sector. According to the results of this study, the selected groups of organizations contribute a lot in achieving CE through carbon management practicing. The results support the declaration of the proposed hypothesis, indicating that CE is related to the exploration, adoption, and implementation of CMPs.

Climate entrepreneurship and attitude toward the emissions trade scheme regulation

SEM provides very reliable results with the responses to the attitude of ETS policies and their relation with CE. These newly implemented regulations on the ETS in China have a great impact on CE. Table 3 shows the relation between forward-looking attitudes to adopt policies and CE. It shows that laggard between these two will affect the climate, and if these regulations of the ETS in China are enforced strictly and make the organizations bound to adopt and implement newly launched ETS policies, this will be beneficial for China and the whole world (Jiang and Ye, 2020). These selected organizations oppose setting up ETS policies. They argue that ETS policies are not implemented properly across the world. If they go with these policies, it would undermine competition with the global market (Swartz, 2016). These selected groups of firms have some challenges in conforming

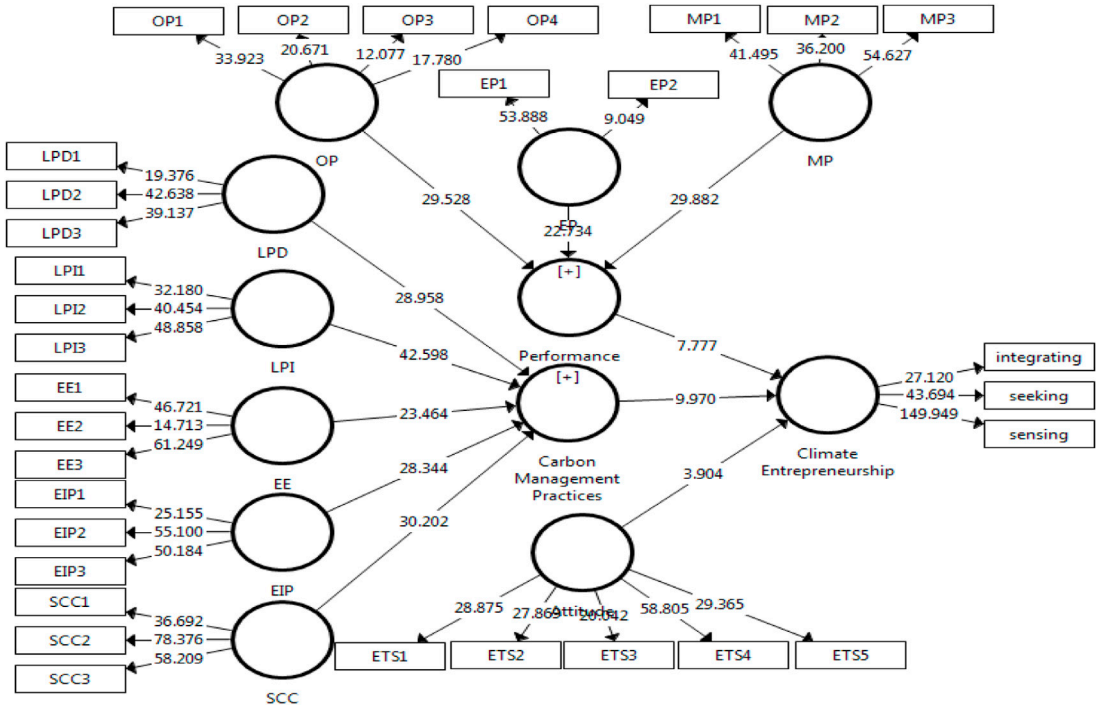

FIGURE 3
Model loadings with the t-values of variables.

to the new policies of the ETS. These results show partial support for H3, affirming that attitudes toward regulations of the ETS are related to CE.

Conclusion, suggestions, and limitations

By using the questionnaire survey of key informants of Chinese organizations, this study draws some interesting and realistic findings. The relation among OP, CMP, regulations, and CE is very strong and significant. These negative relationships show that organizations are not in favor of adopting modern technology, effective for carbon emissions, which is highly expensive and time-consuming, which will harm their profitability. The government needs to make strict policies for organizations and enforce policies that will effectively work for the society, country, and whole world. There is some delay in the Chinese ETS launch, which took more than 10 years to develop. China considers this policy as a tool to promote carbon emission reduction or decarbonization. This could be effective and helpful for the Chinese nation and the world. The Chinese ETS 2021 policy needs strong political support to achieve success, and this support could be driven from the cross-ministry collaboration it requires to make sure that the ETS will help China attain its climate goals.

Theoretical implications for this study, based on logical contributions, are now revealed. This is the first study that analyzes the climate entrepreneurship, that is, sensing, seeking and integrating of Chinese firms. In addition, the study also deployed the impact of three latent variables, that is, OP, CMP, and attitude on CE, in order to offer in-depth analysis. This study may provide the base for upcoming future studies on CE. The results of this current study support the natural resource-based view by the significant impact of latent variables on CE. This also suggested that working on all three latent variables may enable the Chinese firms to control the impact of climate change that affects the society, natural environment, and other stakeholders.

This study concludes by adopting a wide strategy from past exploration studies that selected organizations acquire technologies that better fit the organizational ability to improve CE. The CMP, OP, and attitude of organizations have different implications for emission extraction organizations. As the results show, investments on carbon management and firm's performances are keys to meeting the long-term needs of the society and the firms. The CMP, OP, and attitude of the firms will increase the managerial capability and utilize the resources to control climatic responses. This study proposed that emission-oriented activities are important for the growth and sustainability, and thus, it is an important thing to acquire these practices to achieve CE.

Limitation and future research

Limitations and some suggestions are stated as this study is based on a very specific area and is based on a newly developed concept. The results of this study point out policies related to carbon emissions and more information about OP and management practices that facilitate public awareness. This could help the public create pressure on organizations to decrease carbon emissions. This study is focused on four main factors of the climate change policy network, and the main focus is on OP, low-carbon management, attitudes toward climate change regulations, and CE. Many other possible factors were not included. The present study is focused on a limited sample size, which is based on only one province in the future. This could increase the sample size, and further longitudinal research will show a better understanding over time that how CE changes. Future research requires a vast circle of samples from small–medium enterprises, services, and other sectors. Meanwhile, focusing on the OP, CMP, and attitudes toward climate change regulations can also improve CE and make a positive contribution to controlling climate change. Other areas for the academia are to focus on green practices, how to control climate change effects, and how other sectors creatively strengthen process innovation and achieve green practices. The statistical results of this study are not enough in extracting significant conclusion in futuristic approach, and data samples should be large enough to apply more complex statistical techniques that will make authors get more relevant results.

Data availability statement

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the participants was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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