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Corporate environmental commitment and financial performance: Moderating effects of marketing and operations capabilities

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ABSTRACT

Previous studies linking corporate environmental initiatives with financial performance primarily have focused on main effects and generated inconsistent findings, offering an incomplete understanding of this relationship and potential contingency factors. This study examines whether marketing and operations capabilities enhance the financial effects of corporate environmental commitment (CEC). Analyses of a large panel data sample reveal that CEC can improve both near-term profitability and forward-looking value for firms with strong marketing capability. In contrast, operations capability only moderates the impact of CEC on firm value. In addition, this study reveals a bidirectional relationship between CEC and firm performance and finds that a firm's slack resource (short-term profitability) and marketing capability serve as antecedents of CEC. These findings suggest unique implications for marketing managers, chief executives, investors, and policy makers.

1. Introduction

Companies can no longer develop their strategies based on assumptions of inexhaustible natural resources (Kotler, 2011). Ignorance of environmental imperatives can lead to severe consequences such as tarnished brand reputation, hefty fines, and litigation costs. Advocates of sustainable corporate practices are found among non-equity stakeholders and investors alike. However, not every corporate executive is entirely convinced that the benefits of corporate environmental commitment (hereafter, "CEC") exceed its costs (e.g., Bansal, 2002). This management mentality is a common obstacle for the integration between sustainability and company activities (e.g., BSR/GlobeScan, 2013, p. 26).

Despite the importance of CEC–firm performance relationship, the current literature reveals limited and inconsistent results. Some studies suggest that environmental initiatives enhance firms' financial performance (e.g., Dowell, Hart, & Yeung, 2000; Russo & Fouts, 1997), whereas other studies find that the impact of sustainability emphases on firms' performance is either neutral (e.g., Gilley, Worrell, Davidson, & El-Jelly, 2000; Jayachandran, Kalaignanam, & Eilert, 2013) or negative (e.g., Cordeiro & Sarkis, 1997; López, Garcia, & Rodriguez, 2007). Such mixed findings suggest that this relationship could be contingent and motivate us to explore important moderators that have been ignored within the existing literature. Using a large sample of panel secondary data on S&P 500 companies over five years, we find that firms' functional capabilities (i.e., marketing and operations capabilities) moderate the relationship between CEC and financial performance and that such moderating effects are asymmetric with regard to short- versus long-term outcomes. In addition, we examine the recursive relationship between CEC and firm performance, demonstrating how firms' financial gains (or losses) and functional capabilities drive CEC in the next period.

2. Literature review

Previous studies on corporate pro-environmental behaviors have focused on how firms attempt to address ecological problems in their business operations (e.g., Bansal & Clelland, 2004; Dangelico, Pujari, & Pontrandolfo, 2017; Jayachandran et al., 2013). In line with this literature, we define CEC as the extent to which a company integrates ecological issues into its business strategy to reduce the harmful effects of its business-related activities on the natural environment. The extant research has generated mixed results regarding the impact of CEC on firm performance (see Table 1), which may be attributed to two main causes. First, CEC can generate differential effects on firm performance when the relative timing of benefits is taken into consideration. An integration between CEC and business strategy often requires firms to make a substantial short- and long-term investment (Brammer &

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Table 1
Examples of CEC and firm performance studies.

CEC-FP relationship	Study	Operationalization		Selected findings
		CEC	Firm performance	
Positive	Clarkson, Li, Richardson, & Vasvari, 2011	Inverse of toxics release (relative score, within industry and year)	ROA (relative score)	Positive association between environmental protection and subsequent financial performances
	Dowell et al., 2000	Use data from IRRC to determine the degree to which a company adheres to environmental standard	Tobin's Q	Positive association between adoption of strict global environmental standard and firm value
	Klassen & McLaughlin, 1996	Announcements of strong (positive events) or weak (negative events) corporate environmental performance	Stock returns	Positive association between stock returns and positive environmental performance
	Russo & Fouts, 1997	Inverse of environmental scores rated by Franklin Research & Development Corp.	ROA	Positive association between CEC and firm performance
	Zhu & Sarkis, 2004	Firms' internal environmental management, external green supply chain management, investment recovery (e.g., scrap and used materials sale), and eco-design	Operational financial performance	Positive connection between environmental initiatives and operational financial performance
Mixed or neutral	Gilley et al., 2000	Announcements regarding corporate environmental initiatives; product vs. process-driven announcements	Stock returns	Corporate environmental initiatives have no overall effect on financial performance. Product-driven environmental initiatives generate more positive returns.
	Jayachandran et al., 2013	Use KLD data to measure the degree to which a firm attempts to avoid environmental pollution (strength) or violates environmental norms (weakness)	Tobin's Q	The impact of environmental outcomes on firm performance is neutral.
	King & Lenox, 2002	Waste prevention and onsite waste treatment derived from total toxic waste produced by firms	ROA and Tobin's Q	Only waste prevention improves firm performance.
	Klassen & Whybark, 1999	Construct pollution prevention and control indices using data from plant managers' perception of resources (capital, operation, and managerial) allocated across different environmental technology	Manufacturing plant performance relative to competitors	Positive association between pollution prevention and performance (cost, speed, flexibility, and on time delivery). Moderate negative association between pollution control and performance (cost, speed, and flexibility).
	Leonidou, Katsikeas, & Morgan, 2013	Green marketing mix programs (4Ps) that reflect, encourage, and/or emphasize environmental responsibility	ROA; product-market performance (sales volume & growth, market share	Green pricing and promotion programs have positive impact on ROA but no impact on product-market performance. Green product and distribution programs have no significant effects on ROA but positive effects on product-market performance.
Negative	Cordeiro & Sarkis, 1997	Environmental proactivisim (i.e., differences of a company's total waste generated and total release divided by sales)	Forecasted earnings per share	Environmental proactivism negatively affects firm performance.
	López et al., 2007	Whether a firm included in DJSI (1) vs. DJGI (0)	Growth of pre-tax profits	Negative association between sustainability and firm performance

Millington, 2008; Hart, 1995). Therefore, it is meaningful to study both current-term profits and long-term performance as outcomes.

Second, the link between CEC and firm performance may have been oversimplified. Firms are under simultaneous pressure to improve environmental performance and excel financially. However, greater CEC often requires firms to reinvent their operations, strategies (e.g., product, pricing, distribution, and promotional practices), and business models (Dangelico et al., 2017; Hart, 1995; Kotler, 2011). Not every firm can succeed in this process. Therefore, the CEC-firm performance relationship may be contingent upon previously unmodeled firm-specific factors.

A notable effort to probe complexities behind the corporate social responsibility (CSR)-firm performance relationship is found in Surroca, Tribó, and Waddock (2010), which focused on the indirect effect of CSR on Tobin's Q via the mediating role of intangible resources (e.g., culture, reputation). In contrast, we take a different perspective by unveiling unique moderators (instead of mediators) and by comparing short-term and long-term performance implications.

3. Theory and hypothesis

Environmental imperatives present both challenges and opportunities. The resource-based view (RBV) holds that a company is a combination of resources and capabilities, whereby capabilities refer to a firm's ability to efficiently deploy relevant resources (input) to achieve desirable goals (output) (Amit & Schoemaker, 1993). An extension of the RBV to CEC suggests that a firm with capabilities to better leverage its environmental efforts is likely to achieve greater financial outcomes. In particular, CEC-related activities affect both revenue and cost (Klassen & McLaughlin, 1996; Lloret, 2016). Because marketing and operations are two fundamental functions that directly influence revenue and cost (e.g., Narasimhan, Rajiv, & Dutta, 2006), the variation in these capabilities across firms may explain the heterogeneous effects of CEC on firm performance.

Prior studies on CSR suggest that its relationship to firm performance may be bidirectional and recursive (Surroca et al., 2010). On the one hand, CSR potentially enhances firm financial performance; on the other hand, financially successful companies have slack resources available to support socially responsible activities (Waddock & Graves, 1997). Extending this idea, we propose that firms with greater financial slack are more likely to embrace CEC. Moreover, firms can be predisposed to integrate proper environmental initiatives into their marketing and operations ahead of competitors if they foresee the need (Varadarajan, 2015) or are better able to do so. Hence, we expect stronger CEC in firms with superior marketing and operations capabilities. Our theoretical model is depicted in Fig. 1.

3.1. Forward model: impact of CEC on firm performance

3.1.1. Moderating role of marketing capability (MC)

Firms with CEC may gain additional revenue growth *potential* by offering green products to eco-conscious customers at premium prices (Leonidou et al., 2013). However, the literature highlights the complexity of consumer preference for, purchase of, and use of green products (e.g., Kronrod, Grinstein, & Wathieu, 2012; Lin & Chang, 2012). For instance, Luchs, Naylor, Irwin, and Raghunathan (2010) suggest that an emphasis on an inappropriate association between sustainability and product attribute has an adverse effect on consumer preferences for eco-friendly products. In terms of pricing, an excessive premium may backfire, whereas too little is insufficient to cover sustainability costs (Miremadi, Musso, & Weihe, 2012). Furthermore, consumer perceptions of environmental and social responsibilities differ from one region to another (e.g., Palma & Visser, 2012), escalating the challenge of incorporating CEC into product offerings.

We expect MC to enhance the financial benefits of CEC by enabling efficient integration of CEC within the marketing strategy. MC is a firm's efficiency in deploying relevant resources to maximize marketing performance (Dutta, Narasimhan, & Rajiv, 1999). Such efficiency requires company excellence in identifying consumer needs and the factors driving consumer behavior, which leads to superiority in targeting and positioning (Vorhies & Morgan, 2005; Xiong & Bharadwaj, 2013). Firms with strong MC understand latent demand and are able to better segment the market, to select appropriate targets, and to generate well-constructed customer profiles (e.g., Xiong & Bharadwaj, 2013). Hence, they can incorporate CEC initiatives into marketing mixes effectively by developing environmental friendly products, packages, and brands that appeal to the right target market; placing green products in appropriate channels; and building communication strategies around sensible green impressions. Such firms can utilize their market intelligence to locate price-insensitive customers and to achieve a greater margin (Morgan, Slotegraaf, & Vorhies, 2009). Finally, MC helps firms enhance customer attitudes and reduce perceived risks associated with new green products, leading to higher purchase likelihood, faster adoption, and even a higher margin in the near term. Taken together,

H1. When MC is high, the effect of CEC on short-term profitability is more positive.

MC may also enhance the long-term benefit of CEC through improved brand equity and customer loyalty. CEC is a potential source for building brand equity (Ko, Hwang, & Kim, 2013; Menon & Menon, 1997). Central to brand equity is the favorability and strength of brand associations in consumers' memory, which influences the success of marketing programs in a long run (Keller, 1993). A firm with strong MC can gain customer insights regarding environmental concerns and leverage such insights to incorporate CEC into product development and marketing communications, building a favorable brand association and enhancing the brand image. A strong brand image leads to consumer loyalty, repeated purchases, and adoption of the brand's future offerings, resulting in higher and less volatile future cash flows in the long term (i.e., greater customer lifetime value) and, hence, the firm's stock market value. In addition, strong MC helps firms better communicate with consumers, investors, and other stakeholders (Xiong & Bharadwaj, 2013). CEC can solicit stakeholders' positive responses and, thus, potentially support firms' core activities (Jayachandran et al., 2013). If communicated properly, CEC initiatives enhance a corporation's reputation among various stakeholders (Menon & Menon, 1997; Peloza, Loock, Cerruti, & Muyot, 2012). A good reputation helps a firm achieve better social compliance, enhancing long-term efficiency in such marketing activities as public relations and publicity. Taken together, we propose that:

H2. When MC is high, the effect of CEC on long-term firm performance is more positive.

3.1.2. Moderating role of operations capability (OC)

A firm's OC refers to its ability to manage complex sourcing and assembly of materials and components and, thus, enables a firm to efficiently utilize its operations resources to minimize production cost (Dutta et al., 1999; Tan, Kannan, & Narasimhan, 2007). In contrast to the moderating role of MC (i.e., enhancing positive responses from *external* stakeholders, such as customers and investors), the positive interaction between OC and CEC mostly influences the *internal* production process.

CEC may provide opportunities for firms to improve their production processes. However, it can be challenging to successfully incorporate sustainability elements into a complex set of operational tasks. Eco-conscious operations management consists of control and prevention (Hart, 1995). The control approach emphasizes emission and waste reduction using end-of-pipe techniques, whereas the prevention strategy focuses on source reduction, which entails continuous operations learning and process innovation (King & Lenox, 2002; Porter & van der Linde, 1995). The control approach requires little-to-no

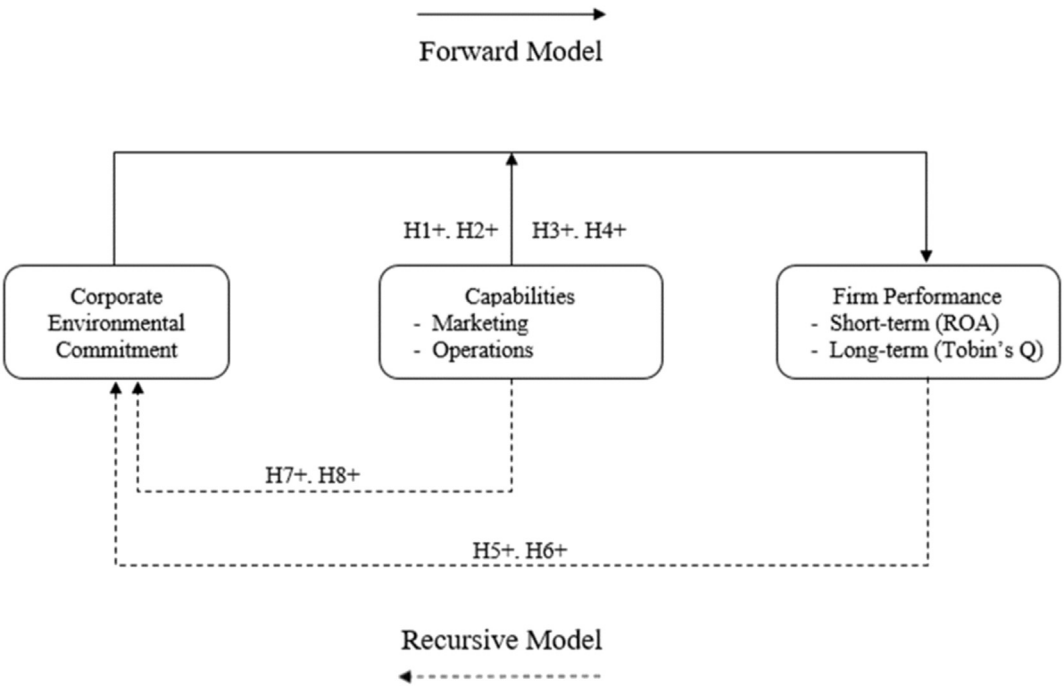

Fig. 1. Recursive relationship between CEC and firm performance.

alteration of the production process (e.g., Klassen & Whybark, 1999) and can produce immediate results. However, firms may incur substantial expenses (e.g., Hart, 1995). Firms with greater OC may enhance the efficiency and minimize the costs of a control approach by better prioritizing and coordinating various pollution treatments and increasing economic values of the by-product wastes. Consequently,

H3. When OC is high, the effect of CEC on short-term profitability is more positive.

The prevention approach, on the other hand, requires substantial modifications of manufacturing process and changes in product design to reduce pollution and waste (e.g., King & Lenox, 2001; Klassen & Whybark, 1999). It embodies greater uncertainty and takes longer time to produce results and, thus, influences long-term firm performance. Pollution also indicates shortcomings in product design and manufacturing process that may require operational rearrangement (Porter & van der Linde, 1995). Such reconfiguration calls for adoption of new technologies (Russo & Fouts, 1997). Firms with superior OC better acquire new technological know-how and apply them to new operating arrangements (Anand, Ward, Tatikonda, & Schilling, 2009; Peng, Schroeder, & Shah, 2008). Such capability can reduce the chance of failure in the reconfiguration process and engenders new and improved means of production, leading to reduced pollution and cost savings in the long run. In fact, Christmann (2000) suggests that firms with "capabilities for process innovation and implementation" can gain cost advantage from their environmental management (p. 669). Moreover, strong OC facilitates continuous operational process improvement in the long run. In sum, strong OC helps reduce long-term operations costs (thus free up future cash flows) and the risk of future operational failure following the change to green practice (thus lower volatility of future cash flows). Therefore,

H4. When OC is high, the effect of CEC on long-term firm performance is more positive.

3.2. Recursive model: firm performance and capabilities as drivers of CEC

3.2.1. Financial slack

Corporate environmental initiatives can be costly and risky endeavors (Peloza et al., 2012). Slack resources facilitate firms' strategic initiatives, experimentation, and suboptimal actions (Bourgeois, 1981). In this regard, profitable firms have a greater tendency to commit to sustainable operations, regardless of the relative timing of returns on CEC-related investment (i.e., suboptimal). Resource-affluent firms can afford discretionary expenses to advance their good corporate citizenship (e.g., Seifert, Morris, & Bartkus, 2004). Stakeholders and the public are more likely to expect financially successful companies to behave responsibly. As the availability of financial slack is proportionate to both short-term profitability and long-term performance, we expect that:

H5. A firm's short-term profitability is positively associated with its level of CEC.

H6. A firm's long-term performance is positively associated with its level of CEC.

3.2.2. Capabilities

Firms with superior MC continually develop marketing intelligence and, thus, can anticipate and respond to changes in customer needs, markets, and technologies in a timely manner (Dutta et al., 1999). In recent years, environmental awareness and the influence of eco-conscious concepts on consumer perceptions and purchases have been increasing (CDP, 2008). Firms with strong MC can identify such trends and take relevant actions ahead of their competitors. Moreover, they can better utilize consumer intelligence to differentiate and to position their brands or product offerings. Therefore, they are more confident about converting CEC into successful new green products that meet emerging consumer needs or incorporating green elements in existing products that enhance customer satisfaction. This positive prospect encourages a greater degree of environmental commitment. In contrast, firms lacking MC are likely to perceive CEC as a challenge rather than an opportunity. Consequently,

H7. A firm's MC is positively associated with its level of CEC.

Firms with strong OC engage in "search routines" and continuously seek improvements in production by refining existing procedures and learning new ones (Peng et al., 2008, p. 731). Such firms are less reluctant to switch to sustainable practices because they are experienced in adjusting their operations to new requirements. Moreover, firms with superior OC are active learners of operating environments (e.g., Dutta et al., 1999) and, thus, more likely to adopt new know-how that enhances operations efficiency and reduces pollution. On the contrary, it can be costly and risky for firms without strong OC to switch to "greener" production due to their low efficiency in acquiring know-how and leveraging resources. As a result,

H8. A firm's OC is positively associated with its level of CEC.

4. Methodology

4.1. Data, measures, and empirical models

Climate change is a widely recognized environmental concern caused by the emission of anthropogenic greenhouse gases such as carbon dioxide (e.g., IPCC, 2007, 2013). Inter-government collaboration and intensive media coverage have raised consumers' awareness of carbon emission effects on their daily lives. Stock market analysts increasingly consider carbon emissions when assessing firms (Eccles, Serafeim, & Krzus, 2011). As a result, firms have started exploring carbon labeling, develop clean technology, and introduce green products. Hence, we focus on corporate carbon emission in this study.

We compiled our sample based on the S&P 500 firms listed in the Carbon Disclosure Project (CDP, www.cdp.net). This data source has been used in several studies (e.g., Lewis, Walls, & Dowell, 2014; Matsumura, Prakash, & Vera-Muñoz, 2014). CDP maintains one of the most comprehensive collections of self-reported carbon-related activities i.e., 82% of S&P 500 firms respond to CDP surveys (Winston, 2010). We hand-collected data from CDP S&P 500 reports from 2008 to 2012 and combined it with other firm-level data from COMPUSTAT. After eliminating missing data, the final sample is an unbalanced panel of 376 firms with 1197 firm-year observations. We used CDP disclosure scores to represent CEC. CDP surveys inquired about management's perceptions of risks/opportunities presented to the firm by climate change and carbon emissions measuring as well as about corporate strategy capitalizing on such opportunities and minimizing the associated risks. Based on the responses, a carbon disclosure score (100-point normalized scale) was assigned to each firm. A high score (> 70) indicates that "senior management understands the business issues related to climate change and building climate related risks and opportunities into core business" (CDP, 2011, p. 21). This score does not reflect carbon emission reduction achievements and, thus, avoids an upward bias toward carbon-intensive industries. A validating variable was constructed by manually coding the companies' responses to the 2008 and 2010 CDP surveys. We selected these years because there was a change in the structure of the CDP questionnaire in 2010. The variable was coded using companies' responses to three groups of questions that assess their (1) identification of opportunities (general business opportunities and opportunities for new products) from climate change (questions 1b-i, 1b-ii, 1b-iii, 1b-iv, and 1b-v from 2008 and questions 6.1, 6.2A/B, 6.4, 6.5, and 6.6 from 2010 surveys), (2) plan/target and actions to lower GHG emissions (questions 3a-i and 3a-iv from 2008 and questions 9.2 and 9.7 from 2010 surveys), and (3) communication with stakeholders concerning the issues related to climate change and sustainability (questions 4c-i, 4c-ii, and 4c-iii from 2008 and questions 22.1, 22.2, and 22.3 from 2010 surveys). These questions capture firms' commitment to environmental sustainability in various aspects of business strategy. Each firm's scores from each group of questions were combined and rescaled between zero and one, creating three indicators. The three indictors converge into a single factor, and the correlation between the factor's composite scores and the disclosure score is highly significant (0.642, $p = 0.000$, $N = 557$), indicating construct and content validities.

We followed the literature to measure MC and OC using the stochastic frontier model. MC can be assessed using an input-output model that measures a firm's efficiency to deploy its marketing resources to maximize sales revenue (Dutta et al., 1999; Xiong & Bharadwaj, 2013). This approach directly builds on the resource-based view that firm capability represents the ability to efficiently utilize relevant resources/inputs to generate desired outputs (Amit & Schoemaker, 1993). We used the firm's sales, general and administrative expenses (SGA), and receivables as proxies for marketing resources/efforts dedicated to building awareness, encouraging favorable product impressions, and facilitating customer relationships while controlling for market conditions using two-digit Global Industry Classification Standard (GICS) codes. Since resources from previous years could influence current revenue, we used a Koyck lag function with higher weighting on more recent years to derive measures of SGA stock and receivable stock. We then used these stock variables as inputs. We derived the MC measure based on the maximum likelihood estimate of the inefficiency and rescaled the measure between 0 and 1000, representing lowest and highest MC, respectively.

OC can be assessed using a cost frontier function, which measures the minimal level of production cost achievable given the amount of resources (see Dutta et al., 1999). We used the stocks of labor cost (based on pensions and retirement benefits as well as on wages and benefits for a robustness check; both measures yield consistent estimates of OC with a correlation of 0.99), firm total assets (as they are the means of production), and capital cost (based on interest expenses divided by long-term debt) as the input variables. We controlled for market conditions using dummies based on two-digit GICS codes. Similar to the measure of MC, we rescaled the maximum likelihood estimate of the inefficiency to measure OC.

Short-term profitability is represented by return on assets or ROA (net income divided by total assets). Tobin's Q (TQ) is the proxy for long-term performance because it integrates multiple performance dimensions (e.g., amount, speed, and volatility of future cash flows) and is inherently forward looking and risk adjusted. TQ was estimated using the approach suggested in the financial literature (Chung & Pruitt, 1994). For ease of interpreting the results, we multiplied TQ by a hundred and ROA by a thousand.

We included the following control variables for the forward models (ROA or TQ as dependent variable or DV). First, we controlled for R&D intensity (RD = the ratio of R&D expenditure to sales) because it influences current-term profits and tangible/intangible firm assets (Peterson & Jeong, 2010). Second, we followed Dotzel, Shankar, and Berry (2013) by controlling for firm net cash flows from operating activities deflated by total assets (OCF). For ease of interpretation, we multiplied RD and OCF by a thousand to make their scales comparable to those of MC and OC. Third, for the long-term performance equation (TQ as DV), we additionally controlled for firm experience in carbon disclosure, i.e., a dummy variable indicating whether the firm participated in a previous year's CDP survey (PCDP), which could affect the completeness of its current year disclosure and investor perception. We also included the firm's global focus (GLOBAL, a dummy variable with the value 1 if the firm reports foreign income) because it may affect long-term growth and performance. Finally, we controlled for firm liquidity (LIQ, current assets divided by current liabilities), which could influence stock performance (Tuli & Bharadwaj, 2009).

For the recursive model, we controlled for firm size (FS, a natural log of total assets) and ecoharzard (ECH, a natural log of each company's total GHG emission disclosed in CDP reports), which can determine the saliency of environmental imperatives and, thus, CEC (Sadovnikova & Pujari, 2017; Varadarajan, 2015). We included the debt ratio (DRATIO, the total debt deflated by total asset) because financial

Table 2
Descriptive statistics.

Panel A. Mean and standard deviation (panel data)

	Variable	Mean	Standard deviation		
			Overall	Between	Within
1	CEC	59.27	22.22	20.33	12.20
2	Marketing capability	53.68	77.17	76.08	3.37
3	Operations capability	101.52	134.29	135.32	0.93
4	Tobin's Q	1.23	0.95	0.85	0.40
5	Return on assets	0.05	0.08	0.06	0.06
6	Total assets	54.76	200.48	196.88	16.16
7	Debt/asset ratio	0.62	0.23	0.22	0.06
8	Global focus	0.72	0.45	0.44	0.10
9	R&D intensity	0.03	0.06	0.06	0.02
10	Operating cash flow/total assets	0.11	0.07	0.06	0.03
11	Ecoharzard	7.72	20.67	18.40	3.88
12	Liquidity	1.05	1.23	0.85	0.96
13	Prior carbon disclosure participation	0.87	0.33	0.30	0.26

Note: Variables 2 and 3 are stochastic frontier estimates rescaled to be between 0 and 1000. Variable 6 and 11 are reported in billion and million, respectively. Other variables are reported in their original scales.

Panel B. Correlation matrix

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	CEC												
2	Marketing capability	**0.18**											
3	Operations capability	− 0.02	**0.39**										
4	Tobin's Q	0.01	**− 0.11**	0.04									
5	Return on assets	0.01	− 0.01	0.04	**0.51**								
6	Total assets	**0.14**	**0.37**	**− 0.07**	**− 0.19**	**− 0.09**							
7	Debt/Asset ratio	**0.07**	**0.21**	0.04	**− 0.23**	**− 0.24**	**0.22**						
8	Global focus	− 0.02	**− 0.05**	**0.09**	**0.23**	**0.18**	**− 0.11**	**− 0.22**					
9	R&D intensity	**0.07**	**− 0.16**	**− 0.20**	**0.23**	**0.05**	**− 0.08**	**− 0.31**	**0.28**				
10	Operating cash flow/total assets	− 0.01	**− 0.08**	**0.07**	**0.66**	**0.56**	**− 0.20**	**− 0.30**	**0.25**	**0.19**			
11	Ecoharzard	− 0.05	**0.29**	**0.13**	**− 0.13**	− 0.02	0.00	0.05	**− 0.26**	**− 0.17**	**− 0.08**		
12	Liquidity	**− 0.16**	**− 0.14**	**− 0.07**	**0.18**	**0.15**	**− 0.12**	**− 0.38**	**0.17**	**0.32**	**0.24**	**− 0.09**	
13	Prior carbon disclosure participation	**0.21**	**0.10**	− 0.04	− 0.02	0.03	**0.06**	0.03	0.01	0.04	− 0.01	0.03	− 0.04

Note: The correlation coefficients reported in bold are significant at 5% level.

leverage influences firm resource allocation, and debt holders can monitor firm spending (e.g., Leftwich, Watts, & Zimmerman, 1981). Finally, we included GLOBAL because firms operating internationally, especially in emerging markets, experience greater pressure to be socially responsible (Dhaliwal, Li, Tsang, & Yang, 2011). Table 2 reports descriptive statistics of the variables.

The forward model is specified as:

$$DV_{it} = \beta_0 + \beta_1 CEC_{it-1} + \beta_2 MC_{it-1} + \beta_3 OC_{it-1} + \beta_4 CEC_{it-1} \times MC_{it-1} + \beta_5 CEC_{it-1} \times OC_{it-1} + \zeta' CTF_{it-1} + u_i + v_{it},$$

where DV is ROA or TQ and CTF_{it-1} represents a vector of control variables specified earlier. We focused on the effects of the interaction terms to test H1 to H4. To test hypotheses H5 to H8, we specify the recursive model as:

$$CEC_{it} = \alpha_0 + \alpha_1 ROA_{it-1} + \alpha_2 TQ_{it-1} + \alpha_3 MC_{it-1} + \alpha_4 OC_{it-1} + \gamma' CTR_{it-1} + u_i + v_{it},$$

where CTR_{it-1} is a vector of control variables for the recursive model. In both equations, the capability variables and interaction terms were mean-centered; u_i represents unobservable firm-specific time-invariant factors and v_{it} is the error term. We estimated fixed-effects models to account for the unobserved heterogeneity across firms. The explanatory variables were lagged by one year to ensure the time order of cause and effect.

5. Results

For the forward model (Panel A, Table 3), CEC negatively influences ROA ($\beta_1 = -0.227$, $p < 0.10$), but this negative impact is mitigated by MC ($\beta_4 = 0.006$, $p < 0.01$), supporting H1. However, H3 is not supported because the moderating effect of OC is insignificant ($\beta_5 = -0.000$, $p > 0.10$). For long-term performance (Panel B), CEC has no significant main effect ($\beta_1 = -0.075$, $p > 0.10$). However, its interaction effects with MC ($\beta_4 = 0.003$, $p < 0.05$) and OC ($\beta_5 = 0.001$, $p < 0.10$) are both significant and positive. Hence, H2 and H4 are supported. For the recursive model (Panel C), ROA significantly predicts CEC ($\alpha_1 = 0.023$, $p < 0.01$, supporting H5) but TQ does not ($\alpha_2 = 0.015$, $p > 0.10$, failing to support H6). In support of H7, MC has a positive and significant coefficient ($\alpha_3 = 1.430$, $p < 0.01$). However, OC does not exhibit a significant effect on CEC ($\alpha_4 = -0.679$, $p > 0.10$). Hence, H8 is not supported.

To interpret interaction effects, we compute the percentage changes in financial performance as CEC increases for firms with strong versus average MC. Specifically, for firms with strong MC (1 standard deviation or SD above the mean), one unit (SD) of increase in CEC could lead to a 10% increase in ROA (relative to sample mean). Similarly, for firms with strong MC, one unit of increase in CEC could lead to a 2.8% increase in TQ.

Finally, to ensure that the results are not biased by potential endogeneity, we re-estimated the forward model using the GMM approach proposed by Arellano and Bond (1991) for a robustness check (see also Narasimhan et al., 2006; Tuli, Bharadwaj, & Kohli, 2010). We conducted an AR(2) test and Sargan tests to ensure the validity of the instruments and found consistent results.

6. Discussion

6.1. Theoretical contributions

We demonstrate important and novel roles of MC overlooked by the literature. Specifically, MC is not only a key driver of CEC but also a moderator that enhances its financial benefits in both the short- and long-run. The vast majority of the marketing-finance literature has focused on the main effects of marketing assets on firm performance (e.g., McAlister, Srinivasan, & Kim, 2007; Mizik & Jacobson, 2003). Only recently have researchers started to examine the contingency roles of marketing variables (e.g., Srinivasan, Pauwels, Silva-Risso, & Hanssens, 2009; Xiong & Bharadwaj, 2013). Our study adds to this emerging stream of research by showing how MC moderates the financial effect of CEC.

This study adds unique insights to the literature on corporate sustainability. First, we systematically examine the determinants of CEC and show that, besides being forced to make compliance efforts, firms with stronger MC are more willing to make an environmental commitment because they are more confident in materializing green initiatives into successful products. However, we do not find a significant effect of OC. MC helps firms develop relationships with and learn from stakeholders, especially customers, thus enabling them to identify an early trend and respond to it appropriately (Krasnikov & Jayachandran, 2008). This notion perhaps underscores the dominant role of MC in driving CEC. In addition, we find that firms primarily determine the level of their CEC on immediately available slack resources (past-term profits) instead of Tobin's Q.

Second, existing studies have mostly focused on the direct main effects of CEC and provided mixed findings about the impact of CEC on firm profitability. As an exception, Surroca et al. (2010) studied how intangible resources (e.g., culture, reputation and innovation) *mediate* the financial impact of CSR. Our study takes a different angle and shows that inconsistent findings in the literature may be explained by key *moderators* that had been ignored by prior research. Moreover, this study is distinguished from previous studies (e.g., Mishra & Modi, 2016; Surroca et al., 2010) by directly comparing and contrasting (1) the effects on near-term accounting profit versus Tobin's Q (forward-looking measure of firm value capturing long-run performance) and (2) the roles of MC versus OC. It is crucial to understand the short-run versus long-run performance implications because sustainability-related decisions involve strategic tradeoffs that affect a variety of internal and external stakeholders who focus on various time horizons (e.g., while CEC may provide longer-run benefits demanded by certain stakeholders, pressure from shareholders often forces managers to adopt a myopic perspective to ensure short-run profits). Our findings reveal that MC helps firms extract accounting profits from environmental commitments. Moreover, by showing the positive interaction effect between a firm's functional capabilities and its CEC on Tobin's Q, we resolve a conundrum that prior research faced i.e., despite the significant investments involved, CEC does not have a significant impact on a firm's value.

Also importantly, our findings indicate the asymmetric moderating roles of MC versus OC on the financial effects of CEC. Specifically, MC enhances both short- and long-term financial benefits of CEC. In contrast, the interaction between CEC and OC enhances firm value but not its short-term profitability. This may be attributed to the high initial investment required to implement costly and nonproductive contamination control technology (Hart, 1995). To significantly mitigate this impact on short-term profits, mere cost reduction (enabled by OC) seems insufficient. Instead, additional revenue generation (enabled by MC) is needed to recoup such high initial costs. However, such investment may help reduce operational costs in future periods, thus enhancing long-term performance.

Finally, this study adds distinct evidence to the literature about the relative importance of the marketing function on firm performance. Some studies imply that firms who place greater emphasis on revenue expansion than on cost reduction can enjoy greater performance (Rust, Moorman, & Dickson, 2002). Our findings corroborate this notion by suggesting that coupling CEC with strong MC (rather than OC) leads to greater profitability.

6.2. Managerial implications

6.2.1. Implications for managers

Marketing managers face increasing pressure to justify the financial

Table 3
Results of forward and recursive model estimations.

Variable	*Model with main effects only*		*Model with interaction effects*	
	Coefficient	Standard error	Coefficient	Standard error
Panel A: Forward model (dependent variable: ROA_{it}, N = 1197)				
CEC_{it-1}	−0.189	0.120	−0.227*	0.123
MC_{it-1}	−0.204	0.618	−0.274	0.640
OC_{it-1}	3.489	2.696	2.725	3.400
$CEC_{it-1} \times MC_{it-1}$			0.006***	0.002
$CEC_{it-1} \times OC_{it-1}$			−0.000	0.001
RD_{it-1}	0.155	0.138	0.146	0.137
OCF_{it-1}	−0.018	0.049	−0.027	0.049
Panel B: Forward model (dependent variable: TQ_{it}, N = 1000)				
CEC_{it-1}	−0.082	0.083	−0.075	0.083
MC_{it-1}	0.371	0.476	0.481	0.509
OC_{it-1}	−0.700	1.833	−3.532	2.320
$CEC_{it-1} \times MC_{it-1}$			0.003**	0.002
$CEC_{it-1} \times OC_{it-1}$			0.001*	0.001
RD_{it-1}	0.191**	0.088	0.185**	0.088
OCF_{it-1}	0.063*	0.034	0.057*	0.034
LIQ_{it-1}	1.338	1.074	1.136	1.068
$GLOBAL_{it-1}$	0.128	0.158	0.119	0.157
$PCDP_{it-1}$	1.152	16.010	2.815	15.916

Note: p-values are based on two-tailed *t*-tests for main effect and control variables, and one-tailed *t*-tests for interaction effects.

Variable	Coefficient	Standard error
Panel C: Recursive model (dependent variable: CEC_{it}, N = 832)		
Slack		
TQ_{it-1}	0.015	0.015
ROA_{it-1}	0.023***	0.007
Capabilities		
MC_{it-1}	1.430***	0.157
OC_{it-1}	−0.679	0.800
Control		
FS_{it-1}	9.870***	2.678
ECH_{it-1}	1.324**	0.652
$DRATIO_{it-1}$	10.460	9.138
$GLOBAL_{it-1}$	0.043	0.044

Note: p-values are based on two-tailed *t*-tests.

* Significant at 0.10 level.
** Significant at 0.05 level.
*** Significant at 0.01 level.

contribution of marketing spending to shareholders and top management (Srinivasan et al., 2009; Xiong & Bharadwaj, 2013). According to recent surveys (Graham, Harvey, & Rajgopal, 2005), CFOs indicate that marketing expenditures are among the first to be cut to meet earnings targets. Our findings can help marketing managers justify the financial benefit of marketing investments. Although it may require substantial investments and time to build up MC, we show that it pays off financially (by enhancing both profitability and firm value), especially when firms make sustainability commitments.

This study also demonstrates the asymmetric effects of CEC-capability interactions on short-term versus long-term performance. For instance, although OC does not help enhance the contribution of CEC to short-term performance, it has a significant moderating effect on firm value in the long run. This suggests that managers should look beyond short-term financial outcomes when making strategic decisions regarding firm capability development. Otherwise, myopic decisions can be made at the cost of the firm's long-term performance.

6.2.2. Implications for top management

Top management is often concerned about the costs and risks associated with CEC and, thus, reluctant to make a sustainability commitment. Our findings suggest that the environmental initiatives of firms with superior marketing and OC can produce both immediate and long-term positive results. Therefore, such firms should not hesitate to take on green initiatives.

Firms have been conscious about disclosing information related to corporate sustainability (e.g., Bansal & Clelland, 2004; Dhaliwal et al., 2011). Since MC and OC enhance the stock market reaction to CEC, firms should consider pairing CEC-related information with information about their strong functional capabilities in conference calls to analysts and in statements to investors (instead of reporting CEC by itself) and increasing such voluntary disclosures to maximize firm value.

6.2.3. Implications for investors

Because the CEC level does not have a significant main effect on firm value (Tobin's Q), investors may not be able to construct stock portfolios for superior gains based on environmental commitments alone. With that said, our findings suggest that firms who excel in MC and OC tend to experience superior financial value as their CEC increases. Therefore, when making investment decisions, investors should *not* consider CEC in isolation of other firm-specific factors, especially marketing and operations capabilities.

6.2.4. Implications for policy makers

We identify and empirically test the antecedents of CEC in this study. Our findings can help public policy makers predict what kind of firms are more (or less) likely to make a sustainability commitment. We demonstrate that MC can be a strong predictor. The ability to identify firms' willingness to commit to sustainability enables policy makers to better adjust regulations to target less-motivated firms and to encourage them to engage in pro-environmental practices.

6.3. Limitations and directions for future research

Similar to the majority of studies in the marketing-finance interface (e.g., Srinivasan et al., 2009; Xiong & Bharadwaj, 2013), our sample only includes large, publicly-listed firms because financial data are not publicly available for private companies. Start-ups have potential to incorporate CEC from their early inceptions (e.g., Hall, Daneke, & Lenox, 2010) but they may lack established MC or OC (e.g., Xiong & Bharadwaj, 2011). A different set of factors could moderate the link between their CEC and firm performance and future research may find interesting insights by studying these firms. In addition, our study focuses on MC and OC because they are directly relevant to revenue improvement and cost containment. Researchers may also examine the roles of R&D capability, especially whether or how it can help transform CEC initiatives into innovations that enhance firm performance. Further, although we made multiple efforts to empirically account for endogeneity issues (by ensuring time sequence, ruling out alternative explanations with control variables and fixed-effect estimators that account for the unobserved heterogeneity across firms, and using the Arellano-Bond GMM approach), the focus of the study is to test the moderating roles—not causal inferences—of firm capabilities. Future studies can formally test the causality between CEC, firm capabilities, and financial performance using alternative empirical methods, such as field experiments. Finally, besides climate change, future research can investigate the financial effects of additional aspects of corporate sustainability, including human rights, poverty reduction, and water quality and availability (BSR/GlobeScan, 2017). We speculate that marketing capability may help firms capitalize most of these aspects by enhancing brand reputation, whereas the moderating role of operations capability may be limited to emission and pollution aspects of the production process (e.g., water quality).

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