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ORIGINAL PAPER

The Influence of Corporate Sustainability Officers on Performance

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Abstract
The creation of a specialized executive position that oversees sustainability activities represents a distinct shift in the structure of top management teams and their approach for addressing sustainability concerns. However, little is known about these management team members, namely the corporate sustainability officers or CSOs. We examine CSO appointments and their association with subsequent sustainability performance. Our results indicate that the creation of a CSO position may represent more of a symbolic versus substantive governance mechanism. Further tests suggest that CSO expertise and the firm's existing sustainability performance affect the association between the CSO and post-appointment sustainability performance. We find no association between CSO appointments and subsequent sustainability performance for firms that were already poor performers, while firms possessing relatively higher levels of prior sustainability performance appointing a CSO begin to experience significant improvements to performance after 3 years. We further find that CSOs with prior sustainability expertise are associated with increases in sustainability performance in firms that were already strong performers, but not in firms with poor sustainability performance. Non-expert CSOs, on the other hand, are associated with initial decreases in performance for poor performing firms, whereas better performing firms hiring non-expert CSOs are able to rely on other sustainability attributes of the firm and benefit from improvements in performance in the long term. We discuss the potential importance of these positions as it relates to symbolic versus substantive governance mechanisms through the lens of top management team literature streams.

Keywords Chief sustainability officer · CSO · Sustainability performance · CSO expertise

> "While others in the C-Suite may benefit most from their deep experience in operations, financial or marketing functions, for example, Chief Sustainability Officers have to stretch thinking and mold change around issues that often emerge from the less-studied intersections of internal business and external world" (Learned, 2014).

Introduction

Management attention to sustainability has become an integral part of the discussion concerning a firm's core operations.[1] This shift is mainly attributed to the incorporation of

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[1] Sustainability is an all-encompassing concept which includes both environmental and social initiatives and outcomes. For the purpose of our paper and our attempts to evaluate the role of the CSO and expertise, our focus on sustainability encompasses both environmental and social performance outcomes. Sustainability has become synonymous with other labels such as ESG and CSR. Prior research often examines sustainability as both environmental and social issues, or solely as environmental issues. We attempt to discuss both environmental and social aspect as sustainability issues, as they both fall under the sustainability umbrella. When prior research examines a specific aspect of sustainability, such as environmental performance, we refer to those results specifically as presented in the original work (e.g., environmental performance instead of sustainability performance).

firm-specific sustainability performance information into all types of decisions made by various stakeholders, including consumers (e.g., Servaes and Tamayo 2013), investors (e.g., Grewal et al. 2017; O'Neill 2016; PWC 2016, 2014; Kim et al. 2012; Neubaum and Zahra 2006; Gao et al. 2015; Eliopoulos et al. 2016), financial analysts (e.g., Dhaliwal et al. 2011, 2012; Gao et al. 2015; Lamy et al. 2016), NGO's, standard setters and regulators (SASB 2016; PWC 2016). Many of these stakeholders have expressed concerns about the ability of the traditional executive team to understand and incorporate sustainability into firm-specific strategy (Eliopoulos et al. 2016; Lamy et al. 2016; Cusak 2011; Langert 2015). While the chief executive officer (CEO) is generally focused on leading overall strategy and identifying market growth opportunities, and the chief financial officer (CFO) is well versed in financial risk and accounting matters (Eliopoulos et al. 2016), these roles do not necessarily facilitate attention to risks and opportunities as they relate to sustainability issues (O'Neill 2016). Increasingly, firms are recognizing the limitations of mainstream executives and are hiring corporate sustainability officers (hereafter, CSO) (Deutsch 2007; Galbraith 2009; Weinreb Group 2011, 2014).[2] Proponents of CSOs argue that possessing the knowledge and skills needed to overcome sustainability language barriers improves communication with external parties who have access to additional resources, facilitating sustainability performance improvements. However, it remains unclear under what conditions the appointment of a CSO reflects substantive sustainability commitments, or merely represents a symbolic governance mechanism.

Prior research documents large variation in strategies to address stakeholder sustainability concerns, including symbolic gestures devoid of any substantive contribution to sustainability performance. Typically, these studies attempt to understand management's actions as they relate to the firm's general environmental performance. For example, a growing body of literature investigates the mitigating nature of governance mechanisms and firm-level sustainability, namely environmental performance (e.g., Berrone and Gomez-Mejia 2009; De Villiers et al. 2011; Darnall et al. 2010; Kock et al. 2012; Rodrigue et al. 2013; Russo and Harrison 2005; Walls et al. 2012). However, we know very little about the outcomes associated with the appointment of executive roles within the top management team specifically dedicated to providing sustainability leadership in response to stakeholder concerns.

Prior research asserts the importance of senior leadership in setting an organization's ethical response to environmental and social expectations or pressures (e.g., Hemingway and Maclagan 2004; Walls and Berrone 2017). While prior literature has examined the role of the CEO in relation to the firm's strategic sustainability commitments, this literature assumes that the CEO is the individual formulating and implementing the firm's sustainability policies (Fabrizi et al. 2014; Waldman et al. 2006). Waldman et al. (2006) acknowledge that the CEO may not be the appropriate level of analysis for sustainability leadership and encourage future research to assess the role of leadership qualities at other levels of the top management team. This introduces the need to adopt an upper echelon view of the top management team when evaluating sustainability performance.

Eliopoulos et al. (2016) argue that a vast majority of CEOs focus on broad firm-specific opportunities which may or may not include sustainability, but often do not actually possess the appropriate understanding or expertise to address specific sustainability opportunities. Sustainability leadership requires broad knowledge of both business and the sustainability-related issues, not found on the resume of many corporate executives (Learned 2014; Weinreb Group 2014). Given the scant literature examining the performance implications of CSOs, our paper attempts to fill this void in the literature. Prior research finds that CSOs are appointed both proactively and reactively (Strand 2014), and that there is an association between CSOs within the top management team and a firm's representation on the Dow Jones Sustainability Index (DJSI) (Strand 2013). That is, it appears that the administrators of the DJSI consider the presence of CSOs on the top management team to be an important metric in the evaluation of a firm's sustainability capabilities. Given a lack understanding of the substantive roles of CSOs on firm performance, Strand (2014) calls on future research to investigate the roles of CSOs, and the relevancy of their backgrounds for firms' sustainability performance.

We answer these calls and propose that a likely factor distinguishing symbolic versus substantive CSO appointments is the sustainability-specific experience/expertise embodied by the individuals holding such positions. Upper echelon theory suggests that the functional backgrounds (including education, prior experience) of the top management team have implications for the strategic outcomes of the firm (e.g., Carpenter et al. 2004). Such personal traits can influence the decisions pursued by managers (e.g., Hambrick 2007) as well as the organizational response to the executive's efforts. For example, in order to implement long-lasting organizational change, leaders must be able to convince employees to work toward established goals (Kotter 1990) and employee support is heightened when a leader has credible experience and expertise. Sophisticated, long-term investors don't solely rely on sustainability information from third parties prior to investing, but spend a substantial amount of time researching firm-specific performance, including management credibility

[2] Examples of companies hiring CSOs include Dow Chemical, DuPont, General Electric, Tyson, SAP, AT&T, Georgia Pacific, Sun Microsystems, and Disney, among others.

with regard to sustainability (Eliopoulos et al. 2016). CSO credibility, along with an ability to communicate sustainability issues, is likely heightened by the sustainability experience/expertise they possess. Therefore, we expect that the appointment of CSOs with sustainability expertise is more likely to be associated with subsequent improvement in sustainability performance.

To address these issues, we examine the CSO appointments for a sample of 1768 firm-year observations (419 unique firms and 79 unique CSO appointments) over the 2002 to 2008 period. This time period is important as it reflects the initial stages of CSO adoption within top management team structures. To isolate the association between sustainability performance and CSO appointments, we utilize a sample of firms for which we can identify the *initial* appointment of the CSO. This identification strategy allows us to cleanly isolate changes in sustainability performance conditional on the appointment of the top management responsible for sustainability performance. On average, we do not find that CSO appointments are associated with increases in subsequent sustainability performance. However, our results are consistent with subsequent performance being contingent on both the existing sustainability performance setting in which CSOs are hired and the CSO's prior sustainability-related expertise. While overall firms do not experience better performance after hiring a CSO, appointments among better performing firms are associated with improvements in subsequent performance after 3 years. With respect to expertise, while we find no association with improved performance when firms hire an expert CSO, on average, we find decreasing performance when firms hire a non-expert CSO. Further, firms with stronger sustainability performance at the time the CSO joined the firm, experienced an improvement in performance after the appointment of a CSO with *sustainability expertise,* but only after 4 years, indicative of the difficulty of CSOs in influencing performance in firms with already established sustainability culture, departments and support. Moreover, better performing firms hiring a non-expert CSO do experience improvements in subsequent performance in the long term, also likely attributable to the influence of their prior sustainability performance and culture. Poor performing firms only experience negative performance after appointing a non-expert CSO, and do not benefit from the appointment of an expert CSO. It is worth noting that our results are robust to controlling for prior sustainability performance patterns, the existence of sustainability governance mechanisms (e.g., board tenure, board independence, and board activity), and other factors potentially influencing the decision to appoint a CSO.

Our study contributes to the literature examining the interplay between corporate sustainability and corporate governance (e.g., Aguilera et al. 2006; Bernard et al. 2016; De Villiers et al. 2011; Eccles et al. 2014; Fabrizi et al. 2014); Flammer and Bansal 2017; Flammer et al. 2017; Kock et al. 2012). The importance of evaluating sustainability governance mechanisms is emphasized by the market's valuation of firms who exhibit greater sustainability leadership reputation (Lourenco et al. 2013). By focusing on a distinct composition of the top management team, we add directly to this literature. The top management team's focus on long-term value creation, often measured by sustainability performance, establishes a tone for ethical leadership and foundation for trust between the firm and its stakeholders. However, ongoing ethical tensions exist when top management team characteristics reflect symbolic versus substantive commitments (e.g., Bansal and Kistruck 2006). The appointment of specialized executive positions is not a costless decision, thus raising the ethical tradeoffs between short-term financial performance, reputational concerns, individual professional commitments, and long-term sustainability investments (Morrell 2018). From an ethical standpoint, as stakeholders continue to demand credible sustainability information and action, greater attention is likely to be placed on the extent that firms appoint experienced and educated leadership to oversee such issues. Our results highlight the need to consider the context of these appointments and the expertise of those appointed to the top management team to lead sustainability initiatives. Our findings complement analogous research related to corporate ethics officers and the importance of evaluating the characteristics embodied by these positions when inferring the extent of executive commitment (Chavez et al. 2001; Zerbini 2017). Our study also offers an additional opportunity to consider how upper echelon theory can provide a lens to gain a better understanding of the ethical practices of organizations.

The Rise of the CSO Among Top Management Teams

Finkelstein et al. (2009) summarize the distinct importance of considering the role and makeup of top management teams (TMT) when investigating manifestations of strategic leadership or responses to the firms' environment. They note that TMTs reflect an aggregation of potentially competing objectives, a congruence of management effort at the apex of the organization, interactions across differentiated roles, and most importantly a sense that CEO leadership alone is not the best predictions of organization outcomes. The establishment of CSOs to top management teams represents a distinct manifestation of the firm's strategic response to societal demands of sustainability concerns (Deutsch 2007; Henshaw and Woods 2011; Miller and Serafeim 2015; Rivenburgh 2010; Strand 2013). Proponents argue that these management positions serve important roles by aligning

the competing objectives among external stakeholders (such as regulatory bodies, customers, suppliers, and advocacy groups) and influential internal stakeholders regarding firms' sustainability initiatives and resource commitments. In design, the CSO position promotes the importance of sustainability considerations at the apex of the executive suite and board of directors and is charged with influencing the firm's sustainability responsiveness.

Given that CSO positions are relatively new within the firm hierarchy, little is known about CSO adoptions and subsequent sustainability performance (Denning 2011). Strand (2013) examines US and Scandinavian companies employing top management team members with titles related to sustainability or corporate social responsibility. Among alternative evolutionary outcomes, he conjectures that chief sustainability positions could reflect a passing trend or become the institutionalized symbol of the firm's attention to sustainability issues similar to the way CFO positions reflect the importance placed on shareholder financial concerns. He documents a positive correlation between CSOs and the organization's inclusion on the Dow Jones Sustainability Index (DJSI), suggesting the presence of the CSO in the top management team is an important consideration by DJSI administrators. Strand (2014) further examines the role of the CSO among 46 of the world's largest corporations and finds that these positions are implemented (and removed) for both proactive and reactive purposes. However, given the dynamic nature of the evolution of CSO positions, the findings of Strand (2014) emphasize the need to consider other factors related to the specific nature of CSO appointments.

Kanashiro and Rivera (2017) build upon the top management team literature by utilizing upper echelon theory to examine the association between CSOs and toxic emissions among 123 firms required to provide certain Environmental Protection Agency reports. They find that the role of the CSO might not reflect substantive governance mechanism outside of groups facing strict environmental regulations. They note that additional research including the professional background and personal traits of the executive is needed and might shed light on the conditions in which CSOs improve performance. Wiengarten et al. (2017) suggest that CSO appointments can have positive associations with future financial performance; however, the associations to environmental or social performance remain unclear. We extend Kanashiro and Rivera (2017) and Wiengarten et al. (2017) by considering the functional expertise of the individual comprising the specific CSO role, a more generalizable measure of sustainability performance, as well as additional considerations for the context of prior performance that pre-empted the CSO appointment.

This study attempts to distinguish the extent that CSOs represent symbolic attempts toward conformity with stakeholder expectations or reflect actual substantive contributions to firm leadership and performance outcomes as they relate to sustainability concerns. The evidence provided herein could then contribute insight into whether such positions fade away, solidify themselves within the narrative of top management teams or further evolve into positions that still reflect underlying broad stakeholder concerns.

Theory and Hypotheses Development

CSO Appointments and Sustainability Performance

Prior literature recognizes many firms adopt governance mechanisms as part of their strategy for responding to sustainability concerns (e.g., De Villiers et al. 2011; Eccles et al. 2014; Elkington 2006; Johnson and Greening 1999; Kock et al. 2012; Rodrigue et al. 2013; Sacconi 2006). A manifestation of these governance mechanisms includes the structure of the TMT. Bansal and Roth (2000) posit that establishing an environmental manager or similar CSO position to oversee a firm's ecological impacts represents an example of a firm-specific response to shifting social contracts and demands, and a desire to improve firm actions within an established set of regulations, norms, values, or beliefs. These executive positions can be seen as a requisite agent, whose presence is necessary for assembling, integrating, and managing the firm's strategic resources in ways to produce desired performance results.

Branco and Rodrigues (2006) argue that strategic resources are not productive on their own; rather, they need to be understood within the context of the firm's ability to deploy resources effectively. The appointment of new executive positions represents strategic incremental investments in these abilities. For example, executive roles are often accompanied by the development of department and support staff. The establishment of a CSO position implies responsibility for performance outcomes and the presence of these executive positions reflects internal power shifts and accountability. CSO presence likely raises the priority level of sustainability responsiveness on the executive suite agenda and in turn a change in the firm's business practices, as well as changing the sustainability language and dialogue throughout the firm. This in contrast to the board's primary "monitoring" responsibilities, whereby the board periodically monitors the activities and risks of the firm, but is not engaged in the day-to-day operational decisions. Prior research suggests that the decision to employ strategically focused executive positions can prompt related performance benefits through improved information processing and strategic accountability among the executive team (Nath and Mahajan 2011). Given the additional investment, power transfers, and accountability for outcomes, we expect that firms choosing to hire CSOs are more likely to alter

sustainability performance as a response to stakeholders' demands.

While the appointment of a CSO might symbolize a commitment to sustainability concerns, we acknowledge that such appointments may not indicate substantive leadership or organizational change, but rather reflect symbolic action that is consistent with societal expectations, while not actually altering firm behavior (Lindblom 1994; Dowling and Pfeffer 1975). Newly appointed management structures may represent "ceremonial conformity," where the firm adopts highly visible practices congruent with social expectations while not actually altering the fundamental firm-specific operations in any way (Meyer and Rowan 1977). Analogous prior research documents mixed results with respect to the establishment of environmental committees and subsequent environmental performance, leading to concerns that such governance actions predominately reflect a symbolic approach to manage stakeholder' expectations. For example, Rodrigue et al. (2013) find that the establishment of environmental committees appears to focus on mitigating reputational harm, versus deploying resources toward improving environmental performance. Consistent with this perspective, they find that corporate directors view environmental committees in more of a 'monitoring' role, where the board relies on the committee for information regarding firm-specific environmental risks, as opposed to a strategic partner in environmental strategy. If a CSO is hired as a form of symbolic management structures, organizational change is not expected, leaving a firm in a compliance or efficiency mode (Miller and Serafeim 2015). Additionally, Strand (2014) argues that CSOs may be hired for either proactive or reactive purposes. We posit that CSOs hired for reactive purposes are more likely to represent a symbolic intention and also less likely to be associated with future performance.

Based on the above discussion, we posit competing propositions. On the one hand, should the adoption of a CSO among TMTs represent substantive governance mechanisms, on average, we would expect a positive association with subsequent sustainability performance improvements. On the other hand, to the extent that CSO appointments represent symbolic actions we would expect no association or even deteriorating performance due to a lack of substantive commitments to sustainability. Given the competing propositions, we state the following null hypothesis:

Hypothesis 1 CSO adoption is not associated with subsequent improvements in sustainability performance.

CSO Expertise and Sustainability Performance

We question whether the potential distinction between a symbolic versus substantive role of a newly established CSO is a function of the characteristics embodied by the individuals holding such positions. We argue that the distinction between these strategies (i.e., substantive versus symbolic) may reside in the expertise of the CSO. Executive expertise embodies potential attributes of informal power (Walls and Berrone 2017). If firms are truly committed to sustainability issues and interested in improving sustainability performance, they will not merely hire a CSO, but will hire a CSO with expertise in sustainability. Further, firms truly interested in these issues would want to hire an individual with expertise in sustainability in order to access the most significant amount of external resources available to substantially increase sustainability performance. These resources may be more easily attainable due to previous connections with external parties or it may merely be the increased credibility associated with expert CSOs and/or the ease in overcoming the sustainability language gap experienced between external stakeholders and common executives. Evidence suggests that a lack of expertise could potentially be driving the language gap between the firm and investors.[3] A greater understanding of sustainability issues, in combination with business knowledge, may help to address and overcome this language gap (O'Neill 2016). Strand (2014) recognizes different strategies in hiring CSOs and argues that future research should consider differences among CSO backgrounds when examining the TMT role of CSOs.

The potential importance of leadership traits suggests that it is not only essential to consider the existence of TMT positions, but also the characteristics embodied by those members (e.g., Hambrick and Mason 1984; Egri and Herman 2000; Kuhnert and Lewis 1987; Podsakoff et al. 2000; Carpenter et al. 2004). Upper echelon theory suggests that the personal characteristics of the executive can shape their perceptions and response to the strategic decisions facing the executive. From a practical perspective, Boiral (2008) argues that the firm's values are rooted in the commitment of its leaders, to the extent that they personally reflect a commitment to sustainability efforts. It is likely that sustainability leadership characteristics are associated with employees' willingness to adopt the leader's vision and desired citizenship behaviors.

One leadership characteristic instrumental in establishing credibility is the prior experience of the individual delivering the message (Kotter 1990). This sentiment is echoed by investors focused on long-term valuation, arguing that management credibility concerning sustainability is vitally

[3] Two of the most pressing issues with regard to the gap between investors and firm-specific sustainability teams are the differing terminology to describe, and different indicators to measure, firm-specific sustainability performance (O'Neill 2016; PWC 2014, 2016), and the inadequate levels of expertise between investors and sustainability teams (O'Neill 2016).

important; in order to provide evidence of credibility, management must "know what they are talking about" (Koller and Bailey 2016). We posit that such credibility may be exhibited by an individual's developed expertise and will garner greater stakeholder support, and ultimately leadership success.

Miller and Serafeim (2015) also express the need to examine expertise, arguing that a change agent's effectiveness in moving firms from one stage of sustainability to the next is likely dependent upon her/his experiences and expertise. Specifically, we consider whether the CSO has prior sustainability expertise. We expect that the expertise of the CSO will be associated with an ability to develop a successful strategy with respect to social and environmental concerns and to communicate sustainability issues with both internal and external stakeholders in a credible manner. In contrast, a CSO without prior experience may have greater difficulty in signaling a credible alignment between the individual's convictions and their commitment to instill substantive changes in the organization as well as communicating with stakeholders. This is also consistent with Boiral (2008) who notes that leadership is exercised through the promotion of values embodied by the leader's self-example. In contrast, we argue that the true values and commitments of CSOs without preexisting sustainability expertise are more likely to be questioned by others within and outside the organization and be encumbered by the values imposed by others onto the CSO position.

The buy-in by those under the CSO is also consistent with the intangible commitment of a CSO to embrace the underlying performance objectives of the position in order to protect her/his reputational capital. While all executive officers are subject to reputational concerns, the experienced CSO has a greater investment in the sustainability reputational capital at risk. This creates greater incentives on the part of the experienced CSO to be a leader of change, as opposed to a manager of the status quo. Additionally, hiring a CSO with expertise is less likely to be a symbolic action given the additional resources required (e.g., time and effort to find candidates). Based on this line of thought, we propose the following directional hypothesis:

Hypothesis 2 The sustainability expertise of a CSO is associated with subsequent improvements in sustainability performance.

Methods

Sample Selection

Our sample selection includes all the firm-year observations in the Standard and Poor's (S&P) 500 index over the 2002–2008 period. This time period is important as it reflects the initial stages of CSO adoption, allowing us to evaluate true performance consequences of CSO appointments. To compute the variables necessary to construct our regression models, we require data from Compustat, KLD,[4] and Corporate Library. After eliminating observations with incomplete data, the final sample is comprised of 1768 firm-year observations, for 419 unique firms. Table 1, Panel A illustrates the sample attrition.

With respect to our variable of interest, *CSO*, we follow Peters and Romi (2013, 2015) and search each firm by year for evidence of a CSO or similar position. We collect information about CSOs and their level of sustainability knowledge from the annual report (form 10-K) or the proxy statement (form DEF14A) as filed with the Securities and Exchange Commission (SEC). Additionally, we incorporate general internet searches for CSO background information as this position is often not included in the top five executive positions in the SEC filings, nor does this position always include bibliographical information in an official public announcement (via Lexis-Nexis, for example). The variability in this position's title required searches incorporating an array of key words (Rivenburgh 2010; Strand 2013, 2014) including, but not limited to: Sustainability Officer, Sustainability Vice President, Responsibility Officer, Corporate Responsibility Officer, Environmental Officer, Environmental Director, and Environmental Health and Safety Officer, including different levels (VP, Global VP, etc.) within the same title. Our CSO variable (*CSO*) is measured as a categorical variable coded 1 if the organization appoints a new sustainability officer, and 0 otherwise.

An important aspect of our analysis is to determine whether the characteristics of CSOs affect sustainability performance. First, we evaluate whether a CSO who possesses sustainability expertise (*CSOExpert)* affects sustainability performance. Although some judgment is involved in CSO expertise classification, we follow prior executive and sustainability literature and industry guidelines in determining expertise. Similar to prior literature examining the associations between corporate executives and their respective performance metrics (e.g., Defond et al. 2005; Aier et al. 2005; Melone 1994), Emerich and Paddock (2011) argue that two characteristics of CSOs that potentially influence the substantive nature of their roles include experience and education. In combination with O'Neill's (2016) assertion that expertise would help to alleviate firm-investor misalignment, we focused our attention on both experience and

[4] For the years included in our study, Kinder, Lydenburg, and Domini (KLD) Research & Analytics owned this data source. Recently, Morgan Stanley Capital International (MSCI) purchased and continues with the Environmental, Social, and Governance (ESG) Statistical Tool for Analyzing Trends (STATS) database.

Table 1 Sample selection

Panel A—sample selection	
	Firm-years
S&P500 from 2002 to 2008	3500
Less: observations without available compustat data	(69)
Firms without available proxy information	(12)
Observations without available KLD analytics data	(571)
Observations without available corporate library data	(1080)
Total firm-year observations	1768
Unique firms	419
CSO appointments	79

Panel B—distribution by year		
Year	CSO appointments	CSO expert appointments
2002	2	1
2003	0	0
2004	7	2
2005	11	8
2006	11	4
2007	39	19
2008	9	6
Total	79	40

education of the social and environmental aspects of sustainability. Following Peters and Romi (2013, 2015), we determine expertise by examining each individual's biography for information related to any environmental or social education (e.g., an MBA in environmental/sustainability issues or a degree in environmental sciences, social services, or public policy) or previous environmental or social experience, including but not limited to, sitting on a sustainability board committee of another firm, prior work experience in environmental or social practice, or positions held as directors of social organizations such as the Red Cross, human rights organizations, sustainability NGOs, etc. Any executive with either experience or education in environmental or social areas were determined to be experts in sustainability. Based on this classification scheme, we create *CSOExpert,* a categorical variable coded 1 if the firm appoints a new CSO and the executive has previous experience in, or an educational background in environmental or social issues, and 0 otherwise (please see "Appendix A" for examples of biographies of sustainability experts).

Table 1, Panel B, displays the subsample distribution of CSO appointments and CSO expert appointments by year. We find that approximately half of the CSO appointments are experts in sustainability. There is an increasing trend in both CSO appointments and officer expertise over our sample period. Interestingly, 2007 was a very strong year for CSO hiring and almost half of those were expert CSOs. Table 2 provides a breakdown of CSOs by industry. We indicate industries included as environmentally and socially sensitive (ESSIs) in our sample using an asterisk and discuss this distinction in our variable description section (Brammer and Millington 2005). Once again, we provide a breakdown of the entire sample, newly appointed CSOs, and newly appointed CSOs with expertise, for comparison purposes. The greatest concentration of newly hired CSOs and CSO experts appears to be in the food and kindred products industry and the chemical and allied products industry.

Multivariate CSO Performance Model

Our primary tests rely on the following ordinary least squares (OLS) regressions model. Because a given firm may appear in the sample multiple times, we estimate the following model with firm-clustered standard errors (Petersen 2009):

Table 2 Industry composition

Industry	SIC code	Firm year observations		CSO appointments		CSO expert appointments	
		N	%	*N*	%	*N*	%
Oil and gas*	13	87	4.92	3	3.80	1	2.50
Food and kindred products	20	111	6.27	13	16.46	8	20.00
Paper and allied products*	26	39	2.21	3	3.80	2	5.00
Printing, publishing, and allied industries mailing	27	34	1.92	1	1.27	1	2.50
Chemicals and allied products*	28	178	10.01	13	16.46	7	17.50
Petroleum refining and related industries*	29	36	2.03	1	1.27	0	0.00
Primary metals*	33	22	1.24	1	1.27	1	2.50
Industrial and commercial machinery and computer equipment	35	88	4.98	6	7.60	2	5.00
Electrical and other electrical equipment and components	36	75	4.24	5	6.33	3	7.50
Transportation equipment	37	65	3.68	3	3.80	0	0.00
Defense*	38	94	5.32	4	5.06	2	5.00
Communications	48	48	2.71	4	5.06	1	2.50
Electric, gas, and sanitary services*	49	179	10.12	5	6.33	1	2.50
Alcoholic beverages*	51	26	1.48	3	3.80	3	7.50
Depository institutions	60	3	0.17	0	0.00	0	0.00
Business services	73	89	5.03	1	1.27	1	2.50
All other industries		594	33.60	13	16.46	7	17.50
Total		1768	100.00	79	100.00	40	100.00

Firm-year observations include all observations in our sample. CSO appointments include only those CSOs being hired during our sample periods and CSO expert appointments include only those CSOs being hired during our sample that also have expertise in sustainability issues. * Indicates firm operating in environmentally or socially sensitive industries

$$
\begin{aligned}
\left(\Delta \text{SustPerf}_{t,t+x}\right) = {} & \alpha + \beta_1(\text{CSO Variable})_t + \beta_2 \text{SustComm}_t + \beta_3 \Delta \text{SIZE}_{t,t+x} + \beta_4 \Delta \text{ROA}_{t,t+x} \\
& + \beta_5 \Delta \text{FIN}_{t,t+x} + \beta_6 \Delta \text{LEV}_{t,t+x} + \beta_7 \text{GLOBAL}_t + \beta_8 \text{CEOChair}_t \\
& + \beta_9 \text{ESSI}_t + \beta_{10} \Delta \text{PPEAge}_{t,t+x} + \beta_{11} \text{LagSustCon}_{t-1} \\
& + \beta_{12} \Delta \text{SLACK}_{t,t+x} + \beta_{13} \text{LitInd}_t + \beta_{14} \text{AGE}_t + \beta_{15} \text{SIC}_t + \beta_{16} \Delta \text{GOV}_{t,t+x} \\
& + \beta_{17} \text{CEOTen}_t + \beta_{18} \text{CEOAge}_t + \beta_{19} \text{BrdTen}_t + \beta_{20} \text{BrdIndep}_t \\
& + \beta_{21} \text{BrdAct}_t + \beta_{22} \text{InverseMills}_t + \beta_n(\text{Year Indicators}) + \varepsilon
\end{aligned} \tag{1}
$$

Our sustainability performance measure is based on KLD Research and Analytics, Inc.'s (henceforth referred to as KLD) categories capturing different elements of a firm's sustainability performance. The categories tracked by KLD are environmental, community, human rights, employee relations, diversity, and product concerns. While KLD also tracks performance in the governance category, we follow prior literature and do not include this in our sustainability performance metric. Instead, we separately analyze a variety of governance metrics including the governance measure in KLD, along with several other specific governance variables previously shown to be associated with sustainability performance. We measure sustainability performance (*SustPerf*) following prior research (Cho et al. 2010, 2012; Cho and Patten 2007; Hoi et al. 2013; Peters and Romi 2015; Rodrigue et al. 2013), by utilizing the total "concerns" score. We use concerns based on Chatterji et al. (2009) assessment that KLD environmental concerns more accurately reflect actual performance, where net environmental scores and total environmental strength scores do not. The raw "concerns" score developed by KLD can be interpreted as an indicator of poor sustainability performance. To ease interpretation within our analysis, we multiply the raw concern score by negative one (Cho et al. 2012; Peters and Romi 2015). Changes in the concern score can then be interpreted as improvements in performance. Henri and Journeault (2010) acknowledge limitations when examining the associations between environmental management on environmental performance in a static setting, as it is likely to take some time for improvements in sustainability performance. Hence, we calculate the change in sustainability performance in order to incorporate the evolution of CSOs and sustainability performance

over time. Evaluating change models also reduces the risk of potential endogeneity issues, resulting from omitted correlated variable problems.

To present a more holistic view of what it entails to have a CSO-oriented position, we construct three related variables capturing the presence and characteristics of a CSO. As outlined above, *CSO*, *CSOExpert*, and *CSONonExpert* are categorical variables capturing whether the firm appoints a corporate sustainability officer, whether a newly appointed CSO has relevant expertise, or whether a new CSO is hired without expertise, respectively. In the model above, we substitute the dependent variable with the values of *CSO*, *CSOExpert*, and *CSONonExpert* to test our respective hypotheses. Specifically, *CSO* is used to test H1, while *CSOExpert* and *CSONonExpert* are used to test H2.

Prior literature recognizes many firms develop sustainability-specific board-level governance mechanisms (Berrone and Gomez-Mejia 2009; Elkington 2006; Greening and Gray 1994; Johnson and Greening 1999; Luoma and Goodstein 1999; Mallin and Michelon 2011; Rodrigue et al. 2013; Sacconi 2006; Walls et al. 2012) such as the creation of a sustainability committee within the board of directors. Miller and Serafeim (2015) argue that the CSO's relationship with the board of directors (i.e., sustainability committee) is an important factor to consider when evaluating CSO effectiveness. Although Rodrigue et al. (2013) find no relationship between the presence of environmental committees and environmental performance, we include it as a control variable to isolate the role of the CSO to the extent it is associated with sustainability performance. Similar to Peters and Romi (2015), we create a categorical variable coded 1 if the firm has a sustainability committee on the board, and 0 otherwise (*SustComm*). We search each firm's SEC filings to determine whether the proxy statement indicates the existence of a committee tasked with sustainability matters. We require the committee responsibility descriptions to specifically mention responsibilities related to the environment or corporate sustainability practices.[5]

[5] We also include already established committees on the board that are not specifically developed to address environmental issues, but have included this responsibility in their guidelines. Such committees include: the audit committee, corporate governance committee, and the nominating committee. An example of such an instance is Ball Corp's proxy statement (Ball Corp 2008), which states: "The Nominating/Corporate Governance Committee is responsible for assisting the Board in fulfilling its responsibility to identify qualified individuals to become Board members; recommending to the Board the selection of Board nominees for the next annual meeting of shareholders; addressing the independence and effectiveness of the Board by advising and making recommendations on matters involving the organization and operation of the Board, Corporate Governance Guidelines and directorship practices; overseeing the evaluation of the Board and its Committees; and *reviewing and assessing the Corporation's Sustainability activities and performance*…"(italics added).

We also control for several changes in firm characteristics that might be expected to be associated with changes in firm sustainability performance and additional firm characteristics in place in the period the CSO was hired, which remain relatively consistent from year to year and potentially explain subsequent performance. Prior studies analyzing the associations between environmental disclosures and environmental performance commonly include controls for firm size (e.g., Berrone and Gomez-Mejia 2009; Cho et al. 2010; Cho and Patten 2007; Kock et al. 2012) and financial performance. Darnall et al. (2010) find that the size of a firm impacts the relationship between stakeholder pressures and firm-specific environmental strategy. In addition to facing greater public pressures, larger and more profitable companies often have more abundant discretionary funds to invest in unique executive positions. We measure the size of the firm (*SIZE)* as the change in the natural log of total assets. We control for firm performance by including return on assets (*ROA),* measured as the change in income before extraordinary items, divided by total assets at the beginning of each year.

To the extent that CSO appointments and sustainability performance are responses to capital market pressure related to external financing needs, we control for the change in external financing needs of the firm. We construct two measures: (1) a change in a firm's financing needs, measured as the firm's sale of common and preferred shares of stock minus the purchase of common and preferred shares of stock, plus the long-term debt issuance minus the long-term debt issuance (*FIN)*, and (2) a change in a firm's leverage, measured as the total debt divided by total assets (*LEV)*.

Additional exposure to country-specific norms can also expand the expectations placed upon the firm to engage in proactive sustainability efforts (Aguilera et al. 2006). Foreign corporate involvement in sustainability issues is more likely than firms operating solely in the USA. As such, firms operating in other countries are likely to face greater pressures from social stakeholders; therefore, we control for firms operating outside the USA by including a categorical variable coded 1 if the firm reports income from foreign operations in the year of CSO appointment, 0 otherwise (*GLOBAL)*.

CEO duality has been found to be negatively associated with corporate social performance (Mallin and Michelon 2011), while separate CEO/director roles have been associated with improved climate change governance practices (Galbreath 2010). Hence, we control for CEO duality by including a categorical variable coded 1 if the CEO is the chairman of the board in the year of CSO appointment, and 0 otherwise (*CEOChair*). We control for environmentally sensitive industries similar to Cho and Patten (2007), by coding as 1 firms operating in the following industries: chemicals, metals, oil exploration, paper, petroleum, and public utilities, and 0 otherwise. Similar to Brammer and Millington (2005),

we also control for socially sensitive industries by coding as 1 for firms in extractive (mining and petroleum), chemical, paper, pharmaceutical, alcoholic beverages, and defense, and 0 otherwise. The combined variable, *ESSI*, represents a firm's operations in any one environmentally or socially sensitive industry. Firms within ESSIs inherently have worse sustainability performance; therefore, we anticipate firms within ESSIs to be negatively associated with subsequent sustainability performance.

Older property, plant, and equipment likely require more pollution-intensive technology, which is associated with poorer environmental performance (Rodrigue et al. 2013). The risk associated with a greater concentration of pollution-intensive technologies may also incite firms to desire a central internal figure to oversee environmental/sustainability risks. Hence, we control for changes in the age of a firm's property, plant, and equipment by including *PPEAge*, measured as the change in the ratio of the firm's net PPE to gross PPE.

A firm's prior sustainability performance is sticky and likely explains future performance of the firm (Chatterji and Toffel 2010). Thus, we include a lagged variable of sustainability performance to control for preexisting sustainability concerns. The variable is the lagged KLD sustainability concern score (*LagSustCon*). This variable can also capture other unidentified firm-specific factors that may affect the likelihood of subsequent investments aimed at improving sustainability performance. Firms with poor sustainability performance have the greatest room for improvement; therefore, we predict a positive relationship between prior sustainability concerns and subsequent improvements in sustainability performance. Unlike the measurement of our dependent variable, we do not multiply our lagged performance variable by − 1 (i.e., the lagged variable is positive when performance is lower, and dependent variable is positive when performance is better).

Prior literature also controls for a firm's financial slack as a measure of resource availability (Hambrick et al. 1996; Kock et al. 2012), where greater available resources to invest in sustainability projects increase the likelihood of subsequent sustainability performance. We measure slack as a change in cash plus short-term investments, divided by long-term debt (*SLACK)*. Evidence suggests lawsuits against firms for employing greenwashing, rather than practicing genuine sustainable operations is on the rise (Kropp 2012; Roos 2009). Therefore, we also include a variable capturing the extent that firms are subject to greater amounts of litigation risk to control for the incentive of hiring CSOs to mitigate sustainability exposures. Based on the classification provided by Francis et al. (1994), we control for a firm's litigation risk by including a categorical variable (*LitInd)* coded 1 if a firm operates in any one industry listed as inherently facing a particularly high probability of litigation (SIC codes 2833–2836, 3570–3577, 3600–3674, 5200–5961, and 7370), and 0 otherwise. The age of a firm may also influence its sustainability activities (Cho et al. 2010), so we control for the age of the firm (*AGE)* at the time of CSO appointment and expect a positive association with the presence of a CSO and subsequent performance. To ensure that our results are not due to industry-related effects (beyond those captured by ESSI), we control for other industries by including variable for two-digit SIC code represented in the sample (*SIC)*.

Based on the findings in previous studies, we control for corporate governance, CEO and board characteristics. First, we control for overall changes in firm-specific corporate governance performance, measured as the concerns (multiplied by − 1) of KLD's governance metric (ΔGov), and expect stronger governance to be associated with improved sustainability performance. Next, we control for CEO power, entrenchment, and career concerns by including *CEOTen* as the length of time (in years) a CEO has held her/his position when the CSO is appointed (Fabrizi et al. 2014; Waldman et al. 2006) and *CEOAge* representing the age of the CEO in the current year of CSO appointment (Fabrizi et al. 2014). We expect CEOs with longer tenures to be more entrenched and to have greater influence to implement sustainability initiatives, resulting in increased future performance. Similarly, we expect older CEOs to be less concerned with career risk, allowing them more flexibility to invest in risky sustainability initiatives and more likely to be associated with increased subsequent performance. We also control for general board characteristics. We expect stronger boards to align with the stakeholders of the firm and support sustainability initiatives. Specifically, board tenure (*BrdTen*), measured as the average tenure of the directors sitting on the board in the year of CSO appointment (Berrone and Gomez-Mejia 2009; Kock et al. 2012); board independence (*BrdIndep*), measured as the ratio of outside board members to total board members in the year of CSO appointment (Dalton et al. 1998; Kock et al. 2012); and board activity (*BrdAct*), represented by the total number of directors on the board in the year of CSO appointment (Peters and Romi 2013). Finally, we include year fixed effects to control for systematic macroeconomic effects driving trends in attentiveness to sustainability concerns. Table 3 provides a summary of the variable definitions for our models examining changes to sustainability performance.

The Choice to Appoint a CSO

Endogeneity and self-selection could be factors affecting our results. The appointment of a CSO is not random, so factors influencing the firm's underlying decision to appoint a

Table 3 Variable definitions

SustPerf	Total concerns rating based on KLD STATS data for: environment, community, employee relations, human rights, diversity, and product, multiplied by − 1;
CSO	An indicator variable equal to 1 in the year the firm first appoints a new CSO, 0 otherwise;
CSOExpert	An indicator variable equal to 1 in the year the firm first appoints a new CSO with expertise in sustainability, 0 otherwise;
CSONonExpert	An indicator variable equal to 1 in the year the firm first appoints a new CSO without expertise in sustainability, 0 otherwise;
SustComm	An indicator variable equal to 1 if the firm has a sustainability committee, 0 otherwise;
SIZE	The log of total assets;
ROA	The ratio of net income to total assets;
FIN	The sales of common and preferred stock and issuance of debt less the purchase of common and preferred shares and debt reduction;
LEV	The ratio of total debt to total assets;
GLOBAL	An indicator variable equal to 1 if the firm reports foreign income, 0 otherwise;
CEOChair	An indicator variable equal to 1 if the CEO is the Chairman of the Board, 0 otherwise;
ESSI	An indicator variable equal to 1 if the firm is in an environmentally sensitive or socially sensitive industry, 0 otherwise;
PPEAge	Ratio of net PPE to gross PPE;
LagSustCon	Total concerns rating based on KLD STATS data for: environment, community, employee relations, human rights, diversity, and product;
SLACK	Cash plus short-term investments, divided by long-term debt;
LitInd	An indicator variable equal to 1 if the firm operates in a high-litigation industry (SIC codes 2833–2836, 3570–3577, 3600–3674, 5200–5961 and 7370;
AGE	Age of the firm;
SIC	Two-digit SIC code;
GOV	Total concerns rating based on KLD STATS data for governance, multiplied by a − 1;
CEOTen	The number of years the current CEO has held her/his position;
CEOAge	The age of the current CEO;
BrdTen	The average tenure of directors sitting on the board;
BrdIndep	The ratio of outside board members to total board members;
BrdAct	Total number of directors on the board

CSO could ultimately explain the subsequent level of sustainability performance, as opposed to the actions directly associated with the appointment of a the new CSO. As previously discussed, we focus on changes in sustainability performance and we set temporal precedence (i.e., incorporate a lead-lag approach) in our main model to mitigate these issues. To further mitigate the potential self-selection problem in our setting, we also incorporate the Heckman (1979) two-stage procedure to enhance our inferences, although we caveat the lack of a clear instrument for the selection equation. Our first step utilizes a probit model to determine the likelihood of appointing a CSO (similar to Peters and Romi 2013). Using the estimates of the first-stage model, we construct the inverse mills ratio and include it in the second-stage (OLS) performance model as an additional control variable. The first-stage probit model was based upon the following specification:

We adopt a risk management perspective to predict the appointment of a CSO. From a risk management perspective, sustainability efforts can be viewed as a response to the compliance and operational risks, as well as external constituency pressures facing the firm. Therefore, we include variables to proxy for resources available to the firm and the scope of strategic and compliance risks facing the firm. Unless otherwise noted, our variables are defined above. We first include a lagged measure of prior sustainability concerns to proxy for the firms focus on sustainability strategies and incentives for adopting a CSO (*SustConc*). We also expect sustainability committees to desire a CSO who can partner with the committee toward sustainability endeavors, or who can carry out the initiatives of the committee (*SustComm*). We consider whether a firm's operations within a highly litigious industry (*LitInd*) may increase risk, where a firm may hire a CSO to decrease their exposure to such

$$
\begin{aligned}
[CSO]_{i,t} = {} & \alpha + \lambda_1 \text{SustConc}_{i,t-1} + \lambda_2 \text{SustComm}_{i,t-1} + \lambda_3 \text{LitInd}_{i,t-1} \\
& + \lambda_4 \text{LEV}_{i,t-1} + \lambda_5 \text{ROA}_{i,t-1} + \lambda_6 \text{GLOBAL}_{i,t-1} + \lambda_7 \text{ESSI}_{i,t-1} + \lambda_8 \text{PPEAge}_{i,t-1} \\
& + \lambda_9 \text{AGE}_{i,t-1} + \lambda_{10} \text{INSTOWN}_{i,t-1} + \lambda_n (\text{Year Indicators})
\end{aligned} \tag{2}
$$

risks. Similarly, we include *LEV* to represent the level of financial risk facing the firm. In addition to the expectation that firms with greater financial performance (*ROA*) will have greater resources with which to invest in CSOs, we also assert that firms operating globally will be more likely to face pressures to invest in sustainability initiatives (*GLOBAL*), including the hiring of CSOs. Again, we control for a firm's operations within environmentally and socially sensitive industries (*ESSI*) with an indicator variable equal to 1 if the firm is in an environmentally or socially sensitive industry, 0 otherwise. We include property, plant, and equipment age (*PPEAge*) as a measure of the firm's fixed exposure to sustainability risks and an indicator variable to capture the age of the firm.

According to recent trends in the USA, institutional investors are the largest group of socially responsible investors (USSIF 2014). Among institutional investors in general (those investing in both socially responsible funds and those not considered socially responsible), sustainability performance has become an important investment consideration (Grewal et al. 2017; Kim et al. 2012; Neubaum and Zahra 2006; Gao et al. 2015; Eliopoulos et al. 2016). Additionally, Shleifer and Vishny (1986) argue that large stockholders are more likely to have incentives to monitor management because the benefits from monitoring are likely to outweigh the costs. Therefore, we include a variable to proxy for the influence of institutional ownership on appointing a new CSO. In order to control for the amount of institutional investors associated with each firm, we include *INSTOWN*, measured as a 1 if the firm's institutional ownership is above the median, and 0 otherwise. Finally, we include year fixed effects to control for rising trends in the appointments of CSOs.

Results

Descriptive Results

Table 4 provides the descriptive statistics for all variables presented in levels (as opposed to changes) at time t. Panel A indicates that four percent of the firms in our sample appoint a new CSO. Of those observations, slightly over half include individuals with sustainability expertise (Panel B). This is in stark contrast to the number of firms establishing a sustainability committee within the board of directors

Table 4 Summary statistics

Variable[a]	Mean	Median	SD	Maximum	Minimum
Panel A—variables for main model—$n = 1768$					
CSO	0.04	0.00	0.21	1.00	0.00
SustComm	0.24	0.00	0.43	1.00	0.00
SIZE	9.58	9.53	1.19	13.93	6.43
ROA	0.06	0.06	0.08	0.50	− 0.85
FIN	37.41	− 230.32	4865.45	63,918.00	− 35,508.00
LEV	0.21	0.20	0.13	0.75	0.00
GLOBAL	0.67	1.00	0.47	1.00	0.00
CEOChair	0.78	1.00	0.42	1.00	0.00
ESSI	0.37	0.00	0.48	1.00	0.00
PPEAge	0.52	0.51	0.14	0.88	0.00
LagSustCon	2.40	2.00	1.85	11.00	0.00
SLACK	15.20	0.29	163.12	5983.70	0.00
LitInd	0.18	0.00	0.38	1.00	0.00
AGE	38.63	44.00	16.61	57.00	2.00
GOV	0.92	1.00	0.73	4.00	0.00
CEOTen	6.48	5.00	6.60	45.00	0.00
CEOAge	54.91	55.00	5.92	79.00	38.00
BrdTen	9.39	8.91	3.74	28.17	1.00
BrdIndep	0.17	0.13	0.11	0.82	0.00
BrdAct	11.00	11.00	2.10	20.00	5.00
Panel B—CSO characteristics based solely on CSO appointment sample—$n = 79$					
CSOExpert	0.51	1.00	0.50	1.00	0.00
CSONonExpert	0.49	0.00	0.50	1.00	0.00

[a]All variables are listed in their raw form (not changes) for descriptive statistics. Variables are defined in Table 3

Table 5 Correlation matrix

	ΔSustPerf	CSO	CSOExpert	CSONonExpert	SustComm	ΔSIZE	ΔROA	ΔFIN	ΔLEV	GLOBAL	CEOChair	ESSI
CSO	− 0.04											
CSOExpert	0.01	0.70***										
CSONonExpert	− 0.06***	0.70***	− 0.02									
SustComm	− 0.02	0.08***	0.07***	0.05**								
ΔSIZE	− 0.06***	− 0.04**	− 0.03	− 0.03	− 0.02							
ΔROA	0.03	− 0.02	− 0.02	− 0.01	− 0.00	0.06***						
ΔFIN	− 0.03	0.00	0.02	− 0.01	0.04*	0.08***	− 0.03					
ΔLEV	0.01	0.01	0.01	0.01	− 0.10***	− 0.02	− 0.05**	0.21***				
GLOBAL	− 0.02	0.08***	0.07***	0.04**	0.18***	0.03	− 0.04*	− 0.05**	− 0.15***			
CEOChair	− 0.03	− 0.00	0.00	− 0.01	0.05**	0.05**	− 0.04*	0.01	− 0.11***	0.02		
ESSI	− 0.01	0.02	0.01	0.02	0.26***	0.10***	− 0.02	− 0.07***	− 0.17***	0.05**	0.12***	
ΔPPEAge	− 0.05**	0.03	0.02	0.01	0.06***	0.28***	− 0.00	− 0.02	− 0.01	0.03	0.00	0.10***
LagSustCon	0.07***	0.05***	0.02	0.05**	0.31***	− 0.06***	0.03	0.09***	− 0.13***	0.05**	0.04	0.17***
ΔSLACK	0.01	− 0.00	− 0.00	− 0.00	0.02	− 0.00	0.02	− 0.00	− 0.06***	0.01	− 0.03	− 0.01
LitInd	0.01	0.02	0.04	− 0.02	− 0.06***	0.08***	− 0.03	− 0.04*	− 0.07***	0.01	0.01	− 0.06***
AGE	− 0.03	0.07***	0.05**	0.05**	0.24***	− 0.01	− 0.04*	− 0.04**	− 0.24***	0.13***	0.16***	0.27***
SIC	0.04*	− 0.08***	− 0.05**	− 0.06***	− 0.19***	− 0.08***	0.07***	0.09***	0.26***	− 0.36***	− 0.03	− 0.40***
ΔGOV	− 0.01	0.03	0.04*	− 0.00	− 0.01	0.01	0.03	− 0.00	− 0.01	− 0.03	− 0.04*	0.00
CEOTen	0.01	− 0.04*	− 0.04*	− 0.01	− 0.10***	0.00	− 0.04*	− 0.01	0.04*	− 0.04*	0.20***	− 0.02
CEOAge	− 0.02	− 0.02	− 0.03	0.01	0.03	− 0.02	0.01	0.03	− 0.03	− 0.03	0.26***	0.08***
BrdTen	0.05**	− 0.00	− 0.01	− 0.00	− 0.02	0.01	− 0.00	0.02	− 0.00	0.01	− 0.11***	− 0.11***
BrdIndep	− 0.02	− 0.05**	− 0.07***	− 0.00	− 0.10***	0.07***	0.05**	− 0.02	0.05**	− 0.09***	− 0.09***	− 0.12***
BrdAct	− 0.04*	0.02	0.01	0.01	0.11	− 0.07***	0.03	0.09***	− 0.05**	− 0.15***	− 0.02	− 0.04*

	ΔPPEAge	LagSustCon	ΔSLACK	LitInd	AGE	SIC	ΔGOV	CEOTen	CEOAge	BrdTen	BrdIndep
LagSustCon	− 0.08***										
ΔSLACK	− 0.01	− 0.00									
LitInd	− 0.00	0.09***	0.02								
AGE	0.11***	0.16***	− 0.01	− 0.01							
SIC	− 0.10***	− 0.09***	0.00	0.02	− 0.22***						
ΔGOV	0.00	− 0.06***	− 0.02	0.01	− 0.01	− 0.01					
CEOTen	0.00	− 0.10***	− 0.04*	0.02	− 0.08***	0.01	0.01				
CEOAge	− 0.01	0.08***	− 0.03	− 0.07***	0.11***	− 0.04*	− 0.00	0.45***			
BrdTen	0.05**	− 0.05**	0.01	0.10***	0.15***	0.01	0.05**	0.35***	0.14***		
BrdIndep	0.02	− 0.10***	− 0.00	0.07***	− 0.25***	0.02	0.03	0.09***	0.01	0.06***	
BrdAct	− 0.05**	0.16***	− 0.01	− 0.09***	0.21	0.14***	− 0.03	− 0.02	0.10***	− 0.01	− 0.10***

***, **, * indicate $p < .01$, $p < .05$ and $p < .10$ levels, respectively. Variables are defined in Table 3

Table 6 First-stage Heckman model of CSO appointment

$$[\text{CSO}]_{i,t} = \alpha + \lambda_1 \text{SustCon}_{i,t-1} + \lambda_2 \text{SustComm}_{i,t-1} + \lambda_3 \text{LitInd}_{i,t-1} + \lambda_4 \text{LEV}_{i,t-1} + \lambda_5 \text{ROA}_{i,t-1} + \lambda_6 \text{GLOBAL}_{i,t-1} + \lambda_7 \text{ESSI}_{i,t-1} + \lambda_8 \text{PPEAge}_{i,t-1} + \lambda_9 \text{AGE}_{i,t-1} + \lambda_{10} \text{INSTOWN}_{i,t-1} + \lambda_n (\text{Year Indicators})$$

	CSO appointment	
Variables	Estimate[a]	*p*-value
SustConc_{t-1}	0.08	0.23
SustComm_{t-1}	0.33	0.24
LitInd_{-1}	0.30	0.32
LEV_{t-1}	1.02	0.34
ROA_{t-1}	− 0.49	0.82
GLOBAL_{t-1}	0.69**	0.03
ESSI_{t-1}	− 0.03	0.92
PPEAge_{t-1}	− 0.29	0.78
AGE_{t-1}	0.02**	0.02
INSTOWN_{t-1}	− 0.39	0.34
Year indicators	Yes	
Pseudo R^2	0.10	
N	1768	

[a]Results are based on two-tailed tests where ***, **, * indicate $p \leq .01$, $p \leq .05$ and $p \leq .10$ levels, respectively. Variables are defined in Table 3

(mean = 0.24). The firms in our sample are larger firms (mean of *SIZE* = 9.58) and over half have operations outside the USA (mean of *GLOBAL* = 0.67). Approximately one-third of the firms operate within an *ESSI* and have an average of 2.4 sustainability concerns listed by KLD the year prior to adopting a CSO, with a range from 0 to 11 sustainability concerns overall. The firms in our sample are well established (mean of *AGE* = 38.63 years), have established and seasoned CEOs (mean *CEOTen* = *6.48* and mean *CEOAge* = 55), and have relatively large boards (mean *BrdAct* = 11).

Table 5 presents the pairwise correlation matrix and indicates that, from a univariate perspective, new CSOs are not related to subsequent changes in sustainability performance. Similarly, overall, expert CSOs are not statistically related to changes in performance, while non-expert CSOs are negatively related to performance. Sustainability committees are also not related to subsequent changes in performance, but are positively related to newly appointed CSOs regardless of expertise, although it would appear that sustainability committees do prefer expert CSOs (indicated by stronger correlation).

CSO Appointments and Subsequent Performance

Table 6 presents the results of our first-stage Heckman model predicting a CSO appointment. The appointment of a CSO is positively associated with global operations (coefficient = 0.69, *p*-value = 0.03) and the age of the firm (coefficient = 0.02, *p*-value = 0.02). Using the parameter estimates from the first-stage probit model, we calculate the inverse Mills ratio following Heckman (1979). We then include the inverse mills ratio as an additional control variable in the second-stage OLS sustainability performance models.

Table 7 documents the association between CSO appointment and subsequent sustainability performance, measured as one-, two-, three-, and four-year subsequent changes in performance to allow time for the new CSO's strategies to be implemented and evaluated. Columns 1, 4, 7, and 10 provide the regression results for newly appointed CSOs as the variable of interest. In each of these columns, the CSO coefficient is not significant, meaning firms hiring a CSO do not experience a change in subsequent sustainability performance, supporting hypothesis 1 (in the null form). Result is consistent with the notion that CSO appointments represent more of a ceremonial conformity, signaling an alignment with stakeholder pressures, without an actual intent to change performance.

Turning to control variables, firms with poor sustainability performance (greater values reflect more concerns or worse performance) prior to CSO appointment, are more likely to experience subsequent improvements in sustainability performance, possibly indicating that firms with poor performance are more likely to make greater strides toward improving future performance following the appointment of a CSO. Further, results also indicate that firms with greater board activity experience consistently worsening sustainability performance subsequent to appointing a CSO.

We note that subsequent performance can differ depending on the nature of the firm's prior decisions regarding strategic focus or investments. Similar to the variation in strategy chosen by different firms, not all firms respond to strategic efforts in the same manner. This would suggest that the ability of a CSO to promote changes might differ depending on the operating environment in which they are employed, supported by the positive and significant result on our lagged sustainability performance variable. For example, Servaes and Tamayo (2013) examine the association between corporate social responsibility and firm value and find different associations depending on a firm's level of consumer awareness. Eccles et al. (2014) also evaluate sustainability activities and find diverse initiatives and outcomes between high and low performing (sustainability) firms. We follow prior literature by acknowledging differences among the influence of sustainability initiatives and separately examine high and low sustainability performing firms. To explore this distinction, we split the sample based upon prior performance (i.e., better performers versus worse performers).

Table 7 CSO appointment and subsequent sustainability performance

$$(\Delta\text{SustPerf}_{t,t+x}) = \alpha + \beta_1(\text{CSO Variable})_t + \beta_2\text{SustComm}_t + \beta_3\Delta\text{SIZE}_{t,t+x} + \beta_4\Delta\text{ROA}_{t,t+x} + \beta_5\Delta\text{FIN}_{t,t+x} + \beta_6\Delta\text{LEV}_{t,t+x} + \beta_7\text{GLOBAL}_t + \beta_8\text{CEOChair}_t + \beta_9\text{ESSI}_t + \beta_{10}\Delta\text{PPEAge}_{t,t+x} + \beta_{11}\text{LagSustCon}_{t-1} + \beta_{12}\Delta\text{SLACK}_{t,t+x} + \beta_{13}\text{LitInd}_t + \beta_{14}\text{AGE}_t + \beta_{15}\text{SIC}_t + \beta_{16}\Delta\text{GOV}_{t,t+x} + \beta_{17}\text{CEOTen}_t + \beta_{18}\text{CEOAge}_t + \beta_{19}\text{BrdTen}_t + \beta_{20}\text{BrdIndep}_t + \beta_{21}\text{BrdAct}_t + \beta_{22}\text{InverseMills} + \beta_n(\text{Year Indicators}) + \varepsilon$$

	Column 1 Δsustainability performance 1 year		Column 2 Δsustainability performance 1 year better performers		Column 3 Δsustainability performance 1 year worse performers		Column 4 Δsustainability performance 2 year		Column 5 Δsustainability performance 2 year better performers		Column 6 Δsustainability performance 2 year worse performers	
Variable	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value
Intercept	− 0.28	0.66	0.77	0.34	− 0.19	0.84	− 0.81	0.48	0.49	0.72	− 2.07	0.19
CSO	**− 0.16**	**0.16**	**− 0.20**	**0.32**	**− 0.15**	**0.28**	**− 0.12**	**0.42**	**0.07**	**0.74**	**− 0.20**	**0.28**
SustComm	− 0.07	0.24	0.02	0.89	− 0.07	0.33	− 0.09	0.45	0.05	0.80	− 0.10	0.47
ΔSIZE	− 0.25	0.15	− 0.21	0.42	− 0.27	0.21	− 0.37**	0.05	− 0.33	0.20	− 0.45*	0.07
ΔROA	0.33	0.18	0.63	0.19	0.19	0.49	0.79*	0.08	0.32	0.65	0.74	0.19
ΔFIN	− 0.00	0.30	− 0.00*	0.07	− 0.00	0.87	− 0.00	0.70	0.00	0.86	− 0.00	0.79
ΔLEV	0.02	0.93	0.37	0.19	− 0.30	0.55	− 0.71	0.14	− 0.76	0.20	− 0.82	0.29
GLOBAL	− 0.03	0.78	− 0.10	0.44	0.08	0.56	0.16	0.34	0.02	0.91	0.33	0.16
CEOChair	− 0.07	0.23	− 0.08	0.37	− 0.07	0.33	− 0.02	0.83	− 0.07	0.60	− 0.00	0.98
ESSI	0.04	0.46	− 0.10	0.17	0.09	0.16	0.06	0.57	− 0.26*	0.06	0.23*	0.06
ΔPPEAge	− 0.53*	0.10	− 0.05	0.96	− 0.47	0.16	− 0.30	0.70	0.50	0.59	− 0.55	0.59
LagSustCon	0.05***	0.00	0.15**	0.02	0.05**	0.03	0.12***	0.00	0.12	0.27	0.13***	0.01
ΔSLACK	0.00	0.14	0.00	0.11	0.00	0.20	0.00	0.85	− 0.00	0.91	0.00**	0.05
LitInd	− 0.03	0.67	− 0.06	0.54	− 0.00	0.98	0.02	0.86	− 0.06	0.75	0.07	0.66
AGE	− 0.00	0.70	− 0.00	0.63	0.00	0.80	0.00	0.79	− 0.00	0.74	0.01	0.43
SIC	0.00*	0.08	0.00	0.21	0.00	0.15	0.01**	0.03	0.00	0.15	0.01**	0.05
ΔGOV	0.01	0.93	0.03	0.65	− 0.01	0.90	0.04	0.60	0.04	0.68	0.04	0.68
CEOTen	0.00	0.75	0.01	0.23	− 0.00	0.99	0.00	0.87	0.01	0.41	− 0.00	0.96
CEOAge	− 0.00	0.28	− 0.00	0.73	− 0.01	0.24	− 0.01	0.27	− 0.01	0.47	− 0.01	0.42
BrdTen	0.01	0.14	0.00	0.77	0.01	0.15	0.02*	0.10	− 0.00	0.92	0.04**	0.03
BrdIndep	− 0.04	0.88	− 0.06	0.87	− 0.09	0.79	− 0.42	0.26	− 0.10	0.85	− 0.65	0.23
BrdAct	− 0.03	0.01	− 0.01	0.59	− 0.04***	0.01	− 0.06***	0.00	− 0.01	0.65	− 0.09***	0.00
InverseMills	− 0.05	0.69	− 0.19	0.19	0.10	0.54	0.20	0.32	− 0.14	0.57	0.48	0.08
Year Indicators	Yes		Yes				Yes		Yes			
R^2	0.03		0.07		0.03		0.05		0.05		0.07	
N	1768		654		1114		1480		574		906	

	Column 7 Δsustainability performance 3 year		Column 8 Δsustainability performance 3 year better performers		Column 9 Δsustainability performance 3 year worse performers		Column 10 Δsustainability performance 4 year		Column 11 Δsustainability performance 4 year better performers		Column 12 Δsustainability performance 4 year worse performers	
Variable	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value
Intercept	− 0.76	0.65	− 0.26	0.91	− 1.91	0.39	− 3.27	0.16	− 1.56	0.58	− 5.90*	0.06
CSO	**− 0.11**	**0.66**	**0.68****	**0.02**	**− 0.46**	**0.11**	**− 0.02**	**0.95**	**0.92*****	**0.00**	**− 0.51**	**0.25**
SustComm	− 0.31*	0.09	− 0.02	0.95	− 0.43**	0.05	− 0.16	0.52	0.10	0.79	− 0.20	0.52
ΔSIZE	− 0.37*	0.09	− 0.13	0.66	− 0.58**	0.03	− 0.36	0.13	0.08	0.82	− 0.65**	0.02
ΔROA	1.71***	0.00	2.63***	0.01	1.15**	0.04	1.08	0.11	1.64	0.15	0.44**	0.03
ΔFIN	0.00	0.79	0.00	0.52	0.00	0.72	0.00	0.45	− 0.00	0.36	0.00	0.61

Table 7 (continued)

	Column 7 Δsustainability performance 3 year		Column 8 Δsustainability performance 3 year better performers		Column 9 Δsustainability performance 3 year worse performers		Column 10 Δsustainability performance 4 year		Column 11 Δsustainability performance 4 year better performers		Column 12 Δsustainability performance 4 year worse performers	
Variable	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value
ΔLEV	0.00	0.99	− 0.51	0.40	0.03	0.97	− 0.92	0.27	− 1.74**	0.05	− 0.91	0.46
GLOBAL	0.24	0.35	0.15	0.67	0.41	0.23	0.55	0.12	0.23	0.60	0.94*	0.06
CEOChair	0.12	0.41	0.06	0.80	0.12	0.55	0.16	0.51	− 0.25	0.40	0.31	0.36
ESSI	0.06	0.69	− 0.26	0.21	0.22	0.24	0.06	0.76	− 0.29	0.25	0.27	0.99
ΔPPEAge	− 0.20	0.78	− 0.73	0.47	0.09	0.92	− 0.09	0.92	− 0.22	0.83	− 0.04	0.97
LagSustCon	0.21***	0.00	0.21	0.19	0.26***	0.00	0.28***	0.00	0.30	0.13	0.32***	0.00
ΔSLACK	0.00	0.31	0.00	0.99	0.00***	0.00	0.00	0.63	− 0.00	0.15	0.00***	0.00
LitInd	0.08	0.72	− 0.16	0.56	0.15	0.58	0.15	0.61	− 0.43	0.27	0.42	0.25
AGE	0.00	0.62	0.00	0.85	0.01	0.39	0.01	0.30	0.01	0.38	0.12	0.25
SIC	0.01	0.11	0.01	0.32	0.01	0.13	0.01**	0.04	0.01*	0.08	0.11*	0.06
ΔGOV	0.13	0.14	− 0.06	0.57	0.21*	0.07	0.16	0.11	− 0.10	0.43	0.29**	0.03
CEOTen	− 0.00	0.73	− 0.01	0.38	− 0.01	0.65	− 0.01	0.52	− 0.00	0.95	− 0.01	0.48
CEOAge	− 0.02**	0.06	0.01	0.79	− 0.02*	0.08	− 0.02*	0.10	− 0.02	0.37	− 0.02	0.21
BrdTen	0.03	0.12	0.01	0.78	0.05*	0.07	0.04	0.12	0.02	0.60	0.06*	0.10
BrdIndep	− 0.56	0.31	− 0.54	0.47	− 0.60	0.42	− 0.90	0.20	− 0.52	0.60	− 1.14	0.19
BrdAct	− 0.09***	0.00	− 0.04	0.28	− 0.12***	0.00	− 0.11***	0.00	− 0.07	0.19	− 0.15***	0.00
InverseMills	0.30	0.32	0.08	0.85	0.60	0.12	0.77*	0.06	0.26	0.60	1.37***	0.01
Year Indicators	Yes		Yes		Yes		Yes		Yes		Yes	
R^2	0.10		0.09		0.05		0.13		0.14		0.16	
N	1134		450		684		838		348		490	

Bold values indicate results for our variables of interest

[a] Results are based on two-tailed tests where ***, **, * indicate $p \leq .01$, $p \leq .05$ and $p \leq .10$ levels, respectively. Variables are defined in Table 3

Columns 2 and 3, 5 and 6, 8 and 9, and 11 and 12 provide results for CSO appointment when evaluating better and worse sustainability performing firms one-year, two-year, three-year, and four-year subsequent to a CSO hire, respectively. The threshold determining inclusion in better or worse performing firms is based on the median value for lagged sustainability concern scores (median = 2). Keeping in mind that lagged performance is not multiplied by − 1 (i.e., higher scores reflect worse performance), if a firm's lagged sustainability concern score is greater than or equal to 2, the firm is included as a worse performing firm, whereas if a firm has less than 2 sustainability concerns, it is included in the better performing firm group.

We find that newly appointed CSOs are not associated with changes in subsequent performance for historically better performing firms, until 3 years after the CSO appointment, at which time performance improves. However, we fail to find any improvement in subsequent performance for firms with worse performance prior to a CSO appointment. The pattern among worse performing firms is consistent with the notion that CSO appointment may be an attempt toward ceremonial conformity, as opposed to a strategic effort to promote positive change in the firm's performance. Relative to the symbolic versus substantive mechanisms arguments, we speculate that this could be indicative of perceived low substantive commitments to sustainability efforts. Given that KLD measures take into account the perceptions of performance relative to other market participants, a lack substantive commitment or investment could lead to deteriorating performance relative to peers. Likewise, upper echelon arguments also suggest that a lack of expertise could mitigate the ability of such positions to make transformative or substantive achievements. In light of the growing attention to this area and improvements by other peers, it is plausible that these firms are then seen as deteriorating in performance.

With respect to our control variables, both better performing firms and worse performing firms experience similar results to the main model, although this result changes with time. Once firms have had a CSO in position for over a year, the prior performance attributed to better performing firms is no longer associated with subsequent improvements in performance. This change coincides with the association between CSO appointments and subsequent improvements in performance in years three and four (for better performing

Table 8 CSO expertise and subsequent sustainability performance

$$(\Delta\text{SustPerf}_{t,t+x}) = \alpha + \beta_1(\text{CSO Variable})_t + \beta_2\text{SustComm}_t + \beta_3\Delta\text{SIZE}_{t,t+x} + \beta_4\Delta\text{ROA}_{t,t+x} + \beta_5\Delta\text{FIN}_{t,t+x} + \beta_6\Delta\text{LEV}_{t,t+x} + \beta_7\text{GLOBAL}_t + \beta_8\text{CEOChair}_t + \beta_9\text{ESSI}_t + \beta_{10}\Delta\text{PPEAge}_{t,t+x} + \beta_{11}\text{LagSustCon}_{t-1} + \beta_{12}\Delta\text{SLACK}_{t,t+x} + \beta_{13}\text{LitInd}_t + \beta_{14}\text{AGE}_t + \beta_{15}\text{SIC}_t + \beta_{16}\Delta\text{GOV}_{t,t+x} + \beta_{17}\text{CEOTen}_t + \beta_{18}\text{CEOAge}_t + \beta_{19}\text{BrdTen}_t + \beta_{20}\text{BrdIndep}_t + \beta_{21}\text{BrdAct}_t + \beta_{22}\text{InverseMills} + \beta_n(\text{Year Indicators}) + \varepsilon$$

Variable	Column 1 Δsustainability performance 1 year		Column 2 Δsustainability performance 1 year better performers		Column 3 Δsustainability performance 1 year worse performers		Column 4 Δsustainability performance 2 year		Column 5 Δsustainability performance 2 year better performers		Column 6 Δsustainability performance 2 year worse performers	
	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value
Intercept	0.28	0.65	0.79	0.32	− 0.21	0.82	− 0.82	0.47	0.49	0.72	− 2.07	0.19
CSOExpert	**0.03**	**0.82**	**− 0.14**	**0.58**	**0.13**	**0.45**	**0.15**	**0.44**	**0.09**	**0.70**	**0.14**	**0.62**
CSONonExpert	**− 0.36****	**0.03**	**− 0.31**	**0.35**	**− 0.38****	**0.05**	**− 0.39****	**0.05**	**0.03**	**0.94**	**− 0.44****	**0.04**
SustComm	− 0.07	0.22	0.01	0.91	− 0.08	0.32	− 0.09	0.42	0.05	0.80	− 0.11	0.44
ΔSIZE	− 0.25	0.16	− 0.22	0.41	− 0.26	0.23	− 0.37**	0.05	− 0.33	0.20	− 0.44*	0.07
ΔROA	0.34	0.18	0.65	0.18	0.19	0.50	0.81*	0.07	0.33	0.64	0.75	0.18
ΔFIN	− 0.00	0.27	− 0.00*	0.06	− 0.00	0.83	− 0.00	0.67	0.00	0.86	− 0.00	0.75
ΔLEV	− 0.03	0.92	0.37	0.18	− 0.31	0.53	− 0.70	0.15	− 0.75	0.20	− 0.82	0.30
GLOBAL	− 0.03	0.75	− 0.10	0.42	0.07	0.57	0.15	0.34	0.02	0.91	0.33	.017
CEOChair	− 0.07	0.22	− 0.08	0.38	− 0.07	0.31	− 0.02	0.80	− 0.07	0.61	− 0.01	0.96
ESSI	0.04	0.46	− 0.10	0.18	0.09	0.15	0.06	0.55	− 0.26*	0.06	0.23*	0.06
ΔPPEAge	− 0.53*	0.09	− 0.03	0.98	− 0.49	0.15	− 0.31	0.69	0.50	0.59	− 0.57	0.57
LagSustCon	0.05***	0.00	0.15**	0.02	0.05**	0.03	0.12***	0.00	0.11	0.27	0.13***	0.01
ΔSLACK	0.00	0.14	0.00	0.11	0.00	0.20	0.00	0.85	− 0.00	0.91	0.00**	0.04
LitInd	− 0.03	0.59	− 0.06	0.52	− 0.01	0.88	0.01	0.91	− 0.06	0.75	0.06	0.72
AGE	− 0.00	0.69	− 0.00	0.61	0.00	0.78	0.00	0.79	− 0.00	0.74	0.01	0.43
SIC	0.00*	0.08	0.00	0.22	0.00	0.15	0.01**	0.03	0.00	0.15	0.01**	0.05
ΔGOV	0.00	0.98	0.04	0.64	− 0.02	0.84	0.04	0.59	0.04	0.67	0.04	0.70
CEOTen	0.00	0.74	0.01	0.24	0.00	0.97	0.00	0.87	0.01	0.41	− 0.00	0.97
CEOAge	− 0.00	0.30	− 0.00	0.73	− 0.01	0.26	− 0.01	0.29	− 0.01	0.47	− 0.01	0.44
BrdTen	0.01	0.13	0.00	0.77	0.01	0.54	0.02*	0.10	− 0.00	0.92	0.04**	0.03
BrdIndep	− 0.02	0.94	− 0.06	0.88	− 0.06	0.86	− 0.40	0.29	− 0.10	0.85	− 0.62	0.25
BrdAct	− 0.03***	0.01	− 0.01	0.58	− 0.04***	0.01	− 0.06***	0.00	− 0.01	0.65	− 0.09***	0.00
InverseMills	− 0.05	0.67	− 0.19	0.18	0.10	0.54	0.20	0.32	− 0.14	0.57	0.48*	0.09
Year Indicators	Yes		Yes		Yes		Yes		Yes		Yes	
R^2	0.03		0.07		0.03		0.05		0.05		0.07	
N	1768		654		1114		1480		574		906	

Variable	Column 7 Δsustainability performance 3 year		Column 8 Δsustainability performance 3 year better performers		Column 9 Δsustainability performance 3 year worse performers		Column 10 Δsustainability performance 4 year		Column 11 Δsustainability performance 4 year better performers		Column 12 Δsustainability performance 4 year worse performers	
	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value
Intercept	− 0.83	0.63	− 0.23	0.92	− 2.00	0.36	− 3.33	0.15	− 1.52	0.59	− 2.92*	0.06
CSOExpert	**0.34**	**0.35**	**0.44**	**0.18**	**0.12**	**0.82**	**0.34**	**0.48**	**0.75*****	**0.01**	**− 0.38**	**.55**
CSONonExpert	**− 0.53**	**0.11**	**1.13*****	**0.00**	**− 0.85*****	**0.00**	**− 0.43**	**0.45**	**1.64*****	**0.01**	**− 0.60**	**0.33**
SustComm	− 0.31*	0.09	− 0.01	0.97	− 0.42*	0.06	− 0.17	0.51	0.11	0.77	− 0.20	0.52
ΔSIZE	− 0.37*	0.09	− 0.12	0.69	− 0.58**	0.03	− 0.37	0.12	0.08	0.81	− 0.65**	0.02

Table 8 (continued)

	Column 7 Δsustainability performance 3 year		Column 8 Δsustainability performance 3 year better performers		Column 9 Δsustainability performance 3 year worse performers		Column 10 Δsustainability performance 4 year		Column 11 Δsustainability performance 4 year better performers		Column 12 Δsustainability performance 4 year worse performers	
Variable	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value	Estimate[a]	*p*-value
ΔROA	1.72***	0.00	2.59***	0.01	1.14**	0.04	1.08*	0.09	1.62	0.16	0.44	0.61
ΔFIN	0.00	0.80	0.00	0.57	0.00	0.74	0.00	0.48	− 0.00	0.37	0.00	0.35
ΔLEV	0.01	0.98	− 0.54	0.38	0.01	0.99	− 0.92	0.27	− 1.85**	0.04	− 0.92	0.45
GLOBAL	0.24	0.34	0.15	0.68	0.41	0.23	0.56	0.11	0.22	0.61	0.94*	0.06
CEOChair	0.11	0.45	0.06	0.79	0.11	0.59	0.15	0.53	− 0.24	0.44	0.35	0.36
ESSI	0.05	0.72	− 0.26	0.20	0.21	0.26	0.06	0.78	− 0.30	0.23	0.27	0.33
ΔPPEAge	− 0.18	0.80	− 0.74	0.46	0.11	0.89	− 0.07	0.94	− 0.20	0.85	− 0.03	0.98
LagSustCon	0.21***	0.00	0.20	0.19	0.26***	0.00	0.28***	0.00	0.30	0.13	0.32***	0.00
ΔSLACK	0.00	0.31	− 0.00	0.97	0.00***	0.00	0.00	0.62	− 0.00	0.13	0.00***	0.00
LitInd	0.07	0.73	− 0.16	0.57	0.15	0.58	0.15	0.60	− 0.44	0.26	0.42	0.25
AGE	0.00	0.60	0.00	0.85	0.01	0.38	0.01	0.29	0.01	0.37	0.02	0.23
SIC	0.01	0.11	0.00	0.31	0.01	0.13	0.01**	0.04	0.01*	0.08	0.01*	0.06
ΔGOV	0.13	0.13	− 0.07	0.54	0.20	0.07	0.16	0.11	− 0.11	0.41	0.29**	0.03
CEOTen	− 0.00	0.74	0.00	0.78	− 0.01	0.66	− 0.01	0.53	− 0.00	0.97	− 0.01	0.48
CEOAge	− 0.02	0.07	0.01	0.38	− 0.02	0.09	− 0.02*	0.10	− 0.02	0.35	− 0.02	0.21
BrdTen	0.03	0.12	0.01	0.77	0.05	0.07	0.04	0.12	0.02	0.59	0.06*	0.10
BrdIndep	− 0.55	0.32	− 0.56	0.46	− 0.60	0.43	− 0.88	0.21	− 0.52	0.60	− 1.14	0.19
BrdAct	− 0.09***	0.00	− 0.04	0.28	− 0.12	0.00	− 0.11***	0.00	− 0.07	0.19	− 0.15***	0.00
InverseMills	0.31	0.31	0.08	0.85	0.61	0.11	0.78*	0.06	0.26	0.61	1.37***	0.01
Year Indicators	Yes		Yes		Yes		Yes		Yes		Yes	
R^2	0.10		0.09		0.13		0.13		0.14		0.17	
N	1134		450		684		838		348		490	

Bold values indicate results for our variables of interest

[a]Results are based on two-tailed tests where ***, **, * indicate $p < .01$, $p < .05$ and $p < .10$ levels, respectively. Variables are defined in Table 3

firms). Another difference between better and worse performing firms is that worse performing firms appear to absorb the entire impact of board activity noted in the main models. As boards become more active in worse performing firms, they experience worse subsequent sustainability performance.

CSO Expertise and Subsequent Performance

Table 8 provides the results of our regressions when we substitute our CSO variable with the CSO expertise variable, *CSOExpert*, and a variable representing the appointment of a CSO without sustainability expertise, *CSONonExpert*. Similar to the prior table, Columns 1, 4, 7, and 10 consider changes in future sustainability performance for our overall sample in years one, two, three, and four, respectively. Similarly, the remaining columns separately evaluate the associations of CSO expertise with better and worse performing firms, respectively. Overall results suggest that hiring an expert CSO is not associated with subsequent sustainability performance until the CSO has been in place for 4 years and, even then, this relationship is only experienced by better performing firms. This may indicate the difficulty in improving performance in firms having already established strong sustainability performance, where firms are more likely to already have strong sustainability departments and support staff working toward sustainability initiatives. In contrast, for worse performing firms, an expert CSO could have more difficulty in garnering support and resources (both external and internal) to impact change.

With respect to non-expert CSO appointments, results indicate significantly negative decreases to performance, and again, this result is completely attributable to firms with poor prior performance. If a poor performing firm hires a CSO to signal an alignment with stakeholder desires for sustainability without an intention to actually change behavior, as reflected in a non-expert hire, the result is even worse performance. This indicates that symbolic management team structures provide an inadequate response to sustainability concerns. This suggests that stakeholders will eventually

realize, upon further deteriorating performance and a continued inability to communicate with the firm, that the CSO does not signal a commitment to organizational change. In better performing firms, non-expert CSOs do not appear to hinder subsequent performance. Strong performing firms likely implement a variety of elaborate sustainability strategies, which compensate for the overall negative association between performance and the appointment of non-expert CSOs. But, in year three, results indicate a shift in the association between CSO appointment and sustainability performance. While the overall association is no longer significant and the association within poor performing firms remains statistically negative, the association between non-expert CSO appointments and performance for better performing firms actually improves. We posit that this change might be attributable to the influence of the strong sustainability culture discussed previously. Within a strong performing firm, the additional mechanisms above and beyond the CSO that help to improve sustainability performance can potentially influence a non-expert CSO and develop means to improve performance. Overall, our findings in Table 8 provide mixed results for hypothesis 2. These results may reflect the difference between hiring a CSO as a signal of a true commitment to sustainability initiatives (expert), versus hiring a CSO as a form of ceremonial conformity (non-expert).

Discussion and Conclusion

Prior research indicates firms engage in symbolic legitimation tactics to manage stakeholder impressions of sustainability performance. In the face of questionable firm-specific sustainability disclosures, stakeholders are tasked with the challenge of evaluating the actions of a firm's commitment to sustainability initiatives and performance. While hiring a CSO would appear to be a commitment to future sustainability performance, it remains unclear how effective these positions can be and what characteristics they should embody. These questions are particularly salient considering other executive positions might be focused more directly on short-term financial goals (Denning 2011), in direct opposition to the long-term perspective of sustainability. Focus on long-term value creation by sustainability executives is fundamental to leading ethically and building trust between the firm and its stakeholders. Therefore, understanding the influence of the CSO and the symbolic versus substantive nature of CSO appointments is important.

Our results document mixed associations between sustainability performance outcomes after the appointment of CSOs, dependent upon sustainability behavior prior to the CSO appointment. While overall there appears to be no association between CSO appointments and subsequent sustainability performance, upon deeper examination, we document a positive relationship between CSO appointment and subsequent performance, but only by firms that already enjoy strong sustainability performance, and only after considerable time in the position (e.g., at least 3 years). More importantly, when firms choose to appoint individuals with prior sustainability expertise, firms with strong existing sustainability performance further improve sustainability performance in the long-term, while worse performing firms' performance remain constant. On the other hand, when firms hire a non-expert CSO, firms with poor existing sustainability performance experience significantly worsening performance. However, firms with strong existing sustainability performance actually experience improvements in performance after 3 years, possibly representing a form of "culture capture," where the CSO position is influenced by the sustainability culture and resources already associated with strong sustainability performance within the firm. These results at least partially support the assertion that expertise may be an important indicator of a firm's ability to instill permanent change, where a lack of expertise may represent a more symbolic approach to sustainability, restricting firms from successfully implementing change.

We argue that our results are important to academics, analysts, investors, employees, regulators and standard setting bodies, NGOs, and other stakeholders. Theoretically, we offer support that substantive governance mechanisms reflect the appointment of expert CSOs who provide the most firm-specific benefits, in terms of sustainability performance improvements. While that may be because these are strategically the firms most interested in actually changing behavior as opposed to participating in ceremonial conformity (symbolic mechanisms), it may also be that these firms hire experts, who have greater access to external sustainability funds not available to non-experts (substantive mechanisms). These findings extend our theoretical understanding of sustainability strategy and contribute to the academic literature as it relates to sustainability and CSOs.

From a practical standpoint, financial analysts and investors have voiced concern about the lack of sustainability knowledge and focus of management in public firms (O'Neill 2016, PWC 2014, 2016; Eliopoulos et al. 2016; Lamy et al. 2016). For example, Larry Fink, CEO of BlackRock, recently called upon public firm executives to provide stronger service to social purpose, in addition to shifting their profitability focus from short-term to a more long-term approach (Morrell 2018). He addressed the continued pressures from the investment community for firms to understand how environmental or social issues might affect firm growth and demonstrate leadership in communicating firm-specific sustainability action to stakeholders. To earnestly work toward these goals, leadership must possess the necessary skills to understand the relationship between

profitability, long-term growth, and sustainability, and be able to communicate these issues with stakeholders internal and external to the firm. Depending upon the symbolic versus substantive strategies of the firm, the CSO represents both a champion for sustainability issues within the firm, as well as a focal point for communication with external stakeholders, including the investment community.

Our findings are also important to standard setters and regulators as they attempt to navigate a balanced solution to the asymmetric relationship between management and external stakeholders with regard to sustainability information. As standard setting bodies such as the Sustainability Accounting Standards Board (SASB) continue their work toward providing the markets with material, relative sustainability information (Rogers 2016), understanding the substantive role of expert CSOs is important. If standard setters are aware of the substantive roles of these individuals possess, they may be able to improve firm-specific transparency by exploiting CSO expertise.

Finally, it cannot be discounted that other individuals, not associated with capital market mechanisms, may also gain from the results of our study. For example, NGOs allocate significant resources to building relationships with firms in order to improve sustainability performance. Understanding the symbolic versus substantive roles of CSOs and, more specifically, the differences manifested by CSO expertise in combination with prior firm performance, provides an indication of the appropriate strategy to reach firms. Likewise, the evolution of the educational norms of CSO positions (such as the growth in MBA programs focused on sustainability concerns) creates new opportunities to understand the implications for knowledge-based leadership positions.

The increasing presence of such positions and their natural transition up to the corporate ladder will create additional research opportunities. If expert CSOs overcome the language barrier expressed by stakeholders, their relative position with respect to the C-suite may provide substantive role over the CEO/CFO decisions as it relates to subsequent performance. We acknowledge that the focus of the CSO position is likely to continue shifting in response to stakeholder demands. Future research may provide insight into whether this position fades away, solidifies itself within the narrative of top management teams, or further evolves into positions that still reflect underlying broad stakeholder concerns.

This study is subject to numerous limitations. First, the collection process employed to gather data on CSOs, CSO expertise, and sustainability committees is subjective. While we were careful to base our search algorithms on prior literature, there is the possibility that we missed some firms that employ similar positions. Moreover, to the extent that we have misclassified firms as not having CSOs, our findings should be conservative. Secondly, we are limited in our ability to affirm causality compared to association. For example, we cannot rule out the extent that other executives or attributes of the firm have on the improvement in sustainability performance. However, the adoption of CSOs with sustainability expertise does appear to be a significant determinant of sustainability performance gains among some firms and the differential association of expertise is consistent with the reputational needs of the individuals to fulfill their roles. Further, we cannot rule out that some firms may still use these positions as symbolic attempts. In other words, not every expert appointment necessarily reflects substantive intent. Third, it is possible that the absence of performance improvements in worse performing firms may also indicate that the CSO's may require a more long-term focus. We argue that the fact that we find differences between better and worse performing firms and between firms hiring expert versus non-expert CSOs provides evidence that a four-year timeframe is adequate. Finally, our study is also limited to one archival attribute of the CSO position, namely expertise. We encourage future researchers to employ alternative methods to determine how the traits of the CSO reflect their ability to lead environmental and socially responsible activities at the firm level and also at the individual employee level.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Human and animal participants This article does not contain any studies with human participants or animals performed by any of the authors.

Appendix A: Examples of CSO Expertise

Gene Kahn, former CSO and VP Global Sustainability Officer, General Mills (Bloomberg 2016)**:** "Mr. Gene Kahn was the Founder at Small Planet Foods, Inc. He is a Member of the Advisory Board at Uplift Equity Partners, LLC. He currently serves on the Boards of the Governor's State of Washington Sustainability Panel, the Rachel Carson Council, and the Center for Organic Education and Promotion. Mr. Kahn has been an organic foods pioneer and an environmental leader for more than 30 years. In 1972, he founded Cascadian Farm. Prior to this, Mr. Kahn served on the Boards of the Washington State Nature Conservancy, Washington State University College of Agriculture Advisory Board, and the US Department of Agriculture's National Organic Standards Board."

Patricia Calkins, VPEHS, Xerox (2010)**:** "Patricia A. Calkins is the vice president of Environment, Health and Safety for Xerox Corporation. She is responsible for developing and implementing sustainability policies and

strategies throughout Xerox that help save hundreds of millions of dollars annually for the company worldwide. She is dedicated to strengthening Xerox's position as a pioneer in sustainability and is committed to smart environmental management that demonstrates that doing what's right for the environment is not a cost of doing business, but an opportunity to benefit the world in which we work and live.

Calkins joined Xerox in 1993 as a manager of resource conservation, developing plans to help the company capture energy and materials savings through more sustainable and efficient processes, facilities and product design. Since then, she has assumed increasingly responsible management positions in quality, business process management and product design, enabling the company to remain at the forefront of driving environmental improvement throughout the value chain.

Before joining Xerox, Calkins began her career as a chemist for AT&T and then moved on to initiate many of the company's sustainability initiatives. During her tenure, she focused on how changes in product and process design could eliminate many environmental challenges, including eradicating the use of toxic chemicals in the electronics manufacturing process. For her efforts, she was recognized for her engineering excellence. In 1992, she joined Abt Associates as a senior scientist where she worked directly with US Environmental Protection Agency in developing market-based voluntary sustainability programs. She also provided consulting services to corporations developing environmental leadership strategies.

Calkins earned a Bachelor of Arts degree in biology from Merrimack College, North Andover, Massachusetts, and a Master of Science degree in civil/environmental engineering from Tufts University. In 2001, she received her executive M.B.A. from the University of Rochester. Calkins currently serves as a member of the external advisory board for the University of Michigan's Center for Sustainable Systems and is on several boards, including the Central and Western New York Chapter of the Nature Conservancy and the and the Golisano Institute for Sustainability at the Rochester Institute of Technology."

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