**Executive Compensation, Sustainable Compensation Policy, Carbon Performance and Market Value**

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**Executive Compensation, Sustainable Compensation Policy, Carbon Performance and Market Value**

We examine the interrelationships among executive compensation, environmental-social-governance-based (ESG) sustainable compensation policy, carbon performance and market value. Using one of the largest datasets to-date, consisting of 4,379 firm-year observations covering a period of 15 years (2002-2016) from 13 industrialised European countries and insights from neo-institutional theory (NIT), our findings are four-fold. First, our results suggest that process-oriented carbon performance is positively associated with market value, whereas actual-carbon performance has no effect on market value. Second, we show that the market value–process-oriented carbon performance nexus is moderated by executive compensation. Third, our results indicate that executive compensation has a positive effect on process-oriented carbon performance, but has no similar effect on actual-carbon performance. Fourth, we show that the process-oriented carbon performance–executive compensation nexus is reinforced for companies that adopt ESG-based sustainable compensation policy. Our results are generally robust to controlling for governance mechanisms, alternative measures/estimations and endogeneities. Overall, our evidence supports legitimisation aspect of NIT and suggests that the market tends to reward firms with superior process-oriented carbon performance instead of undervaluing firms with excessive actual-carbon emissions. This implies that firms appear to use incentive-based mechanisms to symbolically improve their process-oriented carbon performance without substantively improving their actual-carbon performance.

***Key words:*** Executive compensation, ESG-based sustainable compensation policy, carbon performance and climate change, corporate governance and market value

**Introduction**

 “…*According to a 2013 Glass Lewis study, 44% of companies from the S&P 100 and other leading global indices linked at least some executive compensation to at least one sustainability criteria, up from 42% in 2012. Unfortunately, according to Farient Advisors, only 10% of the S&P 100 tie executive compensation to sustainability targets*.” (Welsh, 2014, p.1).

 Global efforts to reduce global warming and improve climate change through the design and implementation of sustainable global, national and corporate environmental management, policies and regulations, especially those relating to carbon (greenhouse gas emissions – GHG) reduction initiatives have intensified over the past 30 years (Brooks and Schopohl, 2019). This study, therefore, seeks to make a number of new contributions to the existing literature by investigating the interrelationships among executive compensation (EC), environmental-social-governance-based (ESG) sustainable compensation policy, carbon performance (CP) and market value (MV). Our extensive analyses are informed by theoretical insights drawn from a multi-dimensional neo-institutional theory (NIT) that incorporates legitimation (‘symbolic’/‘social’) and efficiency (‘substantive’/‘economic’) motives.

From a theoretical perspective, NIT suggests that a firm’s response to institutional pressures is often driven by two motives: legitimisation (‘symbolic – moral/social view’); and efficiency (‘substantive – instrumental/economic view’) (Meyer and Rowan, 1977). These pressures can be coercive/regulative (governments regulations), cognitive/educative/mimetic (learning from/copying others) and normative (global standards) (Scott, 2001) that often lead to isomorphic/similar behaviour/structures (Powell and DiMaggio, 1991). Thus, on the one hand and from the legitimation/moral/social perspective, firms may symbolically (Ashforth and Gibbs, 1990) comply with such institutional pressures in order to gain (extend), maintain, and repair (defend) organisational legitimacy (Suchman, 1995). In this case, firms may engage in process-oriented[[2]](#footnote-2) social and environmental practices in order to primarily enhance their financial performance and protect shareholders’ interests, but such process-oriented climate change activities may not lead to improvements in actual-CP (reductions in GHG emissions) (Aguilera *et al.*, 2007). On the other hand and from efficiency/instrumental/economic perspective (North, 1991), firms are more likely to engage in substantive economically efficient/cost reducing climate related initiatives that can subsequently enhance both their actual-CP (GHG emissions reduction) and MV. The resulting substantive improvements in actual-CP (Arena *et al*.., 2018; Clarkson *et al*., 2015) will not only serve the interests of corporate shareholders and executives, but also the larger environment/humanity (Mazouz and Zhao, 2019).

Meanwhile, climate scientists report a rapid increase in GHG emissions, leading to observable global warming and climate change (Gallego-Alvarez *et al*., 2015; Ortiz-de-Mandojana e*t al*., 2019). At the same time, national governments, supra-national bodies and business leaders are showing increasing interests in responding to these risks by developing various carbon related policies, strategies and actions (Baboukardos, 2018). These initiatives range from climate change regulations to extensive disclosure requirements aimed at limiting the rise in average global temperature below 2°C (Haque, 2017). In this case, the 1997 Kyoto protocol and 2015 Paris agreement are among the earliest and latest legally binding global accords to, respectively, reinforce these initiatives by obliging the ratifying countries to limit GHG emissions and global warming by enhancing energy efficiency (Haque and Ntim, 2018).

 Discernibly, one way by which such global GHG targets can be achieved is to encourage top corporate executives of large public corporations to adopt and implement GHG reduction initiatives (Welsh, 2014). Unsurprisingly, this has resulted in the explosion of markets for ‘green’ products and services for corporations over the past decade (Brooks and Schopohl, 2019). For example, the market for ‘green bonds’ has not only grown from nothing to USD$1.45 trillion within the last decade, but also set to reach USD$100 trillion within the next decade (CBI, 2019; GBD, 2019). Similarly, using Newsweek’s annual green rankings that track companies that link EC to green performance targets, Heaps (2015) has shown for the first time that the majority of the globe’s largest 500 listed corporations tied an aspect of their executives’ compensation to some green targets (GHG emissions).

 A crucial policy question is whether such ‘green’ initiatives that are increasingly being pursued by senior executives of such large public corporations actually lead to observable reductions in GHG emissions or not. In this instance, we seek to specifically ascertain whether EC packages (ESG-based sustainable compensation policy) can be used to incentivise a substantive engagement of corporate executives with the often ‘largely aspirational’ global climate change and carbon reduction initiatives.

 Admittedly and whilst several strands of studies examining the links among CG, EC, CP and MV exist (Aktar *et al.,* 2018; Goergen and Renneboog, 2011; Berrone and Gomez-Mejia, 2009), none has addressed them in an integrated and multi-dimensional manner that we do in our current study. For example, one strand of the extant literature has examined the link between EC and MV (Chahine and Goergen, 2014; Core *et al.*, 1999; Elmagrhi *et al*., 2019). They generally report that the pay-for-performance sensitivity link is positive, but relatively small. Another strand of the existing studies has investigated the effect of CP on MV (Kim *et al.*, 2015; Qiu *et al*., 2016; Trumpp *et al*., 2015) with mixed findings. For example, whilst Matsumura *et al.* (2014) find a positive effect of CP on MV, the evidence of Delmas *et al.* (2013) for the same link was inconclusive. A third strand of the literature has investigated the association between EC and CP (Campbell *et al.,* 2007; Maas, 2018; Mahoney and Thorn, 2006). With some exceptions (Haque, 2017; Ji, 2015), the findings of these studies largely indicate that there is a positive relationship between EC and CP. A final strand of the extant literature has examined the impact of CG structures on: (i) MV (Mangena *et al*., 2012; Ntim, 2016; Singh *et al.*, 2018); (ii) CP (de Villiers *et al*., 2011; Tauringana and Chithambo, 2015); and (iii) EC (Ntim *et al*., 2019; Ogden and Watson, 2012; Sarhan *et al*., 2019). The findings of these studies generally suggest that good governance is associated with better carbon/environmental, compensation and financial outcomes, albeit with some exceptions (Cong and Freedman, 2011; Haque and Ntim, 2018).

 Observably, the above/past studies arguably suffer from a number of limitations. First, measures used to capture some of these (CP) mechanisms may be misleading, and thereby resulting in inaccurate findings. For example, most of these studies employ absolute measures of CP without carefully splitting them into process-oriented and actual-CP (Qian and Schaltegger, 2017; Ziegler *et al*., 2011), and thereby failing to ascertain whether such process-oriented plans lead to actual reductions in GHG emissions. Second, the existing studies have mostly provided a simple one directional testing of the links among these measures. However, the relationship among CG, EC, CP and MV are arguably very complex and interdependent such that a simple modelling of these relationships may result in spurious correlations (Arellano and Bond, 1991; Blundell and Bond, 1998). For example, none of the existing studies have examined how the process-oriented CP–MV (EC) link may be moderated by EC (ESG-based sustainable compensation policies).

 Third and although the EU currently remains the single largest economic block with 28 relatively highly industrialised countries and by extension, the single largest polluting economic unit in the world, the existing few studies have focused mostly on Australia, China, India and US (Chang *et al.*, 2015; Cordeiro and Sarkis, 2008; Lattermann *et al.*, 2009; Ji, 2015) to the neglect of EU countries in particular, but cross-country studies in general. This has arguably impaired the ability to generalise existing findings fully across countries. Finally and despite the fact that a number of studies have investigated general corporate social and environmental performance, especially its valuation consequences (Busch and Hoffmann, 2011; Lins *et al.,* 2017), a clear majority of them have been informed by theoretical insights drawn from traditional theories, such as legitimacy, resource dependence, stakeholder and, especially the ubiquitous agency theory (Ntim and Soobaroyen, 2013). As elaborated later, both agency theory (AT) and resource dependence theory (RDT) are related to ‘economic efficiency’, with AT focusing on self-interest and wealth maximisation behaviour of a firm and its actors, such as managers and shareholders, and RDT explaining a firm’s unique resources and competencies. By contrast, stakeholder and legitimacy theories seem to be more appropriate in explaining ‘symbolic/societal/moral’ aspects of a firm’s role within the society. Whilst all these theories are very useful in explaining the relationships among efficiency and symbolic constructs separately, they are not multifaceted and all-encompassing like NIT that can simultaneously predict multi-dimensional (economic and social links) associations. Arguably, this has also impeded theoretical application/extension.

Consequently and in this paper, we seek to make a number of new contributions to the extant literature. Specifically, we depart from the existing literature by engaging in an integrated and multi-dimensional analysis that captures complex direct and indirect relationships among CP, EC, ESG-based sustainable compensation policy and MV. This is conducted by using firms drawn from 13 industrialised European countries, which despite being at the forefront of the Kyoto and Paris climate agreements often with relatively well-developed CG and carbon enforcement standards, acutely lacks academic studies that examine such relationships. Specifically, we contribute to the literature by first examining how CB influences MV, and subsequently investigating whether EC moderates the CP–MV relationship. Secondly, we contribute to the existing literature by investigating how EC determines CP, and ascertain whether ESG-based sustainable compensation policy moderates the EC–CP relationship. We are among the first to capture both (symbolic) process-oriented and (substantive) actual-CP, along with their determinants (e.g., EC and ESG) and impacts (on MV), by examining both direct relationships and moderating effects (see, Figure 1). With this, we seek to bring together the different strands of the literature relating to CG, CP, EC and MV in a combined empirical framework. Unlike past studies, our analyses are informed by distinctive theoretical insights drawn from the robust multi-dimensional NIT that incorporates legitimation (social) and efficiency (economic) motives using data over a 15-year period (4,379 firm-year observations) across 13 EU countries. In this case, our study offers new insights on, and contributes to, the existing literature by extending the application of the multi-dimensional NIT framework that seeks to explicitly test and integrate the hitherto untested complex relationships among CG, CP, EC and MV, and thereby offer empirical evidence to support the NIT’s predictions or otherwise.

The rest of the paper is structured as follows. Section 2 presents the study’s background. Section 3 reviews the theory, empirics and develops hypotheses. Section 4 explains data/research methodology. Section 5 discusses the empirical results, whilst section 6 concludes the paper.

**Current status of climate change, governance and EC reforms in European countries**

 European countries have been at the forefront of climate change agreements and carbon reduction initiatives. For example, EU countries, such as UK were among the first to ratify the 1997 Kyoto protocol that provided the first major legally binding global platform for the EU to set out comprehensive policies to reduce GHG emissions (Delbeke and Vis, 2016). As part of the 1997 Kyoto protocol, the EU implemented several climate legislations on a key joint carbon reduction initiative – EU Emission Trading System (ETS) (European Commission, 2016).

Whilst the EU countries fell slightly short of meeting GHG reduction targets (23.5-Gt-CO2-eq. against a cumulative target of 26.7-Gt-CO2-eq.) of the first commitment period (2008-2012), they are on track to overachieve the target for the second commitment period (2013-2020) (European Commission, 2016). For example, in 2015, the EU managed to reduce its GHG emissions to 22% below 1990 levels, with new mitigation policies being in place to meet at least a 40% domestic reduction in emissions by 2030 (European Commission, 2016).

Discernibly, the December 2015 draft Paris climate change agreement, which is set to replace the 1997 Kyoto protocol in 2020, is widely considered as a milestone global initiative to enhance and accelerate global transformation to a low-carbon/climate resilient society (European Commission, 2016). The EU move quickly to ratify it in October 2016 (whilst the US, for example, withdrew from it in June 2017) as part of its commitment not only to reduce domestic/industrial GHG emissions, but also to increase its share of renewable energy sources, and thereby improve energy efficiency (European Commission, 2016). In spite of these notable climate related regulations and initiatives, there seems to be a lack of progress in designing and enforcing firm-specific policies and guidelines that can help policymakers to monitor both process-oriented and actual carbon performance at a firm-level.

Aside its strong commitment to climate change reforms, the EU has pursued a number of initiatives to reform CG in EU firms. In this case, the EU action plan of 2003 covers CG issues, such as the independence of the board, separation between the CEO and chairperson, the balance between executive and non-executive directors, remuneration policy of directors, disclosures of financial and non-financial information, and protection of shareholder rights (IFC, 2015). Moreover, the European Commission developed and introduced CSR guidelines for EU firms in 2006, and published a CSR strategy in 2011 (IFC, 2015). The EU action plan of 2012 provided further guidance on good CG mechanisms aimed at encouraging EU firms to increase long-term growth-orientated investments and sustainable corporate practices, such as those relating to achieving reductions in climate change and GHG emissions (IFC, 2015). Observably, many of these initiatives have been revised through the Shareholders’ Rights Directive of the EU that has outlined, among others, the provision to both vote and disclose directors pay.

**Literature review: Theory, empirics and hypotheses development**

***NIT Perspective for CP***

 Although the extant literature has employed several economic- (agency and resource dependence) and socio-based (legitimacy and stakeholder) theories to explain the links among CP, EC, CG and MV, we apply NIT in this study for three reasons. First and as elaborated further, NIT is a multi-dimensional and all-encompassing theory that is able to directly and/or indirectly capture both traditional economic (agency/resource dependence theory) (DiMaggio and Powell, 1983; Meyer and Rowan, 1977) and social (legitimacy/stakeholder theory) theoretical predictions simultaneously (Ashforth and Gibbs, 1990; Suchman, 1995). Second and more importantly, our current study seeks to explore complex and multi-dimensional relationships among EC, ESG-based sustainable compensation policy, process-oriented (symbolic) and actual (substantive) CP and MV, which inherently involves multiple institutions and stakeholders with divergent interests. Therefore, we argue that as a robust multi-dimensional and all-encompassing theory, NIT is naturally the most appropriate theoretical framework to adopt to conduct our analysis involving both symbolic (legitimisation) and substantive (efficiency) constructs. Finally, there has been increasing calls (Aguilera, 2005; Aguilera *et al*., 2007) for alternative theories to traditional ones to be employed in order to offer new insights that can further advance theoretical insights/improvements. Our current study is, thus, a direct response to such calls.

 Meanwhile NIT scholars (North, 1991; Powell and DiMaggio, 1991) have defined the notion of ‘institution’ as economic and social practices, norms and beliefs relating to varied parts of society (religion/politics/law) that are widely accepted. Discernibly, ‘economic institutions’ can be formal (statutes/rules), but also informal (norms/conventions). In this case, scholars (North, 1991; Scott, 2001) contend that the central focus of economic institutions (companies/countries/individuals/groups) tends to be about maximising economic growth. Therefore, economic-oriented NIT can be directly related to notions of ‘economic efficiency’ (Ntim and Soobaroyen, 2013)/‘instrumentality’ (Aguilera *et al*., 2007)/‘substantiveness’ (Ashforth and Gibbs, 1990). Specifically and as inherent in economic-oriented theories (agency/resource dependence theory) (Ntim, 2016), it indicates that economic institutions (nations/companies/groups/individuals) should strive to maximise their own interests at the expense of other societal members by out-competing others for scarce societal resources (Aguilera *et al*., 2007).

 By contrast, sociologists do not only take institutions as a means by which goods and services can be efficiently produced, but also as a system of high cultural, ethical, moral and social value (Meyer and Rowan, 1977). In this case, the sociologists’ conceptualisation of NIT is that institutions will not only contest for scarce societal resources ('economic/instrumental/substantive efficiency’) (Ntim and Soobaroyen, 2013), but also attempt to gain approval of/support from the larger society for their right to exist (‘social/moral/symbolic legitimacy’) (Ashforth and Gibbs, 1990). Hence and similar to the predictions inherent in social-oriented theories (legitimacy/stakeholder theory) (Aguilera *et al*., 2007), social legitimacy involves demonstrating awareness of, and concern for, how one’s actions and inactions impact on, as well as may be perceived by, others (Suchman, 1990).

 On this basis, NIT is often reduced to two simple opposing theoretical views, whereby institutions’ seek to conform to/make decisions that seek to maximise their: (i) economic/financial wealth (‘economic efficiency/simply ‘efficiency’); and/or (ii) level of social approval/acceptance (‘social legitimacy’/simply ‘legitimacy’). In this instance, the achievement of ‘economic efficiency’ will usually require serious (’substantive’) efforts over a relatively longer time period, whilst the realisation of ‘social legitimacy’ may normally require impression management (‘symbolic’) efforts that may be achieved within a short period of time.

 Powell and DiMaggio (1991) extended NIT by classifying institutional forces that can compel institutions to seek ‘economic efficiency’ and/or ‘social legitimacy’ explicitly into three: (i) ‘coercive/regulative’; (ii) ‘cognitive/educative/mimetic’ and (iii) ‘normative’ (North, 1991). Briefly, coercive/regulative forces refer to the presence of institutions that can force actors to conform to accepted standards (government laws/regulations). Cognitive/educative/mimetic forces refer to the capacity of corporations to copy the behaviour of other corporations (the process of voluntarily learning and sharing best practice), whilst normative institutional forces refer to widely expected and accepted standards of social behaviour (international norms/practices).

 Consequently, NIT has been successfully applied in explaining the diffusion and/or imposition of a number of corporate practices, such as accounting and governance standards (Aguilera *et al*., 2007). In a similar vein, we seek to extend the application of NIT to CP and EC, including ESG-based sustainable compensation policies that have been introduced under the global environmental regulatory frameworks (Kyoto and Paris agreements), which have been adopted and imposed on EU countries by the EU. With this, we specifically extend NIT to capture both the incentive-based determinants and valuation consequences of symbolic (‘legitimation’) process-oriented CP and substantive (‘efficiency’) actual-CP.

 In this case, NIT indicates that a major way by which corporations can gain social legitimacy is to voluntarily adopt and/or comply with accepted institutional norms, rules and conventions (Scott, 2001). In this regard, EU corporations as economic institutions may need to comply with CP targets that are not only set by the EU (coercive/regulative pressures) (Clarkson *et al*., 2015), but also as way of learning from best practice from peers (cognitive/educative/mimetic pressures) and/or as part of international norms (Paris climate agreement) (Kim *et al.*, 2015). Complying with carbon regulations of this nature cannot only help to improve corporate legitimacy by enhancing corporate image, but also economic efficiency in the form of gaining access to critical resources, such as finance by securing the support of different influential stakeholders (governments and shareholders).

 In this respect, EU companies can do so by designing process-oriented CP, EC and ESG-based sustainable compensation policy initiatives (Qian and Schaltegger, 2017) that may (i) symbolically improve their corporate image and legitimacy in the eyes of their powerful stakeholders (legitimation’), but do not necessarily result in actual reductions in GHG emissions (Ziegler *et al*., 2011); and/or (ii) substantively reduce actual GHG emissions that can reduce operating costs by improving corporate efficiency, and thereby impact positively on MV (Campbell *et al.,* 2007).

***Empirical literature and hypotheses development***

 Past empirical studies have examined the link between: (i) CP and MV (Baboukardos, 2018; Trumpp et al., 2015); (ii) EC and MV (Chahine and Goergen, 2014; Sarhan *et al*., 2019)/CP (Cordeiro and Sarkis, 2008; Maas, 2018)/CSR (Ji, 2015; Mahoney and Thorn, 2006); and (iii) CG and MV (Ntim, 2016; Singh *et al.*, 2018)/EC (Goergen and Renneboog, 2011; Elmagrhi *et al*., 2019)/CP (Haque, 2017)/CSR (Aktar *et al.,* 2018; Chang *et al*., 2015). We, therefore, draw from these different strands of the literature to develop our hypotheses.

*Carbon performance and market value*

 In line with NIT’s predictions discussed above, an improved CP is likely to be associated with higher MV not only through energy savings/greater operational efficiency and improved access to critical resources (‘efficiency’), but also improved environmental legitimacy (‘legitimation’) (Berrone and Gomez-Mejia, 2009; de Villiers *et al.*, 2011). From an ‘efficiency’ point of view, Matsumura *et al.* (2014) argue that investors and markets determine MV by assessing two aspects of carbon emissions: climate-related risk profile of a firm; and the lack of resources and capabilities to integrate climate change risk into business strategy. From a ‘symbolic’ aspect of NIT, powerful executive management might focus on improving process-oriented CP in order to gain environmental legitimacy and hence, impress investors and markets (Delmas *et al.* 2013). Similarly, as Matsumura *et al.* (2014) argue, markets may not always undervalue firms with greater carbon emission if their voluntarily disclosed emissions data are insufficiently reliable. In this circumstance, markets might reward process-oriented, rather than actual-CP of a firm, as the former can easily be communicated to the markets. Accordingly, firms may focus on improving process-oriented CP, which is expected to be perceived favourably by the market, and thereby leading to an improved MV.

Noticeably, a limited number of empirical studies (Clarkson *et al*., 2015; Lins *et al.,* 2017; Qian and Schaltegger, 2017) have examined the impact of GHG disclosures and/or emissions on MV. For example, Matsumura *et al.* (2014) find an inverse association between actual GHG emissions and MV in S&P 500 companies. Similarly, Kim *et al.* (2015) find that carbon intensity is positively associated with cost of capital of Korean firms. In contrast, past studies examining both process-oriented and actual-CP are relatively scarce. Studies by Busch and Hoffmann (2011) and Delmas *et al.* (2013) are discernible exceptions. For instance, Busch and Hoffmann (2011) find that actual CP (lower GHG emissions) is positively linked to MV (Tobin’s Q) in global firms. However, Delmas *et al.* (2013) find that process-oriented CP, rather than actual CP, is positively related to MV in US firms.

Therefore and given that the market may be deceived to respond to observable process-oriented carbon performance efforts more favourably, we support symbolic aspect of NIT and expect process-oriented measure, rather than actual CP measure, to have a greater positive effect on MV. Thus, our first hypothesis is:

*H1a: Ceteris paribus, CP has a positive relationship with MV, and this relationship is greater for process-oriented CP than actual CP.*

*The carbon performance–market value nexus: The moderating effect of executive compensation*

 Whilst a firm’s carbon abatement projects are likely to generate long-term financial gain, these costly investment projects are less likely to be materialised without active involvement of powerful executive management. According to NIT’s predictions, firms can design and use EC to persuade managers to undertake social and environmental initiatives, which in turn can enhance both organisational legitimacy (‘legitimacy’) and economic benefits (‘efficiency’) of a firm (Mahoney and Thorn, 2006; Campbell *et al.*, 2007). Therefore, EC can be considered as an effective mechanism to improve MV through an improvement in CP. Considering our arguments relating to symbolic aspect of NIT, we intuitively expect that EC is likely to reinforce the positive relationship between CP and MV, and this moderating effect would be greater for process-oriented CP than actual CP.

 Empirically and to the best of our knowledge, there is no evidence on whether EC can moderate the CP–MV link. Past studies have primarily examined the direct link between CP and MV (Baboukardos, 2018; Bernardi and Stark, 2018; Qiu *et al*., 2016), without considering the potential moderating effect of EC. Ntim and Soobaroyen (2013) is of closer relevance to our study. Using a sample of large South African firms, they find that the interaction between CG and CSR has a greater positive effect on MV than CSR alone, implying that CG reinforces the CSR–MV nexus. Observably, they did not examine whether EC can moderate such a nexus. However, past evidence indicates that EC has a positive effect on: (i) MV (Chahine and Goergen, 2014; Core *et al.*, 1999; Ntim *et al*., 2019); and (ii) CSR (Campbell *et al.,* 2007; Cordeiro and Sarkis, 2008; Maas, 2018). This implies that EC is likely to affect the link between CP and MV, and thus, our second hypothesis is:

*H1b: Ceteris paribus, EC reinforces a positive relationship between CP and MV, and this moderating effect is greater for process-oriented CP rather than actual CP.*

*Executive compensation and carbon performance*

 From an efficiency perspective of NIT, the market can encourage carbon reduction initiatives by rewarding firms with better carbon performance with higher valuation and vice-versa. Therefore, well-meaning corporate boards can be expected to use incentive-based mechanisms, such as EC to motivate executive management to undertake carbon abatement projects. Indeed, past evidence (Tauringana and Chithambo, 2015) indicates that incentive-based mechanisms of CG can be instrumental in enhancing corporate CP in a number of ways.

First, powerful executives are likely to be reluctant to pursue long-term emission reduction projects, since they require substantial capital investments amid uncertain financial benefits at least in the short-term (Haque, 2017). Second, as Berrone and Gomez-Mejia (2009) argue, environmental projects require labour-intensive structures and high performing employees to design and implement environmental protection or emission reduction initiatives, such as developing green products and services, or reducing the risks of environmental mishaps and legal sanctions. Therefore, firms need to use appropriate incentives to attract and/or motivate these talented employees with certain expertise and innovative mind-sets. Third, Melis *et al.* (2015) argue that firms with generously-remunerated executives are likely to be exposed to public and media scrutiny. Therefore, firms offering attractive remuneration policies might be under pressure to remain proactive in climate related matters in order to reduce potential negative media publicity, and thereby enhance corporate legitimacy.

Empirically, a number of studies have documented a positive EC–CP nexus (Cordeiro and Sarkis, 2008; Haque, 2017; Maas, 2018). For example, Mahoney and Thorn (2006) find a positive relationship between stock-based compensation and positive aspects of CSR of Canadian firms. Ji (2015) also finds similar evidence among US firms. Further, Berrone and Gomez-Mejia (2009) find a positive association between pollution prevention strategies and total CEO pay among US firms in polluting industry.

Together, we argue that EC is a critical determinant of a firm’s carbon related strategies and actions, even though the design of EC and its impact on CP are more likely to be driven by economic motives of shareholders and executives. Therefore, as the legitimation/symbolic perspective of NIT suggests, EC is likely to promote those climate related practices that will enhance corporate legitimacy, reduce carbon risks and improve financial benefits of the powerful economic agents. As we have previously argued that process-oriented CP enhances corporate legitimacy and economic benefits for shareholders and executives, we expect EC to have a greater positive effect on process-oriented CP than actual CP, a notion that is consistent with the legitimation/symbolic aspect of NIT. Thus, our third hypothesis is:

*H2a: Ceteris paribus, EC is positively associated with CP of a firm, and this relationship is greater for process-oriented CP than (a reduction in) actual carbon emissions.*

*Executive compensation and carbon performance: The moderating effect of ESG-based sustainable compensation policy*

 The provision of ESG-based sustainable compensation policy is likely to play a critical role in motivating corporate executives to undertake carbon initiatives, which can in turn enhance both organisational legitimacy and MV. As part of sustainable corporate strategies, corporations are increasingly using sustainable compensation policy to motivate executives to pursue social and environmental projects. For example, the Newsweek Green Rankings 2015 show that more than half of US firms and around 69% of global firms tend to have a part of their EC schemes to incorporate some form of green performance targets (Heaps, 2015). Empirically, Campbell *et al.* (2007) find that sustainable compensation schemes reduce environmental exposure premium component of CEO compensation in US firms.

We argue, therefore, that in the presence of a sustainable compensation policy, the board of directors and the compensation committee of the board might be in a better position to evaluate carbon risks of a firm to design a more effective EC scheme, which may enhance corporate CP. However, as Cordeiro and Sarkis (2008) argue, corporate boards might utilise CP-based compensation contracts, as a symbolic (‘legitimation’) rather than substantive (‘efficiency’) management practices, with the aim of enhancing organisational legitimacy or maintaining good standing with their stakeholders. In the context of our study, the European Commission has not mandated sustainable compensation policy for EU corporations, which is likely to cause the latter to adopt such policies as a symbolic measure so as to enhance corporate legitimacy in response to growing criticisms of excessive EC. Therefore, any symbolic ESG-based compensation policy without requiring explicit guidelines and mandatory emission reduction targets, might enhance process-oriented CP, but may not necessarily lead to a substantive actual decline in GHG emissions. Thus, our final hypothesis is:

*H2b: Ceteris paribus, the positive effect of EC on CP is greater for firms that adopt ESG-based sustainable compensation policy, and this moderating effect is greater for process-oriented CP than (a reduction in) actual carbon emissions*.



In conclusion, Figure 1 captures the operationalisation of our conceptual framework outlining the two theoretical constructs of the NIT – efficiency (substantive) and legitimisation (symbolic) constructs, including five specific measures of these constructs and their predicted interrelationships, as explained by our hypotheses. It also shows how three substantive measures – executive compensation (EC), actual carbon performance (GHG), and market value (MV); and two symbolic measures – process-oriented carbon performance (PCRI), and ESG-based compensation policy (ESG) influence each other through direct relationships and/or moderating effects.

**Methodology**

*Sample and data*

 Our initial sample was based on the availability of ESG data in the Thomson Reuters Asset4 database. We started with all the available sample of 6,814 firm-year observations from 517 non-financial firms that are listed on the main stock exchanges of 13 industrialised European countries, including Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, and UK. We then removed 1,164 observations with missing firm-level data on CP. Finally, we eliminated 1,271 observations with missing yearly data relating to the independent variables. Our final sample is based on an unbalanced panel dataset consisting of 4,379 firm-year observations from 494 listed firms, covering a period of 15 years (2002-2016). Table 1 shows industry- and country-wise distribution of the sample. We used *Asset4* dataset to collect CP and CG data, and *Worldscope* database to collect MV and other financial data.

Table 1 Here

*Empirical models and variables*

 In order to examine the relationships among EC, ESG-based sustainable compensation policy, CP and MV, we use firm fixed-effects regressions with heteroskedasticity adjusted standard errors clustered at the country-level. We carry out the Hausman test, which suggests that fixed-effects model is appropriate for our unbalanced panel dataset. As shown in our conceptual framework (Figure 1), we apply NIT by using three substantive (efficiency) constructs (GHG, EC and MV) and two symbolic (legitimisation) constructs (PCRI and ESG). Using MV (*Q*) as the dependent variable, we estimate the following models to examine how symbolic and substantive carbon performance (CP) measures are related to MV (*H1a*), and to test if this relationship is moderated by the level of EC (*H1b*). As specified in our conceptual framework, Eq.(1) measures direct relationship between CP and MV, and Eq.(2) estimates the moderating effect of EC on the CP–MV nexus.

$Q\_{it}=β\_{0}+β\_{1}\*CP+β\_{2}\*EC+β\_{3}\*B.Size+β\_{4}\*Separation+β\_{5}\*Independence+β\_{6}\*Size+β\_{7}\*Profitability+β\_{8}\*Debt+β\_{9}\*Cash+β\_{10}\*Cap\\_Intensity+β\_{11}\*Capex+β\_{12}\*Mkt2Bk (1)$

$Q\_{it}=β\_{0}+β\_{1}\*(CP\*EC)+β\_{2}\*B.Size+β\_{3}\*Separation+β\_{4}\*Independence+β\_{5}\*Size+β\_{6}\*Profitability+β\_{7}\*Debt+β\_{8}\*Cash+β\_{9}\*Cap\\_Intensity+β\_{10}\*Capex+β\_{11}\*Mkt2Bk (2)$

In these models, MV (*Q*) of firm *i* in the year *t* is a function of carbon performance (CP), level of executive compensation (*EC*), firm-specific CG and other firm characteristics as control variables, and the error term *ε*.

We estimate the following models to measure the relationship between the level executive compensation (*EC*) and two carbon performance (*CP*) measures, such as PCRI and GHG (*H2b*), and to test if this relationship is moderated by the ESG-based compensation policy of a firm (*H2b*). In line with our conceptual framework, Eq.(3) measures direct relationship between EC and CP, and Eq.(4) estimates the moderating effect of ESG on EC-CP nexus.

$CP\_{it}=β\_{0}+β\_{1}\*EC+β\_{2}\*ESG+β\_{3}\*B.Size+β\_{4}\*Separation+β\_{5}\*Independence+β\_{6}\*CSR+β\_{7}\*Size+β\_{8}\*Profitability+β\_{9}\*Debt+β\_{10}\*Cash+β\_{11}\*Cap\_{Intensity}+β\_{12}\*Capex+β\_{13}\*Mkt2Bk+ϵ (3)$

$CP\_{it}=β\_{0}+β\_{1}\*\left(EC\*ESG\right)+β\_{2}\*B.Size+β\_{3}\*Separation+β\_{4}\*Independence+β\_{5}\*CSR+β\_{6}\*Size+β\_{7}\*Profitability+β\_{8}\*Debt+β\_{9}\*Cash+β\_{10}\*Cap\_{Intensity}+β\_{11}\*Capex+β\_{12}\*Mkt2Bk+ϵ (4)$

In these models, carbon performance (*CP*) of firm *i* in the year *t* is a function of the level of executive compensation (*EC*), ESG-based compensation policy (*ESG*), firm-specific control variables, and the error term *ε*. The variables of these empirical models are defined as follows:

*Carbon performance and executive compensation measures*

As shown in our conceptual framework (Figure 1), we use two alternative measures as overall CP of a firm: (i) (symbolic) process-oriented CP (policies, processes, disclosures and strategic actions); and (ii) (substantive) actual CP (actual GHG emissions). Following these past studies (Delmas *et al*., 2013; Matsumura *et al.,* 2014), we develop and use carbon reduction initiatives (*PCRI*) index as a measure for process-oriented CP, and the natural logarithm of total GHG emissions as actual CP. *PCRI* index represents 21 firm-specific carbon reduction initiatives, with higher *PCRI* indicating greater climate-related activism of a firm. The Appendix contains all 21 carbon reduction initiatives and how they were measured. In order to address the concerns of validity of our *PCRI* variable,we have also estimated Cronbach’s alpha of the individual items of *PCRI*. The alpha value of 0.8896 indicates that our instrument is valid in that the individual items of *PCRI* have relatively higher internal consistency. Table 2 describes all the variables contained in our empirical models, including the details of emission-related activities that are used to construct *PCRI* index.

Table 2 Here

We use two alternative measures of EC, namely the natural logarithm of total fixed and variable compensations paid to all senior executives[[3]](#footnote-3), as reported by the sampled firms (*EC*), and ESG-based compensations policy (*ESG*). We also use sustainable compensation policy (*ESG*), which is a dummy variable indicating a firm’s adoption of ESG-based compensation policy.

*Control variables*

 We use two sets of control variables capturing CG and other firm characteristics. Following related literature (Berrone and Gomez-Mejia, 2009), we use several CG indicators, such as board independence, board size, CEO-chair separation and the presence of CSR committee of the board. We follow available literature (de Villiers *et al.*, 2011), in using several firm characteristics as control variables. These include, firm size, profitability, slack, leverage, capital intensity, capital expenditure and the ratio of market to book value of equity. We do not explain the details of these control variables to conserve space.

**Empirical results**

*Descriptive statistics and univariate analysis*

 Table 3 shows descriptive statistics of all variables. It shows that the *PCRI* index values range from 0 to 20, with a mean value of 7.72 and a standard deviation of 4.94. In addition, *GHG* emission values range from 4.38 to 19.29, with the mean value of 12.88, and a standard deviation of 2.47. It is also evident that the mean value of Tobin’s *Q* is 1.53, with a standard deviation of 0.88. Table 3 also shows that the proportion of independent directors in the sample firms are around 51 percent. In addition, around 32 percent of firms have adopted sustainable compensation policy. Table 4 shows bivariate correlations among the variables. It is evident that both *PCRI* and *GHG* have weak negative relationships with MV, and positive relationship with the level of EC. In addition, ESG-based policy has a positive relationship with *PCRI*. Overall, these are broadly consistent with *H2a*, although a weak negative relationship between *PCRI* and MV seems to be contrary to our *H1a* expectations. However, it is important to undertake multivariate analysis before drawing a statistical inference about this relationship. Table 4 also shows that the correlation coefficients among the independent variables are reasonably low, suggesting that we do not seem to have any serious multicollinearity problems.

Tables 3 & 4 Here

*Multivariate results and discussion*

 *Carbon performance and market value.* Table 5 shows estimation results of fixed-effects regression of MV (Tobin’s *Q*) against a symbolic carbon performance (PCRI), two substantive measures - actual carbon performance (GHG) and incentive (EC) measures, and other governance and financial control variables. Column 1 shows the estimated results for Eq.(1) with carbon reduction initiatives (*PCRI*) and executive compensation (*EC*) as the main test variables, together with all control variables. It is evident that both *PCRI* and *EC* have statistically significant positive relationship with MV, as expected. Column 2 shows the estimated results for Eq.(2) with the interaction between *PCRI* and *EC* (*PCRI\*EC*), as the test variable, along with all the other control variables. It is evident that *PCRI\*EC* has a positive relationship with MV (*Q*). Columns 3 shows estimation results for Eq.(1) by replacing *PCRI* with *GHG* as the main test variable, and column 4 shows estimated results for Eq.(2) with the interaction between *GHG* and *EC* (*GHG\*EC*), as the explanatory variable. It is shown that both *GHG* and *GHG\*EC* are statistically insignificant or inconclusive, although *EC* remains statistically significant and positive, as a standalone variable.

Table 5 Here

Altogether, our estimated results (shown in columns 1 and 3) offer support for *H1a* in that CP has a positive relationship with MV of a firm, and that this relationship is greater for (symbolic) process-oriented rather than (substantive) actual CP (reduced GHG emissions). Our evidence indicates that there seems to be no market-specific incentive for firms to improve substantive carbon performance in the form of reduced GHG emissions, as firms can focus on improving symbolic process-oriented carbon performance to enhance market value. This evidence is consistent with the legitimisation aspect of NIT in that firms, driven by organisational self-interest and active agency (Scott, 2001), tend to seek corporate legitimacy by engaging in symbolic demonstration of climate related activities (such as process-oriented CP), that can easily be communicated to the investors, rating agencies and markets, leading to an improved MV. Our evidence supports the findings of Delmas *et al.* (2013), although they used old dataset (covering 2004-2007 period) relating to environmental performance-based ratings of US firms. Our results also suggest that the European stock markets do not seem to undervalue firms for engaging in excessive GHG emissions, a finding that contradicts the results of other US-based studies (Matsumura *et al.*, 2014; Busch and Hoffmann, 2011) that show an inverse relationship between GHG emissions and MV by using either cross-sectional data of 2007 or panel data over a relatively short time (2006-2008). Therefore, as the legitimisation aspect of NIT suggests, firms might be more inclined to engage in climate related activities through strategic and operational initiatives in the forms of policies, processes and management practices, without undertaking substantial commitments to reduce actual GHG emissions.

Moreover, our results (shown in columns 2 and 4 of Table 5) suggest that the substantive incentive-based mechanisms, such as the level *EC* positively moderate the relationship between *PCRI* and *MV*, but this moderating effect does not hold for the *GHG–MV* relationship. This evidence is also consistent with the legitimisation aspect of NIT as explained earlier, and thus provides further support for *H1b* in that *EC* reinforces positive association between *CP* and *MV*, and this moderating effect is greater for process-oriented, rather than actual CP. This evidence also partly corroborates Ntim and Soobaroyen (2013), who find that CG reinforces the relationship between CSR and MV. Among the control variables, board independence and CEO-chair separation have inverse associations with MV, whereas profitability, market to book value of equity (*Market2book*) and capital intensity have positive relationships with MV.

 *Executive compensation and carbon performance.* Table 6 shows estimation results of carbon reduction initiatives (*PCRI*) and *GHG* emissions (*GHG*) against *EC* and other control variables. Column 1 shows estimation results of Eq.(3) with *PCRI* as the dependent variable and the level of executive compensation (*EC*) and ESG-based compensation policy (*ESG*) as the main test variables. It is evident that both *EC* and *ESG* have positive relationships with *PCRI,* as expected. Column 2 shows specification results of Eq.(4) with *PCRI* as the dependent variable and the interaction between *EC* and *ESG* (*EC\*ESG*) as the test variables. It is shown that *EC\*ESG* has a positive relationship with *PCRI*. However, as columns 3 and 4 show, both the level of EC and *ESG*-based compensation policy, as well as their interaction have statistically insignificant relationships with *GHG* emissions.

Table 6 Here

Taken together, these results offer support for *H2a* and *H2b* in that EC is positively associated with (symbolic) process-oriented, rather than (substantive) actual CP, and that a symbolic *ESG*-based sustainable compensation policy tends to moderate the *EC*–*PCRI* relationship (rather than *EC–GHG* relationship). This evidence is consistent with the legitimisation aspect of NIT in that the market-oriented incentive-based mechanisms, such as the level of EC is likely to enhance the symbolic aspect of carbon performance, but does not improve actual carbon performance. Moreover, a symbolic ESG-based compensation policy tends to moderate positively the relationship between EC and PCRI, but this moderating effect does not hold for EC–GHG relationship. These results partly corroborate several recent studies (Berrone and Gomez-Mejia, 2009; Mahoney and Thorn, 2006) that find a positive relationship between EC and CSR performance in the US and Canada, although they did not use carbon related measures. Our evidence on moderating effect is consistent with the findings of Cordeiro and Sarkis (2008), who examine US firms and find a positive relationship between environmental performance and CEO compensation only among firms that adopt environmental performance-based compensation policy. Nonetheless, they use cross-sectional data of 1996 and ordinary least square regressions to examine environmental performance, as a determinant of CEO compensation, rather than vice-versa.

Our estimation results further suggest that an increase in EC or an adoption of ESG-based compensation policy does not necessarily improve subsequent actual CP in the form of reduced GHG emissions. This is consistent with the arguments of Cordeiro and Sarkis (2008) that corporate boards might use sustainable compensation contracts, as a symbolic rather than substantive management practices to enhance organisational legitimacy. One likely reason is that there seems to be a lack of structured guidance in the design and adoption of ESG-based sustainable compensation policies through which firm-specific emission reduction targets can be set, gradual progress towards the target can be monitored, and non-compliance (compliance) can be undervalued (rewarded).

Together, our results are consistent with the legitimisation aspects of NIT in that corporate executives’ engagement in climate related projects are driven by economic motives, and that incentive-based mechanisms enhance process-oriented, rather than actual CP, since the former can lead to greater legitimacy and improved MV. Thus, this evidence validates the significance of the legitimation/moral view of NIT in explaining the direct and moderating relationships among EC, ESG, CP and MV compared with the substantive/efficiency perspective of NIT. We, therefore, argue that our NIT framework is appropriate in testing the effects of (i) process oriented and actual CP on MV and (ii) EC and ESG-based compensation policy on CP of a firm. Among the other CG variables, the presence of CSR committee shows positive relationship with *PCRI*. In addition, firm size shows a positive relationship with *PCRI* and GHG. Moreover, capital intensity has a positive relationship with GHG emissions, whilst capital expenditure has a negative relationship with GHG emissions.

*Robustness tests*

 We perform a number of robustness tests. First, to address the concerns about potential endogeneity and reverse causality among EC, CP and MV, we estimate Eqs.(1)–(4) by using dynamic two-step system generalised method of moments (GMM) panel data estimator, as proposed by Arellano and Bond (1991) and Blundell and Bond (1998) with Windmeijer’s (2005) finite sample correction and heteroskedasticity-adjusted standard errors. We have also added country dummies in all our models to control for county-level fixed-effects. In our GMM regression of CP (*GHG* and *PCRI*), we use *EC* as an endogenous variable, the specification of MV (*Q*) includes CP (*GHG* or *PCRI*) as an endogenous variable. In all specifications, the first lags of all independent variables are used as instruments. The validity of the instruments is tested using Hansen *J* statistic of over-identifying restrictions and Arellano-Bond test of the absence of serial autocorrelation. The estimation results shown in Tables 7 and 8 suggest no significant difference with the reported findings. Second, we estimate Eqs.(3-4) by replacing EC variable with its first lag, and find no significant qualitative difference between the estimation results (not reported) and the reported findings. Finally, to assess the sensitivity of our results to country-level factors, we include country-level macro-economic factors, such as GDP per capita and inflation rate, and an index of country-specific governance indicator (covering control of corruption, government effectiveness, political stability, regulatory quality, rule of law, voice and accountability) in the regression model. The results (for brevity, not reported, but available on request) indicate that our evidence is largely robust to the inclusion of these country-level control variables.

Tables 7&8 Here

**Conclusion**

 The past 30 years have witnessed increasing interests in the environmental effects of corporate activities and particularly their impact on climate change and global warming. In this paper, we have sought to address this lacuna in the extant empirical literature by examining the interrelationships among executive compensation (EC), ESG-based sustainable compensation policy, carbon performance (CP) and market value (MV). Using firm fixed-effects models to analyse an unbalanced panel dataset of 4,379 listed firm-year observations from 13 industrialised European countries, covering a period of 15 years (2002-2016) within a multi-dimensional neo-institutional theory (NIT) framework, our estimated results extend, as well as provide a number of new contributions to the existing literature, as follows.

First, our results contribute to existing literature by suggesting that (symbolic) process-oriented carbon reduction initiatives rather than an actual (substantive) CP (reduced GHG emissions), is positively associated with MV, and this relationship is moderated by the level of EC. Second, we show that EC has a positive relationship with process-oriented CP, and this relationship is reinforced for firms that adopt ESG-based compensation policy. Third, our results suggest that the level of EC and ESG-based compensation policy do not seem to have statistically significant relationship with actual reductions in GHG emissions. Fourth, unlike other studies, we provide evidence of a direct relationship between CP and MV; and between EC and CP, and show how these relationships are moderated by EC and ESG policy, respectively. We are among the first to utilise NIT to explain the complex interrelationships among symbolic and substantive aspects of carbon performance, as well as incentives and market value measures. Our results offer empirical support for the legitimation/social view of NIT in that firms appear to symbolically focus on process-oriented carbon reduction initiatives in order to enhance corporate legitimacy and improve investors’ perceptions rather than implementing substantive carbon reduction initiatives that can bring about significant improvement in actual CP. By contrast, we find limited evidence supporting the efficiency/economic view of NIT that firms may engage in substantive environmental management that can increase their efficiency by reducing carbon emissions and costs.

Our findings have a number of policy implications. First, our evidence suggests that firms might focus on demonstrating superior process-oriented carbon reduction initiatives to improve environmental legitimacy and MV, but may not be necessarily undervalued for engaging in increased actual GHG emissions. Therefore, policymakers and long-term institutional investors need to be proactive in creating awareness among investors about the disastrous consequences of climate change and promoting greater disclosures of GHG emissions of a firm. Moreover, fund managers, analysts, and rating agencies ought to use not just the symbolic ESG indicators, but also measurable account of substantive GHG emissions to rate companies and advise market participants accordingly. This is likely to help shareholders to make well-informed investment decisions after evaluating the climate related risks of a firm. Second, incentive-based governance mechanisms do not seem to moderate self-serving motives of powerful executives, and incentivise them to reduce GHG emissions of a firm. In particular, a symbolic adoption of ESG-based compensation policy seems unlikely to improve actual CP. Therefore, regulators ought to design explicit guidelines on sustainable compensation policy with mandatory GHG emission reduction targets together with appropriate enforcement mechanisms to detect and punish non-compliance. Third, voluntary regulatory initiatives and firm-level managerial commitment do not seem to be enough, given that carbon abatement projects require significant financial commitment over a long period of time. Therefore and to be effective, specific enforceable CP targets at global, national and corporate level will have to be set.

Finally and although our findings are robust and important, their limitations need to be explicitly acknowledged. First, we consider process-oriented CP (*PCRI*) as a symbolic measure and GHG emissions as a substantive measure of CP, but do not examine the relationship between these two variables. Therefore, future research can examine the impact of PCRI on actual CP (GHG emissions). Second, our measures for EC, ESG-based compensation policy, CP and MV may or may not reflect actual practice. In this case, future studies may offer new insights by conducting in-depth case studies and interviews with various stakeholders (managers, shareholders and regulators) about their views regarding these issues. Similarly, due to lack of data, the number of variables used, especially governance ones could have been expanded to include others (institutional owners, analysts and external auditors) who play roles in measuring and monitoring carbon emissions. Future studies may, therefore, enhance their insights by incorporating these variables into their models. Finally, our study focuses on firms listed in industrialised European countries, future studies can, therefore, replicate our study by extending our analyses to other countries, which may have different institutional, regulatory and cultural contexts.

**References**

Aguilera, R.V., D.E. Rupp, C. Williams and J. Granapathi (2007). ‘Putting the s back in corporate social responsibility: A multilevel theory of social change in organizations’, *Academy of Management Review,* **32**, pp.836–863.

Aguilera, R.V. (2005). ‘Corporate governance and director accountability: An institutional comparative perspective’, *British Journal of Management*, **16**, pp.s39–s53.

Akhtar, P., Z. Khan, J.G. Frynas, Y.K. Tse and R.R. Nicholson (2018). ‘Essential micro-foundations for contemporary business operations: Top management tangible competencies, relationship-based business networks and environmental sustainability’, *British Journal of Management*, **29**, pp.43–62.

Arellano, M. and S. Bond (1991). ‘Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations’, *Review of Economic Studies,* **58**, pp.277 – 297.

Arena, C., G. Michelon and G. Trojanowski (2018). Big egos can be green: A study of CEO hubris and environmental innovation, *British Journal of Management*, **29**, pp.316–336.

Ashforth, B.E. and B.W Gibbs (1990). ‘The double-edge of organizational legitimation’, *Organization Science***, 1**, pp.177-193.

Baboukardo, D. (2018). ‘The valuation relevance of environmental performance revisited: The moderating role of environmental provisions’, *British Accounting Review*, **50**, pp.32-47.

Bernardi, C. and A.W. Stark (2018). ‘Environmental, social and governance disclosure, integrated reporting, and the accuracy of analyst forecasts’, *British Accounting Review*, **50**, 16-31.

Berrone, P. and L. Gomez-Mejia (2009). ‘Environmental performance and executive compensation: an integrated agency-institutional perspective’, *Academy of Management Journal*, **52**, pp.103–126.

Blundell, R.W. and S.R. Bond (1998). ‘Initial conditions and moment restrictions in dynamic panel data models’, *Journal of Econometrics*, **87**, pp. 115–143.

Bold, F. (2016). ‘Shareholder rights directive: Policy brief’. Accessed date: 30 June 2017. <http://www.purposeofcorporation.org/documents/briefing-shareholder-rights-directive.pdf>

Brooks, C. and L. Schopohl (2019). Special issue: Green accounting and finance. *British Accounting Review*, Available at: <https://www.journals.elsevier.com/the-british-accounting-review/call-for-papers/special-issue-green-accounting-and-finance>. Accessed on 19 January 2019.

Busch, T. and V.H. Hoffmann (2011). ‘How hot is your bottom line? Linking carbon and financial performance’, *Business & Society,* **50**, pp.233–265.

Campbell, K., D. Johnston, S.E. Sefcik and N.S. Soderstrom (2007). ‘Executive compensation and nonfinancial risk: An empirical examination’, *Journal of Accounting and Public Policy,* **26**, pp.436–462.

Chahine, S. and M. Goergen, M. (2014). Top management ties with board members: How they affect pay–performance sensitivity and IPO performance?’, *Journal of Corporate Finance*, **27**, pp.99-115.

Chang, L., W. Li. and X. Lu (2015). ‘Government engagement, environmental policy, and environmental performance: Evidence from the most polluting Chinese listed firms’, *Business Strategy and the Environment*, **24**, pp.1–19

Clarkson, P.M., Y. Li, M. Pinnuck and G.D. Richardson (2015). ‘The valuation relevance of greenhouse gas emissions under the European Union carbon emissions trading scheme’, *European Accounting Review,* **24**, pp.551-580.

Climate Bonds Initiatives (CBI) (2019). Green bonds. Available at: <https://www.climatebonds.net/about>, Accessed on 19 January 2019.

Combined Code (2016). ‘*The combined code on corporate governance’*, London: Financial Reporting Council.

Cong, Y. and M. Freedman (2011). ‘Corporate governance and environmental performance and disclosures’, *Advances in Accounting, incorporating Advances in International Accounting*, **27**, pp.223–232

Cordeiro, J.J. and J. Sarkis (2008). ‘Does explicit contracting effectively link CEO compensation to environmental performance?’ *Business Strategy and the Environment*, **17**, pp.304-317.

Core, J.E., R.W. Holthausen and D.F. Larcker, (1999). ‘Corporate governance, chief executive officer compensation, and firm performance’, *Journal of Financial Economics*, **51**(3), pp.371-406.

de Villiers, C., V. Naiker and C.J. van Staden (2011). ‘The effect of board characteristics on firm environmental performance’, *Journal of Management*, **37**, pp.1636–1663.

Delbeke, J. and P. Vis (2016). ‘EU climate policy explained’, European Union. Accessed date: 29 June 2017. <https://ec.europa.eu/clima/sites/clima/files/eu_climate_policy_explained_en.pdf>

Delmas, M.A., D. Etzion and N. Nairn-Birch (2013). ‘Triangulating environmental performance: What do corporate social responsibility ratings really capture?’ *Academy of Management Perspectives*, **27**, pp.255-267.

DiMaggio, P. J. and W.W. Powell (1983). ‘The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields’, *American Sociological Review*, **48**, 147-160.

Elmagrhi, M.H., C.G. Ntim, Y. Wang and A. Zalata (2019). ‘Corporate governance disclosure index–executive pay nexus: The moderating effect of governance mechanisms’, *European Management Review*, Forthcoming.

EU Council (2017). ‘*Shareholders' rights in EU companies: Council formal adoption’*, Press release no. 173/17, Council of the EU, Brussels, Belgium. Accessed date: 30 June 2017. <http://www.consilium.europa.eu/en/press/press-releases/2017/04/03-shareholder-rights-eu-companies/>

European Commission (2015). ‘EU ETS Handbook’, Climate Action, Brussels, Belgium. Accessed date: 29 June 2017. <https://ec.europa.eu/clima/sites/clima/files/docs/ets_handbook_en.pdf>

European Commission (2016*). ‘Implementing the Paris agreement - progress of the EU towards the at least -40% target*’, Climate Action, Brussels, Belgium. Accessed date: 29 June 2017. <https://ec.europa.eu/clima/sites/clima/files/eu_progress_report_2016_en.pdf>

Gallego-Alvarez, I., L. Segura and J. Martínez-Ferrero (2015). ‘Carbon emission reduction: the impact on the financial and operational performance of international companies’, *Journal of Cleaner Production*, **103**, pp.149-159.

Goergen, M. and L. Renneboog (2011). ‘Managerial compensation’, *Journal of Corporate Finance*, **17**(4), pp.1068-1077.

Green Bonds Database (GBD) (2019). Green bonds. Available at: <https://www.bonddata.org/>. Accessed on 19 January 2019.

Greenbury Report (1995). ‘*Directors’ remuneration*’, Confederation of British Industries, London: GEE Publishing Ltd.

Haque, F. (2017). ‘The effects of board characteristics and sustainable compensation policy on carbon performance of UK firms’, *British Accounting Review*, **49**, pp.347–364.

Haque, F. and C.G. Ntim (2018). ‘Environmental policy, sustainable development, governance mechanisms and environmental performance’, *Business Strategy and the Environment*, **27**, pp.415–435

Heaps, T. A.A. (2015). ‘Corporations are going green by linking executive pay to energy and emissions targets’, Newsweek, 4th June 2015. Accessed date: 15 September 2015. <http://www.newsweek.com/corporations-are-going-green-linking-executive-pay-energy-and-emissions-338708>.

Higgs Report (2003). ‘*Review of the role and effectiveness of non-executive directors’*, London: UK Department of Trade and Industry.

IFC (2015). *A guide to corporate governance practices in the European Union,* Washington, DC: International Finance Corporation.

Ji, Y.-Y. (2015). ‘Top management team pay structure and corporate social performance’, *Journal of General Management*, **40**, pp.3-20.

Kim, Y.-B., H.T. An and J.D. Kim (2015). ‘The effect of carbon risk on the cost of equity capital’, *Journal of Cleaner Production*, **93**, pp.279-287.

Lattemann, C., M. Fetscherin, I. Alon, S. Li and A.M Schneider (2009). ‘CSR communication intensity in Chinese and Indian multinational companies’, *Corporate Governance: An International Review*, **17**, pp.426–442.

Lins, K.V., H. Servaes, and A. Tamayo (2017). ‘Social capital, trust, and ﬁrm performance: The value of corporate social responsibility during the ﬁnancial crisis’, *Journal of Finance*, **72**(4), pp.1785–1824.

Maas, K. (2018) Do corporate social performance targets in executive compensation contribute to corporate social performance? *Journal of Business Ethics*, **148**, pp.573–585.

Mahoney, L.S. and L. Thorn (2006). ‘An examination of the structure of executive compensation and corporate social responsibility: A Canadian investigation’, *Journal of Business Ethics,* **69**, pp.149-162.

Mangena, M., V. Tauringana and E. Chamisa (2012). ‘Corporate boards, ownership structure and firm performance in an environment of severe political and economic crisis’, *British Journal of Management*, **23**, pp. s23–s41.

Matsumura, E. M., R. Prakash and S.C. Vera-Mu˜noz (2014). ‘Firm-value effects of carbon emissions and Carbon Disclosures’, *Accounting Review*, **89**, pp.695-724.

Mazouz, K. and Y. Zhao (2019). ‘CEO incentives, takeover protection and corporate innovation’, *British Journal of Management*, Forthcoming.

Melis, A., S. Gaia and S. Carta (2015). ‘Directors' remuneration: A comparison of Italian and UK non-financial listed firms' disclosure’, *British Accounting Review*, **47**, pp.66-84.

Meyer, J. and B. Rowan (1977). ‘Institutionalized organizations: Formal structure as myth and ceremony’, *American Journal of Sociology*, **83**, pp.340-363.

North, D. C. (1991). Institutions. *Journal of Economic Perspectives*, **5**(1), pp.97-112.

Ntim, C.G. (2016). ‘Corporate governance, corporate health accounting, and firm value: The case of HIV/AIDS disclosures in Sub-Saharan Africa’, *International Journal of Accounting,* **51**, pp.155–216.

Ntim, C.G., and T. Soobaroyen (2013). ‘Corporate governance and performance in socially responsible corporations: New empirical insights from a neo-institutional framework’, *Corporate Governance: An International Review,* **21**, pp.468–494.

Ntim, C.G., S. Lindop, D.A. Thomas, H. Abdou and K.K. Opong (2019). ‘Executive pay and performance: The moderating effect of CEO power and governance structure’, *International Journal of Human Resource Management*, Forthcoming.

Ogden, S. and R. Watson (2012). ‘Remuneration committees, pay consultants and the determination of executive directors’ pay’, *British Journal of Management*, **23**, pp.502–517.

Ortiz-de-Mandojana, N., P. Bansal, and J.A. Arag´on-Correa (2019). ‘Older and wiser: How CEOs’ time perspective influences long-term investments in environmentally responsible technologies’, *British Journal of Management*, Forthcoming.

Powell, W.P. and P.J. DiMaggio (1991). ‘*The new institutionalism in organizational analysis’*, Chicago: The University of Chicago Press.

Qian, W. and S. Schaltegger (2018). ‘Revisiting carbon disclosure and performance: Legitimacy and management views’, *British Accounting Review***, 49**, pp.365-379.

Qiu, Y., A. Shaukat and R. Tharyan (2016). ‘Environmental and social disclosures: Link with corporate financial performance’, *British Accounting Review*, **48**, pp.102-116.

Sarhan, A.A., C.G. Ntim and B. Al-Najjar (2019). ‘Corporate board diversity, corporate governance, corporate performance and executive Pay’, *International Journal of Finance and Economics*, Forthcoming.

Scott, W.R. (2001). ‘*Institutions and organizations’*, 2nd eds. Thousand Oaks, CA: Sage.

Singh, S. N. Tabassum, T.K. Darwish and G. Batsakis (2018). ‘Corporate governance and Tobin’s Q as a measure of organizational performance’, *British Journal of Management,* **29**, pp.171–190.

Suchman, M.C. (1995). ‘Managing legitimacy: Strategic and institutional approaches’, *Academy of Management Review*, **20**, pp.571-606.

Tauringana, V. and L. Chithambo. (2015). ‘The effect of DEFRA guidance on greenhouse gas disclosure’, *British Accounting Review,* **47**, pp.425–444.

Teeter, P., and J. Sandberg (2017). ‘Constraining or enabling green capability development? How policy uncertainty affects organizational responses to flexible environmental regulations’, *British Journal of Management*, **28**, pp.649–665.

Trumpp C., J. Endrikat, C. Zopf and E. Guenther (2015). ‘Definition, conceptualization, and measurement of corporate environmental performance: A critical examination of a multidimensional construct’, *Journal of Business Ethics*, **126**, pp.185–204.

Turnbull Report (1999). ‘*Internal control: Guidance for directors on the combined code*’, London: The Institute of Chartered Accountants in England and Wales.

Welsh, H. (2014). ‘An insider’s view: why more companies should tie bonuses to sustainability, The Guardian, Monday 11th August 2014. Accessed date: 15 September 2015. <http://www.theguardian.com/sustainable-business/2014/aug/11/executive-compensation-bonuses-sustainability-goals-energy-water-carbon-dsm?CMP=share_btn_link>

Windmeijer, F. (2005). ‘A finite sample correction for the variance of linear efficient two-step GMM estimators’, *Journal of Econometrics*, **126**, pp. 25-51.

Ziegler, A., T. Busch and V.H. Hoffmann (2011). ‘Disclosed corporate responses to climate change and stock performance: An international empirical analysis’, *Energy Economics,* **33**, pp.1283–1294.

|  |  |
| --- | --- |
| *Table 1. Distribution of the sample based on country and industry*  |  |
|  | Firms | Obs | Percent |
| ***Panel B: Distribution of the sample by country*** |  |  |  |
| Aerospace & Defense | 27 | 262 | 5.98 |
| Construction | 53 | 518 | 11.83 |
| Food producers | 34 | 284 | 6.49 |
| Utilities | 33 | 282 | 6.44 |
| Healthcare | 38 | 315 | 7.19 |
| Information technology  | 19 | 159 | 3.63 |
| Industrial sector | 73 | 605 | 13.82 |
| Mining | 33 | 237 | 5.41 |
| Oil & Gas | 66 | 499 | 11.40 |
| Retailers | 43 | 401 | 9.16 |
| Services | 75 | 817 | 18.66 |
| Total | 494 | 4,379 | 100.00 |
| ***Panel B: Distribution of the sample by country*** |  |  |  |
| Austria | 8 | 75 | 1.71 |
| Belgium | 11 | 90 | 2.06 |
| Denmark | 10 | 87 | 1.99 |
| Finland | 18 | 167 | 3.81 |
| France | 36 | 351 | 8.02 |
| Germany | 46 | 305 | 6.97 |
| Italy | 17 | 95 | 2.17 |
| Netherlands | 15 | 146 | 3.33 |
| Norway | 16 | 132 | 3.01 |
| Spain | 21 | 143 | 3.27 |
| Sweden | 23 | 181 | 4.13 |
| Switzerland | 29 | 256 | 5.85 |
| UK | 244 | 2,351 | 53.69 |
| Total | 494 | 4379 | 100.00 |

*Table 2. Variable definitions*

|  |  |  |
| --- | --- | --- |
| *Variables* | *Symbols* | *Descriptions* |
| *Substantive constructs/measures:* |
| Market Value | Q | Ratio of total assets minus book value of equity plus market value of equity to total assets. |
|  |  |  |
| GHG emissions | GHG | Actual Carbon performance as measured by the natural log of total actual GHG emissions in tons. |
| Executive compensation  | EC | The natural log of total fixed and variable compensation paid to all senior executives (in USD$) as reported by the firm. The fixed component consists of a base salary and other in-kind benefits, such as accommodation, health and transportation. The variable component consists of bonuses and other long-term incentive plans, such as equity ownership and long-term share options.  |
|  |  |  |
| *Symbolic constructs/measures:*  |
| Carbon reduction initiatives  | PCRI  | PCRI index is calculated by adding 21 dummy variables that measure a firm’s degree of engagement with climate protection initiatives, with higher index value indicating greater climate-related activism of a firm (*see the Appendix for further details*). Therefore, a company’s score can range from a minimum of 0 (zero or no carbon reduction initiative instituted) to a maximum of 21 (full or 100% carbon initiative instituted).  |
| ESG-based compensation | ESG | A dummy variable that equals 1 if firm has environmental-social-governance (ESG) related compensation policy, and 0 otherwise. |
| *Corporate governance (control) variables:* |
| Board size | B.size | The natural log of the number of board members. |
| Board independence | Independence  | Percentage of independent directors on board. |
| CEO-Chair Separation  | Separation | A dummy variable that equals 1 if the CEO and the Chair are two different individuals, and 0 otherwise. |
| CSR committee | CSR | A dummy variable that equals 1 if the firm has a corporate social responsibility (CSR) committee of the board, and 0 otherwise. |
| *Financial control variables:* |
| Firm size | Size | The natural log of total assets of a firm. |
| Profitability | Profitability | Return on assets.  |
| Leverage | Debt | The ratio of total debt to total assets.  |
| Slack | Cash  | The ratio of cash and equivalents to total assets. |
| Capital intensity | Cap\_intensity | The ratio of property, plant and equipment to total assets.  |
| Capital expenditure | Capex2Sales | The ratio of capital expenditure to sales. |
| Market to Book value | Market2Book | The ratio of market to book value of equity. |

*Table 3. Descriptive statistics*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | Obs | Mean | Std. Dev. | Min | Max |
| *Substantive constructs/measures:* |
| Q (Ratio) | 4379 | 1.53 | 0.88 | 0.35 | 12.81 |
| GHG (Ln.) | 3227 | 12.88 | 2.47 | 4.38 | 19.29 |
| EC (Ln.) | 4379 | 15.51 | 1.26 | 6.83 | 23.23 |
| *Symbolic constructs/measures:* |
| PCRI (absolute score) | 4379 | 7.72 | 4.94 | 0.00 | 20.00 |
| ESG (%) | 4379 | 32.00 | 47.00 | 0.00 | 100 |
| *Control Variables:* |  |  |  |  |  |
| B.size (Ln.) | 4379 | 2.26 | 0.34 | 0.69 | 3.18 |
| Separation (%) | 4379 | 84.00 | 37.00 | 0.00 | 100 |
| Independence (%) | 4379 | 50.60 | 24.90 | 0.00 | 100.00 |
| CSR (%)  | 4379 | 62.00 | 48.00 | 0.00 | 100 |
| Size (Ln.) | 4379 | 15.44 | 1.60 | 8.01 | 19.98 |
| Profitability (%) | 4379 | 6.91 | 8.76 | -116.48 | 106.82 |
| Debt (5) | 4379 | 24.28 | 16.56 | 0.00 | 133.09 |
| Cash (Ratio) | 4379 | 0.11 | 0.10 | 0.00 | 0.93 |
| Cap\_Intensity (Ratio) | 4379 | 0.58 | 0.39 | 0.00 | 3.14 |
| Capex2Sales (Ratio) | 4379 | 7.80 | 15.36 | 0.00 | 279.87 |
| Market2Book (Ratio) | 4379 | 457.99 | 243.63 | 2.00 | 1122.00 |

Notes: Please see Table 2 for variable definitions.

*Table 4. Correlation matrix*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| GHG (1) | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PCRI (2) | 0.50\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Q (3) | -0.21\* | -0.10\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| EC (4) | 0.27\* | 0.38\* | 0.02 | 1 |  |  |  |  |  |  |  |  |  |  |  |
| ESG (5) | 0.08\* | 0.25\* | -0.04\* | 0.09\* | 1 |  |  |  |  |  |  |  |  |  |  |
| B.size (6) | 0.45\* | 0.38\* | -0.07\* | 0.34\* | -0.01 | 1 |  |  |  |  |  |  |  |  |  |
| Separation (7) | -0.10\* | -0.12\* | -0.04\* | -0.06\* | 0.10\* | -0.18\* | 1 |  |  |  |  |  |  |  |  |
| Independence (8) | 0.03 | 0.05\* | -0.01 | -0.03 | 0.08\* | -0.22\* | 0.05\* | 1 |  |  |  |  |  |  |  |
| CSR (9) | 0.15\* | 0.57\* | -0.06\* | 0.26\* | 0.30\* | 0.15\* | -0.01 | 0.05\* | 1 |  |  |  |  |  |  |
| Profitability (10) | -0.14\* | -0.06\* | 0.58\* | 0.03 | -0.05\* | -0.06\* | 0.01 | 0.06\* | -0.06\* | 1 |  |  |  |  |  |
| Size (11) | 0.75\* | 0.61\* | -0.21\* | 0.45\* | 0.12\* | 0.59\* | -0.16\* | 0.01 | 0.29\* | -0.06\* | 1 |  |  |  |  |
| Debt (12) | 0.18\* | 0.10\* | -0.14\* | -0.02 | -0.02 | 0.11\* | -0.01 | 0.00 | 0.04\* | -0.14\* | 0.23\* | 1 |  |  |  |
| Cash (13) | -0.12\* | -0.17\* | 0.19\* | -0.04\* | -0.04\* | -0.18\* | -0.05\* | -0.01 | -0.09\* | -0.04\* | -0.27\* | -0.29\* | 1 |  |  |
| Cap\_Intensity (14) | 0.46\* | 0.16\* | -0.10\* | -0.04\* | 0.05\* | 0.06\* | 0.02\* | 0.02 | 0.03\* | -0.09\* | 0.12\* | 0.19\* | -0.23\* | 1 |  |
| Capex2Sales (15) | 0.05\* | -0.02\* | -0.03\* | -0.08\* | 0.00 | -0.03\* | -0.01 | 0.03\* | 0.00 | -0.09\* | -0.04\* | 0.01 | 0.08\* | 0.02 | 1 |
|  Market2Book (16) | -0.22\* | -0.12\* | 0.30\* | 0.08\* | -0.05\* | -0.12\* | -0.04\* | 0.02\* | -0.07\* | 0.26\* | -0.19\* | -0.16\* | 0.16\* | -0.17\* | -0.03\* |

Note: \* indicate statistical significance at 5% level.

*Table 5. Fixed-effects regression of carbon performance on market value*

|  |  |
| --- | --- |
| Variables | Substantive construct: Market Value (Q) |
| (1) | (2) | (3) | (4) |
| *Symbolic construct:* |  |  |  |
| PCRI | 0.0177\*\*\* |  |  |  |
|  | (0.00446) |  |  |  |
| *Substantive constructs:*  |  |  |  |
| GHG |  |  | -0.0119 |  |
|  |  |  | (0.0258) |  |
| EC | 0.0313\*\*\* |  | 0.0359\*\*\* |  |
|  | (0.00883) |  | (0.0103) |  |
| *Moderating effects:* |  |  |
| PCRI\*EC |  | 0.00125\*\*\* |  |  |
|  |  | (0.000286) |  |  |
| GHG\*EC |  |  |  | 0.00125\* |
|  |  |  |  | (0.000688) |
| *Control variables:* |  |  |  |
| B.size | -0.000468 | 0.00772 | 0.0779 | 0.0810 |
|  | (0.133) | (0.137) | (0.0583) | (0.0592) |
| Separation | -0.135\*\* | -0.134\*\* | -0.146\*\* | -0.146\*\* |
|  | (0.0614) | (0.0616) | (0.0665) | (0.0670) |
| Independence | -0.000525\*\* | -0.000441\* | -0.00114\*\*\* | -0.00115\*\*\* |
|  | (0.000234) | (0.000227) | (0.000296) | (0.000290) |
| Firm Size | -0.0758 | -0.0673 | 0.0662 | 0.0603 |
|  | (0.0597) | (0.0630) | (0.0606) | (0.0633) |
| Profitability | 0.0104\* | 0.0106\* | 0.0133\*\*\* | 0.0136\*\*\* |
|  | (0.00522) | (0.00527) | (0.00351) | (0.00363) |
| Debt | 0.00320 | 0.00323 | 0.000774 | 0.000743 |
|  | (0.00221) | (0.00220) | (0.00144) | (0.00145) |
| Cash | 0.417 | 0.407 | 0.420 | 0.407 |
|  | (0.309) | (0.309) | (0.259) | (0.247) |
| Cap\_intensity | 0.291\*\* | 0.296\*\* | 0.341\*\* | 0.335\* |
|  | (0.125) | (0.128) | (0.154) | (0.163) |
| Capex2Sales | -0.000577 | -0.000625 | 0.00120\* | 0.00117\*\* |
|  | (0.00112) | (0.00112) | (0.000565) | (0.000436) |
| Market2Book | 0.00102\*\*\* | 0.00103\*\*\* | 0.000932\*\*\* | 0.000931\*\*\* |
|  | (0.000212) | (0.000210) | (0.000151) | (0.000148) |
| Constant | 1.391 | 1.699 | -0.668 | -0.421 |
|  | (1.283) | (1.240) | (1.165) | (1.133) |
| Obs | 4,379 | 4,379 | 3,227 | 3,227 |
| R-squared | 0.164 | 0.163 | 0.155 | 0.152 |
| No of firms | 494 | 494 | 460 | 460 |

Notes: \*\*\*, \*\* and \* indicate statistical significance at 1, 5 and 10% levels, respectively. The figures in parentheses are the heteroskedasticity-adjusted robust standard errors with clustered at country level.

*Table 6. Fixed effect regression of executive compensation on process-oriented carbon reduction initiatives (PCRI) and actual GHG emissions*

|  |  |  |
| --- | --- | --- |
| Variables | Symbolic carbon performance (PCRI) | Substantive carbon performance (GHG) |
| (1) | (2) | (3) | (4) |
| *Substantive construct:* |  |  |  |
| EC | 0.438\*\* |  | -0.0110 |  |
|  | (0.165) |  | (0.00675) |  |
| *Symbolic construct:* |  |  |  |
| ESG | 1.265\*\*\* |  | 0.00203 |  |
|  | (0.172) |  | (0.0402) |  |
| *Moderating effects:* |  |  |  |
| EC\*ESG |  | 0.0876\*\*\* |  | -0.000305 |
|  |  | (0.0136) |  | (0.00245) |
| *Control variables:* |  |  |  |  |
| B.size | -0.0637 | 0.106 | 0.00679 | 0.00371 |
|  | (0.474) | (0.394) | (0.0512) | (0.0507) |
| Separation | -0.193 | -0.163 | 0.0863\* | 0.0860\* |
|  | (0.305) | (0.306) | (0.0435) | (0.0442) |
| Independence | -0.00314 | -0.00205 | 0.000913 | 0.000900 |
|  | (0.00773) | (0.00785) | (0.000543) | (0.000535) |
| CSR committee | 3.492\*\*\* | 3.625\*\*\* | -0.0678\* | -0.0710\* |
|  | (0.501) | (0.433) | (0.0347) | (0.0357) |
| Firm size | 1.864\*\*\* | 2.064\*\*\* | 0.669\*\*\* | 0.664\*\*\* |
|  | (0.469) | (0.396) | (0.0595) | (0.0604) |
| Profitability | -0.0170\*\* | -0.0141 | -0.00339\* | -0.00348\* |
|  | (0.00723) | (0.00805) | (0.00176) | (0.00173) |
| Debt | 0.00139 | 0.00146 | -0.000813\* | -0.000762\* |
|  | (0.00743) | (0.00759) | (0.000426) | (0.000421) |
| Cash | 1.350\* | 1.225\* | 0.289 | 0.294 |
|  | (0.642) | (0.635) | (0.261) | (0.265) |
| Cap\_intensity | 0.616\* | 0.666\* | 0.468\*\*\* | 0.467\*\*\* |
|  | (0.315) | (0.309) | (0.0819) | (0.0826) |
| Capex2Sales | -0.00135 | -0.00232 | -0.00455\*\* | -0.00454\*\* |
|  | (0.00537) | (0.00520) | (0.00189) | (0.00192) |
| Constant | -30.41\*\*\* | -27.31\*\*\* | 2.205\*\* | 2.120\*\* |
|  | (5.524) | (6.377) | (0.967) | (0.957) |
| Obs | 4,541 | 4,541 | 3,339 | 3,339 |
| R-squared | 0.456 | 0.443 | 0.123 | 0.123 |
| No of firms | 498 | 498 | 463 | 463 |

Notes: \*\*\*, \*\* and \* indicate statistical significance at 1, 5 and 10% levels, respectively. The figures in parentheses are the heteroskedasticity-adjusted robust standard errors with clustered at country level.

*Table 7. GMM regression of carbon performance on market value*

|  |  |
| --- | --- |
| Variables | Substantive construct: Market Value (Q) |
| (1) | (2) | (3) | (4) |
| *Symbolic construct:* |  |  |  |
| PCRI | 0.0154\*\*\* |  |  |  |
|  | (0.00577) |  |  |  |
| *Substantive constructs:* |  |  |  |
| GHG |  |  | -0.204\*\*\* |  |
|  |  |  | (0.0525) |  |
| EC | 0.0633\* |  | 0.0976\*\*\* |  |
|  | (0.0363) |  | (0.0318) |  |
| *Moderating effects:* |  |  |  |
| PCRI\*EC |  | 0.00131\*\*\* |  |  |
|  |  | (0.000339) |  |  |
| GHG\*EC |  |  |  | -0.000134 |
|  |  |  |  | (0.00145) |
| *Control variables:* |  |  |  |
| B.size | -0.0570 | -0.00886 | 0.0488 | 0.128 |
|  | (0.0897) | (0.0712) | (0.134) | (0.131) |
| Separation | -0.251\*\*\* | -0.206\*\* | -0.267\*\*\* | -0.217\*\*\* |
|  | (0.0899) | (0.0813) | (0.0864) | (0.0638) |
| Independence | -0.00135 | -0.000627 | -0.00225\* | -0.00203\* |
|  | (0.000998) | (0.000914) | (0.00119) | (0.00105) |
| Firm Size | -0.111\*\*\* | -0.102\*\*\* | 0.0958 | -0.102\*\*\* |
|  | (0.0262) | (0.0239) | (0.0616) | (0.0359) |
| Profitability | 0.00350 | 0.00478 | 0.0662\*\* | 0.0675\*\* |
|  | (0.00368) | (0.00379) | (0.0330) | (0.0334) |
| Debt | 0.00179 | 0.00139 | -0.000425 | -0.000326 |
|  | (0.00198) | (0.00198) | (0.00206) | (0.00174) |
| Cash | 1.766\*\*\* | 1.848\*\*\* | 1.850\*\*\* | 1.610\*\* |
|  | (0.351) | (0.355) | (0.613) | (0.630) |
| Cap\_intensity | 0.0918 | 0.0708 | 0.686\*\*\* | 0.161\* |
|  | (0.0658) | (0.0638) | (0.152) | (0.0976) |
| Capex2Sales | -0.00518\*\* | -0.00641\*\* | -0.00498\*\* | -0.00417\* |
|  | (0.00241) | (0.00311) | (0.00223) | (0.00244) |
| Market2Book | 0.00217\*\*\* | 0.00219\*\*\* | 0.00120\*\* | 0.00133\*\*\* |
|  | (0.000145) | (0.000142) | (0.000470) | (0.000436) |
| Constant | 1.262\*\*\* | 1.880\*\*\* | -0.196 | 1.884\*\*\* |
|  | (0.441) | (0.348) | (0.568) | (0.331) |
| Country dummies | Yes | Yes | Yes | Yes |
| Obs | 3,845 | 3,845 | 2,830 | 2,830 |
| No of firms | 489 | 489 | 452 | 452 |

Notes: This table is based on generalized method of moments (GMM) panel data estimator, as proposed by Arellano and Bond (1991) and Blundell and Bond (1998) with Windmeijer’s (2005) finite sample correction and heteroskedasticity-adjusted standard errors. \*\*\*, \*\* and \* indicate statistical significance at 1, 5 and 10% levels, respectively.

*Table 8. GMM regression of executive compensation on process-oriented carbon reduction initiatives (PCRI) and actual GHG emissions*

|  |  |  |
| --- | --- | --- |
| Variables | Symbolic carbon performance (PCRI) | Substantive carbon performance (GHG) |
| (1) | (2) | (3) | (4) |
| *Substantive construct:* |  |  |  |
| EC | 0.364\*\*\* |  | 0.0552 |  |
|  | (0.106) |  | (0.0547) |  |
| *Symbolic construct:* |  |  |  |  |
| ESG | 1.448\*\*\* |  | -0.455\*\* |  |
|  | (0.493) |  | (0.205) |  |
| *Moderating effects:* |  |  |  |  |
| EC\*ESG |  | 0.0465\*\* |  | -0.0143 |
|  |  | (0.0203) |  | (0.0140) |
| *Control variables:* |  |  |  |  |
| B.size | -1.771 | -1.006 | -0.783 | -0.712 |
|  | (1.141) | (1.331) | (0.568) | (0.699) |
| Separation | 0.0301 | -0.969 | 0.737 | 0.841 |
|  | (0.677) | (1.102) | (0.513) | (0.579) |
| Independence | 0.00185 | 0.00496 | -0.000668 | -0.00355 |
|  | (0.00752) | (0.0109) | (0.00521) | (0.00355) |
| CSR committee | 5.125\*\*\* | 5.871\*\*\* | 0.0829 | 0.161 |
|  | (0.395) | (0.395) | (0.181) | (0.170) |
| Firm size | 0.861\*\*\* | 1.155\*\*\* | 1.272\*\*\* | 1.231\*\*\* |
|  | (0.284) | (0.371) | (0.140) | (0.196) |
| Profitability | -0.0128 | -0.0287 | -0.00680 | 0.0123 |
|  | (0.0179) | (0.0191) | (0.0107) | (0.0108) |
| Debt | -0.00331 | -0.0147 | 0.00559 | 0.00183 |
|  | (0.0135) | (0.0144) | (0.00862) | (0.00780) |
| Cash | -1.113 | -2.474 | 2.022 | 1.828 |
|  | (2.104) | (3.387) | (1.239) | (1.384) |
| Cap\_intensity | 0.863 | 0.427 | 2.394\*\*\* | 2.140\*\*\* |
|  | (0.649) | (0.633) | (0.361) | (0.373) |
| Capex2Sales | -0.0189 | -0.0191 | -0.00724 | -0.00361 |
|  | (0.0132) | (0.0124) | (0.00876) | (0.00834) |
| Constant | -4.941 | 11.03 | -4.939 | -4.387 |
|  | (7.498) | (16.91) | (9.421) | (13.16) |
| Country dummies | Yes | Yes | Yes | Yes |
| Obs | 3,995 | 3,995 | 3,050 | 3,050 |
| No of firms | 495 | 495 | 458 | 458 |

Notes: This table is based on generalized method of moments (GMM) panel data estimator, as proposed by Arellano and Bond (1991) and Blundell and Bond (1998) with Windmeijer’s (2005) finite sample correction and heteroskedasticity-adjusted standard errors. \*\*\*, \*\* and \* indicate statistical significance at 1, 5 and 10% levels, respectively.

**Appendix: Process-oriented carbon reduction initiatives individual items (the PCRI index)**

|  |  |  |
| --- | --- | --- |
| **No.** | **Process-oriented carbon reduction initiative** | **Score** |
| 1. | Does the company engage any emissions trading initiative? | 0 or 1 |
| 2. | Does the company report on initiatives to recycle, reduce, reuse, substitute, treat or phase out total waste, hazardous waste or wastewater? | 0 or 1 |
| 3. | Does the company describe, claim to have or mention processes in place to improve its water efficiency? | 0 or 1 |
| 4. | Does the company report on initiatives to reduce, substitute, or phase out ozone-depleting substances? | 0 or 1 |
| 5. | Does the company make use of renewable energy? | 0 or 1 |
| 6. | Does the company report on initiatives to reduce, reuse or recycle water? | 0 or 1 |
| 7. | Does the company have environmentally friendly or green sites or offices? | 0 or 1 |
| 8. | Does the company report on initiatives to reduce the environmental impact on land owned, leased or managed for production activities or extractive use? | 0 or 1 |
| 9. | Does the company report on initiatives to reduce, reuse, substitute or phase out toxic chemicals or substances? | 0 or 1 |
| 10. | Does the company have a policy to improve its use of sustainable packaging? | 0 or 1 |
| 11. | Does the company use environmental criteria (e.g., ISO 14000) in the selection process of its suppliers or sourcing partners? | 0 or 1 |
| 12. | Does the company show an initiative to reduce, reuse, recycle, substitute, phased out or compensate CO2 equivalents in the production process? | 0 or 1 |
| 13. | Does the company report or show to be ready to end a partnership with a sourcing partner, if environmental criteria are not met? | 0 or 1 |
| 14. | Does the company have a policy for reducing the impact of its operations on biodiversity? | 0 or 1 |
| 15. | Does the company report on initiatives to recycle, reduce, reuse or phase out fluorinated gases such as hydrofluorocarbons, perfluorocarbons or sulfur hexafluoride? | 0 or 1 |
| 16. | Does the company describe, claim to have or mention processes in place to reduce its impact on biodiversity? | 0 or 1 |
| 17. | Does the company report on initiatives to restore or protect native ecosystems or the biodiversity of protected and sensitive areas? | 0 or 1 |
| 18. | Does the company report on initiatives to reduce its impact on native ecosystems and biodiversity? | 0 or 1 |
| 19. | Does the company evaluate the commercial risks and/or opportunities in relation to climate change? | 0 or 1 |
| 20. | Does the company claim to use key performance indicators or the balanced scorecard to monitor its impacts on biodiversity? | 0 or 1 |
| 21. | Does the company have processes in place to improve its energy efficiency? | 0 or 1 |
|  | **Possible total score of a firm** | **0 or 21** |

1. Corresponding author. [↑](#footnote-ref-1)
2. Process-oriented carbon reduction initiatives (PCRI) refer to managerial initiatives, such as plans, policies, processes, disclosures and strategic actions that can be used to address the adverse consequences of climate change. In this paper, the full list of items that form this PCRI index have been presented in the Appendix. Also, for brevity, we have used the following abbreviations throughout the paper for their regular re-occurrence: corporate governance (CG), carbon performance (CP), executive compensation (EC), market value (MV) and neo-institutional theory (NIT). [↑](#footnote-ref-2)
3. We measure total compensation as the natural log of total fixed and variable compensation (in USD$) paid to all senior executives as reported by the firm. The fixed component consists of a base salary and other in-kind benefits, such as accommodation, health and transportation. The variable component consists of bonuses and other long-term incentive plans, such as equity ownership and long-term share options. [↑](#footnote-ref-3)