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Eco-innovation in the extractive industry: Combinative effects of social legitimacy, green management, and institutional pressures

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ABSTRACT

There is growing pressure on extractive industry companies, such as those in the mining and oil sectors, to balance their economic performance with social and environmental practices, yet knowledge is lacking on how social legitimacy drives eco-innovation in extractive industry firms. Drawing upon institutional theory, we examine the impact of social legitimacy on eco-innovation and the moderating roles of green management and institutional pressure. Using a time-lag sample of 161 firms engaged in mining, and oil and gas activities in Ghana, the results indicate that social legitimacy positively relates to eco-innovation. In addition, our results show that the impact of social legitimacy on eco-innovation is moderated by green management practices such that the relationship is amplified when green management is high. Finally, in a three-way interaction effect, we demonstrate that the moderation of green management practices on the linkage between social legitimacy and eco-innovation is enhanced when institutional pressure is greater. These findings contribute to the eco-innovation and sustainability literature.

1. Introduction

Natural resources have the potential to improve growth, development, and poverty alleviation. Globally, the extractive industry sector has grown exponentially, contributing to economic development. However, many countries wherein organizations extract these natural resources face challenges such as resource dependency, and weak governance (Adomako and Tran, 2022a,b; World Bank, 2022). Instructively, extractive industries are divided into two sectors: mining, and oil and gas. Firms in the extractive industries derive raw materials, including oil, coal, gold, iron, copper, and other minerals from the earth. The industrial processes for extracting minerals include drilling, pumping, quarrying, and mining. These processes result in several environmental challenges, such as global warming, ozone depletion, water pollution, and deforestation (Famiyeh et al., 2021). Thus, stakeholder groups such as environmental activists, governments, consumers, and the media have called for firms in the extractive industry to be environmentally cautious (De Melo and Solleder, 2020). Accordingly, many firms in the extractive industry around the world have started to address these concerns through resource deployment to develop new ways of protecting the environment. Eco-innovation—which is

conceptually related to environmental, sustainable, or green innovation (Adomako and Tran, 2022a,b; Adomako et al., 2022)—reflects a variety of innovations that can be used to reduce harm (Díaz-García et al., 2015). Thus, eco-innovation has been defined as "the production, assimilation, or exploitation of a product, production process, service, or management, or business methods that are novel to the organization (developing or adopting it), and which results, throughout its life cycle, in a reduction of environmental risk, pollution, and other negative impacts of resources use (including energy use) compared to relevant alternatives" (Kemp and Pearson, 2008, p. 7).

Scholars have argued that opportunities for eco-innovation are driven by the market or technology (Sanni, 2018; Horbach et al., 2012). For example, demand for environmental products and services continues to grow globally (Carlsson et al., 2010; De Melo and Solleder, 2020). In developing and developed countries, consumer concerns are increasing (Lin and Niu, 2018; Noor et al., 2017) and opportunities are presented by a growing middle-class for consumer to protect the planet (De Koning et al., 2015; Wood et al., 2014). The priorities of multinational buyers in global supply chains also present opportunities (Tong et al., 2018; Zhu and Lai, 2019). For example, in Ghana, local firms advertise a range of new products made from plastic waste, including reusable bags,

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toothbrushes (actively promoting 10 tons of plastic savings per year), belts, dog collars and leashes, accessories, travel towels, designer eyeglasses, and handbags.

With the growing importance of eco-innovation across the globe, especially in sectors that extract raw materials from the Earth, scholars have pursued a diverse set of objectives. These include the identification of factors that drive eco-innovation (Adomako et al., 2022; Bossle et al., 2016; Cai and Zhou, 2014), the performance outcomes arising from eco-innovation (Kammerer, 2009; Dangelico and Pujari, 2010; Zheng and Iatridis, 2022), the identification of dimensions of eco-innovation (Hermosilla et al., 2010), and measurement of eco-innovation (Arun-del and Kemp, 2009; Cheng and Shiu, 2012). Collectively, knowledge accumulation around the eco-innovation construct has been substantial, driven largely by the expectation of organizations to adopt and implement eco-innovation practices to reduce the negative impact of their activities on the natural environment (Adomako, 2020; Adomako and Nguyen, 2020).

Nonetheless, key knowledge deficits remain within the realm of eco-innovation research. First, little effort has been geared toward explaining the impact of social legitimacy on eco-innovation. This is surprising given that social movements—such as environmentalism—and other conservation efforts have embarked on campaigns, demonstrations, and protests, criticizing the mining, and oil and gas organizations for their policies and decision-making modes toward humanity (Gutberlet, 2008; Sung et al., 2018). Social legitimacy reflects the social judgment of acceptance, appropriateness, and desirability on the part of the public and social communities (Shu et al., 2016; Suchman, 1995). In developing countries, social legitimacy may be a critical success factor in business activities, given the public's fear of environmental pollution in these economies (Gifford and Kestler, 2008). As such, organizations are responding to the growing pressure which places a greater emphasis on both knowing and understanding their stakeholders' environmental expectations, which are placed at the center of their activities (Bexell and Jönsson, 2021). Thus, we build on institutional theory (North, 1990; Scott, 1995) and investigate the effects of social legitimacy on eco-innovation. The study also examines the combinative impact of green management and institutional pressure on this relationship.

We contribute to the eco-innovation literature in three major ways. First, we link social legitimacy to the eco-innovation literature. Previous research on eco-innovation has not focused on how social legitimacy predicts eco-innovation. A focus on such research is critical because it may shed light on the topic of how social legitimacy effectively drives eco-innovation. Second, we develop a theoretical rationale for how social legitimacy interacts with green management in predicting eco-innovation. In doing so, we link social legitimacy to green management to clarify which practices foster a robust eco-innovation process in organizations. Third, we contribute to the literature on institutional pressure by establishing a theoretical rationale and providing empirical validation that interacts green management, social legitimacy, and institutional pressure in predicting eco-innovation. In so doing, we add institutional pressure as an important boundary condition to the eco-innovation literature.

The rest of the article proceeds as follows. In the next section, we briefly review the institutional theory, and social legitimacy literature, and emphasize the effect of social legitimacy on eco-innovation. We then introduce our research model to theoretically ground the study and develop our hypotheses. In Sections 3 and 4, we describe the research methodology and our findings, respectively. We conclude the study with a discussion of the theoretical and practical implications, and future research opportunities.

2. Theoretical milieu and hypotheses

2.1. Institutional theory

Institutional theory has gained prominence in the eco-innovation

literature (Connelly et al., 2011; Shu et al., 2016). The literature shows that there are four major motivations for green innovation: legislation, stakeholder pressure, economic opportunities, and ethical considerations (Bansal and Roth, 2000). This view has been supported by Chabowski et al. (2011), who point out that legal, ethical, and discretionary intentions are three major drivers of organizations in going green. The institutional theory emphasizes the rules of the game (North, 1990; Scott, 1995). Institutions could be formal (i.e., laws, regulations, and rules) or informal (i.e., norms, cultures, and ethics). It has been established that organizations should make strategic decisions and pursue their interests within both formal and informal institutional contexts (Scott, 1995). For example, formal institutions are in charge of law legislation and enforcement, and they promulgate regulations and rules. Conversely, informal institutions, such as norms, cultures, and ethics, are largely embedded in social interactions and upheld by the public and social communities.

According to DiMaggio and Powell (1983), organizations tend to respond to both formal, and informal institutions in three ways. First, organizations are awash with coercive isomorphism pressures, which reflect pressures from regulators, and resource providers. Second, organizations are pressured by mimetic isomorphism, which signifies imitation of other organizations to reduce cognitive uncertainty. Third, normative isomorphism demonstrates pressure arising from social factors, such as the public, the community, and trade associations. There are several benefits arising from complying with formal and informal institutional constraints. These include resource acquisition and social legitimacy (DiMaggio and Powell, 1983; Shu et al., 2016). In most developing countries, governmental support and social legitimacy are crucial for firms. For example, governmental support offers organizations access to scarce resources and preferential treatment. This is because, in most developing countries, governments still have considerable control over resources (Acquaah, 2007; Li and Atuahene-Gima, 2001). Related to informal benefits, social legitimacy helps organizations gain access to social resources such as networks of power (Li et al., 2008). Social legitimacy reflects "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995, p. 574). Prior research suggests that organizations with a high social legitimacy are more likely to gain social confidence and a stronger brand image (Sheng et al., 2011). This is likely to help them generate innovations that make better use of natural resources to reduce their ecological footprint. Thus, we demonstrate that the role of social legitimacy in driving eco-innovation is paramount. This is the case because organizations respond to pressures from the social environment, characterized by the presence of social legitimacy, or against a social environment that is not conducive to sustainability ideals, characterized by the absence of social legitimacy (Kibler et al., 2015).

2.2. Social legitimacy and eco-innovation

Previous research has demonstrated that green management fosters social legitimacy and that social legitimacy predicts innovation (Shu et al., 2016). In line with this logic, we posit that social legitimacy is likely to foster eco-innovation. Social legitimacy reflects a perception or assumption that demonstrates that an organization's actions are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions (Suchman, 1995). When the general public perceives that an organization's actions are consistent with acceptable values or beliefs, this has the potential to prompt the organization to go the extra mile to introduce innovations that are environmentally responsible (Driussi and Jansz, 2006; Loia and Adinolfi, 2021). In extending the institutional theory, previous research has argued that an organization can utilize different strategic responses to institutional pressure in the form of passive conformity and active resistance (Oliver, 1991; Zheng et al., 2015). Consistent with this logic,

the institutional theory (DiMaggio and Powell, 1983) indicates that an organization's passive behavior and its response to external pressure can help it take a strategic stance that may appease society. For example, in their decision to undertake eco-innovation, organizations in the extractive industry may have specific, perceptual images of the outcomes they hope to achieve based on their own, as well as others', prior experiences. Gaining greater social legitimacy may help them to improve the quality of their actions and relationships with external stakeholders (Wang and Qian, 2011).

In addition, by gaining greater social legitimacy, organizations cannot afford to soil their relationships with outsider stakeholders, such as governments and local communities. Instead, organizations might be interested in activities that positively respond to environmental challenges. This is likely to be seen by stakeholders as local and national development agendas by the firm. By achieving social legitimacy status, organizations tend to adopt new strategies to attend to the demands of stakeholders and deal with environmental (Vintró et al., 2014) and social protection challenges (Wheeler et al., 2002). Collectively, we expect that by pursuing social legitimacy, organizations find ways to integrate the sustainability challenges into their core business practices. Thus, we suggest that:

H1. Social legitimacy has a positive influence on eco-innovation

2.3. The moderating role of green management

In addition to H1, we predict that green management will positively moderate the relationship between social legitimacy and eco-innovation, such that the relationship is amplified when green management is high. First, it follows that organizations must address environmental challenges to satisfy stakeholder demands (Adomako et al., 2022; Buysse and Verbeke, 2003). Stakeholder pressure for green products offers insights into how green management practices could improve the effectiveness of social legitimacy and eco-innovation. Ghana has formulated some of the best environmental policies in the West African sub-region. The country is invested in establishing institutions to deal with environmental issues and has shown a strong political will to increase pressure on polluting firms (World Bank, 2020; Ali et al., 2021). The national climate change policy introduces caps on emissions and stringent standards and penalties for environmental offenses (UNEP, 2015). Thus, when organizations pursue greater green management practices, it is likely to help them improve their social legitimacy and to develop eco-innovations to satisfy the demands for green products.

Second, green management could improve the influence of social legitimacy on eco-innovation through the provision of opportunities to innovate. Given that green management practices focus on the environmental concerns of external stakeholders, organizations that pursue social legitimacy tend to pay attention to governmental policies, laws, customer concerns, and public interest (Luo and Du, 2012; Mont and Plepys, 2008). The knowledge acquired from green management practices is likely to equip a firm with information as to how to improve its social legitimacy, and this is likely to broaden the firm's research and development (R&D) activities. In addition, given that sustainability is now considered critical for consumers and stakeholders (McDonald et al., 2012), organizations are more mindful of their actions on the environment. This provides opportunities for firms to improve their social legitimacy and develop eco-innovations to meet stakeholder demands. Third, it has been suggested that green management involves the implementation of decision-making activities related to innovations (Harris and Crane, 2002). Firms with a high degree of social legitimacy are typically good at implementing environmentally responsible practices (Driussi and Jansz, 2006) to minimize their negative impacts on the environment and also to improve their accountability regarding environmental issues. Green management requires organizations to rethink their entire strategic processes, such as innovation and operational

systems (Porter and Van der Linde, 1995). To cope with the demands of social legitimacy, organizations tend to alter their core business models to respond to stakeholder pressure (Hu et al., 2020; Schneider and Spieth, 2013). Thus, we suggest that green management moderates the effect of social legitimacy and eco-innovation. This leads us to hypothesize that:

H2. The relationship between social legitimacy and eco-innovation is moderated by green management such that eco-innovation is strengthened when green management is high

2.4. Institutional pressure and green management

In addition to the above hypotheses, we argue that institutional pressure may play a key role in the moderation of green management in the relationship between social legitimacy and eco-innovation. Given that institutional pressure originates from the institutional environment, it has the potency to influence a firm's managerial decisions and practices (DiMaggio and Powell, 1983; Wang et al., 2018). Institutional pressure can be divided into regulatory, normative, and mimetic pressures (Scott, 1995). These pressures normally arise from the organization's stakeholders, such as governments, non-governmental organizations, suppliers, and customers (Oliver, 1997). For example, pressure from politicians, government officials, and government agencies can be considered regulatory pressure. Pressure from regulatory bodies and governments includes rules, rewards, and even sanctions (Bruton et al., 2010; DiMaggio and Powell, 1983). Normative pressure originates from collective expectations, values, and standards within a particular organizational context (DiMaggio and Powell, 1983). Mimetic pressure refers to the pressure that motivates an organization to emulate the acts and practices of those thought to be similar to it (Teo et al., 2003).

In this study, we combine regulatory and normative pressures to constitute institutional pressure. This is because regulatory and normative pressures deserve special attention (Scott, 2005). In addition, in the environmental management literature, regulatory and normative pressures have been considered as crucial for organizations (Brammer et al., 2012; Colwell and Joshi, 2013). We contend that institutional pressure moderates green management such that eco-innovation is strengthened through green management practices. First, in deriving hypothesis 1, we argue that green management is important in leveraging social legitimacy's full potential, since green management aids to identify opportunities for eco-innovation. This ability appears to be more critical when institutional pressure is strong than when it is weak. In environments characterized by a high degree of institutional pressure, organizations' behaviors and actions change constantly, implying that opportunities also emerge regularly—such as climate change action and environmental quality management—to which organizations must react and, consequently, make changes (Zhu and Sarkis, 2007). Second, in environments characterized by institutional pressure, a first-mover advantage can be shortened by competitor actions such that organizations can realize the full eco-innovation potential of social legitimacy only when green management practices aid these organizations to commercialize new eco-products early to help them maximize the time before the second entrant follows (Adomako et al., 2022). Although green management practices can help organizations to reduce toxic emissions and protect the natural environment, they are sometimes very expensive and their returns on investment are far too low (Oliver, 1997). However, green management practices can help organizations gain governmental support and social legitimacy (Shu et al., 2016). Overall, we conclude that the facilitating role of green management practices on the social legitimacy–eco-innovation relationship derived in Hypothesis 2 is consistent with the nature of institutional pressure, as a low level of institutional pressure imposes less challenging and less complex conditions on organizations such that the organizations can be successful when green management practices are

low. Therefore, we suggest that:

H3. The moderation of green management on the relationship between social legitimacy and eco-innovation is stronger when institutional pressure is high than when it is low

3. Method

3.1. The extractive industry, sample, and data

To test our hypotheses, we collected data from the extractive industry—namely, oil and gas, and mining—in Ghana. Notably, the extractive industry has been a major driver of economic growth in many developing countries. However, the extractive industry has come under intense pressure to reduce its impact on society. For example, greenhouse gas emissions, pollution, and biodiversity loss are considered threats from the extraction of natural resources. Organizations are, therefore, encouraged to ensure sustainable practices. For example, the United Nations (UN) has set out guidelines, such as the 2030 Agenda for Sustainable Development and the Paris Agreement on climate change, to help mitigate firms' impact on society. Thus, the extractive industry is an important sector for organizations to respond positively to environmental challenges by assuming responsibility for local and national development.

We developed the sampling frame from Ghana's company register database, which contains details of active public and private companies incorporated in Ghana. The data collection was conducted in two waves to attenuate potential common method bias associated with cross-sectional data. In the first wave (T1), we sampled 200 firms engaged in mining, and oil and gas activities from Ghana's company register database. The sampled firms met the same criteria: (1) independent firms with no foreign affiliation or not part of any company group; and (2) companies with complete information on the chief executive officers (CEOs) and deputy CEOs or general managers. Based on the above criteria, we contacted the CEOs with a questionnaire delivered in person to obtain information on social legitimacy, green management, institutional pressure, and information on the control variables. We visited the headquarters of the sampled firms several times to remind them of the questionnaires. Overall, we received 167 responses from the CEOs. We then removed questionnaires with missing values and obtained a total of 166 responses.

To attenuate potential common method variance issues (Podsakoff et al., 2012), we contacted the deputy CEOs or general managers of the 166 firms to obtain data on eco-innovation. After sending two reminders, we received 164 responses. We further discarded three questionnaires due to missing values. Thus, our final sample contains 161 complete matched responses from the CEOs and their deputies. This represents an 80.5% response rate. The high response rate was due to the face-to-face data collection approach utilized in this study. The final sample contains firms with a mean age of 16.19 (s.d. = 11.31) years and a mean size of 46.69 (s.d. = 12.56) full-time employees.

In order to investigate potential nonresponse bias, we compared respondents to non-respondents in the final sample. Results of t-tests reveal that the respondents do not differ significantly from non-respondents in terms of firm age or size. Thus, nonresponse bias is not likely to affect the findings in this study (Rogelberg and Stanton, 2007).

3.2. Measures

Unless otherwise specified, all the multi-item constructs were captured on a seven-point Likert scale with anchors ranging from 1 = strongly disagree, to 7 = strongly agree. Details of the specific items used to capture the constructs and their respective factor loadings are presented in Table 1.

Social legitimacy. We used the four-item scale developed by Shu et al. (2016) to measure social legitimacy. This scale is based on the

Table 1
Constructs, measurement items, and reliability and validity tests.

Item description	Factor loadings (t-values)
<i>Eco-innovation: $\alpha = 0.87$; CR = 0.88; AVE = 0.65</i>	
<i>Please rate the extent to which you agree or disagree with the following statements:</i>	
The company deliberately evaluates whether the product is easy to recycle, reuse, and decompose, in conducting the product development or design.	0.77 (1.00)
The company uses the smallest possible amount of materials to create the product, in conducting the product development or design.	0.80 (16.23)
The company chooses materials for the product that consume the least amount of energy and resources, in conducting the product development or design.	0.82 (17.99)
The company is improving and designing environmentally friendly packaging for existing and new products.	0.85 (18.65)
<i>Green management: $\alpha = 0.90$; CR = 0.91; AVE = 0.65</i>	
In the past three years, our company has ...	
Protected the environment	0.67 (1.00)
Maintained an ethical working environment	0.77 (10.34)
Utilized resources wisely and responsibly	0.82 (16.45)
Economized the usage of raw materials	0.86 (19.39)
Recycled our products	0.89 (20.19)
Respected the natural laws	0.81 (15.28)
<i>Social legitimacy: $\alpha = 0.87$; CR = 0.88; AVE = 0.65</i>	
In the past three years, our company	
Has been accepted by the community	0.80 (1.00)
Has been accepted by the public	0.83 (17.11)
Has been accepted by the financial agencies (such as the state-owned banks)	0.78 (14.87)
Has been accepted by the public stakeholders, such as environmental protection agencies	0.82 (16.20)
<i>Regulatory pressure: $\alpha = 0.89$; CR = 0.89; AVE = 0.69</i>	
Our firm tries to reduce the threat from the environmental regulations by implementing environmental management practices.	0.79 (1.00)
Environmental regulations are important for our firm to implement environmental management practices.	0.83 (16.86)
The local government has set strict environmental standards with which our firm needs to comply.	0.84 (17.09)
Several penalties have been imposed on firms that violate environmental standards and regulations.	0.86 (18.22)
<i>Normative pressure: $\alpha = 0.89$; CR = 0.89; AVE = 0.67</i>	
The increasing environmental consciousness of consumers has spurred our firm to implement environmental management practices.	0.84 (1.00)
Being environmentally responsible is a basic requirement for our firm to be part of this industry.	0.76 (12.38)
Non-governmental organizations around our firm expect all firms in the industry to be environmentally responsible.	0.78 (13.45)
Community stakeholders may not support our firm if our firm releases toxic substances and emissions.	0.89 (18.12)
<i>Market uncertainty: $\alpha = 0.91$; CR = 0.92; AVE = 0.81</i>	
Customers in our industry tend to look for new products all the time.	0.88 (1.00)
New customers tend to have product needs that are different from those of existing customers.	0.90 (18.23)
We are witnessing demand of our products from customers who never bought from us before.	0.92 (19.27)

Note: CR = composite reliability; AVE = average variance extracted.

legitimacy framework of Scott (1995). The items reflect the degree of acceptance the focal firm has gained from external social institutions, such as the public and community.

Green management. We used six items from Shu et al. (2016) to measure green management. These items signify how firms protect the environment and minimize the negative impacts of a product during its entire lifecycle. Respondents were asked to evaluate how well their firms had protected the environment, respected natural laws, maintaining an ethical working environment, utilized resources wisely and responsibly, economized in the usage of raw materials, and recycled their products.

Institutional pressure. We measured institutional pressure with two constructs, namely, regulatory (four items) and normative pressures (four items) from Wang et al. (2018). These measures evaluate the

respondents' perceptions of the extent to which regulatory and normative pressures exert significant influence on their firms to implement environmental management practices (Wang et al., 2018).

Eco-innovation. We measured eco-innovation with four items from Chen (2008). The items reflect the processes of incorporating pro-environmental decision-making within a firm's product development activities, with respect to environmentally sustainable packaging, materials, and evaluations conducted to improve recyclability, reusability, and decomposability.

Control variables. We added several control variables that could potentially influence eco-innovation. *Firm size* was measured with the number of full-time employees, and *firm age* was captured as the number of years the business has operated since its first sales. We controlled *industry-type CEO age* as the number of years since the CEO was born. Using logarithm transformation of a firm's annual R&D expenditure, the level of R&D activity was measured. Market uncertainty was measured by using three items from Jaworski and Kohli (1993) on a Likert scale ranging from 1 = strongly disagree, to 7 = strongly agree.

3.3. Common method variance, validity, and reliability tests

We evaluated the reliability and validity of the multi-item measures by performing a confirmatory factor analysis (CFA) using the maximum likelihood procedure in LISREL 8.71. We then inspected the model fit using the conventional chi-square (χ^2) test and other recommended fit indices. Although we used different informants in our survey, we assessed potential common method bias issues by following two recommended estimation procedures. First, we utilized the approach suggested by Carson (2007) and estimated a combined CFA measurement model for all the multi-item measures and a common method factor model that was estimated to load on all items. This was done to control for any variance and covariance introduced due to informant bias. Accordingly, we estimated two competing models: Model 1 involved a trait model that was estimated to allow each indicator to load on its respective latent factor. We received adequate model fit heuristics (χ^2 /d.f. = 1.69; RMSEA = 0.05; NNFI = 0.93; CFI = 0.92; SRMR = 0.08). Model 2 estimated a trait-method model which involved the inclusion of a common factor joining all the indicators. Results from Model 2 were acceptable (χ^2 /d.f. = 1.94; RMSEA = 0.04; NNFI = 0.91; CFI = 0.92; SRMR = 0.07). A comparison of the two models shows that Model 2 is not materially better than Model 1.

Second, we followed Lindell and Whitney (2001) and performed a marker test. We utilized "I am very sensitive to criticism from others," an item that measures expressiveness as a market test variable. This item has no theoretical ties with any of the constructs in our model. We found non-significant correlations of expressiveness with other constructs, with correlations ranging from -0.02 to 0.04. Based on the above statistical analyses, we contend that common method bias does not influence our results.

We assessed the reliability and validity of the constructs using Cronbach's alpha, composite reliability, and average variance extracted (AVE) values. We report the reliability and validity of our constructs in Table 1. The results in Table 1 show that Cronbach's alpha, composite reliability, and AVE are all above the threshold value of 0.60, 0.70, and 0.50, respectively (Bagozzi and Yi, 1988). We also found that the percentage of variance explained by the traits measured is greater than the variance explained by the common method factor and error. The CFA also showed an adequate fit between the hypothesized measurement model and the observed data (χ^2 /d.f. = 1.79; RMSEA = 0.05; NNFI = 0.95; CFI = 0.9), which revealed that all factor loadings were greater than the suggested cut-off value of 0.70. These results provide support for the convergent validity of the construct (Fornell and Larcker, 1981). To assess discriminant validity, we compared a five-factor model with alternative models. The results show that the five-factor model adequately fits the data and the alternative models. Thus, the discriminant validity of the five constructs is supported. In addition, we assessed

the discriminant validity of the constructs by inspecting the AVE for each construct to establish whether the AVE for each construct was greater than the shared variances of each pair of constructs (Fornell and Larcker, 1981). We established discriminant validity because the AVE for each construct is greater than the highest shared variance (HSV) between each pair of constructs.

4. Findings

4.1. Estimation approach and results

We present the descriptive statistics and correlations in Table 2. Before embarking on the hypotheses testing, the variables were standardized to address multicollinearity concerns (Aiken and West, 1991). We obtained 3.08 as the largest variance inflation factor (VIF) in the regression models, which is far below the suggested threshold value of 10 (Neter et al., 1990). This suggests that our results are not affected by multicollinearity. In addition, we probed the data further for potential violations such as normality and outliers. No substantial violations were detected, and we concluded that our data were used for testing the hypotheses.

We utilized stepwise regression to test our hypotheses. We present the results of the regression in Table 3 (Models 1–5). Model 1 contains the results of the effects of the control variables. Model 2 adds social legitimacy as the independent variable. The results in Model 2 reveal a significant and positive relationship between social legitimacy and eco-innovation ($\beta = 0.30, p < 0.01$). This result supports Hypothesis 1.

Model 3 adds the direct effects of the moderating variables (i.e., green management and institutional pressure). Hypothesis 2 states that green management moderates the relationship between social legitimacy and eco-innovation. We tested Hypothesis 2 in Model 4 by adding the interaction terms between green management and social legitimacy, which were estimated by multiplying the mean-centered green management and social legitimacy scores for each firm. The results in Model 4 show that green management positively moderates the relationship between social legitimacy and eco-innovation ($\beta = 0.42, p < 0.01$). In addition, a slope test conducted following Aiken and West's (1991) recommendations found that the linkage between social legitimacy and eco-innovation was positive at high levels of green management ($b = 0.22, t = 2.88, p < 0.05$). However, the results of the slope test show no significant effect of social legitimacy on eco-innovation at low levels of green management ($b = 0.04, t = 0.40, p > 0.10$). Thus, the results of the simple slope test provide support for our regression results and Hypothesis 2. The graph of this relationship is plotted in Fig. 1.

Model 5 also tests Hypothesis 3, which predicts that institutional pressure moderates the interaction of green management on the relationship between social legitimacy and eco-innovation. We estimated the three-way interaction term by multiplying the mean-centered social legitimacy, green management, and institutional pressure scores for each firm, showing that the three-way interaction is significant ($\beta = 0.56, p < 0.01$). This result suggests that the moderation of green management on the social legitimacy-eco-innovation linkage is enhanced to a larger extent when institutional pressure is high than when it is low. Thus, Hypothesis 3 is supported.

To further examine the significance of the three-way interaction predicted in Hypothesis 3, we split our data into two groups—high and low institutional pressure—and performed regression analyses to test Hypotheses 1 and 2. The results show that social legitimacy positively relates to eco-innovation for firms operating in environments characterized by high institutional pressure ($\beta = 0.39, t = 6.51, p < 0.01$) and low institutional pressure ($\beta = 0.35, t = 4.53, p < 0.01$). For Hypothesis 2, we find that the moderating effect of green management on the relationship between social legitimacy and eco-innovation is significant for firms operating in high institutional pressure environments ($\beta = 0.37, t = 5.51, p < 0.01$), but the effect is different for firms operating in low institutional pressure environments ($\beta = 0.04, t = 0.44, p > 0.05$).

Table 2
Descriptive statistics and correlations.

Variables	1	2	3	4	5	6	7	8	9	10
1. Firm size (employees)										
2. Firm age (years)	0.04									
3. CEO age	-0.11	-0.02								
4. R&D spending (log)	0.14*	0.12	0.19*							
5. Market uncertainty	-0.06	-0.03	-0.04	0.33**						
6. Regulatory pressure	0.14*	0.06	-0.02	0.11	0.09					
7. Normative pressure	0.12	0.11	-0.03	0.07	0.06	0.14*				
8. Social legitimacy	0.22**	0.14*	0.20**	0.05	0.11	0.18*	0.16*			
9. Green management	0.23**	0.13	-0.05	0.21**	0.14*	0.27**	0.20**	0.29**		
10. Eco-innovation	0.13	0.10	-0.05	0.13	0.15*	0.39**	0.26**	0.33**	0.29**	
Mean	46.69	16.19	47.78	1.50	5.16	5.42	5.44	6.06	4.88	5.81
Standard deviation	12.56	11.31	19.22	1.13	0.86	0.77	0.80	0.63	1.03	0.82

* $p < 0.05$; ** $p < 0.01$.

Table 3
Regression results.

Control variables	Dependent variable: Eco-innovation				
	Model 1	Model 2	Model 3	Model 4	Model 5
Firm size (employees)	0.12*	0.11*	0.06	0.05	0.04
Firm age	0.06	0.05	0.03	0.03	0.03
CEO age	-0.04	-0.03	-0.02	-0.02	-0.02
R&D spending	0.13**	0.12*	0.06	0.04	0.03
Market uncertainty	0.18***	0.17***	0.14**	0.13**	0.12*
Main effects					
H1: Social legitimacy (SL)		0.30***	0.22***	0.16***	0.13**
Green management (GM)			0.25***	0.18***	0.14**
Institutional pressure (IP)			0.19***	0.14**	0.13**
Two-way interaction effects					
H2: SL * GM				0.42***	0.39***
GM * IP				0.13**	0.11*
Three-way interaction effects					
H3: SL * IP * GM					0.56***
Model fit statistics					
F-ratio	3.67***	4.22***	5.19***	5.80***	6.26***
R ²	0.12	0.15	0.19	0.25	0.27
Change in R ²		0.03	0.04	0.06	0.02
Largest VIF	1.78	2.09	2.29	2.65	3.08

N = 161; * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; standardized coefficients are shown.

Fig. 2 plots the three-way interaction, again following the procedure as outlined by Cohen et al. (2003). Results indicate that eco-innovation increases significantly at increasing levels of social legitimacy, green management practices, and institutional pressure. On the contrary, under conditions of low social legitimacy, fewer green management practices, and low institutional pressure, eco-innovation is significantly attenuated. Overall, the findings from the three-way interaction analysis

provide support for Hypothesis 3.

5. Discussion and conclusion

Guided by the institutional theory (Scott, 1995), the present study developed theoretical arguments related to how social legitimacy influences eco-innovation of extractive industry organizations in a developing country. We also explored how green management facilitates the social legitimacy–eco-innovation relationship. In addition, we investigated the degree of institutional pressure in order to clarify the boundary conditions of green management’s role in terms of the social legitimacy–eco-innovation relationship. Results from the empirical study demonstrate that social legitimacy significantly predicts eco-innovation. The findings also indicate that green management facilitates the relationship between social legitimacy and eco-innovation, especially where institutional pressure is greater. These findings theoretically and practically contribute to the eco-innovation literature in several ways.

5.1. Theoretical implications

First, we enrich the eco-innovation literature by investigating how social legitimacy affects eco-innovation. Previous research has expanded our understanding of the drivers of eco-innovation (e.g., Bossle et al., 2016; Cai and Zhou, 2014). For example, prior research shows that regulation (Sanni, 2018), technological trajectory (Sáez-Martínez et al., 2016), and collaboration, alliances, and networks (Fernández et al., 2021) predict eco-innovation. Despite these drivers of eco-innovation, we still know little about how social legitimacy influences eco-innovation. Our findings indicate that social legitimacy positively affects eco-innovation. These findings refresh the perspective on what social legitimacy can bring to firms. Thus, by gaining social legitimacy, firms stand a better chance of improving their eco-innovation activities.

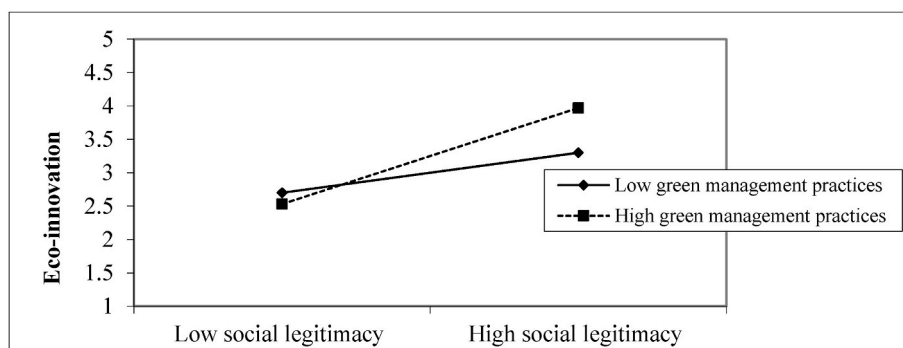


Fig. 1. Interaction effects of social legitimacy with green management practices on eco-innovation.

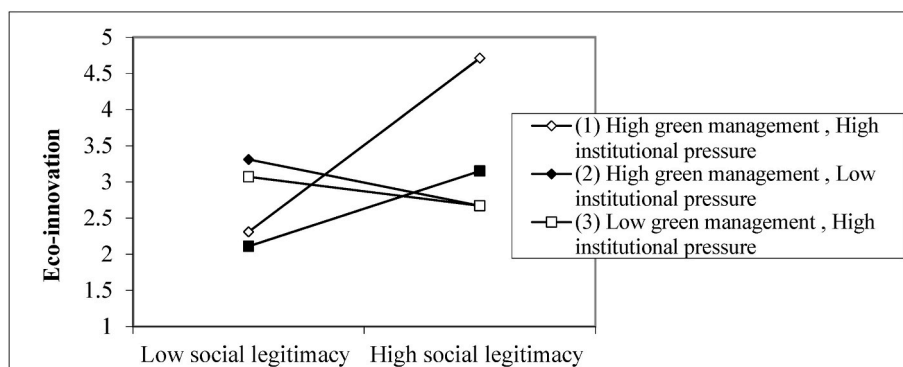


Fig. 2. Interaction effects of social legitimacy, green management, and institutional pressure on eco-innovation.

Second, we contribute to the social legitimacy literature by empirically validating a theoretical argument that the social legitimacy–eco-innovation relationship is moderated by green management practices. Consistent with our theoretical arguments, green management moderates the social legitimacy–eco-innovation relationship, particularly when institutional pressure is greater. Findings show that when green management is low or when green management is high in an environment characterized by greater institutional pressure, there is not a positive correlation between social legitimacy and eco-innovation. This suggests that the social legitimacy–eco-innovation relationship is complex and not one that is positive in all situations.

Third, our study adds to the institutional theory by demonstrating the impact of institutional pressure on the moderation of green management. While previous studies have highlighted the benefits of institutions to firms through the process of institutionalization (North, 1990; Scott, 1995), the moderation of institutional pressure on social legitimacy has not yet been adequately investigated. Thus, in terms of boundary conditions, we highlight that green management facilitates the social legitimacy–eco-innovation relationship in environments characterized by institutional pressure. This suggests that institutional pressure constitutes a boundary condition for green management, as only when there is a specific degree of institutional pressure does green management have substantial value in social legitimacy’s conversion into greater eco-innovation. Overall, the current study improves the development of the institution-based view of strategy (Peng et al., 2009) by showing that institutional pressure is a boundary condition for green management.

5.2. Practical implications

This study also has practical implications. First, the finding that social legitimacy positively relates to eco-innovation may be of interest to managers in new product development. In particular, managers in developing economies might need to acknowledge the relevance of eco-innovation in the new product development process. This is important because firms from developing economies may lack social legitimacy to improve eco-innovation. Second, the finding that green management positively moderates the relationship between social legitimacy and eco-innovation can guide emerging countries’ manufacturing firms to enhance their product development. Moreover, this finding has important implications for managers to strengthen their green management practices to help develop their social legitimacy. Third, managers in emerging countries are advised to pay attention to social legitimacy as it has important implications for eco-innovation. Specifically, our study suggests that social legitimacy is an important enabler of eco-innovation, thus explaining its influence on firm-level outcomes. This relationship provides managers with a clear understanding of the effects of social legitimacy. Finally, the findings of our study highlight not only the important effects of institutional pressure on the moderation of

green management in the relationship between social legitimacy and eco-innovation but also the implications for managers to pay attention to institutional pressure in the business environment.

6. Limitations and future research trajectory

In spite of the strength of our data collection strategy—data were collected from multiple informants (CEOs and their deputies), which helped us to attenuate potential common method bias associated with single-source data (Podsakoff et al., 2012)—this study has some limitations. First, the variables were not manipulated, nor did we use a random assignment strategy, which could have aided in making causal claims. This limitation can be addressed by future studies obtaining multiple data from the same sample over time in a longitudinal design. Such a design will help to improve confidence in inferring causality between social legitimacy and eco-innovation.

Second, our study has concerns related to generalizability because of its focus on small and medium-sized enterprises (SMEs). Future studies may focus on large firms to establish if our results hold. Third, our study is based on data from one emerging economy, Ghana, whose environmental context may not perfectly reflect varying differences across all emerging economies. Ghana is unique in terms of its customs, culture, and regulatory environment, which impact firms’ activities. These limit the applicability of the findings beyond this context. Accordingly, future studies can be conducted using a multi-country setting (Europe, Latin America, and Africa) to capture the unique and varied contextual idiosyncrasies within which social legitimacy drives eco-innovation. Additionally, our dependent variable of eco-innovation was measured by using self-reported data. Measuring eco-product innovation in this way may be affected by social desirability bias in responses. Future studies may therefore employ objective financial data such as profitability, sales growth, and return on investment to capture investment in eco-innovation.

Finally, although our choice of data was justified in our analysis, it could be further enhanced by drawing on multiple sources. We acknowledge this limitation and encourage future research to address this methodological issue.

Author statement

The authors have no conflict of interest to declare.

Data availability

Data will be made available on request.

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