**Stakeholders pressure, SMEs characteristics and environmental management in Ghana**

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**Abstract**

The aim of the paper is to investigate whether firm-specific characteristics and external factors are potential determinants of environmental management practices (EMPs) in SMEs in a developing country, Ghana. The study is based on a sample of 238 SMEs in manufacturing and services sector. OLS regression is employed to model the relationship between the firm-specific characteristics, external factors and the extent of EMPs. It also examined whether these factors differ across dimensions of EMPs. The results demonstrate that industry, firm age, size and primary stakeholders' pressure have a significant effect on the extent of EMPs but ownership type and secondary stakeholders' pressure are not significant. However, both firm-specific and external factors have influence across different dimensions of EMPs with firm factors being fairly consistent. Our results even though consistent with legitimacy and stakeholder theories predictions, suggest that legitimacy contribute greater to EMPs within the research context. Based on the results several suggestions are made to improve EMPs of SMEs in Ghana.

**Keywords**: Firm-specific characteristics and external factors, Environmental management practices, SMEs, Legitimacy and stakeholder theories, Ghana

**Introduction**

Over the past three decades, the social and environmental responsibility of corporations has become very important which has evoked policy direction by international and local governments (Albertini 2013). This has become necessary due to increased levels of environmental challenges resulting in high levels of pollution, depletion of resources, waste and global warming. Businesses are being encouraged to adopt measures necessary to reduce their negative environmental impact in their strategic decisions. The adoption of environmental measures by firms has been linked with both internal and external factors within the operating environment of the firm (Alvarez-Gil et al. 2001; González-Benito and González-Benito 2006; Heras-Saizarbitoria et al. 2016).While empirical research on integration of internal and external motivators for environmental management (EM) abounds in larger firms, it is limited in SMEs’ literature (Henriques and Sadorsky 1996; D’Amico et al. 2016). This is despite the lack of environmental engagement by SMEs and the fact that about 71% of service SMEs not offering any green products (Hoogendoorn et al. 2015).

 However, vast differences exist between socio-environmental management of SMEs and that of large firms as SMEs’ socio-environmental activities are less formalised and highly affected by resources constraints (Hillary and Burr 2011) making the applicability of large firms' findings difficult (Tilley 1999; Vijfvinkel 2011). The limited integration of internal and external motivators affects the evaluation of their differential effect on EM. This creates an impression of isolated effects of these internal and external factors which undermines the understanding of the complexity of factors which affect a firm’s EM and underlying theories. Delmas and Toffel (2004) argued that different institutional pressures experienced by the firm does not explain why firms subjected to the same level of pressure still differ in the level and extent of their EM. This indicates that different factors may be at play which may equally affect EM. Ervin et al. (2013) noted that a firm's performance depends on the organisational structures and other firm characteristics. Therefore, maybe neither firm-specific characteristics or pressure within the institutional environment may fully capture or explain a firm's motivation to engage in EM.

Despite this, most of the limited prior SMEs’ research has focused either on the internal or external motivators for EM (Uhlander et al. 2012; Mensah and Blankson 2013; Mensah 2013; Leoniduo et al. 2016). In developing countries, Mensah (2014) investigated the effect of stakeholder pressure on the environmental performance of hotels. A recent study by Leonidou et al*.* (2017) investigates the influence of firm industry on EM. Studies examining the simultaneous effect of firm-specific characteristics and external motivators is still scarce. Similarly, studies examining the effect of these variables across different dimensions of environmental management practices (EMPs) such as energy, water, waste, materials, pollution and biodiversity management are limited among SMEs (Uhlaner et al. 2012; Hoogendoorn et al. 2015). This research area among SMEs is worth investigation as Singh et al. (2014) observed that determining the relative importance of the drivers of EM is essential to allow for an objective evaluation and development of cost-effective policy to help SMEs to overcome traditional barriers of EMPs (Prakash and Potoski 2012).

Because of this, the objective of the current study is to investigate the association of both stakeholders (primary and secondary) and SMEs characteristics on the extent of overall EM and their effect on different dimensions of EMPs (energy, energy, water, waste, materials, pollution and biodiversity) in Ghana. The Ghanaian environment presents an interesting case upon which to base the study because like most developing countries, the concern for the environment increased in importance after Rio Summit in 1992, with the country coming out with a national environmental plan. This has been followed by environmental Act (Act 490). However, there have been financial challenges faced by the environmental agency charged with implementation of the Act. This has resulted in restriction of its activities to large manufacturing firms (Ahinful 2017). The national environmental assessment rated the country’s environmental management as poor (Ministry of Environment Science and Technology 2012). However, in the mix of all these, the private sector has come out with the Ghana Business Code to encourage voluntary socio-environmental activities. Also, SMEs are being encouraged to contribute to socio-environmental improvement through the institution of annual SMEs’ Corporate Social Responsibility (CSR) award. Therefore, examining the internal and external determinants of SMEs’ EM in Ghana is important to shed light on this all-important issue in a developing economy context where studies have indicated there are limited socio-environmental studies generally and on SMEs in particular (Myung et al. 2012; Jamali et al. 2017).

Overall, the results show that primary stakeholders and SMEs characteristics (industry and size) have a significant effect on EM but secondary stakeholders and SMEs characteristic (firm age and ownership-type) have no significant effect on EM. However, when EM is dis-aggregated into different EMPs (energy, water, waste, materials, pollution and biodiversity), the results show that the association between stakeholders’, SMEs characteristics and individual EMPs differ.

The study makes three contributions to the extant literature. First, our use of six EMPs (energy, water, waste, materials, pollution and biodiversity) to measure EM extends existing studies which are limited to single indicators (Uhlander et al. 2012; Mensah, 2014). The studies using single indicator fail to account for the theoretical foundation for engaging in different EMPs (see Xie and Hayase 2007; Trumpp et al*.* 2015). For example, SMEs may be motivated to engage in energy management for a different reason compared to management of biodiversity. Measuring EM using different EMPs is more informative since EMPs adoption varies among firms due to differences in priorities of EMPs activities (Delmas and Toffel 2004; Morrow and Rondinelli 2002). SMEs are resources constrained and therefore it is expected that efforts and resource allocation may vary across different practices hence comprehensiveness of the EMP measure provide rich insight into the impact of stakeholders and firm-specific characteristics have on the dimensions of EM.

Second, we investigate a comprehensive set of stakeholders and SMEs firm-specific characteristics on EMPs adoption by SMEs in both manufacturing and service sectors which adds to the single industry focused studies and also helps to lessen the challenges of sample specificity relative to previous studies (Alvares-Gil et al. 2001; Mensah and Blankson 2013), especially in developing countries’ context. The heterogeneous nature of the sample improves the generalisation of the study’ results and policy implications on SMEs’ EMPs adoption especially in developing countries where SMEs’ sector is vast with current policies mainly geared towards large firms. Third, we take a multi-theoretical perspective to examine the determinants of EM among SMEs in the Ghanaian setting. The multi-theoretical approach has been noted to enrich understanding of EM due to different factors influencing EM adoption (Ntim and Soobaroyen 2013). The study relies on legitimacy and stakeholder theories to explore the determinants of EM among SMEs. These two theories have been acknowledged to be relevant in the socio-environmental literature of large firms but have received little attention in the SME context (Russo and Perrini 2010; Sen and Cowley 2013; Hoogendoorn et al. 2015). However, the need for legitimation and influence of stakeholders cannot be discounted among SMEs and likely to provide bases for understanding EMPs of SMEs (Jenkins 2006; Gadenne et al. 2009; Hamann et al*.* 2017).

The remainder of the paper is organised as follows: Section 2 covers the theoretical framework, Section 3 reviews the literature and hypotheses development. Section 4 discusses the research method. Section 5 presents and discusses the findings of research. Finally, there is a summary and conclusion.

**Literature and Hypotheses Development**

***Theoretical Framework***

Although socio-environmental management has attracted interest from the academic community over the years, Reverte (2009) suggests there is still no comprehensive theoretical framework explaining the motivation for EM. One source of this challenge is the reliance on a single theory to explain this phenomenon. Gray et al. (1995) contend that even though individual theories are useful in explaining the determinants of EM, their ability to fully explain different determinants and different aspects of EM is limited (Ntim and Soobaroyen 2013). Some theories which have been used in the field include agency, institutional, legitimacy and stakeholder theories. However, the two most dominant in studies relating to socio-environmental activities particularly in large firms are legitimacy and stakeholder theories (Deegan 2002; Reverte 2009). These two theories seem not to receive the same level of attention among SMEs and where the few studies based on SMEs have applied them, they have been applied in isolation (Lepoutre and Heene 2006; Mensah 2014, Hoogendoorn et al. 2015). Laan (2009) suggest that legitimacy and stakeholder theories which are similar and both derived from the broad political economy perspective commonly explain managerial motivation for social responsibility. The need for a multi-theoretical framework in socio-environmental studies is underpinned by the inconclusiveness in the literature regarding either legitimacy or stakeholder theories.

Clearly, whilst legitimacy focuses on the general societal expectation, stakeholder theory recognises that within the wider social system exist different groups with competing interest which must be strategically addressed in the mix of resources constraint for the survival of the firm. Therefore, instead of the firm having one social contract where it is difficult to identify the firm's stakeholders, stakeholder theory expects various negotiated social contract with different stakeholders with priority for powerful stakeholders (Ntim and Soobaroyen 2013). Deegan (2002) asserts there are overlaps between legitimacy and stakeholder theory, they both provide a different and useful point. Reverte (2009) stresses these are alternative theories in EM studies focusing on a distinct aspect of the same issue as there are different factors motivating EM adoption and therefore should not be competing theories. Hence using them jointly should help explain environmental behaviour of the firm.

Stakeholder theory posits there are group who can affect or is affected by the operations of the firm (Freeman 1984) and therefore a firm needs to adopt strategies to address their expectations which is much broader than that of shareholders. The strategies and expectations which management consider depend on the level of influence exerted by the stakeholder (Brenner and Cochran 1991). Stakeholder theory has been instrumental in strategic choices of management since it helps identifies different groups of stakeholders, their competing claims, influence and how to manage it (Donaldson and Preston 1995). From the managerial branch of stakeholder theory, EM by the firm may address social responsibility demand by powerful stakeholders in society (Yunus et al. 2016). Hence the theory helps explain environmental behaviours of firms (Clarkson 1995). Stakeholders may be grouped into primary and secondary stakeholders depending on their direct relevance to the firm profitability, growth and survival (Donaldson and Preston 1995; Buysse and Verbeke 2003) which also influence managerial strategic choices. Primary stakeholders are those with critical resources needed by the organisation to survive. Such stakeholders can influence the economic conditions of the firm. As such their environmental expectations have a greater impact on the firm's environmental strategy (Hoogendoorn et al. 2015). Secondary stakeholders are those with the power to impact on a firm’s economic opportunities indirectly through their influence on other stakeholders since they do not directly transact with the organisation (Mitchell et al. 1997). Firms generally do not have to meet the demands of outside stakeholders. However, the importance attached to various stakeholders’ claim varies over time and in relation to the urgency of the issue (Mitchell et al.1997). On this basis, Hoogendoorn et al. (2015) argued that primary and secondary stakeholders may affect different dimensions of EM.

Legitimacy theory is a generalised 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). Legitimacy affects how people act in relation to organisations and their understanding of the organisations. The theory seeks to explain why a firm undertakes socio-environmental management and argues that a firm can only survive if it operates within the bounds of acceptable social norms and value systems. Woodward (1996) emphasises that the firm operates under non-legally enshrined mandate of society which is likely to be withdrawn where the firm is judged not to be doing the right thing. The implicit terms of this social contract require the firm to execute activities deem appropriate to the wider society. Whenever there is a potential difference between the expectation of society of which the firm is part and what the firm does, the firm's existence is threatened. Sethi (1976) suggested that existence of a disparity between the two value systems cause legitimacy gap and organisations will take all the steps to ensure its legitimacy is not questioned. The firm will pursue several steps or strategies (see Lindblom 1983) to minimise any threat.

Even though society's expectations are not static, the organisations adjust to the environmental requirements. The key according to Perrow (1986) in the legitimisation process is that the organisation tries to control and manipulate the environment to reduce uncertainty and achieve its objective(s) more efficiently. Firms’ can legitimise their operations by the extent to which environmental management practice is incorporated into their overall management strategies. This may help the firm reduce threats of increased regulations and loss of reputation. Yunus et al. (2016) observes that failure to mitigate these threats may influence the perceptions of the parties to the social contract and raise legitimacy concerns. The ability and extent to which a firm can execute its chosen environmental strategies may depend on firm-specific characteristics which determines the resources availability, firm visibility and extent of social dependence (Mathew 1993). Patten (1992), argued that socio-environmental management can be a method of responding to the changing perceptions of an organisation’s relevant publics.

**Prior Research**

Previous research indicates that the extent to which firms adopt EM differs and is mainly determined by firm-specific characteristics (Uhlander et al. 2012) and stakeholder pressure (Park and Ghauri 2015). We specifically draw on stakeholder influence and SMEs characteristics to investigate the how they affect the extent of EM since these have received relatively limited attention especially in developing countries (Jamali et al. 2017). Many prior studies investigating the effect stakeholder pressure and firm-specific characteristics on environmental proactivity have been conducted in larger firms (Henriques and Sadorsky 1996; Fineman and Clarke, 1996; D’Amico et al. 2016; Delgado-Márquez and Pedauga 2017) relatively to SMEs.

From SMEs’ perspective, Schaper (2002) examining the predictors of green purchasing among small pharmacies in Western Australia found that firm size and customers' concerns do not affect the environmental behaviour of the firm. Schaper (2002) suggest that provision of timely and relevant information to update environmental knowledge is most important. Alvarez-Gil et al. (2001) using hierarchical regression model indicate that the factors which determine EM among Spanish hotels are firm size, firm age and exercise of power by stakeholders. The authors identified the single-industry as a limitation and the need to extend the study to cover other industries such as manufacturing to enhance results generalisability. Lefebvre et al. (2003) in an analysis of Canadian SMEs proxied environmental performance by product lifecycle management score (PLM), EMS and Environmental R&D in four industries (Wood, printing, mental and electronics). From the results, pressure group and legislation are influential in PLM in all industries but not firm size. Firm size, pressure group and legislation are significant determinants of EMS and environmental R&D in all industries. Lefebvre et al. (2003) provide insightful information on SMEs' environmental performance. However, the study did not cover SMEs operating in the sub-sector of services.

Also from the UK, Brammer et al. (2012) investigated the effect of firm size on environmental management, public concern and legislation among small and medium firms. The results revealed there is heterogeneity among firms regarding these areas with size being the key determinant. Despite the study being UK focus, the firm level characteristics were limited to only one indicator limiting insight. Uhlander et al. (2012) look beyond size effect of SMEs on EM using resource base view, ecological modernisation and theory of planned behaviour and found that firm size, the tangibility of sector, innovative orientation, perceived financial and family are influential in EM by the firm but not the number of owners. The study is limited to firm only characteristics. Mensah (2014) also examined the association between stakeholders’ pressure and environmental performance of hotels in Ghana. The study documented evidence that primary stakeholders influence the environmental performance of hotels than secondary stakeholders. The study was limited to small and large hotels leaving unanswered the effect on medium accommodations.

Another study which demonstrated the impact of firm characteristics and stakeholder effect in across country study of 800 SMEs in 36 mostly European countries and US is Hoogendoorn et al. (2015). Arguing from the stakeholder theory perspective, they found that firm size, tangibility of sector, market type, external support and legislation have a positive effect on different EMPs. The effect of firm size on greening processes is more pronounced among middle-sized firms but not significant for greening products and services. Similarly, customers have an influence on green product and services but not green process of the firm. The evidence also indicates that stringent environmental legislation is legitimised more as a broad social goal and therefore affects green products and services than green process. Although tangibility of sector and external support have a positive association with all types of EM, external financial support has an influence on EM than external non-financial support. This brings into question the impact of external non-financial support on types of EM of SMEs. In a survey of 153 manufacturing firms in Cyprus, Leonidou et al. (2017) investigate internal drivers of small firms’ green business strategy from resource base view. The findings indicate that organisational resources, capabilities and industry type impacts positively on green business strategy. Industries deem to have a more harmful impact on the environment tend to pursuit of a green business strategy strongly.

From the review of the literature, integration of firm-specific characteristics and stakeholder variables is limited especially among SMEs. Usually one of these group of variables is treated as control variable receiving less attention in the literature and there are methodological challenges with such approach (Spector and Brannick 2011; Heras-Saizarbitoria et al. 2016). Also, most of the studies are underpinned by single theory even where variables from both groups are captured. Different theories focus on different aspects of EM aside their commonality which further shape understanding of why firms differ in their EMPs responses. In spite of the call for EM studies to consider the effect of different determinants on different dimensions of EM (Uhlander et al. 2012), such studies are generally limited in the SMEs’ context with the few studies focusing on aggregated EM. Most of the limited SMEs’ studies focus on developed economies and the results are also mixed. However, considering the differences in developmental stages and the business environment, it is important that such studies are extended to developing countries since applicability of the findings from developed countries may be limited in developing countries’ context.

**Hypotheses Development**

***Stakeholder pressure.*** Previous studies have indicated that stakeholder pressure has been instrumental in developing organisational resources and performance (Fineman andClarke 1996; Gallego-Alvarez et al. 2017). However, Mitchell et al. (1997) and Frooman (1999) outlined the conditions and strategies under which stakeholders’ influence becomes the driving force of organisational change including environmental improvement. Parker and Ghauri (2015) found that some primary and secondary stakeholders of SMEs operating in emerging economies are important contributors to the firm’s socio-environmental activities, especially where they weigh power. The ability of the firm to comply with the socio-environmental demands of stakeholders result in various benefits including granting of operational licences, support, access to resources from the stakeholders and the society which may lead to improved business performance (Parker et al. 2014). This according to Donaldson and Preston (1995) involves the firm designing and implementing specific processes necessary for managing expectation of stakeholders. Kassinis and Vafeas (2006) and Ramanathan (2016) all demonstrated empirically there is a positive link between stakeholder pressure and EM. This relationship is underpinned by the suggestion that effective and strategic response to stakeholders act as internal resources for the firm since such firms may be in a position to develop much deeper and wider environmental related processes and network with external parties which may increase access to environmental information and best practices in the industry (Yu and Ramanathan 2014).

High pressure from stakeholders especially regulatory bodies is associated with reactive or worse environmental performance since the strategic intent of firms under such circumstance is to cope with legitimacy issues that may arise for inactiveness (Gonzales-Benito and Gonzales-Benito 2006; Delgado-Márquez and Pedauga 2017). Mensah (2014) found secondary stakeholders have no significant impact on EM. However, pressure from both primary and secondary stakeholders may lead firms to improve EM as this mostly depends on the dynamics, stakeholder power and strategies (Frooman 1999). From the above discussion, it can be concluded that both stakeholder groups play an essential role in advancing EM of the firm. Therefore, we hypothesis as follows:

H1a. *There is a significant positive relationship between primary stakeholders and*

 *environmental management practices.*

H1b. *There is a significant positive relationship between secondary stakeholders and*

 *environmental management practices.*

***Ownership type***. Ownership and control are intertwined in most cases among small businesses which facilitate environmental activities (Aragon-Correa et al. 2008). The small ownership associated with SMEs make decision making and allocation of resources relatively easy for organisational activities such as EM where it aligns with the personal values and briefs of owner-managers (Hoogendoorn et al. 2015). This together with relatively simple and centralised management structure make small ownership businesses much quicker, flexible and responsive to the business environment which is very dynamic with stakeholders for greening increasing (Goffee and Scase 1995). However, small ownership has also been suggested as affecting negatively on SMEs’ EM since it affects time availability for environmental information searching. This is because owner-managers are multi-tasking and do little aside from the normal day-to-day business activities. SMEs face resources poverty relating to management staff, capital and knowledge which affects their socio-environmental engagement (Lepoutre and Heene 2006). This is an indication that SMEs, where ownership is relatively not restricted or larger, may enjoy some advantages such as availability of resources in the form of finance and different expertise, skills and knowledge from the different owners which may improve EM or minimise EM constraints linked to ownership. Therefore, SMEs with relatively larger ownership type may be more placed to engage in socio-environmental activities. This may increase social capital through networking and relationship building and reduce survival threat (Sen and Cowley 2013). However, Uhlander et al. (2012) did not find significant effect between the number of owners and EM of SMEs. We hypothesise that:

H2. *There is a significant positive relationship between ownership type and environmental*

 *management practices*.

***Industry.*** Industrial associations are noted to set industrial norms for EM which aim to protect the industry's collective reputation (Hoffman 1999; King and Lenox 2000). Firms within an industry, in periods of high uncertainty, imitate EM of leading competitors to enhance their legitimacy (DiMaggio and Powell 1983; Abrahamson and Rosenkopf 1993). The industrial sector in which a firm operates determines its pollution potential and consistent with stakeholder theory determines the level of scrutiny from regulatory bodies, consumers, civil society and the general public (Gonzalez-Benito and Gonzales-Benito 2006). Firms operating in sectors considered sensitive and with the generally high environmental impact such as manufacturing invest much resources in environmental management to reduce their environmental risk (D'Amico et al. 2016; Heras-Saizarbitoria et al. 2016). Industries such as the services sector deemed to have a less harmful effect on the environment are less scrutinized and the regulation level is much lesser. Such industries due to their perceived low level of environmental effect are less embedded in environmental management since they attract relatively lesser stakeholder pressure (Roberts 1992). Therefore, differences in industry characteristics also affect EM uptake (Perrini et al. 2007; Aragon-Correa et al., 2008). Singh et al. (2014), Hoogendoorn et al. (2015) and Leonidou et al. (2017) documented a positive effect of industry on EM. We, therefore, hypothesised that:

H3. *There is a significant relationship between industry and environmental*

 *management practices.*

***Firm age.*** Older firms are deemed to have gained experience and knowledge in the operational environment. This may play to the advantage of older firms since with passing time, they might have accumulated managerial capabilities and knowledge which enhances how they handle uncertain conditions relating to EM emanating from the various stakeholders (Leonadiou et al. 2017). Older firms it is suggested may have a reputation to protect base on their track records on socio-environmental activities which might have created a greater expectation among stakeholders and failure to meet such expectation may create legitimacy gap with untold consequences for the firm (Roberts 1992). Also, older firms due to long existence might have established a network of professional and social stakeholders from whom EM information may be accessed to manage various EMPs issues (Alsaeed 2006; Kang and Gray 2011). Again, Neubaum et al. (2004) argued that young firms' environmental behaviour may be negatively affected by resource scarcity, the liability of newness and consistent concern over their survival. Younger firms are more radical and faster at the adoption of modern pro-active pollution prevention technologies relative to older firms who may refuse to accept the need for environmental innovation because of constraints posed by their existing resources (Alvezes-Gil et al. 2001; Segarra and Teruel 2014). From legitimacy theory perspective, a firm’s failure to adjust to the environmental requirements of parties to the social contract overtime may raise legitimacy concerns (Yunus et al. 2016). The effect of firm age from empirical studies have shown mixed results with Singh et al. (2014) indicating that firm age has a positive influence on EM. However, Alvarez-Gil et al. (2001) found firm age to be negatively related to EM with Arend (2014) and Hoogendoorn et al. (2015) showing that firm age has no significant effect on EMPs. We hypothesise that:

H4. *There is a significant positive relationship between firm age and environmental*

 *management practices.*

***Firm size.*** Larger firms are deemed to have the needed resources to integrate environmental concerns into their activities (Chithambo and Tauringana 2014). Larger firms are more visible which expose them to a greater level of external pressure (Uhlander et al. 2012). From the legitimacy theory perspective, larger firms attract high public scrutiny which easily affects their social contract whenever they are deemed to engage in unacceptable social behaviour. Buysse and Verbeke (2003) and Knox et al. (2006) argued that larger firms have broad stakeholder base which impacts on their EMPs and due to their size, their individual impact is relatively high on the community. EM may be adopted by such firms to mitigate or avoid any legitimate concerns. On the contrary, Aragon-Correa et al. (2008) suggest that due to the complex nature of large firms’ operations, incorporating EM involve massive changes which are costly and therefore small firms are well placed to adopt EM quickly due to less formalisation and flexibility. Smaller firms, therefore, have a lower cost advantage and less political visibility to create much legitimacy concerns with their operations. Uhlaner et al. (2012) and Hoogendoorn et al. (2015) suggested that the difference in size is equally relevant among SMEs. From empirical studies, Brammer at al. (2012) and Hoogendoorn et al. (2015) find a positive effect of size on EM. However, Clemens (2006), Arend (2014) and Heras-Saizarbitoria et al. (2016) found no significant effect of firm size on EM. Based on the above arguments and empirical studies, it is hypothesised that:

H***5***. *There is a positive relationship between firm size and environmental management*

 *practices.*

**Research Method**

***Sample and data collection***

The data for the study was collected from a survey of SMEs operating in manufacturing and service sectors in the Kumasi metropolis of Ghana. The lists of SMEs in manufacturing and service were taken from the National Board for Small-Scale Industry and Ghana Tourism Authority in the region respectively. The involvement of both manufacturing and service firms is in line with previous calls to widen the scope of SMEs environmental management studies to more than one industry (Lucas and Wilson 2008; Ervin et al. 2013). The choice of Kumasi metropolis is because it is the first to undertake environmental sanitation programme between 1989 and 1994 by UNDP and World Bank which has seen it built a reputation as environmental sanitation pioneer in Ghana (WaterAid 2016). SMEs in the study was defined in line with the Ghana Statistical Service (2015) which classifies firms with employees of 1-5 as micro, 6-29 small and 30-99 medium. The total population of 494 consisted of 238 manufacturing firms and 256 hotels in the Kumasi metropolis. To improve the representativeness of the target population and reduce sampling error, firms were sampled based on industrial sector using simple random sampling procedure (Ezeah and Roberts 2012). The final sample consisted of 149 manufacturing firms and 156 service firms bringing the total to 305.

The data was collected using questionnaires and owner-managers were encouraged to participate voluntarily. The self-administered questionnaires were pre-tested prior to its administration among some owner-managers of SMEs not part of the final sample for the study. The comments received from the respondents were incorporated into the questionnaire before sending them out. The content of the questionnaire was mainly shaped by empirical environmental management practices literature. The survey questionnaires were distributed to owner-managers of the firms at their premises from April to May 2016. The choice of owner-managers is in line with their dominant control over all strategic decisions and resources allocation for activities such as EMPs (Lapoutre and Heene 2006, Gadenne et al. 2009). The questionnaire was in four parts. Part one was designed to elicit socio-demographic information of owner-managers. Also, requested were firm-specific information such as ownership status, industry, employee numbers and years in operation. Part two contained questions relating to environmental management practices (energy, water, waste, materials, pollution and biodiversity) of the firm. Part three involves questions on stakeholder influence on the EMPs of the firm. At the end of the survey period, 244 questionnaires were returned with 238 being considered useful. This represents a response rate of 78%.

**Measurement of variables**

***Dependent variable and construct validation***

The study’s dependent variable, environmental management practices (EMP) was measured as a higher order construct comprising of six reflective components: energy efficiency, water, waste, material, pollution, and biodiversity management (DEFRA 2013). From the extant literature, a large pool of items was extracted to measure each component. This gave us the flexibility to determine which items were empirically relevant to the context. Using a 5-point measuring scale from “1=not at all” to “5=to a great extent”, the respondents were asked to indicate the extent to which their firms adopt measures to manage each item identified for each component of EMPs. Since new items were developed specifically for the study’s context, we adopted exploratory factor analysis (EFA) to check for unidimensionality (Hair et al. 2014). Many items necessitated that separate EFAs were conducted on each set of measures we identified for each component of EMPs. The final EFA was conducted on all the retained items (i.e. those that loaded on the first component, had loadings above .50 and a mean score above 3.00). After checking for suitability for EFA, we relied on principal component and varimax as the estimation and rotation techniques respectively (Pallant 2007; Field 2013). The results obtained, and all other relevant statistics are shown in Table 1.

**[TABLE 1 ABOUT HERE]**

The reliability of the items for each component was above .70 which indicate that the retained items had good internal consistency (Field 2013). Given these results, we averaged each set of items to obtain a composite score for each component, after which an overall average score was computed for EMPs (Hair et al. 2014). Prior to this, we assessed the bivariate correlations between the components to ensure there exist substantial associations (.40 to .70) and yet components retained high unique variance (i.e. coefficients not greater than .70) (see Table 3) (Hair et al. 2014).

**Independent variables**

***Stakeholders effect***

Collaborating literature (Fineman and Clarke 1996; Mitchell et al. 1997; Alvarez-Gil et al. 2001; Buysse and Verbeke 2003; Park et al. 2014) with preliminary field research, we identified ten stakeholders for the study, viz., local customers, international customers, management/employees, suppliers, local community, state institutions, industry/trade associations, lenders (banks/others), NGOs, and media. Consistent with the literature (Donaldson and Preston 1995; Parker and Ghauri 2015), the first four stakeholders were classified as "primary" while the remaining six were classified as "secondary". This grouping was important not just because the literature suggests so, but then it also allows us to understand the relative importance of each group in contributing to environmental management practices in the research context. On a scale of 1 (not at all) to 5 (a great extent), the respondents were asked to indicate the extent to which each stakeholder is perceived as influencing the firm's EMPs in the past years. The list of the stakeholders was not presented to them according to the classification – they were randomised.

Since there is no justification for expecting internal consistency in the firms' experience with the influence of each stakeholder, both the primary and the secondary stakeholders' constructs were captured in a formative sense (Diamantopoulos and Siguaw 2006). Having assessed the content and the item specifications and the contextual relevance of the items we continued to check for multicollinearity prior to constructing formative indices for the constructs (Diamantopoulos and Winklhofer 2001). As shown in Table 2, the highest bivariate correlations between the items in each group and that of variance inflation factors (VIF) were all within the recommended thresholds (Diamantopoulos and Siguaw 2006). The indices were created as the unweighted linear sum of the measurement items (Diamantopoulos and Siguaw 2006).

***Legitimacy effect***

Based on the legitimacy perspective (Reverte 2009), the study considered four variables: firm ownership-type where owner-managers were asked to indicate the legal status of the firm as a sole proprietor, partnership, company or others. The firm industry, years in operation, and employee numbers were also stated. These variables were coded as ownership-type (1= “company”; 0 = “others”), firm industry (1= “manufacturing”; 0 = “service”); firm age (natural log number of years in operation), and firm size (natural log of number of employees). These variables are also defined in Table 2.

**[TABLE 2 ABOUT HERE]**

**Model estimation and hypothesis testing**

To test for the study’s hypotheses, we applied OLS regression analysis. The following hierarchical models allowed us to evaluate the significance of each block variables – starting with the legitimacy variables, and then stakeholder variables.

*Model 1: Legitimacy effects*

EMP = β0+ β1Ownty + β2Ind + β3Fage + β4Fsize + ε

*Model 2: Stakeholder effects (while controlling for Legitimacy effects)*

EMP = β0+ β1Ownty + β2Ind + β3Fage + β4Fsize + β5PStake + β6SStake + ε

*where*:

EMP = Environmental management practices; Ownty = ownership type; Ind = industry; Fage = firm age; Fsize = firm size; PStake = primary stakeholders pressure; SStake =secondary stakeholders pressure.

 β0 is the intercept; β1-6 are the beta values and ε is the error term to be estimated.

**Results and Discussion**

***Descriptive statistics***

The demographics of owner-managers indicate that majority of them fall within the economically active age group (15-55) with 59.7% being males and 40.3% females, an indication of the SMEs’ field being male dominant. Educational levels vary with the majority of 40.3% having junior/secondary education and 36.6% with bachelor’s degree. The ownership type is dominated by sole proprietorship (41.6%), followed by company (37.8%) with 20.6% being a partnership. Table 3 indicates that the average EM is 3.49 with a standard deviation of 0.34. The average level of primary and secondary stakeholders’ pressure is 4.0 and 4.8 respectively. The average number of employees was 10 and the years in operation average 9 for the firms. In testing the proposed hypothesis path, an analysis of common method bias was undertaken since this could be a challenge when the dependant and independence variables are collected from a single respondent. Therefore, Herman's one-factor analysis was conducted. The results indicated that common method bias was not a problem (Podsakoff and Organ 1986).

**[TABLE 3 ABOUT HERE]**

Table 3 presents the correlation results for the study. The results indicate that the bivariate association between the dependant and the independence variable do not show an unacceptable level of multicollinearity since the highest correlation coefficient between them is .488 which does not exceed the recommended level of .9 (Field 2013). Except for owner-manager age and gender, EM has a significant association with both the independence and control variables. Further checks from the variance inflation factor in Table 4 also revealed figures below 10 which indicate that multicollinearity is not much of a challenge in the study.

***Regression Analysis***

The hypotheses developed were tested using multiple regression. The results are presented in Table 4. Model 1 which had firm-specific characteristics as independent variables is significant at 1% and contributes 17.9% of the variance in EM. From the results of the model, industry, firm age and size are significantly associated with EM whiles ownership type is not significant. The Model 2 which had both primary and secondary stakeholders’ pressures was significant at 1% and contributes 17.4% of the variance of EM. The results in Model 2 indicate that only primary stakeholders' pressure has a significant effect on EM. Therefore, H1a, H3, and H5 are supported with H1b, H2 and H4 not supported. Although some of the hypothesised effects of variables relating to legitimacy (H3 and H5) and stakeholders’ pressure (H1a) were each statistically significant, the adjusted R2 values suggest that legitimacy contribute slightly better to EM within the research context.

**[TABLE 4 ABOUT HERE]**

***Further analysis***

In line with the calls to examine the conditions under which SMEs undertake different environmental activities (Halme and Laurila 2009; Uhlaner et al. 2012), further analysis was conducted and the results are presented in Table 5. The results indicate that ownership type has no significant effect on any dimension of EMPs. The service industry has a significant effect on energy, water and material EMPs. The firm age is significantly related to only energy efficiency EMP whilst firm size has a significantly positive effect on waste, pollution and biodiversity EMPs. The stakeholder variables result indicate that primary stakeholders have a significant influence on water, waste, material, pollution and biodiversity EMPs with secondary stakeholders influencing waste management EMP only. These results indicate the complex nature of the relationship between firm-specific characteristics and stakeholder pressures which is very important for policy formulation.

**[TABLE 5 ABOUT HERE]**

**Discussion**

The results indicate that the way in which SMEs interact with the natural environment is being influenced by firm-specific characteristics because of legitimacy and stakeholders’ pressure emanating from those with a stake in the business. The results provide evidence that primary stakeholders’ pressure influences EM and also water, waste, material, pollution and biodiversity EMPs. This has been attributed to their financial stake in the firm as they want it to perform better. From the managerial branch of stakeholder theory, managers need to strategically manage powerful stakeholders such as customers, employees and suppliers who can affect the financial fortunes of the company directly. Lepoutre and Heene (2006) and Sen and Cowley (2013) documented evidence to the effect that SMEs tend to be more concerned with primary stakeholders due to the strong ties with the firm. The development of policies and strategies by management to address the concerns of primary stakeholders is of priority.

Secondary stakeholders’ pressure on EM is non-significant and also on all dimensions of EMPs besides waste. The significance of waste may be due to the distractive effect of waste on the environment making it a focus of local communities, state institutions and the medias. This is consistent with prior findings by Lepoutre and Heene (2006) and Mensah (2014) but contrary to Parker and Ghauri (2015). This result may be due to the indirect strategies which in most instance have to be adopted by secondary stakeholders to affect the economic and social licence of the firm. Although secondary stakeholders may employ lobbying, boycotts, blackmailing and legal means to force the firm to address its negative environmental impact, it is effectiveness where secondary stakeholders are well organised. Usually secondary stakeholders in developing countries are not well organised as pressure groups to achieve needed results. Therefore, managers may not yield to their pressure as they may not be a formidable force. Another reason which may account for this result is that secondary stakeholders such as NGOs and the media spend their limited resources on large firms than SMEs where they feel they can make much of an impact and in the current study's context, the myriad of social challenges deflect the attention of secondary stakeholders (i.e. NGOs) from the environment considered as periphery.

The results indicate that ownership type has no significant effect on EM and none of the EMPs dimensions. This is contrary to the suggestion that SMEs’ ownership structure affords its flexibility to engage in environmental management (Aragon-Correa et al. 2008). The results also indicate that industry is significantly associated with EM and that service firms have significant effect on energy, water and material management. High level of consumption coupled with recent cost increases in utility tariffs seems to have influenced the sector’s energy, water and material management practices significantly. The results also confirm a significant association between industry and EM by previous studies (Singh et al. 2014 and Leonidou et al. 2017) which supports the public pressure perspective of legitimacy theory. Surprisingly service sector firms in the study’s context undertake EM relative to manufacturing firms. This may be due to differences in their relevant public with those of the service sector including foreign customs who may be more demanding due to their experience elsewhere. This may have influenced service firms to improve their environmental uptake relative to manufacturing firms which mostly produce for the local market.

Regarding firm age, the results suggest that the overall association is insignificant but firm age has a positive effect on energy efficiency EMP only. This may result from knowledge gained overtime in energy handling. This is contrary to Roberts (1992) suggestion that older firms might have gained a reputation over the years through various EMPs and would not want to lower stakeholders’ expectation which may have legitimacy challenges for the firm. Firm size is associated with EM and also have significant effect on waste, pollution and biodiversity EMPs. These present good external outlooks for the firm and therefore its management helps legitimises the firms’ operation much better in the public eye due to its visibility. From the result that size differences among SMEs impacts on their EM uptake indicate a linear relationship between size and EM. Consistent with prior studies (Brammer at al. 2012; Uhlander et al. 2012) results and in line with legitimacy perspective, “larger” SMEs are more likely to undertake EM as a way of demonstrating their environmental commitment to gain legitimacy from the relevant public in support for their activities and hence survival. This may be seen in the light of legitimacy theory since larger firms due to their visibility may easily come under public scrutiny and therefore EMPs uptake lessen any potential criticism. This is also aided by their relative resources availability. The results emanating from the effect of firm-specific characteristics (industry and firm size) show the instrumental role such factors play as resources in improving EMPs. Leveraging such resources may cause efficiency in EMPs and external legitimacy.

**Summary and Conclusion**

The study investigates the association between stakeholders (primary and secondary, SMEs characteristics and environmental management (EM). The results suggest that primary stakeholders are associated with EM while secondary stakeholders are not. Regarding individual environmental management practices (EMPs), the results suggest that primary stakeholders are associated with water, waste, material, pollution and biodiversity EMPs. In terms of the SMEs characteristics, the results indicate that firm industry and size significantly affect EM but not ownership type or age. The effect of the SMEs characteristics on individual EMPs are mixed. For example, firm ownership is not associated with any of the six EMPs. Firm industry, however, is associated with energy efficiency, water and material EMPs. Firm age is only associated with energy efficiency while firm size is associated with waste, pollution and biodiversity.

The results have implications for policy formulation regarding EMPs of SMEs. For example, since secondary stakeholders have only an effect on waste management, this indicates the need to improve the environmental awareness of secondary stakeholders such as the general public through seminars and workshops to demand environmental accountability from SMEs which will signal for them to do more environmentally to avoid revocation of their social licences. Enhancement of the capabilities of secondary stakeholders’ strategic tools of enforcing EMPs among firms such as legal suits, boycotts and demonstrations is necessary to achieve better EMPs outcome. The SMEs seem to construct their EMPs based on primary stakeholder pressure and some firm-specific characteristics suggesting that pieces of advice targeted at owner-managers of SMEs on EMPs should pay more attention to these factors which will lead SMEs to improve their EMPs.

Despite the contribution and implication of the results for the advancement of SMEs' EMPs, the results should be interpreted in the light of the following limitations. First, the choice of firm and stakeholder variables as proxies for legitimacy and stakeholder theories variables even though follows the prior literature, this could be extended to include organisational factors such as profitability, leverage, liquidity and financial slack to improve insight of the issue (Reverte 2009; Chithambo and Tauringana 2014). Second, the current study focussed on legitimacy and stakeholder theories only but introducing other theories such as resource base and agency theories may offer an additional explanation for EMPs among SMEs. Third, the study is limited to one developing country affecting the extension of the results to all developing countries in general. Futures studies should consider cross-country context to improve on results generalisation. Further, the investigation of these factors from the qualitative perspective, as opposed to quantitative approach in the current study, could be very insightful.

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**Table1.**

**EFA and reliability test results on Environmental management practices (EMPs)**

|  |  |
| --- | --- |
|  **Items**  | **Components of EMP** |
| Material mgt. | Waste mgt. | Biodiversity mgt. | Pollution mgt. | Water mgt. | Energy efficiency |
| 1. Professional handling of material
 | .803 | .000 | .064 | .207 | .095 | .030 |
| 1. Quality material
 | .797 | .067 | .041 | .012 | .143 | .080 |
| 1. Avoidance of overstocking
 | .741 | .118 | .000 | .201 | .144 | .212 |
| 1. Check material for damages /dents before acceptance
 | .737 | .058 | -.016 | .077 | .322 | .147 |
| 1. Stock taking
 | .722 | -.023 | .040 | .121 | .252 | .140 |
| 1. Conducive storage of all materials
 | .677 | .212 | .054 | .095 | .281 | .209 |
| 1. Remind staff to follow good practices by putting up posters
 | .538 | .040 | .083 | .225 | .454 | .169 |
| 1. Waste recycling
 | -.130 | .834 | .145 | .216 | .147 | -.055 |
| 1. Waste separation at source (into different kinds)
 | .031 | .827 | .181 | .115 | .014 | .055 |
| 1. Staff are made aware of good waste handling procedures
 | .227 | .786 | .128 | .041 | .056 | .297 |
| 1. Proper waste disposal (professionally)
 | .311 | .762 | .149 | -.029 | .003 | .226 |
| 1. Purchase materials with recyclable future
 | .036 | .749 | .098 | .281 | .116 | .265 |
| 1. Environmentally friendly (biodegradable) packaging
 | .019 | .700 | -.023 | .240 | .286 | .156 |
| 1. Treatment of waste water to avoid the impact of effluents on wetlands
 | .033 | -.037 | .830 | .152 | .030 | .083 |
| 1. Sponsorship for nature organisations
 | -.039 | .262 | .800 | .251 | .001 | -.118 |
| 1. Providing staff/guests with ecosystem services information
 | .086 | .326 | .793 | .116 | .065 | -.002 |
| 1. Soil and vegetation protection
 | -.095 | .109 | .778 | .273 | .003 | .054 |
| 1. Restoration of contaminated areas
 | .269 | .024 | .734 | .140 | .195 | .125 |
| 1. Use of environmentally friendly fuel
 | .217 | .067 | .174 | .788 | .131 | .150 |
| 1. Emission reduction technologies on existing vehicles/equipment
 | -.084 | .187 | .397 | .705 | .113 | -.038 |
| 1. Fuel and emission efficiency vehicles/equipment
 | .235 | .091 | .250 | .679 | .262 | -.125 |
| 1. Taking advantage of e-commerce opportunities
 | .187 | .215 | .097 | .645 | -.031 | .280 |
| 1. Improved route planning for visits and deliveries
 | .173 | .193 | .182 | .631 | .151 | .269 |
| 1. Encourage use of mass transport by staff/tourist
 | .201 | .272 | .322 | .557 | .052 | .245 |
| 1. Conduct water walk rounds
 | .196 | .110 | .047 | .245 | .782 | .067 |
| 1. Staff training in water management
 | .285 | .205 | .087 | .121 | .742 | .130 |
| 1. Stop leaks and spills
 | .470 | .064 | .125 | .080 | .667 | .278 |
| 1. Eliminate unnecessary water usage
 | .381 | .108 | .054 | .058 | .657 | .146 |
| 1. Water taps not in use are always well closed
 | .390 | .077 | .048 | -.020 | .559 | .385 |
| 1. Energy efficient lights/bulbs
 | .110 | .150 | -.013 | .149 | .116 | .799 |
| 1. Turning off lights and equipment not in use
 | .281 | .137 | .067 | .114 | .047 | .733 |
| 1. Employee education and training
 | .125 | .278 | .099 | .164 | .211 | .692 |
| 1. Proper maintenance and replacement of old equipment
 | .192 | .143 | -.022 | .073 | .310 | .646 |
|  |
| Eigenvalue | 10.937 | 4.403 | 2.832 | 1.627 | 1.467 | 1.351 |
| Variance explained (%) | 33.142 | 13.342 | 8.581 | 4.930 | 4.445 | 4.094 |
| Scale reliability (Cronbach alpha) | .912 | .903 | .881 | .865 | .890 | .843 |
| Kaiser-Meyer-Olkin (KMO) = .887; Bartlett’s test of Sphericity = χ2(DF) = 3099.322 (528); p < .0001 |

**Table 2.**

**Formative measures: descriptive statistics and collinearity analysis**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Stakeholders | VIF | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | Local customers | 1.933 | 1 |  |  |  |  |  |  |  |  |  |
| 2 | International customers | 1.497 | .353 | 1 |  |  |  |  |  |  |  |  |
| 3 | Management/employees | 1.556 | .504 | .335 | 1 |  |  |  |  |  |  |  |
| 4 | Suppliers | 1.5 | .416 | .272 | .311 | 1 |  |  |  |  |  |  |
| 5 | Local community | 1.088 | .043 | -.065 | .087 | .133 | 1 |  |  |  |  |  |
| 6 | State institutions | 1.249 | .202 | .227 | .311 | .264 | -.031 | 1 |  |  |  |  |
| 7 | Industry/trade associations | 1.741 | .524 | .443 | .488 | .303 | .061 | .354 | 1 |  |  |  |
| 8 | Lenders (e.g. banks) | 1.144 | .138 | .213 | .153 | .217 | .097 | .145 | .130 | 1 |  |  |
| 9 | NGOs | 1.79 | .530 | .284 | .347 | .399 | .095 | .168 | .328 | .202 | 1 |  |
| 10 | Media | 1.424 | .337 | .246 | .224 | .225 | .128 | .049 | .262 | .068 | .442 | 1 |
|  |  |
| Min  |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Max  |  | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mean  |  | 2.86 | 2.92 | 3.35 | 2.81 | 3.29 | 2.84 | 2.90 | 2.66 | 2.78 | 2.91 |
| Standard deviation  |  | 1.378 | 1.464 | 1.308 | 1.378 | 1.280 | 1.371 | 1.382 | 1.495 | 1.468 | 1.442 |

Table 3.

Correction results and descriptive statistics

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1 | Environmental management  | 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | Energy efficiency  | .708\*\* | 1 |  |  |  |  |  |  |  |  |  |  |  |
| 3 | Water management  | .762\*\* | .543\*\* | 1 |  |  |  |  |  |  |  |  |  |  |
| 4 | Waste management  | .733\*\* | .451\*\* | .414\*\* | 1 |  |  |  |  |  |  |  |  |  |
| 5 | Material management | .756\*\* | .513\*\* | .694\*\* | .406\*\* | 1 |  |  |  |  |  |  |  |  |
| 6 | Pollution management | .779\*\* | .441\*\* | .430\*\* | .501\*\* | .476\*\* | 1 |  |  |  |  |  |  |  |
| 7 | Biodiversity management | .688\*\* | .286\*\* | .325\*\* | .465\*\* | .297\*\* | .572\*\* | 1 |  |  |  |  |  |  |
| 8 | Primary stakeholders | .488\*\* | .269\*\* | .351\*\* | .390\*\* | .287\*\* | .528\*\* | .329\*\* | 1 |  |  |  |  |  |
| 9 | Secondary stakeholders | .432\*\* | .298\*\* | .296\*\* | .425\*\* | .198\*\* | .415\*\* | .273\*\* | .684\*\* | 1 |  |  |  |  |
| 10 | Firm ownership  | .204\*\* | .206\*\* | .110 | .174\*\* | .053 | .215\*\* | .150\* | .169\* | .143\* | 1 |  |  |  |
| 11 | Firm industry  | -.299\*\* | -.336\*\* | -.294\*\* | -.152\* | -.208\*\* | -.196\*\* | -.159\* | -.171\* | -.178\* | -.113 | 1 |  |  |
| 12 | Firm age | .194\*\* | .223\*\* | .136\* | .134\* | .117 | .232\*\* | .039 | .208\*\* | .209\*\* | .261\*\* | -.040 | 1 |  |
| 13 | Firm size | .241\*\* | .211\*\* | .129\* | .203\*\* | .103 | .233\*\* | .186\*\* | -.012 | .077 | .169\*\* | -.177\*\* | .290\*\* | 1 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Min | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4.00 | 6.00 | 0 | 0 | 0.00 | 1.10 |
| Max | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 20.00 | 30.00 | 1 | 1 | 3.37 | 4.16 |
| Mean | 3.49 | 3.84 | 3.68 | 3.26 | 3.83 | 3.23 | 3.07 | 11.80 | 17.50 | .38 | .45 | 2.02 | 1.88 |
| Standard deviation | .834 | .974 | 1.141 | 1.139 | 1.102 | 1.148 | 1.281 | 3.999 | 4.785 | .486 | .498 | .709 | .753 |

*\* p < .05; \*\* p < .01*

Table 4.

Main OLS regression results

|  |  |  |
| --- | --- | --- |
|  | *Standardised estimates (t-values)* | VIF |
| *Independent variables:* | Model 1 | Model 2 |
| Firm ownership  | .087(1.229) | .044(.693) | 1.149 |
| Firm industry  | -.293(-4.298) \*\*\* | -.215(-3.469) \*\*\* | 1.091 |
| Firm age | .152(2.156) \* | .056(.874) | 1.684 |
| Firm size | .131(1.844) \* | .168(2.638) \*\* | 1.184 |
|  |  |  |  |
| Primary stakeholders |  | .338(4.074) \*\*\* | 2.063 |
| Secondary stakeholders |  | .132(1.593) | 1.950 |
|  |  |  |  |
| *R2* | .179 | .353 |  |
| *∆ R* |  | .174 |  |
| *F* | 10.057\*\*\* | 16.605\*\*\* |  |
| *F of ∆ R2*  |  | 24.577\*\*\* |  |

*Notes:*

1. Dependent variable: environmental management
2. Hypothesized paths were evaluated at t-value ≥ 1.645 (5%, 1-tail test)
3. Model significant at \*p < .05, \*\* p < .01, \*\*\* p < .001

Table 5.

Further OLS regression analysis

|  |  |
| --- | --- |
|  | *Dependent variables [standardised estimates (t-values)* |
| *:**Independent variables:* | Energy efficiency | Water management | Waste management | Material management | Pollution management | Biodiversity management |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Firm ownership  | .083(1.208) | -.012(-.168) | .079(1.154) | -.037(-.501) | .062(.987) | .024(.330) |
|  |  |  |  |  |  |  |
| Firm industry  | -.288(-4.290) \*\*\* | -.284(-4.169) \*\*\* | -.024(-.360) | -.208(-2.887) \*\*\* | -.089(-1.441) | -.091(-1.301) |
|  |  |  |  |  |  |  |
| Firm age | .162(2.313) \*\* | .090(1.270) | -.036(-.516) | .053(.705) | .067(1.037) | -.056(-.763) |
|  |  |  |  |  |  |  |
| Firm size | .076(1.090) | .059(.842) | .172(2.496) \*\*\* | .026(.346) | .195(3.047) \*\*\* | .197(2.727) \*\*\* |
|  |  |  |  |  |  |  |
| Primary stakeholders | .086(.960) | .221(2.423) \*\*\* | .203(2.271) \*\* | .205(2.121) \*\* | .439(5.281)\*\*\* | .306(3.257) \*\*\* |
|  |  |  |  |  |  |  |
| Secondary stakeholders | .129(1.442) | .069(.753) | .268(3.006) \*\*\* | .031(.322) | .063(.763) | .033(.353) |
|  |  |  |  |  |  |  |
| *R2* | .237 | .214 | .245 | .119 | .329 | .168 |
| *F* | 9.489\*\*\* | 8.316\*\*\* | 9.877\*\*\* | 4.129\*\*\* | 16.479\*\*\* | 6.147\*\*\* |

*Notes*

1. Hypothesized paths were evaluated at t-value ≥ 1.645 (5%, 1-tail test)
2. Model significant at \*p < .05, \*\* p < .01, \*\*\* p < .001

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