COLLEGE OF BUSINESS, ARTS AND SOCIAL SCIENCES

BRUNEL BUSINESS SCHOOL

BRUNEL UNIVERSITY, LONDON

Corporate accountability for biodiversity and species extinction: A systematic literature review and empirical evidence

A thesis submitted for the degree of Doctor of Philosophy by

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Abstract

This thesis investigates corporate accountability for the biodiversity and species extinction (B/E) crisis. Specifically, it consists of a systematic literature review, three empirical essays, and an introduction and conclusion chapters.

Essay one conducts a systematic literature review. Using a sample of 51 publications, it identifies current limitations of finds that there is a distinct lack of empirical evidence in B/E literature. Furthermore, this essay presents future research directions.

Essay two investigates the relationship between species specific disclosure and determinant factors which motivate firms to provide disclosure. Using a sample of 200 Fortune Global firms from 2012 to 2020, results show that firms that self-report environmental fines, gain assurance from one of the big four accounting firms, and high biodiversity impact firms, motivates species-specific disclosure.

Essay three offers unique insights on country level governance mechanisms. Using a sample of 200 Fortune Global firms from 2012 to 2018, empirical analysis found that firms headquartered in countries with higher corruption and weaker legal institutions motivate B/E disclosure. These findings are considerably impactful as they contest the assumption that firms in stronger institutions conform to pressures by providing disclosure. Furthermore, evidence suggests that national culture using Hofstede's cultural dimensions is an influencing factor in B/E disclosure.

Essay four provides first-time empirical insights that the personal attributes of a firm's CEO are important mechanisms of B/E disclosure. Using a sample of 200 Fortune Global companies from 2012 to 2020, this research chiefly highlights that powerful CEOs motivate B/E disclosure and it provides evidence that a career horizon problem exists in B/E reporting.

Overall, the research findings are in line with the predictions of the multi-theoretical framework that combines insights from stakeholder, deep ecology, legitimacy, institutional, and upper echelons theories. In summary, this thesis provides methodological, theoretical and empirical contributions to literature which is essential for understanding how and what motivates firms to account for B/E. Notably, this study demonstrates firms are not responsibly responding to the B/E crisis and transformational change is required from firms to prevent further B/E decline and meet the SDGs by 2030. This thesis presents a series of implications for policymakers,

regulators, practitioners, investors, and academics which is highlighted and articulated in the study.

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Acknowledgement

I would like to take this opportunity to offer my sincere thanks and gratitude to my supervisor, Dr Ahmed Elamer for his continuous guidance, support and mentoring throughout my doctoral research. Dr Elamer has consistently provided me with motivation, encouragement, and invaluable advice during the period of supervision and has shared his knowledge and expertise. He continues to inspire and support me on my academic journey. Furthermore, I wish to specially thank my second supervisor Professor Robin Jarvis for his assistance, comments, suggestions and guidance. I am very fortunate for the guidance and supervision of both supervisors and am eternally grateful.

I would also like to express my sincere thanks to my external examiner, Professor Collins Ntim (Southampton University) and my internal examiner, Dr Olayinka Uadiale (Brunel University) for their time and invaluable comments and suggestions on my thesis.

I also take this opportunity to thank and appreciate all the administrative and academic staff at Brunel University Business School for their support. Furthermore, I would like to extend this thanks to the staff of the Brunel Graduate School for the excellent development and training opportunities and constant support throughout the PhD journey. I also appreciate the support of PhD colleagues for their friendship, support, comments, and motivations, particularly during the difficult times in the pandemic.

My appreciation also goes to Brunel University for financing and supporting my PhD studies. I am extremely grateful for this opportunity. Furthermore, I wish to extend my thanks to all the academic staff in the Brunel Business School Accounting division and for their continuous support and assistance.

I would like to express my gratitude to all participants of the workshops and conferences at which I have presented my work during my PhD study. In particular, the helpful comments I received from participants at the Centre for Critical Accounting and Auditing Research Annual Conference (August 2021), British Accounting and Finance (BAFA) Annual Doctoral Conference (April 2021), Brunel Business School Doctoral Conference (November 2020), and the Biodiversity and Sustainable Development Conference (July, 2020).

I further wish to extend my sincere gratitude and thanks to Dr Ahmed Elamer, Dr Monomita Nandy, Dr Abeer Hassan, and Dr Suman Lodh for their support and guidance in the early stage of publication. I greatly value their academic expertise and appreciate their time supporting me in the publication process.

Special appreciation is expressed to my undergraduate supervisor Dr Abeer Hassan (University of the West of Scotland) who initially encouraged me to pursue a PhD, and who continues to provide me with guidance and support in pursuing my academic career. Additionally, I am extremely grateful to David Williamson (Head of Internal Audit, University of the West of Scotland) for encouraging me to pursue my PhD.

Last, but not least, a great appreciation goes to my family, my son Jack, my parents and brother for their endless support during my PhD journey. This would not have been possible without their continued support and encouragement along the way.

Publications and conferences

Hassan, A., Roberts, L. and Rodger, K. (2021). Corporate accountability for biodiversity and species extinction: Evidence from organisations reporting on their impacts on nature, *Business Strategy and the Environment*, doi.org/10.1002/bse.2890

Roberts, L., Hassan, A., Elamer, A. & Nandy, M. (2021). Biodiversity and extinction accounting for sustainable development: A systematic literature review and future research directions, *Business Strategy and the Environment 30*(1), pp.705-720.

Hassan, A., Elamer, A.A., Lodh, S., Roberts, L. and Nandy, M. (2021). The future of non-financial businesses reporting: Learning from the Covid-19 pandemic, *Corporate Social Responsibility and Environmental Management*, *28*(4), pp.1231-1240.

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Centre for Critical Accounting and Auditing Research Annual Conference (CCAAR), University of Witwatersrand, Johannesburg, South Africa, 18 August 2021.

The British Accounting and Finance (BAFA) annual Doctoral Masterclass, 9 April 2021.

Brunel Business School Annual Doctoral Conference, 12 November 2020.

Biodiversity and Sustainable Development in Human Welfare Conference, India, 29 July 2020.

List of Abbreviations

2SLS – Two-Stage Least Squares

B/E - Biodiversity and species extinction

CBD - Convention of Biological Diversity

CEO - Chief Executive Officer

CFO - Chief Financial Officer

COP15 - The 15th meeting of the Conference of Parties

CSR - Corporate Social Responsibility

CVO - Chief Value Officer

DiD – Difference in difference

ESG - Environmental and social governance

GRI - Global Reporting Initiative

IUCN - International Union on Conservation of Nature

OECD - Organization for Economic Cooperation and Development

SDGs - United Nations sustainable development goals

SER - Social and environmental reporting

SLR - Systematic Literature Review

WEF - World Economic Forum

WHO - World Health Organization

Chapter 1 - Introduction

1.1 Biodiversity and species extinction crisis

Natural capital, which supports economies, health, productivity, security, and wellbeing, has been brutally attacked by humanity and is declining at a rate unprecedented in human history (Ceballos et al., 2020, Everard et al., 2020; Kolbert, 2014). As a consequence, the planet is now in the midst of a declared climate emergency (Dasgupta, 2021). Over the last few decades, humanitarian prosperity has come at a cost, and it has been suggested it would take 1.6 times earth's natural resources to maintain future human sustainability (WWF, 2018). Extreme weather events and disasters such as heatwaves, flooding, wildfires, and global warming, all contribute to the present environmental challenges and climate crisis. However, one element inextricably linked to the planetary emergency is the biodiversity and species extinction (hereafter B/E) crisis, which has received less attention from academics, policymakers and leaders. There is a strong interrelationship between the two (IPBES, 2019). Climate disasters negatively impact biodiversity, and biodiversity contributes to the mitigation of climate change and adaption through the healthy ecosystem services it supports (CBD, 2021). Please refer to Appendix 1 for definitions of biodiversity, species, ecosystems and extinction.

The main driver of B/E loss is the exponential growth in human population and consumerism. The recent IPBES (2019) report states that the most important driver in biodiversity loss is overexploitation of natural resources in the land and sea for human consumption. This demand leads to habitat loss and degradation, which is primarily caused by changes in land use for intensified harvesting of agriculture, industrial impacts and development, urbanization and deforestation to meet the demands and needs of human consumption. Furthermore, oceans and wetlands are degraded by overfishing, drilling, extraction and mining. This loss leads to the disruption of species integrity which, consequently, leads to an imbalance in and degradation of healthy ecosystems, and ultimately species extinctions. Alarmingly, recent research suggests only 3% of global land remains undisturbed and ecologically intact from human infringement (Plumptre et al., 2021).

A succession of evidence indicates that there is an existential threat from further B/E loss to humanity. For example, the World Wildlife Federation (WWF) Living Planet Report

(2020) outlines that species populations have declined by 68% since 1970. Moreover, the IPBES (2019) report states that one million species are on the verge of extinction, which are declining at a rate unprecedented in human history. The World Economic Forum (2020, p.7) recognises biodiversity loss as one of the top five global risks, stating, "biodiversity loss has critical implications for humanity, from the collapse of food and health systems to the disruption of entire supply chains". Recently, Dasgupta (2021) outlined the risk of further planetary decline and reinforced the notion that biodiversity loss is a defining challenge of our generation, which is critical for poverty reduction and inequality, thus offering a strong economic case to urgently act.

The COVID-19 pandemic has emphasised the delicate relationship between humanity and nature and has propelled the biodiversity crises into the spotlight. Experts suggest that infectious diseases (such as COVID-19) are a result of habitat loss, illegal wildlife trafficking, and generally, humanity's destruction of nature (Ceballos et al., 2020, Everard et al., 2020; WHO, 2020). Scientists believe the planet has now entered the period of a sixth mass extinction (Ceballos, Ehrlich and Dirzo, 2017; Pievani, 2014) with human overexploitation being the main driver (Kolbert, 2014). The next section discusses the relationship between businesses and the B/E crisis.

1.1.1 Business and the biodiversity and extinction crisis context

Business operations have an immense impact on the planet. Thus, the focus of this research draws on the role of corporate organisations in addressing the B/E crisis. All organisations impact biodiversity by "using natural resources, producing or consuming products, owning and managing lands, or financing activities which have a direct impact" (Businessandbiodiversity.org, 2021, non-paginated). Not only do organisations detrimentally impact biodiversity, they also rely on the services that healthy ecosystems provide for business survival (IFC, 2021). Economic activity directly or indirectly depends on biodiversity to supply goods and services (KPMG, 2020). For example, further deforestation, pollinator extinction, and soil erosion threatens the food chain, given 75% of global food crops depend on natural pollination (Deloitte, 2020). This industry, which has an estimated worth between $235 billion and $577 billion is at risk (WEF, 2020). The pharmaceutical industry is hugely dependent on nature, with around 70% of all cancer drugs having a natural origin (PWC & WWF, 2020). Moreover, further coral reef erosion and land degradation could negatively impact the economic value of the tourism industry (WEF, 2021).

Thus, further decline poses serious consequences to the sustainability of businesses, and could lead to disrupted supply chains, economic loss, and a decline in societal health. The Swiss Institute (2020) estimates that biodiversity and ecosystem services account for around a half of global GDP (55%), with a fifth of global countries at risk of ecosystem collapse. Some estimate that value biodiversity provides between $125 trillion to $145 trillion per year (Costanza et al., 2014). Unquestionably, further biodiversity decay would be catastrophic, with huge consequences to societal and business wellbeing. Further decline is not only an existential threat to humanity, but from a business perspective, failure to address the B/E crisis poses reputational and material financial risk to organisations in terms of their long term sustainability (Deloitte, 2021). It is therefore imperative that organisations recognise the intrinsic value of nature and the consequences that further loss poses, as well as the impact their operations have on biodiversity (KPMG, 2020).

From a corporate perspective, there is a suggestion that firms may face increased stakeholder pressure for transparency in their efforts to protect nature (Atkins and Atkins, 2016; Barut et al., 2020; Smith et al., 2018). As stakeholders and consumers become increasingly environmentally conscious and concerned about the impacts organisations have on nature, there is likely to be an increased demand for accountability (Samkin et al., 2013; Smith et al., 2018). Consumer awareness is gaining momentum with activist groups such as Greenpeace and Extinction Rebellion, and naturalist David Attenborough publicly challenging governments and companies to act towards conserving the planet. In this context, corporate behaviour towards biodiversity must begin to change as silence on this issue will be deemed as irresponsible corporate behaviour and could lead to future pressures and disinvestment from shareholders (King and Atkins, 2016). Consequently, firms must be accountable for their impact on biodiversity and species extinction or face reputational damage and financial material risk.

1.2 Research motivation and research gap

The motivation for this study developed due to the current gaps in the literature and the current biodiversity loss and species extinction crisis. An extensive discussion of the gaps in the literature are provided and discussed in detail in Chapter 2 (section 2.7) which motivates the subsequent empirical chapters. The main motivations of the study and a summary of the gaps in the literature are discussed below.

The first motivation stems from the global response to prevent the further decline of nature. Compelling evidence has been building on the importance of the crisis (Dasgupta, 2021; WEF, 2020, WHO, 2021). Of particular note are the United Nations Sustainable Development Goals (SDGs), which comprise an urgent global strategy for future prosperity, and the ongoing 15th Conference of Parties to the Convention on Biological Diversity (COP15), the largest biodiversity summit in the last decade, which is convening to agree upon targets to protect the natural world. Both are expected to be crucial in developing a post-2020 global biodiversity framework. Furthermore, the OECD (2021) expects biodiversity measures to be included in COVID-19 policy responses in the pandemic recovery. This indicates that biodiversity will become a significant factor in safeguarding sustainable economic health and wellbeing. Biodiversity recovery plans are expected to be integrated and embedded in future policies (CBD, 2021) and rooted in company decision making for economic prosperity (Dasgupta, 2021). With this in mind, it is of critical importance to closely examine the way companies are communicating information about B/E.

The second motivation comes from the existential threat to humanity and business sustainability due to the rapid acceleration of biodiversity loss and species extinctions. Consequently, it is important to understand whether or not firms realise, recognise, and if they are acting to provide accountability towards the B/E crisis, given the fact that firms will face pressure from investors, lenders, consumers, and stakeholders at large in the future (KPMG, 2020). Businesses play a crucial role in addressing the B/E crisis due to both their impact and reliance on healthy ecosystems (Deloitte, 2020; KPMG, 2020; WEF, 2020) and have a two-way relationship with biodiversity; their impact on biodiversity, and the impact of biodiversity on the business (Hassan et al., 2020; Reade et al., 2015).

The third motivation for the study comes from the lack of attention from accounting academia on how corporate firms are reporting on their impacts and efforts to protect nature (Adler et al., 2018; Haque and Jones, 2020; Jones and Solomon, 2013). Despite some notable contributions in B/E accounting literature (e.g., Adler et al 2018; Atkins et al., 2018; Hassan et al., 2020; Maroun and Atkins, 2018; Roberts et al., 2021; Weir, 2018), there remains clear evidence gaps examining the factors that currently motivate firms to provide disclosure on B/E. This emerging stream of literature is beginning to receive attention, with scholars calling for further examinations (e.g., Büchling and Maroun, 2021; Atkins and Atkins, 2018; Roberts et al., 2021). Consequently, this has motivated the researcher to first provide a systematic review

of all B/E literature and second, identify current gaps to enhance the literature and provide future research directions.

The fourth motivation comes from a lack of empirical evidence examining the relationship between B/E disclosure and determinant factors which may motivate and influence a firm's B/E disclosure. There are three empirical motivations here: (1) There remains limited empirical evidence for the relationship between species-specific disclosure and determinant factors which motivate such disclosure. Prior empirical research found important mechanisms can influence firms to provide disclosure (e.g., Addison et al., 2019; Adler et al., 2018; Bhattacharya and Yang, 2019; Rimmel and Jonäll, 2013). However, with the exception of Roberts et al. (2021) there remains a gap to empirically examine the relationship of determinant factors to species-specific disclosure. (2) An empirical gap exists in examining the influence of external governance mechanisms on B/E disclosure. Wider CSR studies examine the influence of institutional factors and suggest that national values and beliefs can influence disclosure (e.g., Baldini et al., 2018; Cai et al., 2015; Lu and Wang, 2021; Tang and Koveos, 2008). To the best of the researcher's knowledge, no studies have empirically examined the influence of national culture, corruption, and legal environment on a firm's B/E disclosure and therefore this knowledge gap motivates this study. (3) Lastly, an empirical gap exists examining the effects of the CEO's characteristics on B/E disclosure. The literature suggests the personal attributes of CEOs can motivate CSR performance, earnings management and financial performance activities (e.g., Haga et al., 2021; Haque 2017; Henderson, Miller and Hambrick, 2006: Jeong et al., 2021; McClelland et al., 2012; Strike et al., 2015). To the researcher's knowledge, no studies have empirically examined the effect of the CEO's personal attributes on B/E disclosure and therefore this study is motivated to bridge this gap in knowledge.

The fifth motivation is to contribute to the theoretical discussion behind preventing further B/E loss, which is dominated by anthropocentric corporate behaviour, that stakeholder theory should consider species to be valued as a main stakeholder in society (Roberts et al., 2021). This dimension supports the deep ecology perspective of valuing nature's intrinsic worth (Samkin et al., 2013). Additionally, researchers argue that no single theory can explain motivations to provide B/E disclosure (Gaia and Jones, 2019), therefore, the researcher is motivated to contribute to this discussion by offering insight into legitimacy, stakeholder, institutional, and upper echelons theory from a B/E perspective.

The final motivation for this study arises from the measurement methodology of disclosure in prior research. To date, a number of studies have relied on the Global Reporting Initiative to measure biodiversity disclosure (e.g., Bhattacharyya and Yang, 2019; Boiral, 2016; Haque and Jones, 2020). The literature argues that this method is limited and is used as a method to reference biodiversity. Alternatively, this research employs a comprehensive B/E framework that can arguably better capture additional B/E information that other methods can miss (Atkins and Maroun, 2018; Hassan et al., 2020). The B/E framework employed in this research builds on the GRI initiatives, Aichi targets, SDGs, and other disclosure items based on the literature, which exceeds the frameworks employed in prior literature. This enables the capsulation of B/E information potentially missed by other frameworks.

1.3 Research objectives, research questions and research hypotheses

1.3.1 Research objectives

This study addresses the following specific research objectives:

The first objective is to synthesise and analyse the existing B/E literature to identify gaps in existing knowledge and provide potential research opportunities. This objective is achieved in Chapter 2.

The second objective is to investigate what motivates firms to provide disclosure on species. Specifically, this chapter examines the relationship between species specific disclosure and determinant factors which motivate such disclosure. This objective is achieved theoretically and empirically in Chapter 3.

Third, the study examines what role external governance mechanisms of the legal environment, level of corruption, and the national culture of a firm's headquarters country has on its B/E disclosure. This aim is achieved theoretically and empirically in Chapter 4.

Finally, the fourth objective is to examine what role a CEO's characteristics play in a firm's B/E disclosure. Particularly, this chapter examines the effect of the CEOs personal attributes of gender, tenure, power, and career horizon problem on a firm's B/E disclosure. This is achieved theoretically and empirically in Chapter 5.

1.3.2 Research questions

To achieve the research objectives, the following research questions shall be addressed by the research.

RQ1. What is the extent of the current knowledge in biodiversity and extinction accounting literature, and what are the identified gaps?

RQ2. What are the determinant factors that influence companies to provide species disclosure?

RQ3. What role does national culture, legal environment, and corruption play in a firm's B/E disclosure?

RQ4. What CEO characteristics motivate B/E disclosure?

1.3.3 Research hypotheses

The research hypotheses are based on the research objectives and questions. The first group of hypotheses is related to RQ2 to examine the relationship between a firm's species disclosure and the relevant influencing factors. The second group is related to RQ3 to examine the influence of external governance mechanisms of culture, legal environment and level of corruption on a firm's B/E disclosure. The final group is related to RQ4 to examine CEO characteristics on a firm's B/E disclosure. Details of these groups are given below:

First: The association between species disclosure and determinant factors.

H1: There is a positive association between firms disclosing species information and buying assurance.

H2: There is a positive association between firms disclosing species information and gaining an award.

H3: There is a positive association between firms disclosing species information and partnership engagement.

H4: There is a positive association between firms with self-reported environmental fines and species disclosure.

H5: There is a positive association between firms from high biodiversity industries and species disclosure.

Second: External governance mechanisms of culture, legal environment and level of corruption that motivate B/E disclosure.

H1: There is a negative relationship between the legal framework in a country and the firm's B/E disclosure.

H2: There is a negative relationship between a firm's B/E disclosure and the level of corruption in a country

H3a: There is a relationship between firms in low power distance countries and B/E disclosure.

H3b: There is a relationship between firms in collectivist countries and B/E disclosure.

H3c: There is a relationship between feminine countries and a firms B/E disclosure.

H3d: There is a positive relationship between firms in a high uncertainty avoidance country and B/E disclosure.

H3e: There is a relationship between firms in long-term oriented countries and B/E disclosure.

Third: The CEO characteristics that motivate B/E disclosure.

H1: There is a positive relationship between female CEOs and B/E disclosure.

H2: There is a relationship between CEO power and B/E disclosure.

H3: There is a relationship between CEOs with short tenure and B/E disclosure.

H4: There is a relationship between short career horizon and B/E disclosure.

1.4 Research methodology

The methodological approach to this research is presented in this section. To achieve the objectives and answer the research questions, the research philosophy, strategy, approach, and design are discussed below**.**

1.4.1 Research philosophy

The research paradigm is the philosophical framework that maps the planning of the study based on the assumptions of knowledge (Collis and Hussey, 2014). Positivism and interpretivism are the two research assumptions in business and management studies (Collis and Hussey, 2014), which drive the research and apply methodical and analytical techniques to draw conclusions. Saunders et al. (2019) find that positivism observes measurable facts in sampling connected with hypothesis testing. Likewise, O'Gorman and MacIntosh (2014) note that a positivist framework naturally aligns to quantitative studies, by focusing on facts and causality. The fact that some results may be ignored due to the study's highly structured design is a potential weakness recognised in the positivist philosophy. However, it is important to note that the literature suggests no research philosophy "fits all". The most appropriate fit is the positivist logic paradigm, given the researcher will employ existing theory to develop hypotheses that would be either be rejected or confirmed (Saunders et al., 2019). The epistemological assumption of the positivist paradigm is that the knowledge is valid when the phenomena is observable and measurable (Collis and Hussey, 2014).

1.4.2 Research strategies

The positivist approach is generally associated with quantitative studies, in which data is collected then analysed to test hypotheses and theories (Saunders et al., 2019). Whereas qualitative studies are usually associated with an interpretive philosophy with no intention to statistically examine relationships, and with a greater emphasis placed on the quality of the data (Collis and Hussey, 2014). In line with the objectives of this research and to answer the research questions, the most appropriate choice is the quantitative strategy.

1.4.3 Research approach

The two main research approaches are deductive and inductive (Collis and Hussey, 2014; Saunders et al., 2019). The inductive approach is widely accepted to apply qualitative methods with observations derived from empirical reality (Collis and Hussey, 2014). Here, first the data is collected and analysed, then a theory is built from the conclusion of the data analysis (Bryman and Bell, 2003). In deductive logic, the research approach is employed in exploring relationships in the analysis of quantitative studies (O'Gorman and MacIntosh, 2014). Deductive logic embeds the theoretical structure for hypothesis development before encapsulating data to test for an empirical observation (Hussey and Collis, 2014; Hair et al.,

2019). Based on the philosophical assumptions described in the previous section and subsequent justifications, deductive logic is appropriate for this research. In this approach, research questions are formed, hypotheses are developed based on existing theories, then statistical techniques are employed to provide empirical analysis to accept or reject the hypotheses according to the theories.

1.4.4 Research design

A detailed discussion of the research design is exhibited in Chapter 3 (section 3.5), Chapter 4 (section 4.5), and Chapter 5 (section 5.5), where the variables, definitions and measurements relevant to each chapter are presented.

In summary, this study uses a sample of 200 companies (see Appendix 2) from the Fortune Global 500 over a period of five years. These companies are the world's largest companies by revenue, and are typically leaders in sustainability reporting, and have the most significant impact on biodiversity (Adler et al., 2018; KPMG, 2020). The annual corporate sustainability report (CSR) (or equivalent) of each respective company are downloaded from the companies' official websites and the Global Reporting Initiative (GRI) sustainability disclosure database (Boiral, 2016; Boiral and Heras- Saizarbitoria, 2017). Where CSR reports are not available, annual financial reports are downloaded instead. The final sample consists of 956 firm-year observations with 44 observations excluded due to a report being absent, or due to an inability to translate it into the English language. Based on prior research, B/E and species disclosure is manually collected from the annual reports using content analysis with a key-word search (e.g., Adler et al., 2018; Atkins et al., 2018; Hassan et al., 2019; Rimmel and Jonäll, 2013; Roberts et al., 2021). Refinitiv is used to obtain financial and environmental data and BoardEx is used to collect board data. This study uses STATA software to test hypotheses and examine the relationships between variables.

1.5 Structure of study

This section outlines the structure of the thesis, which comprises six chapters. Empirical Chapters 3, 4, and 5 contain relevant theories, research design, hypotheses development, and results. The current study is organised as follows:

Chapter 2 presents a systematic literature review (SLR) of the current knowledge of B/E accounting. First, the chapter begins with a discussion on B/E itself and the various bodies that have pursued ways to highlight biodiversity loss and provide guidance to encourage

voluntary disclosure. Following this, the SLR is presented, where the literature is examined, synthesised and analysed via a theoretical framework, methodology, and sample characteristics. This will facilitate the identification of gaps in the current literature and will present future research directions which frame the development of the research questions for the empirical chapters. Hence, this chapter provides the answer to research question R1.

Chapter 3 examines firms that disclose information regarding their efforts to protect and conserve species and their habitats. This chapter empirically examines what influences and motivates these firms to provide such disclosure and offers the answer to research question R2. The chapter outlines the theoretical framework, development of hypotheses, research design, and variable measurements and definitions. Finally, the results of the study are reported with descriptive statistics, correlation analysis, and regression analysis, and robustness tests.

Chapter 4 empirically examines the relationship between firms which provide B/E disclosure and national culture, legal environment, and level of corruption, which provides the answer to RQ3. The chapter presents the theoretical framework, hypotheses development, research design, and variable measurements and definitions. The results of this study are presented with descriptive statistics, correlation analysis, regression analysis, and a battery of robustness tests, including sub-sample analysis.

Chapter 5 empirically examines the relationship between CEO characteristics and B/E disclosure. Particularly, the CEO's gender, CEO's tenure, CEO's power, and CEO's career horizon are empirically examined. The chapter presents the theoretical framework, hypothesis development, research design, variable measurements and definitions. The study results are reported by descriptive analysis, correlation analysis, regression analysis, and supported by robustness tests including sub-sample analysis.

Finally, Chapter 6 presents the concluding remarks of the thesis. It begins by presenting a summary of the research findings. This is followed by the research contributions, implications and recommendations, and finally the limitations, and future research directions.

Chapter 2 - Biodiversity and Extinction Accounting: A Systematic Literature Review[1]

2.1 Overview

This chapter seeks to provide a comprehensive overview of the extant literature on B/E accounting within the context of organisational reporting. This chapter expands upon the research of Roberts et al. (2020) to review fifty-one publications from January 2013 to March 2021. Through a systematic literature review (SLR) of B/E literature, this SLR identifies current limitations and provides a discussion of potential research directions. Limitations and research opportunities are analysed via a theoretical framework, methodology, and the location of studies. This chapter purposefully provides an overview of the current B/E literature to map why (theories), how (methodology), and what (evidence) is known in the current literature. This will enable us to identify gaps in existing knowledge, and lead to the development of the empirical chapters. This chapter provides the answer to RQ1.

This chapter is structured as follows. The next section presents the introduction to the study. Section 2 presents the SLR methodology and publication selection process. Section 3 presents a comprehensive literature review of B/E accounting. Section 4 provides a critical analysis of the literature. Section 5 presents a discussion of the limitations and provides directions for future research, and finally, Section 6 provides the concluding remarks.

[1] This chapter is based on the publication: Roberts, L., Hassan, A., Elamer, A. & Nandy, M. (2021). Biodiversity and extinction accounting for sustainable development: A systematic literature review and future research directions, *Business Strategy and the Environment 30(1),* pp. 705-720.

2.2 Introduction

B/E accounting is considered an extension of corporate social responsibility (CSR), and environmental and social governance (ESG) (Atkins et al., 2018; Hassan et al., 2020). However, despite growing interest in environmental research, such as carbon accounting (e.g., Gibassier et al., 2020b; Milne et al., 2011: Schaltegger and Csutora, 2012), climate (Bryant et al., 2019) and wider environmental research (e.g., Cho et al., 2012; Cho and Patten, 2013; Clarkson et al., 2011), B/E research has received little attention from accounting scholars and is still in its infancy. As discussed in Chapter 1, the topic is gaining momentum due to the severity of biodiversity decline and the obvious connection to business dependence on biodiversity. In addition, the suggestion that infectious diseases and pandemics are related to human encroachment with nature (Johnson et al., 2020, WHO, 2020) highlights how further decline is an existential threat to business survival (Deloitte, 2020). It is expected that organisations will begin to engage in genuine efforts to protect and conserve biodiversity (Roberts et al., 2021) and therefore it is expected that this embryonic strand of research will gain more attention.

The objective of this chapter is to answer RQ1 and extend the research of Roberts et al. (2020) to provide a comprehensive overview of B/E accounting literature, which will facilitate the identification of gaps in existing knowledge and define the empirical chapters. However, before this discussion, the next section provides a discussion on extinction and the various bodies that have pursued ways to highlight biodiversity loss and provide guidance to encourage reporting disclosure.

2.3 Species extinction in the Anthropocene

There is substantial scientific evidence that the planet is in the midst of its sixth mass extinction event (Barnosky et al., 2011; Ceballos et al., 2020; Wake and Vredenburg, 2014). Historically, planet Earth has survived five previous mass extinctions, i.e., global events characterised by the planet losing around three quarters of its species (Barnosky et al., 2011). These previous events are believed to have been caused by natural events such as volcanic eruptions and asteroid impacts, which subsequently caused major ecological change in the Earth's ecosystems. Although life did survive prior extinction events, the development of

nature took millions of years before humans (homo sapiens) and the planet's ecosystems evolved to its current status. However, this sixth mass extinction event is considered a result of human activity, also known as the 'Anthropocene extinction event' (Ceballos et al., 2017; Kolbert, 2014). According to Steffen et al. (2015) there are nine planetary boundaries which regulate and stabilise the resilience of Earth (see Figure 2.1). Crossing these boundaries can trigger irreversible or abrupt environmental changes, which can result in a detrimental impact on human development (Rockstrom et al., 2009).

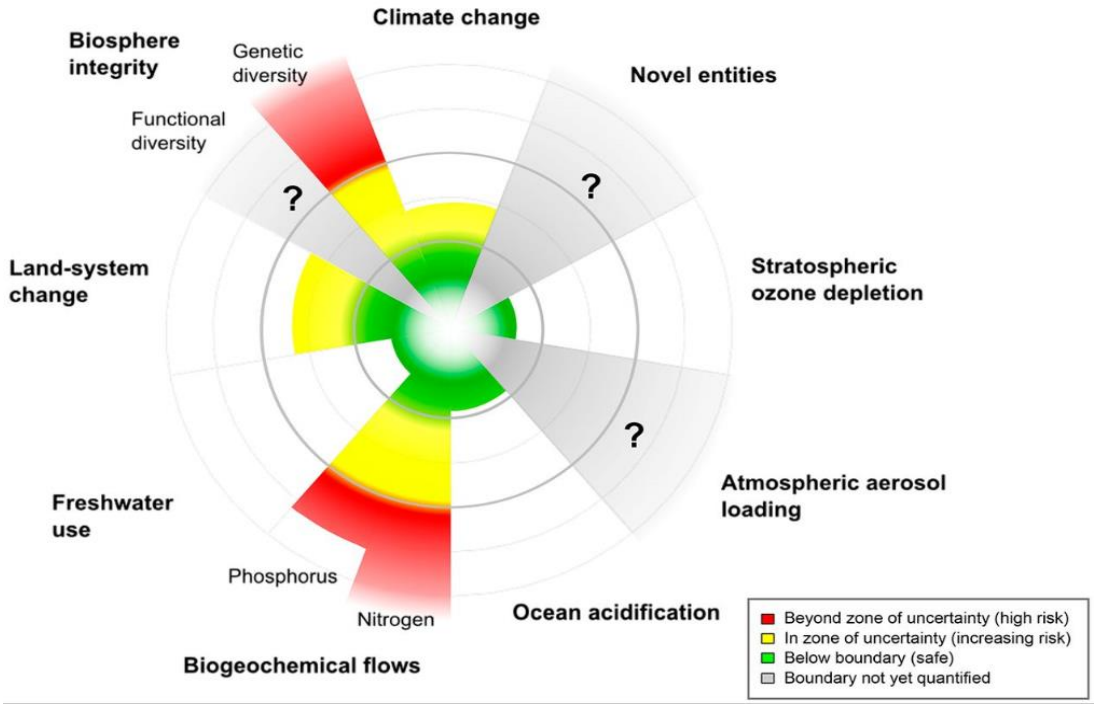

Figure 2.1 Planetary boundaries

Steffan et al. (2015, p6)

Two particular boundaries, biosphere integrity (which relates to ecosystem and biodiversity loss) and climate change are considered core boundaries, which on their own have the potential to cause catastrophic change to civilisation if overshot. Currently, four boundaries are considered in a zone of uncertainty; these include, climate change, land system change, biosphere integrity, and biogeochemical flows. Planetary boundary research has been criticised by scholars (e.g., Montoya et al., 2018) who argue that planetary collapse is not inevitable, rather a less desirable human existence would follow. However, stronger research suggests that

the integrity of the planet is severely under threat, which compromises civilisations, meaning human extinction is not impossible (Gray and Milne, 2018).

2.3.1 Action and guidance for biodiversity and species extinction

Various bodies have pursued strategies to raise awareness of the biodiversity and species extinction crisis. Influential naturalist Sir David Attenborough has publicly educated millions through documentaries and books as nature's voice of reason, and he has begged society to put nature at the heart of decisions. Conservation organisations, such as The Nature Conservancy, The World Wildlife Fund for Nature (WWF), Flora and Fauna International, Conservation International, and Oceana have been instrumental in promoting conservation. These organisations offer corporate partnerships that provide expert guidance and opportunities to adapt and innovate to responsible trade (Jones and Solomon, 2013). The literature supports the notion that such collaboration increases a firm's disclosure on B/E and is considered a defining mechanism for influencing responsible reporting (e.g., Atkins et al., 2014; Hassan et al., 2020).

Global coalitions have emerged to steer businesses in the direction of conserving biodiversity. All B/E disclosure is voluntary and therefore, strategies to protect and conserve are hugely dependent on individual corporate commitments and priorities (Haque and Jones, 2020). Because disclosure is voluntary, firms do not have to follow any reporting guidelines, however, some guidance does exist. For example, The Natural Capital Coalition, The Biological Diversity Protocol and the recent Business for Nature movement have partnered with conservation organisations to encourage companies to act by considering their impact on nature. Recently, corporate coalitions have called on governments and policymakers to implement regulations and provide a standardised framework to integrate biodiversity impact into corporate strategy. To incentivise responsible behaviour to nature, corporate entities are calling on governments to collaborate and provide ambitious policies and targets to prevent and reduce B/E loss. For example, currently, more than 700 companies with combined revenues of USD $4.3 trillion, employing 10 million people worldwide, are urging for this action (Businessfornature.org, 2021). This implies that companies crave a consistent, transparent, standardised reporting tool to help guide them in responsibly conserving and protecting nature. Businesses, regardless of size or industry, are expected to play an important role in reversing B/E loss (UNglobalcompact.org, 2021). Organisations are asked to responsibility trade and pursue opportunities to mitigate risks and solve societal challenges

through collaboration and innovation. The most notable organisations and treaties that provide guidance on biodiversity initiatives are discussed below.

2.3.2 The Convention on Biological Diversity (CBD)

One of the first global agreements for the conservation of biodiversity originated from the CBD. The international convention, established by the United Nations, emerged in 1993 with three main objectives: to conserve biodiversity, sustainably use biodiversity, and fairly share from its benefits (CBD, 2020). The CBD devised a "Strategic Plan for biodiversity 2011-2020" with 20 goals, otherwise known as the "Aichi Biodiversity Targets" as a strategy for governments and society to save biodiversity (CBD, 2006). The targets provided an opportunity to raise awareness, reduce pressures, safeguard, and improve the status of biodiversity by 2020. Despite these efforts, biodiversity has continued to rapidly decline over the past decade. Regrettably, none of the targets have been fully achieved, although it is noted some progress has been made (CBD, 2020). The CBD is now preparing for a post-2020 biodiversity framework, given earlier efforts are being considered insufficient due to the continuing decline.

The United Nations Summit on Biodiversity took place in 2020, where heads of state and governments were called to raise ambitious plans for recovery to meet the "Living in harmony with nature by 2050" strategy. In 2022, the COP15 will take place in Kunming, China, where after consultations, the post-2020 biodiversity framework will be agreed. This is expected to be an ambitious strategy, with all of society, including businesses, required to implement its goals.

2.3.3 The United Nations Sustainable Development Goals (SDGs)

In 2015, the United Nations shared the '2030 Agenda for Sustainable Development', which included the universal 17 Sustainable Development Goals. The SDGs have a vision to transform the planet by 2030 and are the most significant call to action for all nations. The SDGs build on decades of work, originating at the Earth Summit in Rio de Janeiro in 1992, and are accepted by all 193 member states. In total, 169 targets aim to eliminate poverty, protect the planet, and ensure peace and prosperity by 2030 (UN.org, 2021). Two goals specifically relate to biodiversity. Goal 14 "Life below water", to "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" (UN.org, 2021, non-paginated) and Goal 15 "Life on land", to "Protect, restore and promote sustainable use of terrestrial

ecosystems, sustainably mange forests, combat deforestation, and halt and reverse land degradation and halt biodiversity loss" (UN.org, 2021, non-paginated). Additionally, the UN recognises that wildlife trafficking contributes to disturbing ecosystems, which can cause infectious disease such as COVID-19 (UN.org, 2021). Crucially, these goals require all actors globally to implement them in order to achieve this vision of global prosperity.

2.3.4 The International Union for Conservation for Nature (IUCN)

The International Union for Conservation for Nature's Red List is the most comprehensive list of the status of plant, animal, and fungi species in the world. The IUCN Red List is a vital indicator of the health of the world's biodiversity, because it offers information on the distribution, population, and environment of different species (IUCN, n.d.). Essentially, it is an audit of the health of biodiversity, which is classified into categories of extinction risk: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Conservation Dependent and Least Concern. The list is utilised by businesses, government agencies, educational organisations, and non-government organisations (NGOs). Currently, in 2021, there are more than 134,400 species on the Red List, with more than 37,400 species threatened with extinction, which includes 14% of birds, 26% of mammals, 33% of corals, 34% of conifers, and 41% of amphibians (IUCN, 2021). The Red List is not a complete assessment of all global biodiversity; however, it is the most recognised and comprehensive audit of global biodiversity.

2.3.5 Global Reporting Initiative

Since 1997, the Global Reporting Initiative has been the leading global organizations in environmental and sustainability reporting (GRI, 2021). Widely adopted by organisations, the mission of these standards is to enable transparent, responsible reporting to create a sustainable future for society (GRI, 2021). The standards, which are a broad variety of metrics on environmental and sustainability aspects, includes biodiversity impact indicators for voluntary disclosure practice. These standards are widely regarded as the most credible reporting system (Boiral, 2016) with around three-quarters (73%) of the world's largest organisations, from varied industries and countries, using the GRI framework (KPMG, 2020). They are considered a common communication tool for organisations communicating their impact on the planet and people in a consistent way. The GRI framework involves indicators specific to biodiversity. GRI disclosures have been widely used in research to examine

companies' biodiversity reporting (e.g., Rimmel and Jonäll, 2013, van Liempd and Busch, 2013). Additionally, they are embedded into reporting frameworks for B/E accounting disclosure (e.g., Atkins and Atkins, 2018; Hassan et al., 2020), which is discussed later in this chapter. The GRI indicators have evolved through various versions, originally version G3.1, then from 2013, version G4, with indicators EN11, EN12, EN13, and EN14 biodiversity specific. These are continuously being developed and were updated in 2016, to 304-1, 304-2, 304-3, and 304-4. The indicators are:

- Disclosure 304-1 - Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas
- Disclosure 304-2 - Significant impacts of activities, products, and services on biodiversity
- Disclosure 304-3 - Habitats protected or restored
- Disclosure 304-4 - IUCN Red List species and national conservation list species with habitats in areas affected by operations (GRI Standards, 2016).

The GRI signposts the IUCN Red List in their framework to encourage organizations to compare species information from the Red List with their records to prepare documentation and monitoring records. However, as shall be discussed later in this work, scholars have provided evidence that these indicators are used to simply refer to biodiversity and species, and are inadequate in addressing the crisis (e.g., Boiral, 2016; Gray and Milne, 2018).

This section has provided an explanation on extinction and the various bodies that have pursued ways to highlight biodiversity loss and provide guidance to encourage reporting disclosure. In the next section, the SLR is presented, which aims to identify the current gaps in the extant literature and provide future research directions.

2.4 SLR Methodology

A systematic literature review (SLR) is a comprehensive, evidence-based selection of the most relevant academic research that uses a replicable method to evaluate and synthesise extant literature (Alvarez Jaramillo et al., 2019; Fink, 2005; Mio et al., 2020; Rafi-Ul-Shan et al., 2018; Wang and Chugh, 2014). The aim of conducting an SLR is to provide a summary of

existing knowledge, outline the development of a topic, determine research gaps, and propose potential research activities (Khan et al., 2020; Sivarajah et al., 2017). To implement the SLR, three phases are followed (Mio et al., 2020). First, the planning the process begins by defining the research aim and objective. The second phase is to identify, select and evaluate the literature. The third stage is to synthesise and report the results of the analysis.

Based on the objective outlined in the introduction, and to answer the first research question, the purpose and main aim here is to expand upon the extant literature (Roberts et al., 2021) by providing an SLR in the context of B/E accounting, which includes corporate, government, or public level organisations. The aim is to provide a comprehensive literature review by synthesising and analysing B/E accounting publications to critically analyse the main limitations in the existing knowledge, and to provide direction for future research (see Figure 2.2).

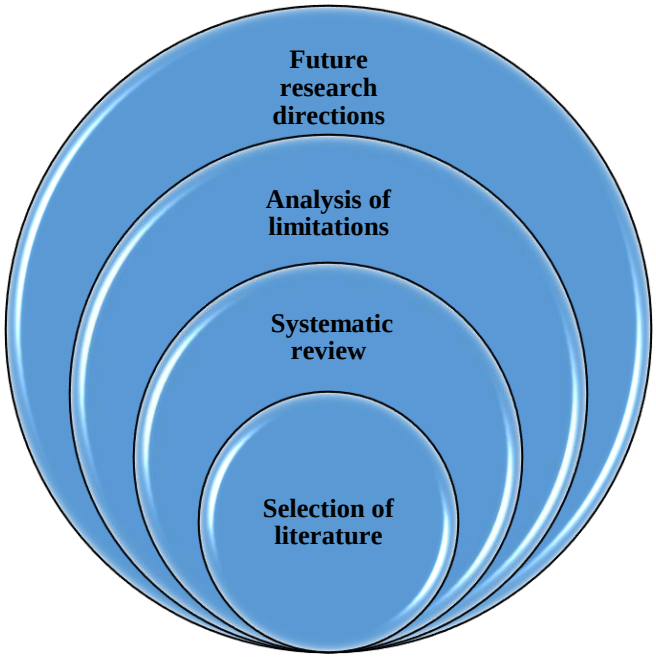

Figure 2.2 Process of SLR

The second stage sets out the parameters of the literature evaluation. Following prior studies (Rafi-Ul-Sham et al., 2018) peer-reviewed journals are examined to ensure high-quality

results. Due to limited publications in the research area, book chapters from academic scholars are considered. Published articles from January 2013 to March 2021 in the English language are considered. Directed by advice from literature, the following conditions were applied for the inclusion or exclusion criteria:

Table 2.1 Inclusion and exclusion criteria for SLR

a)	Articles are gathered from databases: Business Source Premier, Emerald, Elsevier, Google Scholar, Science Direct, Wiley Online, Taylor and Francis and Springer Link (Ali et al., 2017)
b)	To ensure an article's suitability, keywords and synonyms were utilised (Khan et al., 2020; Khlif and Chalmers, 2015). "Biodiversity reporting, accounting or disclosure", "extinction reporting, accounting or disclosure", and "threatened or endangered species" were used to search title, keywords, and abstract (Plockinger et al., 2016)
c)	A consideration of qualitative, quantitative, conceptual, or theoretical papers (Mio et al., 2020; Rafi-Ul-Shan., 2018)
d)	To confirm final suitability by reading the article for satisfactory selection (Mio et al., 2020; Sivarajah et al., 2017)
e)	A search the reference lists of selected articles to ensure the capture of literature omitted from previous steps (Bartolacci et al., 2019; Harrison et al., 2016)
f)	Theses, working or conference papers are excluded, since the literature argues grey literature can be unreliable (De Vita et al., 2014; Harrison et al., 2016)

2.4.1 Selection of publications

B/E accounting is an emerging stream of literature with limited publications. However, the main objective of the SLR is to provide a comprehensive overview of the existing knowledge. The literature argues that B/E accounting is a multidisciplinary area (Jones and Solomon, 2013) with insights offered from science, ecology, and accounting disciplines (Hassan et al., 2020). In this vein, to capture relevant articles, some publications outside

business related journals are included due to their insightful contribution. The results indicate that the accounting community have responded to the B/E crisis with The Accounting, Auditing & Accountability Journal (AAAJ), which is arguably the most influential journal in this regard, publishing twenty articles (see Table 2.1).

Table 2.2 Publications by journal

Acronym	Journal	Articles Published	ABS rating
AAAJ	Accounting, Auditing and Accountability Journal	20	3*
AF	Accounting Forum	2	3*
AJEM	Australasian Journal of Environmental Management	1	
BAR	British Accounting Review	1	3*
BSE	Business, Strategy, and the Environment	4	3*
CB	Conservation Biology	1	
EI	Ecological Indicators	1	
EPG	Environmental Policy Journal	1	
IJBSEM	International Journal of Biodiversity Science, Ecosystem Services and Management	1	
JBE	Journal of Business Ethics	3	3*
MAJ	Managerial Auditing Journal	1	2*
SEA	Social and Environmental Accountability Journal	3	1*

*Journal ranking is in accordance with Chartered Association of Business Schools Academic Journal Guide 2018.

journals had published one or two articles. In total, thirty-nine publications were considered for review.

Additionally, four published books have been considered for this review (see Table 2.2). First, *Six Capitals, or Can Accountants Save the Planet* (Gleeson-White, 2014) presents the idea that a revolution of accounting is required to prevent the further decline of nature, and future reporting should include the consideration of natural capital. *Chief Value Officer* (King and Atkins, 2016) suggests businesses have a role to play in saving the planet by enhancing corporate governance practices. *Around the World in 80 Species* (Atkins and Atkins, 2018) offers extinction accounting chapters from guest academic authors exploring B/E accounting

worldwide. Although these chapters are short, they present insightful contributions in the B/E accounting context and provide evidence that is scant in research publications. The selected books provide ten chapters, and overall, the study comprises of fifty-one chapters, books and journal publications.

Table 2.3 Books and chapters included in the SLR

Book		Count
1. Around the world in 80 species	(Chapters)	9
2.Accounting for Biodiversity	(Chapter)	1
2. Chief value officer		1
3. Six Capitals, or can accountants save the planet?		1

The third stage of the SLR process is to present the overall results. To analyse the SLR, the publications following prior literature (Adhikariparajuli et al., 2020; Khan et al., 2020) are classified. This enables direction for future research opportunities. Firstly, the publications are analysed by year of publication. This enables the examination of attention in academia. Second, the publications are analysed by geographic location of study by country, which are then classified by developed or developing county. Third, an examination of research methods takes place, followed by an analysis of the theoretical framework in the literature. Finally, the SLR presents the main limitations in the literature, with suggestions of future research directions.

This section has presented the SLR methodology and publication selection process. The next section presents the literature review on B/E accounting.

2.5 Literature Review

This section reviews the existing B/E accounting literature. It will first discuss the current knowledge, then the literature will be analysed to present limitations, which will then lead to future research directions that will frame the remaining chapters.

2.5.1 The emergence of accounting for biodiversity

The initial seeds of the academic accounting for biodiversity literature began with Jones (1996, 2003). Jones (2003) draws on the belief that organisations are stewards of natural capital, with the underlying principle that organisations are accountable to stakeholders and the wider community. Jones (1996) proposes a natural inventory model to account for species and habitats on various stages subject to the vulnerability and critical importance of species. He remarks that accountants must step out of the normal accounting paradigm to assist organisations in becoming responsible for natural capital. Testing his inventory model on a small country park, the author concludes from his small pilot study that providing an inventory of habitats, flora and fauna is feasible, but requires a gargantuan corporate shift from greening rhetoric (Jones, 2003). In response to Jones (1996, 2003), early empirical studies begin to address the void in accounting for biodiversity. Accounting for biodiversity began to blossom in 2013 and caught the attention of academics when the AAAJ published a special issue on biodiversity accounting. The special issues originality were a call for academia to explore the neglected research strand and the edition provided empirical evidence of accountability from organisations.

2.5.2 Biodiversity reporting within corporate organisations

The 2013 AAAJ special issue includes notable contributions from Rimmel & Jonäll (2013) who investigated the top 30 companies from the Stockholm Stock Exchange in Sweden, along with van Liempd and Busch (2013) who examined the biodiversity disclosure of the 27 largest Danish companies. Both longitudinal studies examined annual and sustainability reports for evidence of biodiversity disclosure. Both Scandinavian studies found disclosure from companies to be extremely low and minimalistic. Positively, Rimmel and Jonäll (2013) revealed that disclosure increases in their investigation period of five years, nearly doubling from 2006-2010. Van Liempd and Busch (2013) also found that disclosure increases over their investigation period from 2009-2011, albeit slowly. Regretfully, they also found that the majority of companies do not disclose such information at all. Rimmel and Jonäll (2013) presented interesting results that companies from low-risk sectors disclose more than companies from high-risk sectors. These findings contest the F & C Asset Report (2004) classification that high-risk sector companies pose the highest significant risk to biodiversity and are expected to disclose more in order to gain legitimacy. Presenting a mixed-method study, the authors conducted semi-structured interviews with the companies' CSR directors.

The authors summarised that biodiversity reporting is a new concept with no clear strategies being developed by organisations, and further found that what disclosure is being portrayed is primarily because the GRI has facilitated disclosure, thus justifying the minimal reporting. To this point, it is clear that biodiversity accounting is in its infancy with a salient need for more extensive studies.

In the editorial paper for the special issue, Jones and Solomon (2013) offered reasoning for the poor, minimalistic disclosure from companies and explained that the reason why they are unable to provide transparent, honest disclosure is due to a practical lack of knowledge, scientific expertise, and a lack of consideration for ethical issues. Forward thinking strategies include an interdisciplinary approach for organisations to create a more informed society, with accountants playing an instrumental role, given they are experts at recording, measuring, and reporting data with professional qualities of scepticism, independence, and communicational expertise (Jones, 1996).

Boiral (2016) recognised the weakness in the sample size of prior studies (e.g., Rimmel and Jonäll, 2013; van Liempd and Busch, 2013) arguing that their findings are inconclusive and as a consequence it is argued that larger populations are required for analysis. The author conducted an exploratory longitudinal study of global mining organisations from 2008-2010, investigating biodiversity issues disclosed through GRI standards (version G3.1) in published sustainability reports. The mining sector was specifically selected since through the extraction of natural resources the sector is expected to have a significant impact on biodiversity. Analysed through a qualitative content analysis, impression management is framed to understand organisational disclosures and it was found that neutralisation as an offset of impression management is present in four ways. The findings demonstrate that organisations deny their significant impacts on biodiversity, claim positive or neutral impacts, detach from negative impact, and there is a weakness in responsibilities (Boiral, 2016). Additionally, biodiversity commitments were found to be based on rhetorical statements, which are used to provide justification for their actions, in lieu of honest transparent reporting. The author concludes that biodiversity disclosures are incomparable as there is an absence of transparency with the GRI framework, which is being used simply for impression management, to convey positive news to stakeholders.

The literature has begun to build an argument that GRI is merely used for impression management and concurs that the framework is broad, allowing scope for organisations to

protect their image and gain social legitimacy (Boiral and Heras-Saizarbitoria, 2017; Maroun and Atkins, 2018) with the framework being neither progressive or transformational (Maroun and Atkins, 2018). Scholars agree, however, that while there is an imperative need for biodiversity reporting, the voluntary framework of GRI that is widely utilised by companies does not provide consistent, transparent disclosure and it allows companies to use it for impression management (Cuckston, 2018b; Maroun and Atkins, 2018). Developing realistic solutions is essential, as De Valck and Rolfe (2019) affirm, suggesting that with accumulative threats to biodiversity, an agenda is swiftly required. Solomon et al. (2013) argues that impression management can be applied to cover information through the manipulation of expressed positive information. The GRI standards were initiated to guide voluntary disclosure from organizations in an attempt to halt planetary decline. Yet, it is apparent from empirical studies that it is used as a manipulative tool with researchers arguing it is inadequate.

Empirical evidence from Adler et al. (2017) similarly focuses on mining and metal organizations in Australia, observing that such industries are controversial and reporting that activities are higher. Therefore, it is expected that there would be more polished, quality accountability. Proclaiming that the mining industry and Australian companies have been previously overlooked, the study aims to compare data collected from 2010, 2012 and 2013. Significantly, the United Nations declared 2011-2020 the "Decade on Biodiversity", backed by a motivation to examine if disclosure increased over the investigation period and to determine how specific and detailed these disclosures are. Applying legitimacy theory to the study, the researchers found an increase in quality and quantity over the longitudinal study. However, disclosure was generally bland and unimpressive. Larger companies disclosed more information than small organizations. This publication contributes to the literature, as it extends previous studies of the utilization of the GRI framework to a fifty-item disclosure framework. However, most of the index items are derived from GRI principles. The findings support prior research (e.g., Boiral, 2016; Rimmel and Jonäll, 2013), which found that no depth is apparent in accountability with companies legitimizing themselves by disclosing compliance but providing no elaboration on how they quantify impact.

Bhattacharyya and Yang (2019) extends mining studies (e.g., Adler et al., 2017; Boiral, 2016) to include all sensitive industries in Australia, incorporating materials, utilities, industrial and energy organisations for examination. Exploring 300 companies in a longitudinal study from 2012-2015, the study implements specific factors to a content analysis study of annual and sustainability reports. Coding disclosures on qualitative and quantitative

information and variables of firm-specific factors are used to examine biodiversity reporting. Similar to prior studies, (e.g., Boiral, 2016; Rimmel and Jonäll, 2013) legitimacy theory is applied, as organisations are expected to increase biodiversity disclosure to maintain and gain legitimacy (Bhattacharyya and Yang, 2019). The empirical results confirm that disclosure increased from GRI G3 standards to the implementation on the G4 framework. Biodiversity disclosure increases over the investigation period; however, it is general and qualitative in nature with little or no quantitative information on biodiversity impact. The mining and metals sector provides the most disclosure among similar sensitive industries, which supports prior studies (e.g., Adler et al., 2017; Boiral, 2016) and are harmonious with F & C (2004), which posits that industries with a significant biodiversity impact sectors disclose more information to gain legitimacy. The implementation of the GRI G4 version of the voluntary reporting regime appears to have facilitated more accountability and transparent reporting, rejecting concerns of clarity (Cuckston, 2018b; Maroun and Atkins, 2018). On the other hand, findings of increased disclosure support the legitimacy expectations that by raising awareness on biodiversity through the newly established G4 framework companies report accountability to fill the gap and gain legitimacy. Bhattacharyya and Yang (2019) provide useful insights into organisational biodiversity accountability knowledge. Nevertheless, the sample is specific to organisations engaging in GRI reporting in sensitive industries only, eliminating organisations who may report non-financial information via diverse reporting approaches in a variety of industries, accompanied by the risk of omitting the quantity and quality of further reporting.

Empirical evidence from companies in biodiversity rich mega-diverse countries originates from Skouloudis et al., (2019). The authors offer useful insight, and theirs is the first contribution in the literature to focus on a geographic location that harvests 60-70% of the planet's biological diversity. The research objective is to examine the relationship between biodiversity disclosure from domestic companies in 2016, disclosing on qualitative and quantitative information from GRI G4 disclosure, and potential associations with industry affiliation, country, and company size. Similarly previous studies have considered this problematic, such as Adler et al., (2017) and Bhattacharyya and Yang (2019), where the disclosure is scored on GRI disclosure only, which overlooks potential disclosure. The results illustrate generic, vague statements from companies with organisational size having no effect on disclosure. Furthermore, the findings support studies that high-impact industries (e.g., Adler et al., 2017; Bhattacharyya and Yang, 2019) disclose the most, whereas the lowest level of disclosure comes from low-impact sectors, financials and healthcare. Quantitative information

is extremely low and sporadic and qualitative information that is released is too vague and unreliable to be comparable, parallel to prior studies (Bhattacharyya and Yang, 2019). Companies are found to be indulging in impression management with symbolic commitments to stakeholders, which supports Solomon et al. (2013) and Boiral (2016), however, these authors hint that justification may be a result of companies' lack of awareness and due to having no strategy regarding the importance of ecosystems. Some observed weaknesses in the study, since it is limited to a one-year investigation, therefore is unable to provide reporting trends and is again limited to disclosure on GRI standards. The literature has begun to argue that the continuation of GRI standards disclosure will lead to a fossil record of species (Atkins and Atkins, 2018) with companies indulging in the facilitator to gain legitimacy (Gray and Milne, 2018).

Addison et al. (2019) provide a valuable contribution by assessing 100 companies from the Fortune Global list of 2016 for commitment on biodiversity. The authors affirm that the sample is purposeful as they represent a diverse selection of industries that impact biodiversity at different levels, in accordance with categories from the F&C (2004). The results reveal that industry sector risk does not influence biodiversity disclosure, evidencing the risk the organisation poses to biodiversity is not a catalyst for disclosure, thus contesting prior studies that find that high-risk sectors disclose more (Skouloudis et al., 2019) and supporting the findings of Rimmel and Jonäll (2013). Encouragingly, the study found that almost half of the companies mention biodiversity in their reporting, indicating that awareness of biodiversity is improving, contrasting with earlier research (Rimmel and Jonäll, 2013; van Liempd and Busch, 2013). Thirty-one of these companies were considered to have made clear commitments to biodiversity, however, no companies disclosed quantitative outcomes and provided no information to assess whether organisational impacts were improving. Nonetheless, limitations to this study are evident. The authors exclude any theoretical support to the research, and the results are unable to report trends due to the investigation period being only one year and the study only exploring organisational statements on commitment to biodiversity.

2.5.3 Biodiversity reporting within government organisations

Research on biodiversity reporting in public organisations has also received some attention. A notable study came from Samkin et al. (2014), which developed a biodiversity framework and identified, during a longitudinal study of a New Zealand conservation organisation, whether a deep ecological presence is sensed in reporting. The paper's originality

in assessing a national conservation department offers insight into a potential biodiversity framework. Similar to studies of corporate biodiversity accountability (e.g., Rimmel and Jonäll, 2013; Boiral, 2016), the content analysis exploratory study found a fluctuating but definite increase in disclosure over the years. The organisation is found to have embedded considerable strategic planning in biodiversity reporting and evidences a deep-ecological concern for nature. Expressing this concern through disclosure, the intrinsic value nature provides appears to harmonise with government legislation, although findings reveal the disclosure increase coincided with governmental biodiversity strategy. The authors believe a deep ecology perspective outweighs anthropocentric tendencies, however, as a conservation organisation this is expected as its objectives are to conserve nature, thus contradicting previous corporate accountability research (e.g., Adler et al., 2017; Boiral, 2016; Bhattacharyya and Yang, 2019) where anthropocentric tendencies are apparent in their failure to appropriately account for nature. The limitations of this study extend to researching one conservation organisation, and the preconception that conservation organisations harmonise and regenerate nature, rather than corporate activity inflicting the most impact. Conversely, it is not unreasonable for the more exemplar practices of these conservation organisations to become embedded into corporate reporting.

In their studies of biodiversity reporting in English local councils, Gaia and Jones (2017) conducted investigations with the purpose of providing motivation for disclosures by completing a content analysis of local biodiversity action plans in a longitudinal study from 1998 – 2015. Gaia and Jones (2017) harmonise with the findings of Samkin et al. (2014), wherein the declared decade of biodiversity influences disclosure. Through the lens of stakeholder theory, the findings indicate organisational disclosure harmonises with anthropocentric motivation and target stakeholders, whose behaviours need to become more empathetic towards biodiversity loss, and ultimately must comply with guidance and satisfy stakeholder impressions (Boiral and Heras-Saizarbitoria, 2017). Gaia and Jones (2017) were amongst the first to comprehensively investigate local authorities in Europe. However, these studies are limited to focusing on councils in a single institutional setting; a sample from a variety of countries may provide alternative motivations and more robust reliability.

Gaia and Jones (2019) extended upon this limitation and diversified their study to include all English councils, by contributing an analysis of the factors of biodiversity disclosure within the councils. Extending the theoretical lens to agency, legitimacy, institutional and stakeholder theory they conclude that overall disclosure is low, with less than half of councils

reporting, which disallows stakeholders' clarity on biodiversity status, displaying a weak response to the biodiversity crisis. Determinant factors found a significant relationship with councillors from environmental oriented parties, councils with higher populations and the presence of environmental non-governmental organisations (NGO's). The study admirably recognises that not one single theoretical lens can explain biodiversity reporting. Societal legitimacy is apparent in most public sector contributions, which is comparable to corporate studies. Caveats within the study include it being an investigation of a single institutional setting and its focus being solely on English councils. Talbot and Boiral (2021) investigated biodiversity disclosures of Canadian public organizations where there is a legal obligation to report on biodiversity, however they revealed shamefully low disclosure, citing symbolic commitments, vague statements, and through interviews concluded that the manipulation of figures was taking place in order to impress stakeholders.

2.5.4 The emergence of extinction accounting

This section presents an emerging branch of the literature that deals with extinction accounting. Drawing from biodiversity accounting, the accelerating rate of species extinction, which is being caused by biodiversity loss, leads to the emergence of extinction accounting (Rimmel, 2021). There is a relatively small body of literature concerning extinction accounting. The initial research in this area was principally introduced by Professor Jill Atkins, who substantially expanded upon sustainability reporting (Atkins and Maroun, 2018; Maroun, 2018). As previously discussed, the extant literature has built an argument that biodiversity reporting, which is underpinned by GRI standards, is insufficient in accounting for nature, and is used as a mechanism to reference biodiversity (Atkins and Atkins, 2018; Maroun and Atkins, 2018). Critics argue that GRI has been instrumental in advancing CSR (Milne and Gray, 2013), however, empirical evidence implies that reporting can be manipulated and further purports that in its current format is insufficient, superficial, fails to adequately protect nature, and will lead to a fossil record of species (Atkins and Atkins, 2018; Atkins and Maroun, 2018; Cuckston, 2018b; Zhao and Atkins, 2021). In a response to this, biodiversity accounting has extended to include the extinction element. This uniquely requires more narrative and reflection, and crucially, extends upon the GRI reporting formats (Maroun, 2018). The literature has observed that extinction accounting has the potential to become emancipatory, challenging accounting norms and traditions of accounting (Gallhofer, 2018; Gallhofer and

Haslam, 2019; Maroun and Atkins, 2018), and has the potential to change organisational behaviour towards natural capital.

2.5.5 Extinction accounting literature

In 2018, the AAAJ special issue on "Extinction accounting" provided a springboard for further contributions. Atkins and Maroun (2018) introduced the first sight of an accounting for extinction framework. Although the authors are strong critics of the GRI Standards, the extinction framework embeds these standards and recommends integrated reporting (IIRC, 2013)[2] as a reporting format. The rationale behind integrated reporting is that financial and non-financial information affect one another in value creation, thus entrenching the importance of natural capital to organisations (King and Atkins, 2016). GRI indicators are included in the framework and are seen as a starting point, as they are the most widely accepted format of reporting principles and have been developed for non-financial reporting, despite their earlier critique (Atkins and Atkins, 2018). The objective of extinction accounting is to encourage a proactive, deep ecological account for species and biodiversity as opposed to a more anthropocentric reporting method. It provides an opportunity to transparently disclose information on strategies and initiatives to promote and protect species, mitigate risk, and provides a platform to discuss qualitative and quantitative information regarding aims/targets and liabilities relating to species. The framework claims to be a transformational reporting format (Atkins and Atkins, 2018; Atkins and Maroun, 2018) and optimistically challenges organisational behaviour towards species (Hassan et al., 2020).

Critical observations in the literature suggest the GRI principles only encourage basic disclosure on certain issues and are a basic method of preserving biodiversity. The GRI standards do signpost the International Union for the Conservation of Nature Red List (IUCN)[3]. The Red List's approach to calculating the eight extinction risk classifications it provides has been questioned by Cuckston (2018b), who examined the methods it uses and argued that its

[2] Integrated reporting, as defined by the International Integrated Reporting Council (IIRC), "Integrated reporting is a process founded on integrated thinking that results in a periodic integrated report by an organization about value creation over time and related communication regarding aspects of value creation…an integrated report is a concise communication about how an organizations strategy, governance performance and prospects, in the context of its external environment , lead to the creation of value in the short, medium and long term" (IIRC, 2020, non-paginated).

[3] The IUCN Red List classifies species into eight categories. 1. Extinct (EX), 2. Extinct in the Wild (EW), 3. Critically Endangered (CR), 4. Endangered (EN), 5. Vulnerable (VU), 6. Near Threatened (NT), 7. Least Concern (LC), 8. Data Deficient (DD) (IUCN, 2020).

framing calculability has overflowed. Yet, the Red List provides the world's most comprehensive list of species threatened with extinction and is widely accepted. Rimmel (2021) investigated the use of IUCN categories in extinction accounting in the context of zoo reporting and found that the IUCN indicators play a pivotal role in disclosure and convey sincere reporting to stakeholders.

Atkins et al. (2018) contributed to the literature by providing an exploratory study in the context of the rhinoceros from top South African companies on the Johannesburg Stock Exchange from 2011-2013. Their longitudinal study applied the extinction accounting framework and discovered that companies show a genuine concern for the species, displaying a deep ecological philosophy and rejecting legitimising strategies. This unique insight to extinction accounting contrasts earlier biodiversity focused studies that are predominately supported by legitimising and impression management (e.g., Adler et al., 2017; Boiral, 2016; Milne and Gray, 2018). Nonetheless, the caveat of this study is that it focuses on one iconic species under threat of extinction due to extensive poaching. The study could have been far more convincing if the authors had extended it to include all species mentioned in reporting. Although the authors evidence a sense of compassion for the species in anti-poaching initiatives, philanthropic trends may underpin corporate rationale due to the economic value of the rhinoceros in South Africa.

Empirical evidence from Zhao and Atkins (2018) provide an insight to extinction accounting relating to pandas in the Far East. A small but significant qualitative study found that companies initiatives usually take the form of donations, implying that legitimatising strategies and philanthropic activities are present, which supplements the findings of Atkins et al. (2018). Interestingly, both studies found a relationship between partnership engagement and corporate accountability. Nonetheless, it is suggested that 'appealing' or 'alluring' species may attract more consideration than others (Atkins et al., 2014; Maroun 2018) due to media attention and tourist trade. Weir (2018) observed that a trade-off between species may exist, given certain species attract more attention than others. For example, in his study of UK councils, mammals and birds warranted greater conservation efforts than invertebrates and insects. The demise of the renowned rhinoceros would impact South Africa culturally and financially. The panda is one of the most protected species in the world, it is socially symbolic to China and warrants great media attention (Zhao and Atkins, 2018). Jonäll and Sabelfeld (2018) support this argument, finding that organisational accountability for polar bears in the Arctic region is limited to linguistic displacement, with companies remaining largely silent on

operational impact. The findings in these studies are problematic because of their limitation to investigating one species. Atkins et al. (2014) presented the names of species disclosed by UK and German companies. Encouragingly, a great variety of species are disclosed, however they support Weir (2018), who found that certain species gain more attention than others, suggesting companies are disclosing species specific information from an anthropocentric lens. Adler et al. (2018) explored Fortune Global companies in 2014 and presented the names of species mentioned in company reporting. However, they failed to analyse species that could support or challenge the argument.

Hassan et al. (2020) provided a significant contribution to knowledge by conducting the first quantitative study on B/E accounting. The authors extended upon the study of Adler et al. (2018) to investigate the top 200 companies from the Fortune Global list over a period of three years. Their longitudinal study contributes to the nascent strand of B/E and introduces greenwashing theory to understand corporate motivations. The authors provide the most comprehensive disclosure framework on B/E, superseding previous frameworks offered in the literature. They combine prior literature on biodiversity and species-specific framework (e.g., Adler et al., 2017; Adler et al., 2018; Atkins et al., 2014) and extinction framework (Atkins and Atkins, 2018; Atkins and Maroun, 2018; Atkins et al., 2018; Maroun and Atkins, 2018) to form a comprehensive 53 item disclosure index, which is categorised into five themes. Motivated to explore corporate accountability for nature, descriptive statistics confirm that disclosure increases in the study. The researchers subsequently found significant relationships with B/E disclosure score and the presence of partnerships, high-impact industries, assurance from big four accounting firms[4], environmental awards, and developing countries. Ultimately, a positive relationship was found between disclosure and the presence of partnerships (e.g., Adler et al., 2018; Atkins et al., 2018; Bhattacharyya and Yang, 2019; Boiral and Heras-Saizarbitoria, 2017). The authors therefore confirm that disclosure is low, minimalistic and vague (e.g., Adler et al., 2017; Adler et al., 2018; Gaia and Jones, 2019; Rimmel and Jonäll, 2013, Skouloudis et al., 2019; van Liempd and Busch, 2013).

In summary, this section has presented an overview of the current B/E accounting literature and has discussed the emergence of biodiversity accounting and the evolution of

[4] The big four accounting firms are considered to be KPMG, Deloitte, Ernst & Young and PricewaterhouseCoopers (Hassan et al., 2020).

extinction accounting. This literature will be synthesised and categorised for analysis in the next section.

2.6 Categorisation of literature

In this section, in preparation for analysis, the literature is categorised (Adhikariparajuli et al., 2020). First, the publications are categorised into annual occurrence to determine if and when contributions gain academic attention. Second, the publications are categorised by geographical location, first by country, then by developed or developing nation. Third, the publications are categorised by research methods, and finally, the publications are categorised into an applied theoretical framework.

2.6.1 Articles published per year

The distribution of total publications by year is displayed in Figure 2.3. The results indicate that research peaked in 2018 with eighteen publications. This corresponds with the aforementioned AAAJ special issue, and the book chapter influences from Atkins and Atkins (2018). 2013 provided the second highest, with eight contributions corresponding with the aforementioned AAAJ special edition. So far, in 2021 (end of March) five articles have been published exceeding the total publications from 2019. The growing recognition that biodiversity loss is one of the greatest challenges to society (WEF, 2020) and the implementation of the SDGs may trigger further publications.

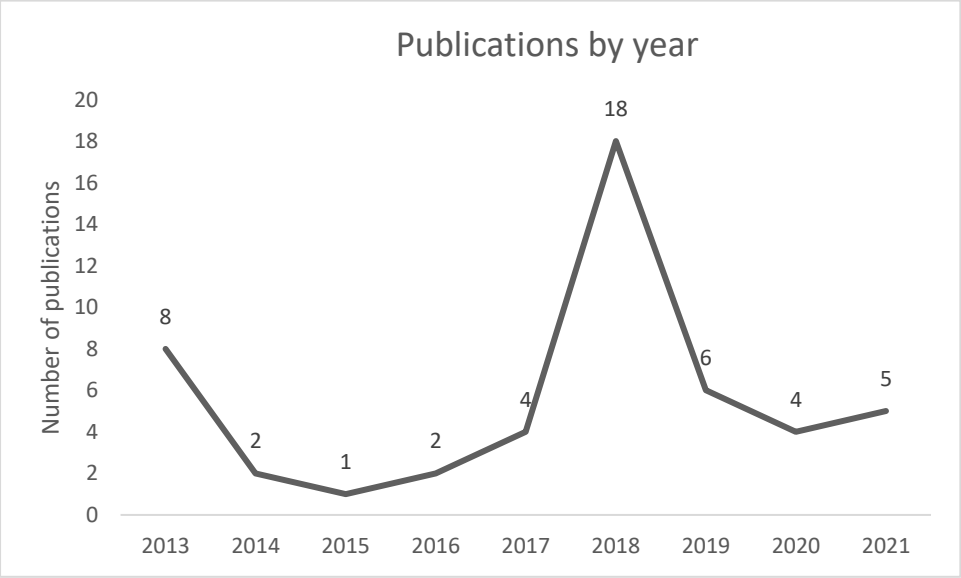

Figure 2.3 Number of articles per year

2.6.2 Publications by geographic location

In this section, publications are analysed by country, then classified into developed and developing countries in accordance with the literature (Ali et al., 2017; Khan et al., 2020). According to Panel A in Table 2.3., research has focused on global organisations for B/E accounting rather than one specific country. The results reveal that the single most investigated country is the UK, with five publications (e.g., Gaia and Jones, 2017; 2019; Weir, 2018). On explanation for this is that active researchers may be primarily based in the country of research, where data collection is accessible. European specific (e.g., Corvino et al., 2021; Haque and Jones, 2020), Australian (e.g., Barut et al., 2020; Bhattacharyya and Yang, 2019) and South African (e.g., Büchling and Maroun, 2018; Maroun and Atkins, 2018) specific research warrant three studies, respectively. The remaining publications studies other countries, including, but not limited to Italy, Denmark, and China which are examined once or twice (e.g., Rimmel, 2021; Zhao and Atkins, 2021).

Furthermore, for the advanced results, countries are classified and counted as either developed or developing countries, following the United Nations classification (UN, 2020). Since global studies are a combination of both classifications, they remain separate. The results in Panel B of Table 2.3 show that B/E accounting is investigated more in developed nations (seventeen times). Examination of organisations in developing nations is significantly lower, with nine studies.

Table 2.4 Publications by geographic location

Panel A.

Region/country	Number of studies
Arctic region	1
Australia	3
Bangladesh	1
Chile	1
China	2
Denmark	1

European	3
Global	7
Italy	1
Kenya	2
New Zealand	2
South Africa	3
UK/Germany	1
UK	5
USA/Canada	1
Panel B.	
Developed countries	17
Developing countries	9
Global studies	7

Although this data highlights further research is required in developing countries and more global studies are required, as this is an emerging strand of research overall, contributions within any setting will enrich the literature.

2.6.3 Publications by research method

This section analyses publications by research methods. Figure 2.4 shows that the majority of research articles (26) prefer the content analysis method. This method is favourable because organisations communicate disclosure through sustainability, environmental, CSR, integrated, or financial reporting formats or company websites (Adler et al., 2018; Hassan et al., 2020; Zhao and Atkins, 2021). This supports prior research (Ali et al., 2017; Fifka, 2013, Khan et al., 2020), which has evidenced extensive use of content analysis in CSR literature. However, a limited number of researchers have applied mixed methods by combining content analysis and interviews. Researchers who use content analysis (e.g., Addison et al., 2019; Atkins et al., 2014; Bhattacharyya and Yang, 2019) use key words to capture data (e.g., Adler et al., 2017; Adler et al., 2018; Hassan et al., 2020). However, there are some limitations to this method. If only specific phrases or keywords are of interest, there is a risk of excluding data,

which may eliminate certain evidence (Collis and Hussey, 2014). Additionally, as organisations prepare their reports, as the literature review argues, they may indulge in impression management (Atkins et al., 2014), which can lead to bias and could question the reliability of the information (Boiral, 2016).

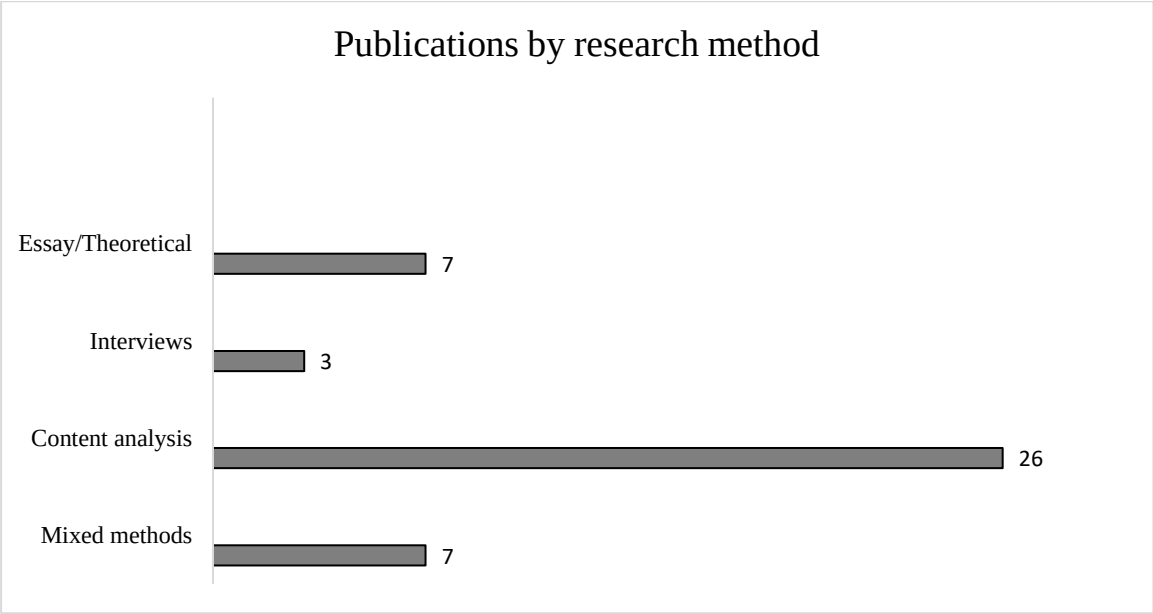

Figure 2.4 Publication by research method

Largely, content analysis studies provide qualitative analysis through data collection via reports and websites. Some researchers categorise data from GRI disclosure (Boiral and Heras -Saizarbitoria 2017; Haque and Jones, 2020) and identify and categorise data through themes and patterns (e.g., Boiral and Heras-Saizarbitoria, 2017; Corvino et al., 2021; Samkin et al., 2014). Coding frames are then applied to interpret the data, with some providing quantitative analysis (Gaia and Jones, 2019; Skouloudis et al., 2019). Fewer studies examine content analysis quantitatively, which is a distinct limitation. Empirical contributions focus on investigating relationships between determinant factors and B/E disclosure. For example, as discussed earlier, positive relationships emerge with wildlife partnerships (Adler et al., 2018; Hassan et al., 2020), gender (Haque and Jones, 2020), board independence and media attention (Bhattacharyya and Yang, 2019), assurance and environmental awards (Hassan et al., 2020), and local council relationships (Gaia and Jones, 2019). It was earlier discussed that the literature argues for the relevance of the industry sector, with some finding a positive relationship with high impact sectors (e.g., Bhattacharyya and Yang, 2019; Hassan et al, 2020;

Haque and Jones, 2020; Skouloudis et al., 2018), while some challenge this relationship (e.g., Addison et al., 2019, Rimmel & Jonäll., 2013) suggesting it requires further investigation.

Some researchers provide a more robust methodology by applying a mixed methods approach, which appears in six publications. In each instance, interviews follow content analysis with company managers, combining primary and secondary data. This method strengthens the reliability and validity of findings. For example, Rimmel (2021) investigated the extinction accounting of a Swedish zoo, gaining insightful rationale from management through an interview in order to better understand the use of IUCN categories in portraying efforts to stakeholders. Talbot and Boiral (2021) presented interviews, which have enriched the extant literature. Offering a better understanding of why biodiversity disclosure are vague and symbolic, interviews revealed that organizations are regrettably indulging in impression management and manipulating figures, while lacking ambitious action plans, and offering vague statements rather than ambitious goals. Likewise, Rimmel and Jonäll (2013) validated their findings with evidence from annual reports and interviews, with respondents offering the rationale that pressure for sustainability reporting motivates an increase in biodiversity disclosure. By interviewing sustainability mangers, Adler et al. (2018) discovered that a lack of knowledge exists regarding how to report on biodiversity and the managers admitted to engaging in offsetting activities. These insights explain organisational motivations and rationale, which cannot be detected in content analysis.

Additional publications provide essay-based and theoretical contributions. For example, Jones and Solomon (2013) argue that biodiversity reporting must evolve to prevent ecosystem collapse. Extinction accounting frameworks are thus introduced (e.g., Atkins and Atkins, 2018; King and Atkins, 2016) to respond to the biodiversity crisis, with an emphasis on the 'extinction' element, due to the severity of planetary decline. It is suggested this revolution of reporting should be embedded into integrated reporting formats, providing organisations the opportunity to be seen as responsible corporate citizens. The rapid decline of the planet is blamed on humanity's drive towards capitalism and a pursuit of profit, with the planet at a tipping point. It is further argued that if transformational organisational behaviour is not made, human extinction is not beyond the realm of possibility (Gray and Milne, 2018).

2.6.4 Theoretical frameworks of literature

The extant CSR and social and environmental reporting (SER) literature cites legitimacy theory as a long-established theoretical framework to explain reporting (Cho and

Patten, 2007; Chauvey et al., 2015; Bhattacharyya and Yang, 2019; Daddi et al., 2018). As B/E accounting is an extension of this, it is no surprise that legitimacy theory is the most widely applied theoretical framework (see Figure 2.5).

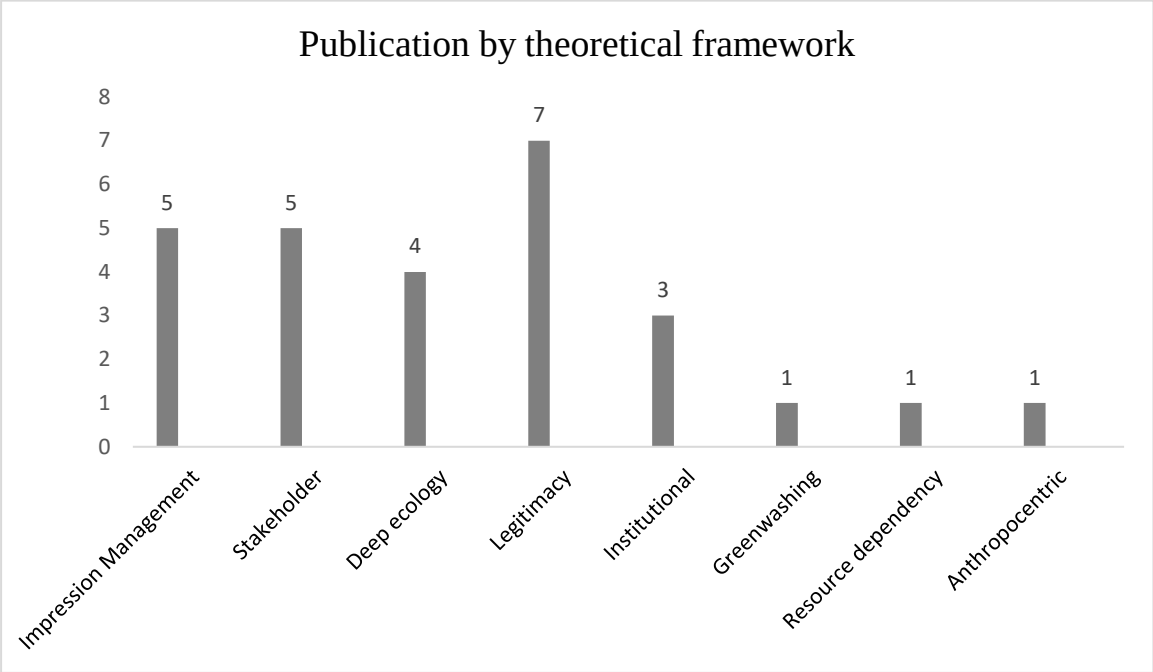

Figure 2.5 Publication by theoretical framework

The literature chapter has demonstrated how companies disclose B/E information to gain legitimacy (e.g., Adler et al., 2017; Bhattacharyya and Yang, 2019; Rimmel and Jonäll, 2013). Legitimacy theory helps explain the empirical findings that as organisational operations impact biodiversity directly or indirectly, disclosure is displayed to meet stakeholder expectations and societal demands (Adler et al., 2018; Cho and Patten, 2007; Cho et al., 2015a; Patten, 2002). Legitimacy, resource dependency, stakeholder, and institutional theories share an ontological view (Chen and Robert, 2010), with a presumption that organisations are influenced by society and vice versa (Chen and Robert, 2010: Bhattacharyya, 2014; Gray et al., 1996). The literature suggests that B/E disclosure increases due to pressures and to manage environmental events (Rimmel and Jonäll, 2013). Legitimacy and impression management are similar in their attempt to improve societal perceptions, maintain reputation and receive greater confidence from stakeholders (Clarkson et al, 2008; Deegan, 2002; Patten, 2015). Impression management contributes to the B/E literature (e.g., Adler et al., 2018; Boiral, 2016; Talbot and Boiral, 2021) by explaining how disclosure is used to merely display good corporate behaviour

(Adler et al., 2018) and present a healthy image (Boiral, 2016). Researchers explain that companies indulge in impression management by manipulating information and by expressing favourable performance while omitting negative impacts (Hassan et al., 2020; Jones and Solomon, 2013). Scholars explain results through other CSR theories, such as stakeholder (e.g., Boiral and Heras-Saizarbitoria, 2017; Rimmel., 2021) and institutional (Gaia and Jones, 2019; Weir, 2019) theories.

Research with a deep ecological perspective has emerged in some studies (e.g., Christian, 2018; Maroun and Atkins, 2018; Samkin et al., 2014). Harmonising with the value of nature, deep ecology believes all species in the natural world should be preserved (Naess, 1989; 2008). Thus, an anthropocentric shallow ecology is rejected, which ranks humans as the most important species, with nature viewed as having value when it can fulfil human satisfaction and benefit humans by contributing to their quality of life and surviva (Jones, 2004; Thompson and Barton, 1994; Samkin et al., 2013).

Biodiversity is viewed as providing goods and services which support the global economy that are necessary to fulfil basic human needs (Gaia and Jones, 2017). Deep ecology theory highlights how there should be equality between all species, which should live in harmony together (Christian, 2018). Christian (2014) explains that nature is invaluable and humans have no right to abuse other species. Deep ecologists are nature lovers and advocate the flourishing of all nonhuman and human life together as one entity (Lovelock, 1979; Naess, 1973). They also encourage environmental restoration and enhancement to the richness and diversity that contributes to all forms of life, with the ultimate aim to protect and enrich all lifeforms (Naess and Sessions, 1984; Samkin et al., 2013).

Given the present intensified biodiversity loss, which is a result of companies' impact on the planet, deep ecologists would argue that corporate attitudes and strategies need to change to ensure a sustainable future for human and non-human life (Christian, 2016; Maroun and Atkins, 2018). Atkins et al. (2014) suggest that pure deep ecology would deny any use of biodiversity to satisfy human or business satisfaction. To reject any use of natural capital is simply not feasible. However, considering the biodiversity and species extinction crisis, a balance must be reached, and companies must embed a form of deep ecological culture for a sustainable future. Maroun and Atkins (2018) suggest both deep-ecological and anthropocentric influences should be considered, and a compromise reached to ensure companies are motivated to disseminating their accountability for biodiversity and species.

Büchling and Atkins (2020) support this notion by suggesting a middle ground praxis must be reached, where neither a deep-rooted ecological perspective nor a capitalist driven strategy should prevail.

Given the extinction crisis, it is argued that anthropocentrism dominates all organisational behaviour (Atkins et al., 2014). From a deep ecological view, it is suggested that companies are reporting on biodiversity and species for incorrect reasons, that they are not protecting it for its intrinsic worth, rather such reporting is on the basis that they face material financial risk if their operations are pervasive to biodiversity (Zhao and Atkins, 2021). Jones (2003) supports this argument that companies are only likely to engage in conservation efforts out of self-interest. However, any effort to demonstrate conservation or protection of nature, even if motivated for anthropocentric reasons, is considered preferable to no attempt at all (Atkins et al., 2014). It is evident there is a need for a monumental shift in organisational reporting, with a genuine commitment necessary from a deep ecological perspective.

Encouragingly, there is evidence of deep ecological motivations in research. Samkin et al. (2014) found that the majority of biodiversity disclosures have a deep ecological perspective. However, they also note there must be a fundamental transformation in corporate behaviour towards biodiversity policies, with the concept of "sustainability" being severely misguided. The authors remark that sustainable economic development is more than corporations engaging in activities such as eliminating fossil fuels, recycling and protecting some species. Rather, a long-term commitment and genuine concern for nature must be embraced to make meaningful contributions to halting the biodiversity crisis. Nature's intrinsic worth must be realised and even the most profit-seeking entities must embed deep ecological perspectives to have a true sustainable future. Roberts et al. (2021) suggest species should be considered equal stakeholders, thus embedding a deep ecological perspective. They go on to explain that some companies are demonstrating this by engaging with wildlife partners, however, there is a huge call for companies to implement this thinking, given their study was largely motivated by anthropocentrism. Companies must not become complacent to the threat of further extinctions, therefore, embedding a deep ecological perspective provides opportunities to responsibly contribute to achieving the SDGs, mitigating material financial risk, and enhancing reputation. An additional theoretical framework begins to appear in the B/E literature (e.g., greenwashing, resource dependency, and agency), which outlined opportunities to extend or challenge the seminal studies adopting these frameworks.

In this section, the literature was categorised by year, geographic location, research methods, and theoretical framework. The next section provides an analysis of the research limitations and provides directions for future research.

2.7 Analysis of limitations and future research directions

In this section, a discussion and a critical analysis of the SLR is provided, which outlines limitations in the extant literature and identifies future research directions in B/E accounting. Following Brutus et al. (2013), common limitations are provided, as they can identify current gaps in the literature. Research on organisational accountability on B/E is expected, as experts link pandemics such as COVID-19 to illegal wildlife trafficking and the destruction of natural habitats (Ceballos et al., 2020; Johnson et al., 2020). Therefore, this may provide a vital starting point for future researchers. Limitations and directions are presented by data source, sample size, sector, country, research methods, and theoretical framework, and the section concludes with a summary of limitations and future research opportunities.

2.7.1 Data source

As discussed earlier, the extant literature is dominated by content analysis. The literature argues that organisations provide statements in company reports that are used for impression management and are therefore biased (e.g., Boiral, 2016; Solomon et al., 2013). Companies are found to deliver repetitive rhetoric to satisfy stakeholders rather than provide transparent disclosure (Talbot and Boiral, 2021). As previously mentioned, Jonäll and Sabelfeld (2018) found companies employ positive linguistic strategies to deflect attention from their actual impact on polar bear habitats. The dramatisation of efforts to protect and restore habitats is often a smokescreen rather than a sincere account of actual impact (Boiral, 2016). This method of data collection may include a reliance on one data source, e.g., sustainability, CSR, financial reports or websites. Gaia and Jones (2019) explain that additional documents, such as letters or emails may not be examined and it may be ambiguous when websites are updated (Adler et al., 2018). In this vein, future research may examine multiple sources, such as social media, letters, and other company documents to provide a more comprehensive overview and thus, increase the reliability of data (Fifka, 2013: Piekkari et al., 2009).

2.7.2 Sample size

The analysis of the literature identifies a limitation in sample size. For example, in book chapter contributions, Maritni et al. (2018) investigated three companies from one industry, while Jonäll and Sabelfeld (2018) examined two companies, again, from a single industry. These chapters provide snapshots and do not provide a true representation of the industry and country (Khan et al., 2020). Likewise, in journal publications, some samples are modest (e.g., Addison et al., 2019; Adler et al., 2018). For example, Atkins et al. (2018) examined only 41 organisations in South Africa; they recognise this limitation and recommend extending the sample to better understand the response to the extinction crisis. Hassan et al. (2020) extended upon prior global studies (e.g., Addison et al., 2018; Adler et al., 2018), however, to challenge or support arguments an extended sample would be desired. As a result, larger data samples should be considered to improve robustness and validity and enhance seminal B/E literature.

2.7.3 Sector

It is observed that a large quantity of publications are limited to a single industry or government setting (e.g., Samkin et al., 2014; Weir., 2018, 2019). For example, Gaia and Jones (2019) examined one institutional setting in the United Kingdom and generalised their results to other developed countries. High impact sectors which depend on and exploit natural capital received the most attention (e.g., Adler et al., 2017; Boiral and Heras-Saizarbitoria, 2017). As discussed, an argument has been built in the literature based on studies that compare the significance of industry sector and B/E disclosure. For example, some studies found a positive relationship between high impact sectors and disclosure (Hassan et al., 2020; Skouloudis et al., 2019), whereas other studies challenged this (Addison et al., 2019; Rimmel and Jonäll, 2013); therefore, further examination is required in this setting. In addition, researchers argue investigating reporting from GRI disclosure is inadequate for understanding rationale (Atkins and Atkins, 2018; Maroun and Atkins 2018), which has led to the emergence of alternative comprehensive frameworks (e.g., Adler et al., 2018; Atkins et al., 2018; Hassan et al., 2020) that expand upon the GRI framework, including species and biodiversity specific indicators. The literature has begun to adopt and implement these frameworks in small studies (e.g., Corvini et al., 2021; Zhao and Atkins, 2018), which have unearthed significant evidence of reporting that GRI disclosure may not capture. Thus, implementing these frameworks for potential research provides a fruitful opportunity to examine organisations in a larger context, industry, or country setting.

2.7.4 Country

It is evident from the previous discussion of the sample characteristics that studies of single countries from developed nations dominate B/E accounting literature. Therefore, there is a clear opportunity to examine practices of organisations from developing nations. A growing body of literature mentions organisations expand in developed countries, and consequently, developing countries receive limited attention. Nonetheless, further examination is encouraged in this context as an argument is building that pandemics such as COVID-19 are a consequence of close contact illegal wet markets and wildlife trade, which originate in developing nations (Johnson et al., 2020; Vidal., 2020). Furthermore, some developing nations harvest some of the world's wealthiest biodiversity. For this reason, understanding conservation and protection efforts in these countries may provide powerful insights. Additionally, global sample studies have begun to emerge (e.g., Adler et al., 2018; Hassan et al., 2020), however, further examination is required to deal with the limitations previously discussed.

2.7.5 Research methods

As discussed early, one of the main limitations in the extant literature is the dependence of secondary data on content analysis. In this analysis, only three studies contribute with interviews, and seven studies with a mixed method approach (interviews and content analysis). Therefore, there is an evident need for primary data analysis, which can arguably provide valuable understanding of organisational beliefs and motivations regarding the B/E crisis (Atkins et al., 2018). Interviews can capture rationale through discussion, expose information not publicly disclosed, and raise awareness (Khan et al., 2020). Specifically, interviews with executives, board members, and shareholders (Haque and Jones, 2020) can investigate future strategies, knowledge and understanding of the B/E crisis, and the given company's vision to align with the SDGs. Additionally, cultural influences are imperative to understand and explain the rationale behind developing solutions for a sustainable future.

2.7.6 Theoretical framework

By synthesising the literature, the analysis reveals that a rigorous theoretical framework is lacking in the extant literature. Indeed, there is a suggestion that research needs to move beyond the mainstream CSR theoretical frameworks (Cuckston, 2018a) to better understand the relationship between nature and accountability. Many studies lack a well-defined

theoretical framework, which is largely due to the embryonic nature of this stream of literature, i.e., some publications in this SLR are from ecological journals or are book chapters. In addition, the literature suggests that addressing the B/E crisis via collaboration between multi-discipline experts and accountants is essential in order to share knowledge and develop solutions (Jones and Solomon, 2013; Weir, 2018). Therefore, it is identified that there is opportunity to borrow and implement theoretical framing from other social science disciplines to support future studies. Furthermore, there is the potential to apply a theory triangulation, which is supported by Gaia and Jones (2019), who explain that a single theory is insufficient for rationalising results. As discussed earlier, legitimacy is the most employed theory in the existing literature. Other theories have begun to emerge, such as stakeholder, deep ecology, impression management, upper echelons, and greenwashing theories. Due to the emerging nature of this strand of research, these theoretical frameworks can be further employed in the context of potential research identified to contribute to the knowledge of B/E accounting.

2.7.7 Summary of limitations and potential research discussion

Based on the above discussion, the main gaps in the existing B/E accounting literature are identified through synthesising and analysing this SLR. Overall, it is observed that there are various opportunities to further understand the relationship between organisations and the biodiversity and species extinction crisis. Due to the new emergence of this literature, it is noted there is a relatively small body of work contributing to existing knowledge. Therefore, any contribution to challenge or support the extant literature, or extend it by employing the limitations identified here would indeed enhance knowledge and help develop solutions. A further limitation in research is the focus on a single species, such as Atkins et al. (2018) who studied the rhinoceros in the context of South African tourism, or Zhao and Atkins (2018; 2021), who investigated panda disclosure in China. The literature argues that attractive, higher profile species may garner greater protection than others, which indicates superficial endeavours to conserve nature, with organisations indulging in impression management. Studies from Adler et al. (2018) document species mentioned in reporting, but omit them in their analysis. Consequently, opportunity exists to qualitatively examine species disclosure to explain motivations in conservation efforts, and quantitatively examine what factors influence species disclosure. These are unquestionable fruitful avenues for potential research.

2.8 Conclusion

The objective of this chapter was to provide a rigorous SLR on B/E accounting in the context of organisational accountability. Through synthesising fifty-one research publications, books and chapters, these studies have been critically analysed to identify limitations and gaps in the current literature, and to determine underexplored avenues for future research. It is acknowledged due to the infancy of this stream of literature that the sample is limited. However, this synthesis presents valuable insights into the current body of knowledge. The results indicate that the AAAJ has been instrumental in advancing B/E accounting research. Publications peaked in 2018, with exponential growth expected as a consequence of COVID-19. The literature review has been presented and then critically analysed by categorising it in terms of location, methodology, and theoretical framework, which has then enabled an analysis of future research opportunities. The discussions reveal there are many potential avenues to explore.

In summary, research has focused on organisations from developed nations, unearthing the potential to explore organisations from developing nations and a need to conduct global, regional, or continental studies. There are abundant opportunities for industry or country specific research that uses larger samples to challenge, support and contribute to empirical studies. An opening also exists to challenge applied CSR theoretical framing (Cuckston, 2013), and implement theory triangulation (Gaia and Jones, 2019) to better explain results. Notably, the present literature distinctly lacks primary data in the form of interviews. Advanced insights to understand rationale and behaviour is critical to understand organisations regarding the B/E crisis and would enrich the literature (Atkins and Maroun, 2018; Talbot and Boiral, 2021). In addition, quantitative empirical research to investigate relationships, such as country governance influences and board and ownership characteristics, is essential. Furthermore, the influences of species-specific disclosure could undoubtedly explain motivations for conservation and particularly requires examination.

2.9 Empirical chapter development

The above discussion has deliberately identified and presented limitations within the current B/E literature, which subsequently influences and provides a rationale for the remaining chapters. Specifically, the SLR identifies a lack of empirical studies to examine factors which can influence companies to provide disclosure on B/E. Therefore, to narrow the knowledge gap and respond to the limitations outlined in section 2.7, the remaining chapters employ a sample

of the world's largest organisations over a five-year period, with an expanded dataset to empirically examine what motivates and influences firms to provide disclosure for B/E; this shall be accomplished as follows.

In the next chapter, the relationship between firms providing disclosure on their efforts to protect and conserve species and determinant factors, along with their motivations, is empirically examined. This chapter will extend the study of Roberts et al. (2021) and to the researcher's knowledge, will be the first examination of the relationship of species disclosure with biodiversity risk industries, and firms' self-reporting environmental fines. It is important to understand what motivates companies to report on species specifically, rather than statements on biodiversity, in the context of their efforts to conserve and protect them. Additionally, adopting a multi-theoretical framework, as suggested by Roberts et al. (2020) contributes to the extant literature and responds to limitations in theoretical frameworks (Gaia and Jones, 2019; Roberts et al., 2020). This chapter provides the answer to RQ2.

Chapter 4 purposely draws on an additional limitation discussed in section 2.7. To the researcher's knowledge, no studies have specifically examined the relationship between B/E disclosure and country level governance mechanisms. This can therefore offer valuable insights into what role external governance mechanisms (such as legal environment and culture background) play on B/E disclosure. To date, these insights are limited to CSR disclosure (e.g., Baldini et al., 2018; Gerged et al., 2020; Lu and Wang, 2021). By empirically testing a sample of Fortune Global companies, this study contributes to the B/E, corporate governance, and culture literature and can provide valuable understanding as to what motivates B/E disclosure. This chapter provides the answer to RQ3.

Finally, Chapter 5 empirically examines the effect of CEO characteristics on a firm's B/E disclosure. The wider accounting literature has examined the effect of the CEO characteristics on financial performance, CSR performance and earnings management (e.g., Haga et al., 2021; Jeong et al., 2021; Miller and Hambrick, 2006; Strike et al., 2015). To the best of the researcher's knowledge, by investigating a sample of Fortune Global firms, this study provides the first insights into the influence of the personal attributes of the CEO on B/E disclosure. This study contributes to the B/E and corporate governance literature and provides the answer to RQ4.

Chapter 3 - Factors influencing corporate species disclosure[5]

3.1 Overview

Exploring factors that may encourage companies to provide species disclosure is the main objective of this chapter, given it is important to understand what motivates companies to report on species specifically, rather than statements on biodiversity, in the context of their efforts to conserve and protect them. This chapter discusses the multi-theoretical framework, the research design, and presents the empirical results concerning the influencing factors which motivate companies to provide species disclosure. Hence, this chapter will provide the answer to research question R2.

This chapter is outlined as follows. Section 3.2 presents a discussion on the motivations for research on species disclosure. Section 3.3 discusses the relevant theories in the literature. Section 3.4 presents the hypotheses of the current study. Section 3.5 presents the research design, drawing on the variables' definitions and measurements in 3.5.1, empirical model in 3.5.2, statistical issues in 3.5.3, and sample and data collection in 3.5.4. Section 3.6 presents the results of the study. Specifically, 3.6.1 presents the descriptive statistics, 3.6.2 the correlation matrix, 3.6.3 the main empirical results, and 3.6.4 the additional analysis of the study. Finally, section 3.7 presents the concluding remarks.

[5] This chapter is based on the following published paper: Roberts, L., Nandy, M., Hassan, A., Lodh, S. & Elamer, A. (2021). Corporate accountability towards species extinction protection: Insights from ecologically forward-thinking companies, *Journal of Business Ethics*, pp.1-25.

3.2 Extinction accounting and species disclosure

The biodiversity and extinction (hereafter B/E) crisis is a defining challenge of our generation, with a strong economic case to urgently act (Dasgupta, 2021). The warning signs have been clear for years; the planet is in the midst of a sixth mass extinction (Ceballos et al., 2017; Pievani, 2014). The COVID-19 pandemic has highlighted humanity's fragile relationship with nature and has propelled the B/E crisis into the spotlight. Business activity is recognised as a key driver of the decline of biodiversity and species extinction (Hassan et al., 2020; Maroun and Atkins, 2018; Reade et al., 2015). There has been a stark realisation that healthy ecosystem services, which are underpinned by a healthy variety of species, are the lifeblood of business survival, as all economic activity relies on healthy biodiversity to supply goods and services (Deloitte, 2020; KPMG, 2020; IFC, 2021). Yet, despite business operations having a dependence on nature, the relationship between firms and species remains underexplored in the literature (Gaia and Jones, 2019; Roberts et al., 2020).

Thus, this study focuses on species disclosure from global companies and examines factors which may influence such disclosure. The examination of what motivates companies to conserve and protect species is underexplored in the literature, therefore, this will allow for a better understanding of why companies engage in preventing further B/E loss and can assist in achieving the SDG targets. The discussion in Chapter 2 has identified that B/E accounting literature is limited to understanding corporate behaviour towards biodiversity and relies on biodiversity disclosures to examine the relationship with determinant factors (e.g., Addison et al., 2019; Haque and Jones, 2020). Furthermore, a gap exists to specifically examine species disclosure and mechanisms which motivate such disclosure (e.g., assurance, partnerships, awards, fines, and industry). This study extends upon Roberts et al. (2021), who provided the first glimpse of species disclosure and findings that can enhance knowledge and open debate regarding what factors can motivate species protection. Therefore, this study seeks to contribute to the literature by examining species disclosure of the top 200 companies of Fortune Global over five years. Furthermore, the findings could incentivise firms to become ecologically conscious and provide an indication to policymakers of how to motivate companies to engage in conservation efforts.

The B/E crisis is part of the wider global environmental challenges facing humanity (Sobkowiak et al., 2020). As discussed in Chapter 2, various strategies to reverse planetary decline, such as the Aichi targets, have failed in addressing the climate and biodiversity

emergency (CBD, 2020). The most recent call to action is the SDGs, which have the vision to transform the planet by 2020, and specifically SDG 14 and 15, to conserve, protect, and prevent further marine, species and habitat destruction (UN, 2021). It is recognised that biodiversity loss is one of the top global risks (WEF, 2020), with predicted severe consequences to economic activity if transformational change is not made (Dasgupta, 2021). This motivates a response to calls to contribute to developing solutions for the B/E emergency (Gaia and Jones, 2019; Gibassier et al., 2020a; Roberts et al., 2020) and is significantly timely, as the COP15 post-2020 biodiversity framework strategy is approaching. Furthermore, the COVID-19 recovery includes valuing biodiversity (OECD, 2021), as it is suggested that infectious disease can originate from human encroachment on nature (Johnson et al., 2020 WHO, 2020).

B/E accounting is an emerging strand of literature, with seminal contributions in research stimulating the discussion of species protection by presenting extinction accounting frameworks (e.g., Atkins and Atkins, 2018; Atkins and Maroun, 2018) and biodiversity accountability (e.g., Adler et al., 2018; Boiral, 2016; Rimmel and Jonäll, 2013: Talbot and Boiral, 2021), which is further discussed in Chapter 2. The extinction accounting concept extends earlier biodiversity reporting to include the 'extinction' element due to the urgency of the crisis (Atkins and Atkins, 2018; King and Atkins, 2016). Since emerging studies (e.g., Raar et al., 2020; Roberts et al., 2020) have opened the debate regarding how B/E accountability can prevent further loss, this research builds on these bodies of work to empirically examine species disclosure and determine what factors influence such disclosure. Furthermore, Roberts et al. (2020) specifically identified the need for an examination of species protection disclosure to stimulate debate on how, why, and what influences such efforts to provide disclosure.

Based on the above discussion, the main objective of this study is to empirically examine what motivates firms to provide species disclosure. Specifically, by investigating ecologically conscious firms who have initiated efforts to conserve and protect species and their habitats by providing disclosure, and their relationship with determinant factors, this study makes a number of new contributions. First, this study extends the dataset of Roberts et al. (2021), who investigated species disclosure over three years. Second, this research uniquely investigates, to the best of the researcher's knowledge, the impact of industry and self-reported fines on species disclosure. These overall findings will improve our understanding of a firm's motivations for providing species disclosure and what mechanisms encourage such disclosure. Third, the empirical findings can assist decision-makers and policymakers to align with the SDGs and mitigate further B/E loss, which if not addressed, can have severe financial risk

consequences for business survival. Finally, this research contributes to the growing stream of B/E literature (e.g., Atkins and Maroun, 2018; Hassan et al., 2019; Zhao and Atkins, 2021), which desperately requires attention to contribute to developing solutions for sustainable development (Lambooy et al., 2018; Roberts et al., 2020).

3.3 Theoretical Framework

A number of theories have been employed to explain motivations in biodiversity and extinction disclosure. Chapter 2 discussed in detail (section 2.7.6) the theoretical frameworks applied in B/E studies. In summary, impression management, greenwashing, stakeholder, and legitimacy theory have been applied in the extant literature (e.g., Adler et al., 2017; 2018; Bhattacharyya and Yang, 2019; Talbot and Boiral, 2021). Moreover, Gaia and Jones (2019) suggest one single theory is limited in ability to explain B/E disclosures. Subsequently, Roberts et al, (2021) uniquely applied a multi-theoretical framework, namely legitimacy, deep ecology, and stakeholder theory to enhance and explain findings.

Therefore, in this study, Roberts et al. (2021) are followed and a multi-theoretical framework of legitimacy, deep ecology, and stakeholder theory is applied. Furthermore, a new dimension to stakeholder theory has been suggested, wherein species are of intrinsic value and are essential to business survival. Therefore, species should be considered the main stakeholder in their stakeholder groups, valuing them equally with other recognised stakeholders, such as employees, government agencies, customers, and non-government organisations (NGOs) (Jones, 1995; Schaltegger et al., 2017). In this vein, this multi-theoretical model is used to explain the relationship between species disclosure and determinant factors.

Stakeholder theory has been the theoretical basis of B/E literature (e.g., Rimmel and Jonäll, 2013; Samkin et al., 2014; Boiral and Heras-Saizarbitoria, 2017; Gaia and Jones, 2017; Rimmel, 2021). As the B/E crisis intensifies, it is observed that companies have not done enough to protect species from extinction. The recent COVID-19 pandemic highlights human how intrusion on nature may be one of the factors in zoonotic disease spill over (Ceballos et al., 2020). Stakeholder theory highlights how firms should consider the concerns of groups or individuals that are affected by or can affect their operations (Rimmel, 2021). In this context, species can be affected by operations leading to potential extinctions, and additionally, can

affect business operations as further species extinctions threaten the integrity of healthy biodiversity, which is fundamental for business survival. This argument justifies the rationale behind valuing species as stakeholders, since if companies continue to assault nature, they face material financial risk, given the evidence suggests the planet's natural resources will be unable to sustain humanity (WWF, 2018).

Complimenting the contribution of species to stakeholder theory is the deep ecological perspective. The deep ecology philosophy is that nature is viewed as having intrinsic value, with the intention to protect the diversity and richness of all living beings (Samkin et al, 2014; Naess, 1995). As discussed in Chapter 2 (section 2.6.4), deep ecology rejects anthropocentric shallow ecology, which assumes nature has value because it benefits and contributes to human satisfaction (Callicot, 1994; Thompson and Barton, 1994). For decades, human activity, including deforestation, extractive activities, poaching, illegal wildlife trade, the human population explosion, and the industrial revolution have contributed to a gargantuan loss of biodiversity (Jones, 2003; Samkin et al., 2014). Deep ecology, in its entirety, would oppose the use of all non-human life for consumption, however, profit seeking anthropocentrism has driven the planet to the tipping point. Therefore, there must be some value to the philosophy embedded to motivate a corporate shift in attitude towards biodiversity and species.

Gaia and Jones (2017) highlight that firms should refocus from profit-seeking capitalist objectives to a more balanced thinking that combines elements of deep ecology. Nonetheless, this does not dismiss the importance of a deep ecological stance on extinction (Atkins and Maroun, 2018). However, it is recognised it is unreasonable to assume a shift to complete deep ecology, since this would in fact disprove the use of any biodiversity for human satisfaction, which of course is extreme and impossible. Embedding deep ecology is not to put financial value on species, rather it is to engage in responsible behaviour by protecting and conserving species and habitats (Atkins and Atkins, 2018; Roberts et al., 2021).

Suggesting that firms should focus solely on protecting nature and that there is no need to generate financial returns to shareholders is unrealistic (Atkins and Maroun, 2018). Rather, corporate boards must be convinced to recognise that their responsibility includes stewardship of the natural world (Jones, 2004). As such, embedding deep ecology is driven by anthropocentrism in the business sense, as firms will likely only begin to value nature because of what it can provide to them. However, the mounting evidence for further biodiversity loss and species extinction threatens firms with material financial risk (PWC & WWF, 2020;

Deloitte, 2021) combined with the pandemic crisis, this may be the catalyst to change the present arrogant behaviour to a more balanced pragmatic framing. Furthermore, firms are facing increased consumer and stakeholder pressure. Unintentionally, firms are being forced to imbue elements of deep ecology and consider the value of species with the explosion of ecologically conscious consumers, who are beginning to revolutionize buying trends by demanding nature friendly products.

Legitimacy theory is the most applied theory in the literature to explain B/E disclosure (Roberts et al., 2020). The research argues biodiversity information is presented to fulfil the desires and expectations of stakeholders (Adler et al., 2017; Adler et al., 2018). Patten (2015) explains that firms facing environmental adversity intensifies the non-financial reporting to portray to stakeholders that the firm is managing the event. As the B/E crisis intensifies, it is anticipated that firms must meet external stakeholder pressures and legitimise activities to enhance their reputation and maintain their licence to operate (Adler et al., 2017; Bhattacharyya, 2014; Chen and Roberts, 2010; Gray et al., 1996; Rimmel and Jonäll, 2013). Legitimacy theory explains that companies are driven to provide more environmental information because of societal pressure (Cho and Patten, 2007; Patten, 2002). The omission of such information widens the legitimacy gap, which affects the firm's credibility (Patten, 2002). Samkin and Schneider (2010) discuss ways firms gain, maintain, repair, and include legitimising strategies to seek societal acceptance. Legitimacy theory provides the rationale that a firm's survival is as much its ability to sustain societal acceptance as it is to gain financial success. It is not surprising that firms disclosing B/E information are rife with legitimising activities due to their anthropocentric behaviour (Roberts et al., 2020).

The literature points out that legitimacy and stakeholder theories overlap in SER studies (Deegan, 2002; Gaia and Jones; 2017). Roberts et al. (2021) argue that due to the B/E crisis, species should be considered a main stakeholder in society. This aligns with the deep ecological concept that firms should recognise the intrinsic value of nature and engage in conservation efforts to protect and restore species and their habitats. By embedding deep ecology in corporate strategies, species should be respected as a main stakeholder, rejecting the human hierarchical anthropocentric profit-seeking objectives that have driven us to a planetary crisis (Gray and Milne, 2018).

There is mounting evidence that the planet is at a tipping point and in the midst of its sixth mass extinction, which is driven by anthropocentricism (e.g., Ceballos et al., 2020; WHO,

2021; WEF. 2021). Consequently, it is undisputed that radical change is required in anthropocentric trading; the message is clear, economic wealth and indeed human civilization is at risk if transformational change is not made to protect nature.

Based on the above theoretical discussion, no single theory alone can explain a firm's motivations. Therefore, a triangulation of theories is employed for this research: legitimacy, deep ecology, and stakeholder, with the added dimension of species to stakeholder theory, which can explain the relationship and motivation between species disclosure and determinant factors. It is recognised that firms may provide species disclosure as a legitimacy exercise, however, hopefully these firms are beginning to realise the intrinsic value of nature and the service that healthy biodiversity provides for business sustainability. Hopefully, providing species protection disclosure will become a model for firms to follow as they realise the inherent risks if they continue to apply the "business as usual" model. The application of a multi-theoretical framework (see Figure 3.1) can help us explain motivations to improve biodiversity impacts, which can help achieve economic stability, improve civilisation, and the SDGs.

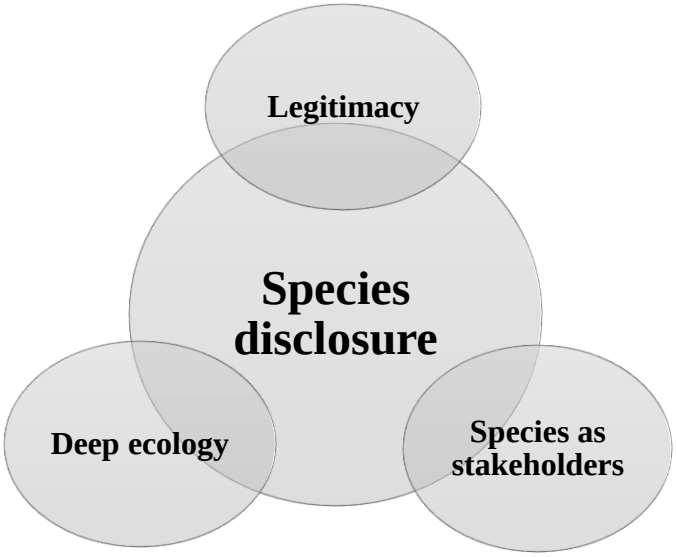

Figure 3.1 Multi-theoretical framework

3.4 Hypothesis development

In this section, the factors that may encourage firms to disclose species information are identified to develop the research hypotheses. The literature suggests biodiversity and

extinction accounting is an extension of corporate social responsibility (CSR) and social and environmental reporting (SER) reporting (Atkins et al., 2018; Bebbington and Larrinaga, 2014; Bhattacharyya and Yang; Hassan et al., 2020; Roberts et al., 2021). Existing CSR/SER literature identifies the factors that assist stakeholders to assess accountability towards nature, which are discussed below. Following previous studies, this study explores how external assurance providers, the presence of wildlife partnerships, gaining environmental awards, self-reporting environmental fines, and the biodiversity risk of industries drives the disclosure of species. These characteristics are discussed below to answer RQ2, which is also supported by the multi-theoretical model explained in section 3.3.

3.4.1 External assurance providers

It is long established in the literature that sustainability reporting is used to meet the needs of societal expectations (e.g., Junior et al., 2014; Kolk and Perego, 2010). However, the literature argues that the quality and reliability of information presented in such reports falls short and is used as a window-dressing activity to display companies as good corporate citizens (Boiral, 2016; Cho et al., 2015b; Gray, 2010). Therefore, to enhance the credibility of information, companies prefer to use third-party assurance to increase stakeholder confidence in reporting (Farooq and De Villiers, 2017; Kolk and Perego, 2010; Kuruppu and Milne, 2010; Peters and Romi, 2015; Maroun, 2018; Simnett et al., 2009). Firms facing public pressure due to poor environmental performance seek external assurance as the independence of the external provider signals better performance and trustworthy information to stakeholders (Boiral et al., 2018; Cho et al., 2014; Maroun, 2018). Empirical studies argue that companies provide voluntary environmental disclosure to gain legitimacy and signal that they are good corporate citizens (e.g., Cho and Patten, 2007; Cho, 2009; Patten, 2015; Giordano-Spring et al., 2015). Consequently, independent assurance can help deflect against negative biodiversity impacts from company operations, reduce legitimacy risks, and create confidence among stakeholders that the firm is conserving and protecting nature. Specifically, firms employ third-party assurance providers to portray the information released in reports as credible, reliable, and importantly, enhance their corporate reputation (Cho et al., 2014).

Some studies suggest that assurance from one of the big four accounting firms improves the reliability of information (Kolk and Perego, 2010; Martinez-Ferrero et al., 2016; Perego, 2019). However, some researchers suggest optimistic rhetoric, reassuring statements, and

accounting scandals questions the trustworthiness of third-party assurance. Although accounting scandals are more specific to financial transparency, sustainability assurance is usually conducted by the firm of the financial audit, with similar ethical issues which, with the intensified un-regulation of biodiversity issues may question its reliability (Boiral and Gendron, 2011; Boiral et al., 2019). Furthermore, consistent with legitimacy theory, firms may prefer to obtain 'low-quality' assurance with less scrutiny, which provides them the opportunity to dissociate and deflect from their harmful impacts to nature (Hassan et al., 2020). However, due to the severity of the B/E crisis and the economic impact of COVID-19, companies may engage in stewardship of protecting and conserving biodiversity with the realisation that they face material financial risk if the crisis declines further (Roberts et al., 2021). In this vein, hopefully, firms will embed ecological culture by regarding species as a main stakeholder. Therefore, in the future, B/E will become an intrinsic element of company reporting with assurance providers being expected to scrutinise a firm's impact on biodiversity.

The motivation for this hypothesis is to extend empirical studies that suggest assurance is a key mechanism in B/E disclosure. For example, Hassan et al. (2020) found an association with biodiversity disclosure and firms gaining assurance, and Roberts et al. (2021) who found a positive significant relation with species disclosed by firms gaining assurance. Due to the emergence of this strand of research and the importance of the B/E crisis, the first hypothesis of the study is:

> **H1:** There is a positive association between firms disclosing species information and buying assurance.

3.4.2 Environmental awards

Firms are motivated to acquire environmental awards, as this is an excellent way to portray themselves as responsible to stakeholders (Cho et al., 2015a; Deegan, 2002). By attaining awards, companies are showing initiative and true commitment to protecting the environment, which can be genuine or deceiving (Clarkson et al., 2008; Haniffa and Cooke, 2005). In the context of CSR reporting, investors may be influenced by firms gaining environmental awards, which can lead to favourable financial performance (Clarkson et al., 2011). In the context of B/E reporting, companies who are ecologically conscious can attain awards to confirm they value species as equals and are displaying initiative in efforts to protect and restore species and their habitats. The extant B/E literature suggests firms should report on awards and prizes concerning their efforts in conservation and showcase their genuine concern

for nature (Adler et al., 2018; Atkins et al., 2014; van Liempd and Busch, 2013). Furthermore, empirical studies find a positive relationship with biodiversity disclosure and environmental awards (Hassan et al., 2020) suggesting awards are an important mechanism in biodiversity disclosure. However, Roberts et al. (2021) examined species disclosure and found a negative statistical relationship with environmental awards. Therefore, there is motivation to further investigate this mechanism in species disclosure and it is expected that companies who gain awards do so as they are ecologically conscious and value species as stakeholders (Roberts et al., 2020). This leads to the second hypothesis:

> **H2**: There is a positive association between firms disclosing species information and gaining an award.

3.4.3 Partnership engagement

Empirical research has found a positive relationship between partnership engagement and a firm's biodiversity disclosure (Adler et al., 2018; Boiral and Heras-Saizarbitoria, 2017; Hassan et al., 2020). Partnership collaboration can play a key role as it encourages shared knowledge, provides expert advice, and can influence protection and conservation efforts (Jones and Solomon, 2013). Firms that collaborate with biodiversity and wildlife partners include but are not limited to the World Wildlife Fund for Nature (WWF), The International Union for Conservation of Nature (IUCN), Flora and Fauna International, Nature conservancy, and Oceana, which can all help firms to engage in protection activities and are therefore more likely to engage in reversing the B/E crisis (Adler et al., 2018; Roberts et al., 2021). This collaboration motivates firms to value species as a stakeholder and is consistent with deep ecology, wherein they are valuing their intrinsic worth, creating long-term value creation, and are aligning with the SDGs (Atkins et al., 2018: Büchling and Maroun, 2018; Zhao and Atkins, 2018). Furthermore, partnership collaboration can offer a public platform to showcase efforts which may be used to legitimise their impacts and initiate seeking public trust (Adler et al., 2018; Deegan, 2002). Indeed, such collaboration may be considered an initiative to greenwash with no real commitment intended (Clarkson et al., 2008). However, in light of the severity of the B/E crisis and the undeniable evidence that future business operations are at risk from further decline (e.g., WEF, 2020; WHO, 2020), ecologically conscious firms are valuing species with the collaboration of partnerships demonstrating a genuine concern for nature. Firms are required to pursue opportunities to mitigate risks and solve societal challenges through collaboration and innovation (UN, 2021). Thus, there is motivation to contribute to the

extant literature and empirically examine the relationship with firms who disclose species and partnership engagement. Based on the above theoretical argument, firms are displaying ecological concern and, therefore, the third hypothesis is:

> **H3:** There is a positive association between firms disclosing species information and partnership engagement.

3.4.4 Self-reported environmental fines

The environmental literature explains that self-reporting fines is not a mandatory requirement in reporting, however, stakeholders value firms that are forthcoming and transparently disclose fines and consider them truly committed to the environment (Clarkson et al., 2008; Rodrigue et al., 2013). Legitimacy theory explains that firms faced with environmental crises are expected to increase disclosure and reassure stakeholders that they are managing the violation (Patten, 2015). Therefore, it would be expected that firms who self-report environmental fines provide species information to maintain their licence to operate and gain societal acceptance (Adler et al., 2017; Adler et al., 2018).

Nonetheless, the B/E literature offers reporting frameworks and encourages the disclosure of negative or harmful impacts to biodiversity and species (Atkins and Atkins, 2018; Atkins and Maroun, 2018). Firms that receive fines from violating environmental laws or legislation by failing to protect threatened or endangered species should disclose fines in reporting, and, if the fine disclosure is *complimented* with an acknowledgement of extinction risk and detail of initiatives, partnerships and targets that need to be reviewed continuously, this can portray ecologically conscious behaviour going forward and drive organisational change to valuing species (Atkins and Maroun, 2018).

Consequently, the COVID-19 pandemic has highlighted how biodiversity loss is an influencing factor of infectious diseases, which poses risk to the global economy with governments factoring biodiversity into stimulus measures for recovery (OECD, 2021). Therefore, it is possible firms charged or penalised for issues relating to biodiversity violations, and illegal wildlife trafficking, may be prominent in future policies.

Haque and Jones (2020) empirically found a statistically insignificant relation between biodiversity disclosure and environmental violation incidents. To the researcher's knowledge, no study has examined the relation between species disclosure and self-reported environmental fines. Therefore, based on the above argument, there is motivation to empirically examine this

relationship. In line with legitimacy theory, it is expected that firms who self-report environmental fines will increase their species disclosure to narrow the legitimacy gap and gain the trust of stakeholders (Clarkson et al., 2008; Hassan et al., 2020). Furthermore, this would protect them from prominent environmental groups and stakeholders and allow them to operate with minimum interference (Adler et al., 2017).

> **H4:** There is a positive association between firms with self-reported environmental fines and species disclosure.

3.4.5 Industry

The relevance of the role of the industry sector's impact on biodiversity is argued in the literature. For example, some studies find a positive relationship with disclosure and firms who violate biodiversity the most (e.g., Bhattacharyya and Managi, 2013; Bhattacharyya and Yang, 2019; Hassan et al., 2020; Haque and Jones, 2020, Skouloudis et al., 2018). Conversely, some challenge this relationship with some research finding that industry affiliation is not a catalyst for disclosure (Addison et al., 2019). Furthermore, some researchers find that low-impact sector firms provide more disclosure than medium-impact firms (e.g., Rimmel and Jonäll, 2013; Adler et al., 2018). Based on legitimacy theory, industries with higher biodiversity impacts are expected to be subject to public expectations and scrutiny, and as a response, they would have a strong incentive to provide higher levels of disclosure (Bhattacharyya and Yang, 2019; Clarkson et al., 2008; Deegan and Gordon, 1996). This association has been reported in wider SER literature where extractive industries have more rigorous legal requirements, face political pressure, and are more environmentally damaging (Cho and Patten, 2007; Giordano-Spring et al., 2015; Patten, 2002).

Nonetheless, all industries, regardless of biodiversity risk, are expected to participate in achieving the SDGs and operate responsibly (UN, 2021). Thus, in the future, all firms, regardless of industry, must begin to embed ecological concern in governance strategies and value species. In the context of species disclosure and biodiversity industry risk, to the researcher's knowledge, no studies have investigated this relationship. Roberts et al. (2020) calls for investigation in this context to understand corporate motivations for species disclose. Hopefully, to mitigate the B/E crisis, future corporate reporting will demonstrate responsible behaviour towards biodiversity regardless of industry (UN, 2021). However, in line with prior research, it is expected that in order to legitimise operations, firms from high biodiversity risk industries must provide more species disclosure. This leads to the fourth hypothesis:

H5: There is a positive association between firms from high-risk biodiversity industries and species disclosure.

3.5 Research design

This section outlines the research design of the current study. Section 3.5.1 discusses the variable definitions and measurements. Section 3.5.2 presents the empirical model. Section 3.5.3 presents the statistical issues. Finally, section 3.5.4 presents the sample selection and data collection.

3.5.1 Variable definitions and measurements

This section provides the definitions of the variables employed in this study and explains how each variable is measured, with an accompanying description in Table 3.1. First, the dependent variable is defined, then the explanatory variables are presented.

Dependent variable

The dependent variable follows Roberts et al. (2021) and is the count of the number of species presented in a firm's annual report. Species were counted if referred to in qualitative terms by presenting names of species or quantitative terms. The total number of species disclosed in each report were recorded. This study argues that species disclosed by organisations are provided as they are engaging in efforts to protect them and their habitats. Only where efforts were presented to conserve, protect, and recognise species are threatened with extinction were they considered for data collection. If companies disclosed a group of species, for example, 100 fish, this was counted as 100, and so on. Duplicated species references were eliminated; in other words, the same species referred to at different areas in the report were only counted once. Furthermore, if companies mentioned the death or harm of species due to operations, these were excluded from the count.

Independent variables

The development of the independent variables are discussed in the hypotheses development section 3.4. The study considers the measure of assurance, referred to as *ASS*, which is measured using a dummy variable that has a value of 1 if a firm's report receives

assurance and 0 if otherwise. The measure of the firm's report receiving assurance from one of the big four accounting firms, referred to as *BIG4*, is measured using a dummy variable, with the value of 1 and 0 if otherwise. The measure of companies receiving environmental awards, referred to as *AWARD*, is a dummy variable with the value of 1 if the firm gains an environmental award and 0 if otherwise.

The measure of the presence of biodiversity or wildlife partnership engagement, referred to as *PARTNER*, is measured using a dummy variable with the value of 1 if partnership engagement and 0 if otherwise. The measure of a firm's self-reporting environmental fines, referred to as *SelfFines*, is measured using a dummy variable with a value of 1 if the firm reports fines and 0 if otherwise. The measure of industry is classified by biodiversity impact risk according to the F & C Asset Management Report (2004). The report classifies industries into three risk-level categories (red-zone, amber-zone, and green zone) and is employed in prior studies (e.g., Adler et al., 2018; Hassan et al., 2020; Rimmel and Jonäll, 2013). Further, we follow Hassan et al. (2020) who group red and amber into "high-risk-zone", and green to "low-risk-zone". The variable referred to as *INDUSTRY* is measured using a dummy variable with the value of 1 if high-risk-zone and 0 if low-risk-zone. Prior empirical studies argue whether or not high or low risk industries significantly influence biodiversity and species disclosure. The literature argues that high-impact sectors provide more information to legitimise activities (e.g., Hassan et al., 2020; Skouloudis et al., 2019), whereas other empirical analyses challenge this argument finding biodiversity impact risk industries does not influence disclosure (e.g., Addison et al., 2019; Rimmel and Jonäll, 2013). Furthermore, Roberts et al. (2020) calls for further empirical studies to explore this relationship in the context of global organisations. Therefore, this justifies the selection of this variable.

Governance

The six dimensions of the "World Governance Indicators" can provide insightful information and significant correlations (Elamer et al., 2017; Gerged et al., 2020). Kaufmann et al. (2011) identified the six dimensions developed by the World Bank. These, indicators are widely applied in multi-country research (Nguyen et al., 2015; Waldron et al., 2017) with empirical research reporting a positive correlation with country-level governance and firm performance (Luo et al., 2012). Roberts et al. (2021) found a significant relation with species disclosure and governance indicators, therefore, this variable is included. Additionally, country-level World Development Indicators (WDI), such as $C0_2$ emissions, forest area (per

square km), GDP annual percentage growth, and inflation are included. These indicators are similarly employed in empirical studies that find significant results (Stephan et al., 2015; Spaiser et al., 2017; Roberts et al., 2021).

Table 3.1 Summary and definitions of variables

Variable	Definitions and coding	Source of measurement
Dependent variable		
NoSpecies	Is the count of number of species collected from company annual reports.	Roberts et al. (2021).
Independent variables		
Assurance	1, if company report has assurance, 0 otherwise.	Hassan et al. (2020).
Big4	1 if audited by one of the big four accounting firms (KPMG, E&Y, PwC, or Deloitte), 0 otherwise.	Gerged et al. (2020), Kolk and Perego (2010).
Award	1, if an environmental award is given, 0 otherwise.	Hassan et al. (2020), Roberts et al. (2021).
Partner	1, if company affiliates with biodiversity/wildlife partnerships, 0 otherwise.	Adler et al. (2018), Hassan et al. (2020).
SelfFine	1, if a company self-reports environmental fine, 0 otherwise.	Clarkson et al. (2008). (ASSET4)
Industry	1, if company industry is classified as red/amber risk industry, 0 if green risk industry. Classification by F & C (2004).	Hassan et al. (2020), Roberts et al. (2021).
Control variables		
Governance	Is the average score of WGI: voice & accountability, political stability, government effectiveness, regularity quality, rule of law, control of corruption.	Kaufmann et al. (2011), Luo et al. (2012).
GDPGrowth	GDP annual growth percentage from World Development Indicator.	Stephan et al. (2015), Waldron et al. (2017).
Inflation	Inflation - GDP deflator (annual %) World Development Indicator.	Elamer et al (2020), Roberts et al. (2020).
ForestArea	Log (Forest area) - Forest areas (sq. km) - World development indicator.	Stephan et al. (2015), Roberts et al. (2021).
C02Emission	CO^2 emission - (metric tonnes per capita)- World Development Indicator.	Spaiser et al. (2017).
SIZE	Natural logarithm of total assets for firm *i* in year *t* (Worldscope WCO2999).	Abdelfattah et al. (2020), Bhattacharyya and Yang (2019), Hassan et al. (2020).
Leverage	Measured by total debt divided by total assets. (Worldscope WCO3255;WCO3501).	Elmagrhi et al. (2018), Haque & Jones (2020).
ROA	Return on assets measured by operating income divided by total assets.	Abdelfattah et al (2020), Elamer et al. (2020).

The sample is classified into developed and developing nations according to the United Nations classification. This follows prior literature (Hassan et al., 2020; Roberts et al., 2021).

A firm from a developed nation is measured using a dummy variable with a value of 1, and a firm from a developing nation is measured with a value of 0. The sample consists of 689 firm-year observations from developed countries and 267 firm-year observations from developing countries.

Control variables

Finally, the models contain the control variables of size, leverage and return on assets. Financial variables are employed as control variables in a stream of biodiversity and wider environmental accounting research (e.g., Abdelfattah et al., 2020; Bhattacharyya and Yang, 2019; Clarkson et al., 2011; Elamer et al., 2020; Elmagrhi et al., 2018; Haque and Ntim, 2018; Haque and Jones., 2020; Hassan et al., 2020). Firm *Leverage* is measured by total debt/total assets. The firm's *Size* is the natural logarithm of the firm's total assets. The firm's return on assets, referred to as *ROA*, is measured by the firm's operating income/total assets.

3.5.2 Empirical model

The following model is developed to test the hypotheses related to the relationship between the number of species disclosed and determinant factors. These hypotheses are H1, H2, H3, H4, and H5. The regression model is specified as:

$$\begin{aligned} \text{NoSpecies}_{it} = {} & \boldsymbol{\beta_0}_{it} + \boldsymbol{\beta_1}\ \text{ASS}_{it} + \boldsymbol{\beta_2}\ \text{BIG4}_{it} + \boldsymbol{\beta_3}\ \text{AWARD}_{it} + \boldsymbol{\beta_4}\ \text{PARTNER}_{it} + \boldsymbol{\beta_5} \\ & \text{SelfFine}_{it} + \boldsymbol{\beta_6}\ \text{Industry}_{it} + \boldsymbol{\beta_7}\ \text{GDPGrowth}_{it} + \boldsymbol{\beta_8}\ \text{Inflation}_{it} + \boldsymbol{\beta_9}\ \text{CO2Emission}_{it} + \boldsymbol{\beta_{10}} \\ & \text{ForestArea}_{it} + \boldsymbol{\beta_{11}}\ \text{Governance}_{it} + \boldsymbol{\beta_{12}}\ \text{ROA}_{it} + \boldsymbol{\beta_{13}}\ \text{Leverage}_{it} + \boldsymbol{\beta_{14}}\ \text{Size}_{it} + \text{Year Fixed} \\ & \text{Effect} + \text{Country Fixed Effect} + \boldsymbol{\varepsilon} \end{aligned} \qquad (3.1)$$

In the equation 3.1, *NoSpecies* is the total count of all species disclosed in reports of sample firm *i* in year *t*. Where, *ASS* refers to assurance *BIG4* refers to assurance from one of big four accounting firms, *AWARD* refers to environmental award, *PARTNER* refers to biodiversity/wildlife partnerships, *SelfFine* refers to self-reported environmental fines, *INDUSTRY* refers to if the firm is a high or low risk biodiversity intensive industry, and *Governance*, *GDPGrowth, Inflation, CO2Emission, ForestArea* refers to country level data. *ROA* refers to return on assets, *Leverage* refers to total debt/total assets, *Size* refers to the size of the firm, *it* period indicators, $\boldsymbol{\beta_0}$ the regression intercept, and $\boldsymbol{\varepsilon}$ the error term.

3.5.3 Statistical issues

This study employs the Poisson regression model because the dependent variable is a count of the number of occurrences of species. This follows similar studies that employ Poisson regression, as it is the most appropriate method to reflect count data in a fixed period of time (e.g., Coxe et al., 2009; Lambert, 1992). The literature supports the notion that using count variables in ordinary least squares (OLS) regression may pose problems and may be unstable (Cohen et al., 2003). Initially, the model was ran in OLS regression and encountered such problems. Therefore, the Poisson model seems appropriate for the data.

To address any heteroskedasticity issues, related studies were followed (e.g., Haque and Jones, 2020; Roberts et al., 2021), and as such, the present study uses a year and country fixed-effect regression model to address the effect of unobservable or omitted variables bias (Alshbili et al., 2019; Elamer and Benyazid, 2018). The fixed-effect model is appropriate, as data allows you to control for unobtainable variables. The statistical software STATA is selected to perform the empirical analysis.

3.5.4 Sample selection and data collection

The present study examines the sustainability reports of the top 200 companies of the Fortune Global 2016 list over five years. The sample is selected for the following reasons. Firstly, as discussed in the SLR, there is a limitation in the literature examining corporate organisation's disclosure on B/E on a global scale. Secondly, these companies are the world's largest companies by revenue, and are typically leaders in sustainability reporting, which often predict trends (KPMG, 2020). Therefore, the sample of the world's largest organisations, as leaders in sustainability reporting, seems appropriate. Previous biodiversity studies (e.g., Adler et al., 2018; Bhattacharya and Managi, 2013) and a stream of environmental and CSR studies (e.g., Cho et al., 2015a; Junior et al., 2014; Kim and Nam, 2012; Kolk and Perego, 2010; Kunz, 2016) employ a sample of Fortune Global companies for this reason. The choice of the top two hundred companies is supported by the literature, since the remaining companies rarely disclose information on biodiversity as it is considered in its infancy (Addison et al., 2018; Adler et al., 2018; Hassan et al., 2020). Third, as the world's largest organisations, Adler et al. (2018) suggest they are expected to make the most significant impact on biodiversity, and gain the most attention from the public, media, and non-government organisations (NGOs). Furthermore, the sample extends prior studies to investigate a longer time series of five years,

as other B/E studies rely on one or three years (e.g., Addison et al., 2019; Adler et al., 2018; Hassan et al., 2020; Roberts et al., 2021). Fourth, these companies represent different industries with various levels of impact risk to biodiversity and are from a variety of countries (Addison et al., 2020; Bhattacharya and Managi, 2013).

The sample period covers the years 2012, 2014, 2016, 2018, and 2020. This follows the literature, that due to the early development of B/E reporting, there is no significant increase in reporting found by year (Hassan et al., 2020). Furthermore, this time series includes the most recent data available at the time of analysis. Corporate sustainability reports were downloaded from company archives, and if these were unavailable, from the GRI Sustainability Reporting database, a method employed in previous studies (Boiral, 2016; Boiral and Heras-Saizarbitoria, 2017). Sustainability reports can be presented as environmental, social, citizenship, or equivalent. Integrated reports are another method for reporting. Where companies did not produce a sustainability (or equivalent) or integrated report, annual reports were studied for biodiversity and species information. Following prior research (e.g., Addison et al., 2019; Cho et al., 2015b) websites were not included, as there is uncertainty regarding when they are updated. A company was excluded if their reporting format was missing or if it was not possible to translate the report into the English language. In total, 44 companies were excluded. The final sample consisted of 956 firm-year observations.

Content analysis was used to collect information from sustainability reports. Content analysis is an analytical technique to systematically analyse and code qualitative data (Bryman and Bell, 2011; Krippendorff, 1980; Saunders et al., 2019). Specifically, it is a "research technique for objective, systematic and quantitative description of the manifest content of communication" (Berelson, 1952, p.18). The method is widely applied in SER literature to analyse an organisation's value through annual reports and make replicable and valid inferences (e.g., Clarkson et al., 2011; Deegan and Gordon, 1996; Patten 2002). Content analysis can be conducted automatically or manually. Manual content analysis is conducted by the researcher by reading the text, and is regarded as a precise method that is feasibly replicated (Klaus, 1980). One limitation recognised here is that it can be time consuming, which may restrict sample size, causing weaker generalizability (Beattie and Thomson, 2007). Automated content analysis is advantageous, as due to the speed, it can facilitate a larger sample, therefore providing more robust reliability and generalizability (Hassan and Marston, 2010). However, this method also has limitations, since if isolated keywords are applied, results can be misleading as the context of the sentence may be ambiguous (Beattie and Thomson, 2007).

There is a concern about the reliability of content analysis in SER literature (Milne and Adler, 1999). Specifically, as corporate reports present voluntary information and are written with a distinct purpose for a target audience, they are criticised as using legitimising and impression management techniques (Smith et al., 2019). However, Adler et al. (2017, p.1720) states "it is an effective technique for collecting and evaluating data from voluntary disclosure". Content analysis is found to be the most applied research method in B/E literature (Roberts et al., 2020) with both manual (Skouloudis et al., 2019) and automatic applications (e.g., Boiral, 2016; Rimmel and Jonäll, 2013).

As explained in section 3.5.1, the main variable is a count of the number of species disclosed in the corporate report, which could be disclosed by specifically naming particular species or providing a count of species. Due to the abundant variety of species, the researcher believed it was correct to manually collect data to ensure a comprehensive, precise encapsulation of species information. Additionally, the objective was to analyse species conserved or protected, therefore, the context and language of the disclosure was distinctly important. As such, an interpretation of the disclosure was the first step of the process, similar to prior studies (e.g., Atkins et al., 2018; Roberts et al., 2021; Zhao and Atkins, 2021).

Consequently, the manual content analysis method is employed in this research. The researcher acknowledges the limitation in the reliability of corporate reports, however, due to the infancy of this topic, to the best of the researcher's knowledge, no database or alternative method exists to collect species disclosure. Furthermore, this study extends the dataset of prior studies (Roberts et al., 2021), which therefore justifies the choice and validity of the method.

The manual content analysis technique consisted of searching by keywords, a method which is employed in studies to highlight areas in the report (Adler et al., 2018; Hassan et al., 2020, Roberts et al., 2021). To ensure all information was captured, the following 28 keywords were searched: "Extinct", "Extinction", "EN11", "EN12", 'EN13", "EN14", "Wildlife", "Habitat", "Species", "Biodiversity", "Biodiversity offset", "Forest", "Ecosystem", "Flora", "Fauna", "Endangered", "Threatened", "Vulnerable", "Accident" (relating to B/E), "Conservation", "Biological diversity", "Protected", "Floral/Faunal wealth", "Rehabilitation", "Groundwater", "Marine", "Vegetation", and "Wetlands" (Adler et al., 2018). Then, these sections were searched for species disclosure, where, if present, species were counted if they were considered protected or conserved. The final step was to manually read the report to ensure no omission of species.

The final sample consisted of companies from twenty-two countries, including Germany, Japan, Mexico, Russia, Switzerland, Thailand, United Kingdom, and the USA. The sample represents companies from a variety of industries. Refinitiv is used to access the Worldscope and ASSET4 database to collect financial and environmental variables.

3.6 Results

This section reports and discusses the results of this study. First the descriptive statistics are reported in section 3.6.1. Then, the correlation analysis is displayed in section 3.6.2. Next, in section 3.6.3, the regression results are reported and discussed. Finally, 3.6.4 presents further analysis.

3.6.1 Descriptive statistics

The results shown in Panel A of Table 3.2 show that 683 out of 956 company reports (71%) fail to disclose any species. These low disclosures support the findings of Roberts et al. (2021), who report similar results. Equally, empirical studies examining biodiversity disclosures report that the majority of companies do not provide information on efforts to protect and restore biodiversity, and what disclose does exist, is symbolic, vague, and manipulated to signal responsible corporate behaviour (Adler et al., 2018; Atkins et al., 2014; Bhattacharya and Managi, 2013; Talbot and Boiral, 2021; van Liempd and Busch, 2013). Considering these are the world's largest organisations, with the greatest impact on biodiversity, and are the leaders in sustainability reporting (KPMG, 2020), this is result is extremely low.

Table 3.2 Species disclosed by year and company

Panel A.	**Sum of companies who provide species disclosure**	
Species disclosed in sample	Frequency of companies	Percent
No	683	71.44
Yes	273	28.56
Total sample	956	100.00

Panel B. Species in sample disclosed by year		
	(1)	(2)
Year	Number of species disclosed	Number of species disclosed (winsorized)
2012	191	191
2014	3664	3664
2016	630	630
2018	9275	9275
2020	1,024,849,944	51,080

However, it is unsurprising, considering the current B/E crisis, that companies are failing to realise the intrinsic worth of nature to business operations. Furthermore, due to the recognised threat to business sustainability (Dasgupta, 2021), the consequences of a continued lack of conservation effort suggests companies will face material financial risk (Atkins and Atkins, 2018). Nevertheless, this study focuses on the remaining 273 (29%) ecologically conscious companies that are providing species information. These companies are demonstrating that they are engaging in conservation efforts to protect species and habitats with a deep ecological perspective.

The number of species disclosed by companies were extremely sporadic and varied. Column 1 in Panel B of Table 3.2 presents the breakdown of species disclosed by year. Column 1 indicates that in 2020, over 1 billion species were protected or conserved, which is an incredible amount. However, this is due to six companies disclosing an extreme number of species, which does not accurately generalize the practice of the sample. Therefore, the dependent variable is winsorized to deal with these extreme natural outliers, as presented in

column (2) of Panel B. The results in both columns indicate an increase in species disclosure over the period of study. There is a decrease of species disclosure in 2016, however, 2020 sees a colossal increase in species disclosure. This optimistically implies companies are shifting to a deep ecological perspective, with companies beginning to realise their dependence on healthy ecosystems. The announcement of the SDGs in 2015 may explain the sudden increase.

It is acknowledged that a small percentage of the sample is reporting on species. Nevertheless, due to the recognition that the B/E crisis is urgent (WEF, 2020; WHO, 2020) and the call of Roberts et al. (2020) to investigate species disclosure and what motivates companies to provide such disclosure, this justifies the significance of results.

Table 3.3 presents a summary of the statistics of all the variables. The average number of species disclosed is around 1 million per firm (of the 29% that disclosed) with a maximum number of species of 960 million.

Table 3.3 Descriptive results

Variable	N	Mean	SD	Min	Max
NoSpecies	956	1,072,033	31,100,000	0	960,000,003
Assurance	956	0.648	0.477	0	1
Big4	956	0.399	0.490	0	1
Award	956	0.190	0.392	0	1
Partner	956	0.274	0.446	0	1
SelfFine	956	0.097	0.296	0	1
Industry	956	0.337	0.472	0	1
GDPGrowth	778	2.812	2.386	-3.3	8.2
Inflation	778	1.659	1.552	-1.5	10.3
C02Emission	583	7.201	6.18	0	20.1
ForestArea	778	1,724,075	1,669,913	159.3	8,153,116
Governance	782	0.847	0.789	-1.61	1.836
ROA	888	0.705	15.88	-1.119	471.439
Leverage	874	0.582	5.517	0.002	153.883
Size	911	19.814	2.301	9.830	26.647

Note: Please see Table 3.1 for variable definitions.

As explained above, this result is due to extreme numbers disclosed by six companiesand it would be unrealistic to conclude this is a true reflection of all firms. Therefore, the winsorized results indicates a more representative account for species disclosure, which implies firms are protecting an average of 72 species each, with a maximum number of species disclosed by a company of 4505. However, there is a significant difference in reported species amongst firms. As such, very few companies are realising their direct or indirect impact on species and their habitats.

For all other variables (dummy variables), the summary statistics imply on average of around 0.65% of reports which disclose species information are assured *(Assurance),* with around 0.40% of reports assured by a big four auditor *(Big4).* Furthermore, only 0.19% of firms report environmental awards (*Award),* and 0.27% report partnership collaboration (*Partner).*

Additionally, self-reported environmental fines are only disclosed on average in 0.09% reports (*SelfFine).* Overall, these results are similar to Roberts et al. (2021) and have slightly increased.

Furthermore, the dependent variable, the number of species disclosed by firms, referred to as (*NoSpecies*), is analysed by industry and country classification[6]. Table 3.4 indicates companies from developing nations disclose more species information than those from developed nations. This finding is consistent with Roberts et al. (2021) who report similar results and supports the argument that developing nations encroach nature with wet markets and illegal wildlife trade, initiating zoonotic diseases which lead to pandemics such as COVID-19 (Ceballos et al., 2020: Ma et al., 2020). Legitimacy theory explains that these firms would provide such disclosure to enhance the reputation and maintain social legitimacy.

Table 3.4 Number of species disclosed by industry and country classification

	Variable	Obs.	Mean	Std. dev.	Min.	Max.
Developing	NoSpecies	267	3,846,331	58,900,000	0	96,000,003
Developed	NoSpecies	689	2524.742	45,709.	0	890,002
Red/amber industry	NoSpecies	323	3,182,693	53,000,000	0	96,000,003
Green industry	NoSpecies	633	57.64297	884.3327	0	21,709

Furthermore, Table 3.4 indicates firms from high and medium biodiversity impact industries disclose more species information than those from low impact industries. This result is consistent with the F & C Report (2004) and is supported by the expectations of legitimacy theory - that these firms have a greater need to report as they face more scrutiny and public concern (Bhattacharyya and Yang, 2019; Deegan and Gordon, 1996). This rejects a deep-ecological concern and valuing species as stakeholders. This also supports the B/E literature, which confirms higher impact industries disclose more biodiversity disclosure (e.g., Hassan et al., 2020; Skouloudis et al., 2019). However, this is the first insight into industry impact on species disclosure and is therefore an important contribution to the literature.

[6] These results are the same when winsorizing the number of species disclosure.

3.6.2 Correlation matrix

Table 3.5 provides the correlation matrix of all variables in the study. This is to identify if there is a presence of high correlation between variables, which may cause multicollinearity problems (Gujarati and Porter, 2009) and affect the reliability of results. The Pearson correlation detects any multicollinearity problems. The literature states that multicollinearity is considered if a correlation is more than 0.80. (Gujarati and Porter, 2009; Haniffa and Cooke, 2005). Thus, there is an acceptance of correlation coefficients if it is less than 0.80. Initially, ROA and Leverage were 0.9, therefore, these variables were orthogonalized. Table 3.5 indicates a maximum of 0.6 as a correlation coefficient, with the remaining coefficient levels being low, implying there are no multicollinearity problems.

Additionally, the correlation matrix is used to measure the intensity of the linear relation between variables (Collis and Hussey, 2014). The results indicate a low positive correlation with *NoSpecies* and *Assurance, Big4, Partner, Industry*, and *Inflation*. It also indicates a low negative correlation with *NoSpecies* and *AWARD, Selffines, GDPGrowth, CO2Emissions, ForestArea* and *Governance*.

Table 3.5 Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) NoSpecies	1.00														
(2) Assurance	0.03	1.00													
(3) Big4	0.04	0.60*	1.00												
(4) Award	-0.01	0.15*	0.07*	1.00											
(5) Partner	0.06	0.10*	0.07*	0.20*	1.00										
(6) SelfFine	-0.01	0.07*	-0.02	0.06	0.16*	1.00									
(7) Industry	0.05	0.02	-0.03	0.12*	0.22*	0.21*	1.00								
(8) GDPGrowth	-0.04	-0.19*	-0.10*	-0.09*	-0.22*	-0.13*	0.02	1.00							
(9) Inflation	0.00	-0.03	0.03	0.02	0.05	0.07*	0.11*	0.06	1.00						
(10) C02Emission	-0.06	-0.02	-0.10*	-0.06	-0.07	0.07	-0.03	-0.06	-0.04	1.00					
(11) ForestArea	-0.04	-0.19*	-0.10*	-0.03	-0.03	0.14*	0.02	0.17*	0.63*	0.26*	1.00				
(12) Governance	-0.03	0.14*	0.07	0.03	0.16*	0.09*	-0.08*	-0.67*	-0.35*	0.18*	-0.33*	1.00			
(13) oROA	0.00	-0.04	-0.03	-0.02	0.05	-0.01	0.06	0.00	-0.03	0.01	-0.03	0.03	1.00		
(14) oLeverage	0.00	0.05	-0.04	-0.04	-0.06	-0.03	0.09*	0.13*	0.02	-0.01	0.06	-0.15*	0.00	1.00	
(15) Size	0.05	0.09*	0.09*	0.12*	0.00	-0.07*	-0.17*	-0.07	-0.01	-0.14*	-0.12*	-0.22*	-0.16*	-0.10*	1.00

*** *p<0.01*, ** *p<0.05*, * *p<0.1*. The variables are defined in the variable description table 3.1.

3.6.3 Empirical results

Table 3.6 reports the fixed-effect Poisson regression to explain the number of species disclosed by firms and related influencing factors. In column 1 of Table 3.6, the model is estimated with Poisson regression with year and country fixed effects. In column 2 of Table 3.6, the model is presented with Poisson Multilevel regression, with year and country fixed effects[7].

The coefficient of firms gaining assurance on their annual sustainability reports *(Assurance)* in column 1 and 2 of Table 3.6 is positive and statistically significant (Column 1: $\boldsymbol{\beta}$=2.883, p<0.01; Column 2: $\boldsymbol{\beta}$=2.883, p<0.01, respectively). This result offers support for H1 and implies firms that gain assurance on annual sustainability (or equivalent) reports provide greater species disclosure than those firms who do not receive assurance. This supports empirical studies (Hassan et al., 2020, Roberts et al., 2021) with research suggesting assured information is deemed more trustworthy, which narrows the legitimacy gap (Cho et al., 2015a; Maroun, 2018). Specifically, from a deep ecological perspective, assurance can be considered a mechanism to value species as stakeholders and support companies in preventing further biodiversity decline and species extinction. A stream of CSR literature argues assured information is unreliable, is used to enhance the credibility of a firm's operations to its stakeholders, with firms providing voluntary information to gain legitimacy (e.g., Boiral et al., 2018; Cho, 2007; Cho and Patten, 2007; Maroun, 2018). Nonetheless, in the context of disclosing efforts to protect and conserve species, this implies firms are embedding a deep ecological perspective with an awareness of the intrinsic value of nature (Samkin et al., 2013). Furthermore, these findings have implications for policymakers, as it is expected that mechanisms such as assurance on biodiversity may be become a fundamental component of company reporting to achieve the SDGs and the possibility of impending frameworks at the UN COP15.

Furthermore, if the assurance is provided from one of the big four accounting firms, it is considered. The coefficient of firms gaining assurance for their annual sustainability reports from one of the big four accounting firms *(Big4)* in column 1 and 2 of Table 3.6 is positive and statistically significant (Column 1: $\boldsymbol{\beta}$=1.304, p<0.01; Column 2: $\boldsymbol{\beta}$=1.304, p<0.01,

[7] Additionally, the model is estimated with Censored Poisson regression and the results remain the same. Please refer to Appendix 4, Column 1.

respectively). This implies firms with reports audited by one of the big four accounting firms provide more species information than those firms who do not. Specifically, these findings indicate auditors from these accounting firms are advising firms that they face reputational and material financial risk in the future if the B/E crisis is not responsibly addressed (Deloitte, 2021; PWC & WWF, 2020). Theoretically, this supports deep ecology by valuing species for their intrinsic worth to healthy biodiversity, which companies fundamentally depend on. It is expected with the economic impact from the COVID-19 pandemic and the suggestion such diseases are linked to the destruction of natural habitats (Ceballos et al., 2020; Johnson et al., 2020) that disclosure will increase. Therefore, these auditing firms play a crucial role in advocating the protection of species from extinction and achieving the SDGs (Roberts et al., 2021). Furthermore, these results support the CSR literature that big auditing firms play a relevant role in CSR reporting (Clarkson et al., 2019; Pucheta-Martinez et al., 2019), however our results challenge the findings of Roberts et al. (2021) who found that the opposite is true.

Table 3.6 Poisson regression and Multilevel Poisson regression of the relationship of species disclosure and determinant factors

NoSpecies	Poisson regression (1)	Poisson Multilevel regression (2)
Assurance	2.883***	2.883***
	(26.89)	(26.89)
Big4	1.304***	1.304***
	(23.42)	(23.42)
Award	-1.181***	-1.181***
	(-23.43)	(-23.43)
Partner	1.721***	1.721***
	(36.60)	(36.60)
SelfFine	1.304***	1.304***
	(9.70)	(9.70)
Industry	0.222***	0.222***
	(5.32)	(5.32)
GDPGrowth	-1.408***	-1.408***
	(-21.74)	(-21.74)
Inflation	0.164***	0.164***
	(6.28)	(6.28)
C02Emission	0.307***	0.307***
	(13.09)	(13.09)
ForestArea	0.000***	0.000***
	(9.77)	(9.77)
Governance	3.684***	3.684***
	(30.59)	(30.59)
oROA	-20.373***	-20.373***
	(-6.03)	(-6.03)
oLeverage	-30.540***	-30.540***
	(-93.33)	(-93.33)
Size	-1.276***	-1.276***
	(-56.24)	(-56.24)
_cons	-1.492***	-1.492***
	(-3.04)	(-3.04)
Year	Yes	Yes
Country	Yes	Yes
N	545	545
R^2		
adj. R^2		

t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Column (1) presents Poisson regression with year and country fixed effects Column (2) presents Multilevel Poisson regression with year and country fixed effects.

H2 predicts firms gain environmental awards to showcase their efforts in protecting nature, and by doing so, narrow the legitimacy gap. However, the coefficient of firms gaining

environmental awards *(Award)* in column 1 and 2 of Table 3.6 shows a negative significant result (Column 1: $\boldsymbol{\beta}$=-1.181, p<0.01; Column 2: $\boldsymbol{\beta}$=-1.181, p<0.01, respectively). This surprising result contributes to the argument building in the literature that gaining an environmental award is an influencing factor in B/E disclosure. Deep ecology would expect that companies who endeavour to protect species and value them as stakeholders would attain awards to showcase their efforts to signal responsibility (Hassan et al., 2020). This result may also imply achieving awards to gain legitimacy is not the intended motivation, conversely, the motivation is deep-ecological concern to species, which should not be a rationale to gain legitimacy. These results are consistent with Roberts et al. (2021) and challenge the influence of environmental awards in B/E literature, which suggests awards are a motivation for biodiversity protection (Adler et al., 2018; Atkins et al., 2014).

The coefficient of firms engaging with wildlife or biodiversity partnerships *(Partner)* in column 1 and 2 of Table 3.6 is positive and statistically significant (Column 1: $\boldsymbol{\beta}$=1.721, p<0.01; Column 2: $\boldsymbol{\beta}$=1.721, p<0.01, respectively). This result implies firms who engage in wildlife partnerships provide more species information than firms who do not. This supports H3 and is consistent with prior studies (Adler et al., 2018; Boiral and Heras-Saizarbitoria, 2017; Hassan et al., 2019; Roberts et al., 2021) explaining wildlife partnerships are a prominent motivation for biodiversity and species disclosure. Specifically, this supports valuing species as stakeholders with firms being ecologically concerned by collaborating with nature partners. Furthermore, meeting the SDG's shared knowledge is encouraged (Atkins et al., 2018; Jones and Solomon, 2013) as wildlife organisations are actively responding to the B/E crisis, which will inspire firms to embed deep ecological strategies. Conversely, firms may use the partnership as a mechanism to legitimise activities and use them as a signalling platform to showcase efforts to enhance stakeholder perceptions of the firm's conservation efforts (Adler et al., 2018; Roberts et al., 2021). Nonetheless, to prevent further species extinction, and indeed the threat to human civilization, shared knowledge is essential to meet targets to mitigate further risk of planetary collapse (Dasgupta, 2021; WWF, 2020). The results are theoretically consistent with the expectations of the multi-theoretical framework.

Column 1 and 2 of Table 3.6 shows a positive and statistically significant relationship between firms reporting species disclosure and their self-reported environmental fines *(SelfFines)* (Column 1: $\boldsymbol{\beta}$=1.304, p<0.01; Column 2: $\boldsymbol{\beta}$=1.304, p<0.01, respectively). This supports H4 and implies companies who provide species information are motivated to do so because of environmental violations to manage the event (Adler et al., 2017; Patten, 2015) and

would reject a deep ecology perspective of valuing species as stakeholders. This is in line with legitimacy theory and impression management strategies, in that the rationale to present conservation information is largely to obfuscate violating incidents, with a strong incentive to disclose "good news" at the expense of "bad news" (Boiral, 2016; Solomon et al., 2013). However, this is a unique significant finding in the context of B/E literature and extends upon Haque and Jones (2020), who revealed statistically insignificant results examining biodiversity disclosure and self-reported violations, and thus warrants further attention. Furthermore, there are indications that post-pandemic biodiversity will be included in stimulus measures for recovery, therefore, fines relating to biodiversity violations may be prominent in future policies (OECD, 2021).

Finally, the coefficient of firms from high and medium biodiversity impact risk industries *(Industry)* in column 1 and 2 of Table 3.6 is positive and statistically significant (Column 1: $\boldsymbol{\beta}$=0.222, p<0.01; Column 2: $\boldsymbol{\beta}$=0.222, p<0.01, respectively). This offers support for H5, and implies and supports the argument that firms from intensive biodiversity impact industries provide more species information than low impact industries and further supports empirical biodiversity studies (Adler et al., 2017; Bhattacharyya and Yang, 2019; F & C Asset , 2004; Hassan et al., 2020; Skouloudis et al., 2019). This also supports the theory that high impact firms will have the greatest motivation to employ defensive or legitimacy-repairing strategies to gain legitimacy (Bhattacharyya and Yang, 2019; Cho and Patten, 2007). This outcome is contradicts Rimmel and Jonäll (2013) and Addison et al. (2019), who found low impact industries provide more disclosure. Nonetheless, industry intensive companies must begin to realise the fundamental value of healthy ecosystems to prevent material risk, reputational damage, and to increased stakeholder pressure (Roberts et al., 2020; Zhao and Atkins, 2021).

For control variables at a country level, this study investigates whether country-level governance has an impact on firms disclosing species information. The results show a statistically significant relationship with *Inflation, CO2Emissions, ForestArea,* and *Governance*. By contrast, the study finds a negative significant relationship with *GDPGrowth.* This implies country level determinants are key factors of the disclosure of species. This is in line with the findings of Roberts et al. (2020; 2021) who recommend research to examine motivations in country-level indicators.

Finally, regarding financial control variables, this study found a negative statistically significant relationship to species disclosure and *Size*, *Leverage*, and *ROA.* This contrasts with the findings of Adler et al. (2018), although it supports other studies (e.g., Bhatttacharyya and Yang, 2019; Haque and Jones, 2020).

3.6.4 Additional analysis

In the previous section, the Poisson regression and Poisson Multilevel regression was employed to examine the relationship between species disclosure determinant factors. To ascertain the robustness of the results, additional tests were conducted. I re-ran the equation (1) by running a robustness test; (2) by winsorizing the dependent variable *(NoSpecies)*, and (3) dividing the data into a sub-sample of developed and developing nations.

Table 3.7 Robustness Tests: Poisson regression and Multilevel Poisson Regression

NoSpecies	Poisson regression (1)	Poisson Multilevel regression (2)
Assurance	2.883***	2.883***
	(3.06)	(3.06)
Big4	1.304	1.304
	(1.40)	(1.40)
Award	-1.181	-1.181
	(-1.09)	(-1.09)
Partner	1.721***	1.721***
	(2.62)	(2.62)
SelfFine	1.304*	1.304*
	(1.72)	(1.72)
Industry	0.222	0.222
	(0.30)	(0.30)
GDPGrowth	-1.408**	-1.408**
	(-2.06)	(-2.06)
Inflation	0.164	0.164
	(0.51)	(0.51)
C02Emission	0.307	0.307
	(1.57)	(1.57)
ForestArea	0.000**	0.000**
	(2.17)	(2.17)
Governance	3.684***	3.684***
	(2.69)	(2.69)
oROA	-20.373	-20.373
	(-0.91)	(-0.91)
oLeverage	-30.540***	-30.540***
	(-5.17)	(-5.17)
Size	-1.276***	-1.276***
	(-4.09)	(-4.09)
_cons	-1.492	-1.492
	(-0.27)	(-0.27)
Year	Yes	Yes
Country	Yes	Yes
N	545	545
R^2		
adj. R^2		

t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Column (1) presents Poisson regression with year and country fixed effects with robustness. Column (2) presents Multilevel Poisson regression with year and country fixed effects with robustness.

In the first test, the results are reported with year and country fixed effect including robustness. Column 1 of Table 3.7 presents the Poisson regression and Column (2) of Table

3.7 presents the Poisson Multiway regression. Additionally, Censored Poisson regression is employed, providing similar results[8]. The findings in Table 3.7 mostly support the hypotheses. Table 3.7 indicates that assurance, partnerships, and self-reported fines remain statistically significant. Firms with partnerships, big four assurance and high-impact industries remain the same but are not statistically significant. For country level indicators, governance and forest area remain statistically significant. Inflation, GDP growth and CO_2 emissions remain unchanged, but are not statistically significant, while firm control variables remain the same.

The second step considers the varying nature the dependent variable, *NoSpecies,* which is the count of the number of species disclosed by firms,. The main strategies to deal with outliers are to delete them or winsorize them. Thus, the dependent variable was winsorized, as this modifies the value without excluding it (Barber and Lyon, 1996; Searls, 1966; Tabachnick and Fidell, 2007). Therefore, *NoSpecies* is winsorized at the 1st and 99th percentile. Table 3.8 presents the model with year and country fixed effects with Poisson (column 1), Multilevel Poisson (column 2), and Censored Poisson (column 3) regression, which supports the main findings. Additionally, the model includes robustness with Poisson (column 4), Multilevel Poisson (column 5), and Censored Poisson (column 6) and the results are consistent throughout. This additional analysis confirms and supports the main results being presented.

[8] Censored Poisson regression results are included in Appendix 4, column 2

Table 3.8 Winsorized regression

The table below reports on the effects of the dependent variable winsorized (*NoSpecies_w*). Columns 1, 2, and 3 present results with year and country fixed effects with Poisson, Multilevel Poisson, and Censored Poisson regression, respectively. Columns 4, 5, and 6 present results with year and country fixed effects with robustness in Poisson, Multilevel Poisson, and Censored Poisson regression respectively.

NoSpecies_w	(1)	(2)	(3)	(4)	(5)	(6)
Assurance	2.883***	2.883***	2.883***	2.883***	2.883***	2.883***
	(26.89)	(26.89)	(26.89)	(3.06)	(3.06)	(3.06)
Big4	1.304***	1.304***	1.304***	1.304	1.304	1.304
	(23.42)	(23.42)	(23.42)	(1.40)	(1.40)	(1.40)
Award	-1.181***	-1.181***	-1.181***	-1.181	-1.181	-1.181
	(-23.43)	(-23.43)	(-23.43)	(-1.09)	(-1.09)	(-1.09)
Partner	1.721***	1.721***	1.721***	1.721***	1.721***	1.721***
	(36.60)	(36.60)	(36.60)	(2.62)	(2.62)	(2.62)
SelfFine	1.304***	1.304***	1.304***	1.304*	1.304*	1.304*
	(9.70)	(9.70)	(9.70)	(1.72)	(1.72)	(1.72)
Industry	0.222***	0.222***	0.222***	0.222	0.222	0.222
	(5.32)	(5.32)	(5.32)	(0.30)	(0.30)	(0.30)
GDPGrowth	-1.408***	-1.408***	-1.408***	-1.408**	-1.408**	-1.408**
	(-21.74)	(-21.74)	(-21.74)	(-2.06)	(-2.06)	(-2.06)
Inflation	0.164***	0.164***	0.164***	0.164	0.164	0.164
	(6.28)	(6.28)	(6.28)	(0.51)	(0.51)	(0.51)
C02Emission	0.307***	0.307***	0.307***	0.307	0.307	0.307
	(13.09)	(13.09)	(13.09)	(1.57)	(1.57)	(1.57)
ForestArea	0.000***	0.000***	0.000***	0.000**	0.000**	0.000**
	(9.77)	(9.77)	(9.77)	(2.17)	(2.17)	(2.17)
Governance	3.684***	3.684***	3.684***	3.684***	3.684***	3.684***
	(30.59)	(30.59)	(30.59)	(2.69)	(2.69)	(2.69)
oROA	-20.373***	-20.373***	-20.373***	-20.373	-20.373	-20.373
	(-6.03)	(-6.03)	(-6.03)	(-0.91)	(-0.91)	(-0.91)
oLeverage	-30.540***	-30.540***	-30.540***	-30.540***	-30.540***	-30.540***
	(-93.33)	(-93.33)	(-93.33)	(-5.17)	(-5.17)	(-5.17)
Size	-1.276***	-1.276***	-1.276***	-1.276***	-1.276***	-1.276***
	(-56.24)	(-56.24)	(-56.24)	(-4.09)	(-4.09)	(-4.09)
_cons	-1.492***	-1.492***	-1.492***	-1.492	-1.492	-1.492
	(-3.04)	(-3.04	(-3.04)	(-0.27)	(-0.27)	(-0.27)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
N	545	545	545	545	545	545
R^2						
adj. R^2						

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Finally, the present study considers the robustness of the results in a sub-sample by dividing firms into developed and developing nations. The results of the Poisson regression, with year and country fixed effects are reported in Table 3.8, and the results are mostly the

same as those reported in Table 3.6[9]. The results reveal that species disclosure is likely to increase if a firm's report is assured *(Assurance)*, have partnership collaboration *(Partner)*, or are a higher-risk industry *(Industry)* in both developed or developing nations. This result is supported through legitimacy theory, which suggests that firms are disclosing to maintain legitimacy and respond to threats (Bhattacharyya and Yang, 2019; Cho and Patten, 2007). Furthermore, this also emphasises how partnership collaboration is a key driver that is supported by deep ecology in valuing species as stakeholders. Moreover, assurance from a big four firm *(Big4)*, awards *(Award)*, and self-reported fines *(SelfFine)* do not influence species disclosure in developing nations. Whereas, in developed nations, this factor influences firms to provide information on species they are protecting and conserving. The results also reveal that country level governance *(Governance)* is a significant factor in developed nations' species disclosure, which requires further investigation.

[9] Poisson regression with year and country fixed effects with robustness are presented in Appendix 5 which mainly supports the findings of Table 3.8.

Table 3.9 Robustness Tests: Poisson regression subsample

NoSpecies	Developing	Developed
	(1)	(2)
Assurance	3.277***	1.467***
	(15.28)	(12.64)
Big4	-2.986***	3.304***
	(-13.46)	(36.69)
Award	-3.788***	0.492***
	(-29.74)	(6.42)
Partner	5.570***	3.973***
	(22.52)	(48.90)
SelfFine	-0.910***	1.223***
	(-4.01)	(7.35)
Industry	1.018***	0.253***
	(5.29)	(4.71)
GDPGrowth	-0.142*	0.404***
	(-1.92)	(3.57)
Inflation	0.381***	1.258***
	(4.39)	(16.82)
C02Emission	0.071	0.057**
	(1.51)	(2.57)
ForestArea	-0.000	-0.000***
	(-0.08)	(-18.51)
Governance	1.369***	-39.049***
	(6.33)	(-19.88)
oROA	91.494***	-25.541***
	(8.44)	(-5.16)
oLeverage	-18.386***	-49.610***
	(-25.67)	(-80.18)
Size	-0.104	-1.648***
	(-1.02)	(-51.54)
_cons	-2.256	157.029***
	(-0.81)	(25.95)
Year	Yes	Yes
Country	Yes	Yes
N	143	402
R^2		
adj. R^2		

t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Column (1) presents Poisson regression with year and country fixed effects in developing countries. Column (2) presents Poisson regression with year and country fixed effects in developed countries.

3.7 Concluding remarks

The urgent and existential threat of further biodiversity loss and species extinction to humanity and sustainable business operations has highlighted the importance of species disclosure in the B/E literature. The aim of the present study was to investigate a sample of the world's largest firms and examine what influences them to provide disclosure on their efforts to protect species from extinction to understand how ecologically conscious companies are when responding to the B/E crisis. This study is motivated by the dearth of empirical research into examining determinant factors in the context of a firm's efforts to conserve and protect species. Therefore, this study examines the impact of determinant factors on a firm's species disclosure using a sample of 200 companies from the Fortune Global over five years.

The results reveal 71% of firms are neglecting the species extinction crisis, which is shamefully low. Firms appear to be ignorant to the fact that they face material financial risk if biodiversity loss and species extinction continues. The results imply that the world's largest companies have yet to act responsibly and protect species and their habitats. The multi-theoretical model explains that these firms are displaying anthropocentric behaviour and failing to embed a deep ecological perspective by valuing species as stakeholders. This evidences the need for an enormous call for change for firms to become respectful towards nature and realise their dependence on healthy biodiversity. However, the remaining 29% of Fortune Global companies provide species information, which demonstrates responsible corporate governance which aligns with deep ecology by realising the intrinsic worth of nature. These companies appear to be ecologically conscious and have initiated efforts to answer the B/E crisis.

The multivariate analysis results suggest that species disclosure is influenced by various factors. Specifically, the results indicate that assurance from one of the big four accounting firms, the presence of partnerships, environmental awards, self-reported environmental fines, and risk-intensive industries all have a significant relationship with firms disclosing species information. These results provide empirical support for the predictions of the multi-theoretical framework of deep-ecology, legitimacy, and the dimension of stakeholder theory that through deep ecology, species should be valued as a main stakeholder by the firm. Additionally, some results indicate firms may provide disclosure to legitimise their operations. This implies transformational changes must be made in corporate accountability towards species, who should specifically contribute towards achieving the SDGs to responsibly conserve and protect biodiversity and species from further decline and extinctions.

The results of this study extend upon and make a number of new contributions to the extant B/E literature. First, this study extends upon the research of Roberts et al. (2021) by expanding the time-series and examining other mechanisms that influence a firms species disclosure. Additionally, these findings enhance the evidence of prior research that the mechanisms of assurance and partnerships clearly influence species disclosure (Roberts et al., 2021). Second, to the author's knowledge, this study is the first to investigate the relationship between species disclosure with self-reported environmental fines and industry biodiversity risk. Third, the study contributes to the emerging stream of B/E literature and answers Roberts et al. (2020), who called for further empirical studies in a B/E context. Lastly, the findings can assist companies in embedding strategies to address the B/E crisis and contribute to achieving the SDGs by advocating for species accountability. Furthermore, these findings support the invitation from corporate coalitions who call for a standardised reporting framework, achievable targets, and ambitious goals to halt the decline of nature (businessfornature.org, 2021).

These results have several implications. The low disclosure implies that it is imperative for businesses to begin realising the intrinsic worth of nature and their reliance on healthy biodiversity. They must begin to embed an ecological culture and value species as stakeholders to prevent further pandemics and the threat to economic stability. It is crucial for humanity to meet the SDGs by 2030. The results imply that partnership engagement is a key driver in preventing further pandemics and species extinctions. Such collaboration provides the opportunity for shared knowledge and guidance from experts to achieve long-term sustainability and thus contribute towards developing solutions meeting the SDGs. The results can also guide policymakers to improve regulatory frameworks in the context of B/E reporting. Specifically, regulators and policymakers are required to establish a uniformed set of reporting guidelines and standards to address the B/E crisis, since failing to achieve the SDGs by 2030 will have severe consequences for humanity. This research aligns with the SDG principles and ongoing post 2020 biodiversity framework at COP-15, and can guide decision-makers in terms of how species protection can helps mitigate risks in the future.

This study contains some limitations, which should be considered potential avenues for future research. The main limitation in this is the use of secondary data. To understand why companies provide species disclosure, future research might consider case-studies and interviews with boards, managers, and executives to understand their views and strategies to protect nature and align with the SDGs, which would provide valuable insights into corporate

motivations. Furthermore, there are undoubtedly other factors affecting species disclosure, such as the influence of industry and country-governance factors, which is a fruitful avenue for future research.

Chapter 4 - The influence of external governance and culture on biodiversity and extinction disclosure

4.1 Overview

This study aims to examine what role external governance mechanisms such as the legal environment, level of corruption, and national culture in a firm's headquarters country has on its B/E disclosure. This chapter discusses the extant literature, applied theoretical construct of the study, research design, and presents the empirical results. Thus, this chapter will provide the answer to RQ3: What role does national culture, legal environment, and corruption play in a firm's B/E disclosure?

This chapter is structured as follows. Section 4.2 presents the literature review. Section 4.3 presents the discussion of the relevant theories in the literature. Section 4.4 provides the hypotheses of the study. Section 4.5 presents the research design, drawing on the variable definitions and measurements in section 4.5.1, empirical model in 4.5.2, statistical issues in section 4.5.3, and sample selection and data collection in section 4.5.4. Section 4.6 presents the results of the study, where section 4.6.1 presents the descriptive statistics, 4.6.2 the correlation matrix, 4.6.3 the main empirical results, 3.6.4 the additional analysis of the results. Finally, section 4.7 presents the concluding remarks.

4.2 Literature review

Drawing on the previous chapter, which investigated the relationship between species and the determinant factors that motivate firms to provide such disclosure, this chapter aims to understand whether or not external governance mechanisms influences a firm's B/E disclosure, and if so, how. Particularly, the wider CSR and ESG literature finds that external governance can have a significant effect on corporate disclosure (e.g., Blanc et al., 2017; Elamer et al., 2017). External governance mechanisms, namely an institution's legal framework, level of corruption, and the dimensions of a nations culture system significantly affects a firm's disclosure and can exhibit differences in accounting and sustainability reporting (Baldini et al., 2018; Garcia-Sanchez et al., 2013; Gray, 1998). In the context of B/E reporting, prior research (e.g., Hassan et al., 2020; Roberts et al., 2021) suggests institutional characteristics are the key drivers behind firms providing disclosure, which warrants further investigation, given they can potentially provide vital insights into corporate rationale.

There has been a lack of exploration of the effects of these mechanisms on B/E disclosure, and as such, the extant literature does not enable us to understand if and how country-level drivers can influence a firm disclosing information on their efforts to conserve biodiversity and protect species and their habitats from their operations. From an institutional perspective, firms face increased stakeholder pressure to be transparent in their efforts to protect biodiversity and species, as society is becoming increasingly concerned and aware of corporate environmental impacts (Atkins and Atkins, 2016; Barut et al., 2020; Smith et al., 2019). Furthermore, the B/E crisis is recognised as a critical challenge to society with the SDGs being one strategy to prevent further decline. Aligning to the SDGs, the post-2020 global biodiversity framework is set to be agreed at the impending COP15 in 2022, with world leaders committing at the G7 summit in the UK to take bold action (UK Cabinet Office, 2021). However, the published draft agreement that calls for the halt and reverse of biodiversity loss has been criticised for lacking ambition and urgency and requires stronger commitment (WWF, 2021). Furthermore, a core element of the 'European Green Deal' is the '2030 EU Biodiversity Strategy', which is anticipated to be published by the end of 2021. Both strategies expect member states to integrate biodiversity values into policies and regulations and propose legally binding targets post 2021 to restore degraded biodiversity and halt further decline (CBD, 2021; European Commission, 2021). Presently, B/E disclosure is voluntary, therefore, firms do not have to provide accountability for their impacts or efforts to conserve nature. However, these impending policies and strategies demonstrate the likelihood of increased scrutiny and societal

and institutional pressures firms that will face in protecting nature. Thus, it is imperative to better understand if such pressures motivate a firm to prove accountability, which therefore motivates this study.

To better understand corporate motivations for providing B/E disclosure, a consideration for potential regulations and pressures provides the motivation to examine the institutional factors of the legal environment and national corruption, which have so far been ignored in the extant literature. Corruption[10] in the context of biodiversity and species is an endemic issue, particularly in developing countries, which are considered mega-diverse in biodiversity as they possess 60-70% of the world's biodiversity (Laurance, 2004; Skouloudais et al., 2019). Corruption has a significant impact on nature as pervasive illegal logging and overexploitation of wildlife and nature is generally driven to meet the needs and desires of consumerism. Activities such as illegal poaching, illicit wildlife trade, and deforestation are perceived as low-risk and highly profitable in organised crime. The recent COVID-19 pandemic highlights the risk illegal wildlife trade can pose in the spill over of zoonotic diseases (Broad, 2020; Ceballos at al., 2020; Everard et al., 2020; Johnson et al., 2020). Despite efforts of conservation, corruption persists, as poaching and wildlife crime is a continuing growing trade, particularly in Asia, which consequently threatens many species with extinction (Atkins et al., 2018; Wyatt et al., 2018). Abuse of power is a key facilitator, and turning a blind eye, collusion, bribery, and theft are forms of patronage that are widely abused at both a firm and institutional level (Wyatt et al., 2018). Common forms of corruption include the illegal trade itself, facilitation of document forgery or fraud, transportation or export, and stockpile management[11]. However, this list is not exhaustive (CITES, 2016, 2019; WWF, 2021). In an institutional context, the falsification of permits, avoidance of inspections, payoffs and/or money laundering are all particularly rife from low-level employees, to ministers, politicians, and officials (Ondoua et al., 2017; WWF, 2021). Wyatt et al. (2018) suggest some national structures such as criminal justice systems and economic and political environments are already compromised with corruption, and therefore they facilitate illegal activities. Consequently, wildlife corruption weakens good governance, the rule of law, the well-being of society, and

[10] Corruption is defined as "any person (public official or private individual) who abuses their position to benefit themselves, people in their network, their community or their organisation" (Wyatt et al., 2018, p.36).

[11] Stockpile management is "the seizure and accumulation of illegal wildlife products, such as elephant ivory, rhino horns, pangolin scales and illicit timber takes place as a continuous process for government authorities worldwide. A lack of robust stockpile management systems increases the chances of a 'leak' from official government stockpiles into the illegal trade" (Zain, 2020).

threatens species with extinction (Zain, 2020). Policies and resolutions including The United Nations General Assembly, The European Union, and the G20 Summit call on member states to heighten political concern for wildlife-trade related corruption (Zain, 2020). Despite these efforts, corruption in the wider wildlife concept remains a growing global concern and a significant contributor to B/E loss (Wyatt and Cao, 2015).

Furthermore, other institutional mechanisms may influence a firm's disclosure. The extant literature argues that cultural background is an important factor of a firm's non-financial disclosure (e.g., Baldini et al., 2018; Garcia-Sanchez, et al., 2013; Ioannou and Serafeim, 2012; Kim and Kim, 2010; Lu and Wang, 2021; Tang and Koveos, 2008). Cultural systems differ by nation and thus various types of values and beliefs can influence businesses, societies and governments (Baldini et al., 2018; Matten and Moon, 2008). Stulz and Williamson (2013) suggest that national culture motivates institutions, and cultural influences in particular can help us understand managers' motivations, behaviours and attitudes (Cai et al., 2015; Christie et al., 2003; Lu and Wang, 2021). Hofstede's cultural dimensions have largely been used to test the impact of culture, they are argued to have a greater impact than other cultural dimensions (e.g., Schwartz, 1994) and are superior for cross-cultural studies (Tang and Koveos, 2008). The interest in culture is motivated by a consideration for cultural impact on CSR disclosure and the call to examine the cultural domicile of firms to better understand the motivations for B/E disclosure (Roberts et al., 2020; Skouloudis et al., 2019).

Based on the above discussion, the main objective of this study is to empirically examine the relationship between national culture, corruption and legal environment on a firm's B/E disclosure. The lack of empirical evidence and a consideration that the proposed biodiversity values should be integrated into policies and regulations at a national and firm level are the main motivations of this study. To answer the research question, this study investigates firms from a cross-country panel dataset with a sample of twenty-two countries from Europe, Asia, Oceania, and North and South America. Specifically, the relationship between Hofstede's cultural dimensions of power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, and indulgence are examined, in addition to the legal environment and level of corruption in the firm's headquarters, and their influence on a firm's B/E disclosure. Theoretically, this research employs legitimacy and institutional theory, since they are best suited to explain a firm's disclosure and association with social and institutional pressures and expectations to maintain legitimacy (Alshbili et al., 2019; Baldini et al., 2020).

To the researcher's knowledge, this study uniquely offers the first insight into national legal systems, corruption, and culture on a firm's B/E disclosure and contributes in several ways. First, this study will add to existing B/E literature (e.g., Atkins et al., 2018; Maroun and Atkins, 2018; Rimmel, 2021) and answers the call (Roberts et al., 2021; Skouloudis et al., 2019) to empirically examine the role of national culture and government effectiveness on B/E disclosure, thus providing essential evidence-based research to understand global efforts to halt the B/E crisis. Second, rather than using the GRI biodiversity framework relied on in prior research (e.g., Bhattacharyya and Yang, 2019; Boiral, 2016; Haque and Jones, 2020), the framework recommended by Hassan et al. (2020) is followed, which exceeds GRI and captures extensive B/E disclosure that the GRI framework omits. Third, this study compliments the emerging quantitative studies in B/E accounting (Bhatacharyya and Yang; 2019; Haque and Jones, 2020; Roberts et al., 2021) and the call of Roberts et al. (2020) for empirical analysis in B/E literature, where quantitative B/E disclosure is ranked more highly, a method employed in wider environmental research (Clarkston et al., 2008; Patten, 2002; Wiseman, 1982). This is because it is suggested that quantitative disclosure will create reliable comparable results across organisations and time periods, thus aligning it with the call for proposed measurable science-based targets to allow businesses, governments, and investors to contribute to achieving targets (Biological Diversity Protocol, 2020; CBD, 2021; Dasgupta, 2021; WWF, 2021). Furthermore, by presenting a sub-sample analysis, this research provides new insights into the effectiveness of the SDGs in the context of B/E disclosure, which the existing empirical literature has failed to address, and which is crucial for understanding motivation and transparency in B/E accountability. Theoretically speaking, this research adds to the limited empirical studies that use legitimacy and institutional theories to examine B/E disclosure and contributes to the discussion in institutional theory, in which it is suggested that firms conform to institutional pressures (Gaia and Jones, 2019: Haque and Jones, 2020).

Lastly, this research is timely, given the impending COP15, post-2020 biodiversity framework, and SDGs and it is anticipated to be impactful, with results that offer a number of practical and policy implications at both a firm and national level. The empirical evidence can influence future B/E reporting and assist policy makers, regulators, and decision-makers in aligning with the SDGs and global strategies, while recognising that the B/E crisis is one of society's greatest challenges in the next decade (Dasgupta, 2021; WEF, 2021).

4.3 Theoretical framework

This research draws on legitimacy and institutional theory to frame this study, as literature suggests they overlap and are appropriate for explaining corporate disclosure in an institutional setting (Baldini et al., 2018; Gaia and Jones, 2019). As discussed in Chapter three, legitimacy theory explains how firms provide disclosure to demonstrate to stakeholders they are operating within the constraints of society (Bhattacharyya and Yang, 2019; Patten, 2002; Rimmel and Jonäll, 2013). Specifically, voluntary disclosure is provided by poor environmental performers to deflect from their negative impacts and influence external stakeholders into perceiving they are operating within the norms of society (Baldini et al., 2018; Lu and Wang, 2021). Legitimacy theory is widely applied in the B/E literature and explains how companies are rife with legitimising activities, which is driven by their anthropocentric behaviour (Adler et al., 2018; Bhattacharyya and Yang, 2019; Rimmel and Jonäll, 2013; Roberts et al., 2020). Moreover, the higher the probability of negative social perceptions of a firm's activities, the greater the desire to maintain or repair legitimacy (Gaia and Jones, 2019), which is implied as being a firm's licence to operate (Adler et al., 2017).

Having been applied in previous studies of environmental and biodiversity disclosure (e.g., Baldini et al., 2018; Elamer et al., 2017; Haque and Jones, 2020; Ntim, 2016; Weir, 2019), institutional theory explains how firms will comply with institutional rules and expectations and uphold corporate legitimacy by conforming to institutional isomorphism identified by DiMaggio and Powell (1983) as coercive, mimetic, and normative. These three pillars are valuable in understanding institutional pressures on a firm as they seek to maintain legitimacy from pressures they face in their institutional location (Alshbili and Elamer, 2019). Consequently, a firm conforms to such pressures,and maintains legitimacy to continue to successfully trade (Alshbili and Elamer, 2019; Kostova and Roth, 2002).

Coercive isomorphism occurs when firms adhere to institutional pressures, such as regulations, laws, and power systems (Campbell, 2007; Gerged et al., 2020; Haque and Jones, 2020). Second, normative isomorphism aligns a firm's practices to the values of professional and trade associations, which influences their policies and practices (DiMaggio and Powell, 1983; Haque and Jones, 2020). Thirdly, firms may emulate competitors in response to uncertainty, i.e., through comparative behavioural pressure, referred to as mimetic isomorphism (Gaia and Jones, 2019; Gerged et al., 2020; Ntim & Soobaroyen, 2013).

Institutional theory assumes that corporate entities are influenced by regulation and organisational and societal expectations that monitor corporate behaviour (Baldini et al., 2020; Campbell, 2007; DiMaggio and Powell, 1983). The theory posits that the institutional context of a firm should be considered along with the political and societal environment influences, which are all influenced by a firm (Deegan, 2002; Gaia and Jones, 2019). Haque and Ntim (2018) argue that firms conform to institutional theory by embedding sustainable strategies to meet regulations and policies to ensure organisational legitimacy. Gaia and Jones (2019) examined the biodiversity disclosure of local authorities in the UK and found councils with greater institutional environmental pressures provide more disclosure to comply with societies expectations. Haque and Jones (2020) complimented these findings in their examination of European firms and conclude that biodiversity disclosure increases due to the concern of institutional pressures, namely the 'EU2020 Biodiversity Strategy'.

The literature suggests legitimacy and institutional theoretical perspectives overlap (Baldini et al., 2018; Gaia and Jones, 2019). For example, the theoretical framework has been used to explain institutional relationships with ESG disclosures (Baldini et al., 2018; Gerged et al., 2020). Furthermore, the extant literature finds sustainability reporting is provided to symbolically respond to institutional pressures and is a legitimising strategy to enhance its corporate image with its stakeholders (Cho et al., 2015a; Talbot and Boiral, 2021). Baldini et al. (2018) found that country level factors significantly affect ESG disclosures, suggesting that legal and cultural factors play a meaningful role, just as institutional theory claims. Boiral and Heras-Saizerbitora (2017) explain that corporate biodiversity initiatives are driven by legitimizing the firm's operations to stakeholders and institutional pressures. Therefore, institutional theory can explain the relationship between a firm's B/E disclosure and institutional and cultural factors. Moreover, this responds to the argument that a single theory is inadequate to explain B/E disclosure (Gaia and Jones, 2019; Haque and Jones, 2020) and therefore the theoretical frameworks of both institutional and legitimacy theory are considered appropriate for this research.

4.4 Hypothesis development

In this section, the country-level external governance factors that may influence firms to provide B/E disclosure are identified to develop the research hypotheses. The existing CSR literature identifies measures that can assist in understanding the motivations of CSR and

environmental performance (e.g., Baldini et al., 2018; El Ghoul et al., 2017; La Porta et al., 1998; Lu and Wang, 2021).

Therefore, following prior research, this study explores how a country's legal system, level of corruption, and national culture can influence a firm's B/E disclosure. The characteristics are discussed below and are supported by the theoretical framework of legitimacy and institutional theories.

4.4.1 Legal system

The extant literature finds that country level legal systems are an important factor to better understand CSR disclosures and environmental performance (e.g., Chih et al., 2008; Jacoby et al., 2019; Prado-Lorenzo and Garcia-Sanchez, 2010). Companies in countries with strong legal enforcement are more likely to be subjected to compliance requirements, monitoring, regulations, stakeholder scrutiny, and compulsory or involuntary disclosure practices, where firms are expected to provide higher disclosure (Lu and Wang, 2021). However, an emerging strand of studies has found that countries with higher government efficiency on laws and regulations on performance reporting provide less information (e.g., Adi et al., 2006; De Oliveira, 2006). Specifically, Lu and Wang (2021) imply that a country's legal environment is a significant factor in a firm's CSR disclosure and found that disclosure is less effective in countries with a strong legal environment and further argue that other institutional mechanisms function adequately, which deters firms from providing CSR disclosure. El Ghoul et al. (2017) support these findings via a study of CSR initiatives in a cross-country sample of 53 countries, finding that CSR initiatives are associated with countries with weaker legal systems. Furthermore, Baldini et al. (2018) also found that countries with stronger legal frameworks negatively relate to ESG disclosures. These empirical institutional studies imply firms in countries that are more constrained with stronger legal systems provide less disclosure than firms in counties less constrained by weaker legal systems who provide more.

Strong legal enforcement would be expected to identify illegal behaviour in corporations and protect stakeholders' interests (La Porta et al., 1998; Puk, 2017). In the context of B/E accounting, firms in weaker institutions would be expected to provide more B/E disclosure in order to legitimise their impact on nature. Prior studies found firms in developing nations, which demonstrate a poorer environmental performance, provide more B/E and species disclosure to narrow the legitimacy gap, since they negatively impact biodiversity the

most and engage in illegal wildlife trafficking and wet markets due to weaker regulations and legal systems (Atkins et al., 2018; Ceballos et al., 2020; Hassan et al., 2020; Roberts et al., 2021). Strong legal enforcement may improve a firm's disclosure. However, legitimacy theory would expect firms in weaker legal institutes to disclose more based on this argument. Thus, it is expected that firms in countries with a strong legal environment will provide less disclosure than firms with a weak legal environment. Therefore, the first hypothesis is:

> H1: There is a negative relationship between the legal framework in a country and a firm's B/E disclosure.

4.4.2 Corruption

Prior studies demonstrate that the level of corruption in a country is an influencing factor in a firm's disclosure practice (e.g., Baldini et al., 2018; Gerged et al., 2020; Ioannou and Serafeim, 2012). Institutional theory explains firms in less corrupt countries provide higher levels of disclosure, since they respond to local institutional pressures and consequently engage in ethical corporate behaviour (Beltratti and Stulz, 2012). By contrast, recent studies have found that firms in countries with higher corruption disclose more to signal to stakeholders a more positive image of the institution (Blanc et al., 2017) and thus gain societal legitimacy to obfuscate their negative impacts. For example, Baldini et al. (2018) found a significant negative relationship between a firm's ESG disclosure and corruption. Likewise, Gerged et al. (2020) found a negative relationship between corporate environmental disclosure and corruption, implying firms in better institutional nations disclose less. Similarly, Boubakri et al. (2021) found a negative relationship between corporate innovation and corruption. In the context of B/E disclosure, wildlife trafficking, illicit markets, and corrupt facilitation aided by officials are the leading drivers of the B/E crisis (Wyatt and Cao, 2015). Moreover, other research reports that institutional corruption is linked to illegal wildlife trades (Lawson and Vin, 2014; Lin, 2005). Consequently, firms with headquarters in more highly corrupted institutions are expected to disclose more to gain societal legitimacy and deflect from unfavourable activities. From an institutional theory perspective, firms may be compelled by mimetic pressures to engage in the low-risk highly profitable illegal wildlife trade. Overall, there is mixed empirical evidence. However, based on legitimacy theory, a negative relationship is expected. Consequently, the second hypothesis is:

> H2: There is a negative relationship between a firm's B/E disclosure and the level of corruption in a country.

4.4.3 Culture

Cultural differences can affect a company's decision making and they are an important mechanism that can affect the motivations and behaviours of a firm providing sustainability disclosure (Garcia-Sanchez et al., 2013; Lu and Wang, 2021). One of the most widely applied frameworks in the literature to study culture is the six cultural dimensions of Hofstede (1980), Hofstede and Bond (1988), and Hofstede et al. (2010), which can collectively explain a firm's behaviour in accounting research (Nguyen and Truong, 2013). The six dimensions (power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, and indulgence) have been applied in a stream of sustainability and CSR literature (e.g., Garcia-Sanchez et al., 2013; Kim and Kim, 2010; Lu and Wang, 2021; Sannino et al., 2020). Each of the six dimensions are discussed below.

Power distance

Power distance reflects the hierarchy, communication patterns, and acceptance and distribution of power (Boubakri et al., 2021). Countries with a higher power distance are undemocratic and individuals are more likely to accept and expect that a hierarchy exists with power unequally distributed. In firms operating in high power distance countries (e.g., Russia, South Korea) individuals are expected to be instructed (Lu and Wang, 2021). Moreover, this allows managers to pursue their own agendas with a disregard for society and stakeholders (Cai et al., 2015). Hofstede (2011) explains that in countries with low power distance (e.g., Norway) powers are more equal and individuals expect managers to discuss decisions. As such, equality is the aim of society, with no emphasis on individuals' differences in wealth or power. Prior studies found firms in low power distance countries are more environmentally friendly, provide more CSR disclosure, and conform to institutional pressures (Cai et al., 2015; Lu and Wang, 2021).

H3a: There is a relationship between firms in low power distance countries and B/E disclosure.

Individualism /collectivism

Individualism means "the degree to which people in a society are integrated into groups" (Hofstede, 2011, p11). Nations scoring high on individualism (e.g., UK and USA) focus on "I", whereas countries scoring low focus on "we", with attention on collectivism (Lu and Wang, 2021). Prior studies find individualist countries are associated with lower $C0^2$ emissions (Disli et al., 2016), however they are negatively related to CSR disclosure (Gallen and Petaita, 2018). Research also finds collectivist countries are stimulated to provide CSR information as they face more scrutiny and are sensitive to stakeholders' perceptions (Garcia-Sanchez et al., 2013). Moreover, Lu and Wang (2021) found firms in collectivist countries provide more CSR disclosure, however, firms in individualist countries demonstrate better environmental performance. Institutional theory expects a level of coercive, if not mimetic isomorphic, pressures to provide B/E disclosure due to higher scrutiny. Based on this discussion, consistent with the CSR literature, firms in collectivist countries are expected to disclosure more. Consequently, H3a is articulated as follows:

H3b: There is a relationship between firms in collectivist countries and B/E disclosure.

Masculinity/Femininity

This Hofstede dimension refers to "the distribution of values between genders" (Hofstede, 2011, p12). The masculine culture dimension suggests values of assertiveness, competitiveness and recognition, whereas feminine values are more empathetic with qualities of modesty, trust and care (Boubakri et al., 2021). Kumar et al. (2019) suggest masculine nations pursue economic growth over quality of life. Conversely, feminine culture places value on quality-of-life and caring for others (Hofstede, 2011). Prior studies found that feminine countries have better environmental performance and provide more CSR disclosure (Garcia-Sanchez et al., 2013; Kim and Kim, 2010; Lu and Wang, 2021). In the context of B/E disclosure, countries must begin to care for nature, engage in conserving and protecting biodiversity, with a specific consideration for species and their habitats, in order to achieve the SDGs and prevent further B/E loss. In line with the assumptions of institutional theory, feminine countries may positively influence B/E disclosure. Therefore, H3c is articulated as follows:

H3c: There is a relationship between feminine countries and a firm's B/E disclosure.

Uncertainty avoidance

The Hofstede cultural dimension of uncertainty avoidance refers to "the level of stress in a society in the face of an unknown future" (Hofstede, 2011, p10). The lower the uncertainty avoidance score the more the country has a relaxed attitude to changes and the more they are calmed if such changes happen. As such, society is less rule-orientated, with a less tolerant appetite for change. In countries with high uncertainty avoidance (e.g., Mexico) individuals are more likely to avoid risk, unnecessarily fight, and elude uncertain circumstances (Hofstede, 2011). These higher avoidance countries are most likely have defined laws and regulations and have a rule-oriented society, however, this can constrain opportunities to innovate and could prevent progressive strategies (Boubakri et al., 2021). The prior literature finds that firms in countries with high uncertainty avoidance perform better environmentally and provide more CSR disclosure than those countries with lower avoidance (Disli et al., 2016; Kim and Kim, 2010; Lu and Wang, 2021; Sannino et al., 2020). This is in line with the assumptions of legitimacy and institutional theory, which expect firms to respond to institutional pressures by engaging in environmental actions to gain corporate legitimacy (Haque and Jones, 2020). Consistent with CSR studies, high uncertainty avoidance countries are expected to provide more B/E disclosure, since they recognise the threat to civilisation from further B/E loss (Dasgupta, 2021). Consequently, H3d is as follows:

> H3d: There is a positive relationship between firms in a high uncertainty avoidance country and B/E disclosure.

Long-term/Short-term orientation

The cultural dimension of long-term/short-term orientation refers to whether individuals focus on the future, present or past (Hofstede, 2011). Short-term orientated countries (e.g., Australia) are proud of their nation and highly regard their culture and traditions, whereas long-term orientated countries (e.g., China) are keen to sacrifice the present for future benefits (Hofstede, 2011). These nations seek and prioritize growth and prosperity (Boubakri et al., 2021). Furthermore, research argues that businesses with higher long-term orientation achieve and promote product innovation, which leads to fruitful future profits for a firm, whereas short-term orientation impedes them by focusing on past and present realities

(Lumpkin et al., 2010; Nakata and Sivakumar, 1996; Waarts and van Everdingen, 2005). A stream of prior studies found that long-term orientated culture is positively associated with CSR disclosure (Boubakri et al., 2021; Halkos and Skouloudis, 2017; Kim and Kim, 2010; Lu and Wang, 2021). To reverse the B/E crisis, and for countries to achieve the SDGs, nations must look to the future to achieve their goals and learn from other countries. Based on this discussion:

H3e: There is a relationship between firms in long-term oriented countries and B/E disclosure.

Indulgence/Restraint

Hofstede (2011, p16) describes indulgence as the "relatively free gratification of basic and natural human desires related to enjoying life and having fun". This dimension is the newest dimension and measures the extent to which individuals control desires. Nations with a high score of indulgence (e.g., Switzerland, UK) have a weaker control over impulses and are driven by the freedom of enjoyment of life. Countries with low indulgence are restrained (e.g., Japan) and tend to have stronger control over impulses, suppress the gratification of needs and have stricter social norms (Hofstede, 2011). Indulgent countries are found to generate more carbon dioxide emissions (Disli et al., 2016) due to human driven fulfilment. As such, this implies anthropocentric dominance and would view nature as fulfilling desires and human satisfaction. Firms headquartered in restrained countries are found to be more environmentally concerned and provide more CSR disclosure (Felix et al., 2018; Lu and Wang, 2021). Firms may tend to conform to institutional pressures and symbolically provide B/E disclosure to legitimise operations (Haque and Jones, 2020). Firms must begin to suppress their demand on biodiversity to fulfil desires and restrain from further depleting biodiversity and ecosystems. Therefore, less indulgent countries are expected to comply with institutional pressures to conform to strategies such as the SDGs. Consequently, H3f is as follows:

H3f. There is a relationship between firms in restrained countries and B/E disclosure

4.5 Research Design

This section outlines the research design of the current study. Section 4.5.1 discusses the variable definitions and measurements. Section 4.5.2 presents the empirical models. Section 4.5.3 presents the statistical issues. Finally, section 4.5.4 presents the sample selection and data collection.

4.5.1 Variable definition and measurement

This section provides the variables employed in this study and explains how each variable is measured. First, the dependent variable is defined, then the explanatory variables are presented.

Dependent variable

The dependent variable is a firm's total score taken from a B/E index of twenty-one indicators (see Table 4.1), which was formed by Hassan et al. (2020) and is a combination of prior literature, the GRI, and the SDG frameworks (Adler et al., 2017; Adler et al., 2018; Atkins and Atkins, 2018; Atkins and Maroun, 2018; GRI, 2020, UN, 2020). A disclosure index is described as a "research instrument to measure the extent of information reported in a particular disclosure vehicle(s) by a particular entity(s) according to a list of selected items of information" (Hassan and Marston, 2010, p.18). The B/E disclosure index is considered appropriate, as Hassan et al. (2020) adopted these indicators in their research to investigate determinant factors in B/E disclosure, which extends prior studies that are limited by solely depending on the GRI biodiversity standards to examine a firm's disclosure (e.g., Bhattacharyya and Yang, 2019; Boiral, 2016, Boiral and Heras-Saizarbitoria, 2017; Haque and Jones, 2020). The limitations of the GRI indicators are discussed in Chapter two, with literature arguing they are used as a mechanism to reference biodiversity and are inadequate in addressing the B/E crisis (Gray and Milne, 2018). Furthermore, this index can encapsulate information the GRI index omits, or disclosure provided from a firm outside the scope of the GRI guidelines. Moreover, it is forward-thinking and progressive, and includes the opportunity to report on efforts to achieve the Aichi targets, SDGs, partnership collaboration, awareness, conservation efforts, B/E goals, and violations and fines.

Table 4.1 Biodiversity and Extinction Disclosure Index

1	Firm reports on corporate expressions of moral, ethical, and/or emotional motivations for preserving species and preventing extinction, with a consideration for ecosystem level effects, including normative reflective self-accounts of the company's impact on threatened and endangered species (Atkins and Atkins, 2018; Atkins and Maroun, 2018).
2	Firm reports on partnership engagement between wildlife/nature/conservation organisations and the company, which aim to address corporate impacts on endangered species (Atkins and Atkins, 2018; Atkins and Maroun, 2018).
3	Firm reports on assessment and reflection on outcome/impact of engagement/partnerships and decisions taken about necessary changes to policy/initiatives going forward (Atkins and Atkins, 2018; Atkins and Maroun, 2018).
4	Firm reports on its involvement in afforestation activities (such as seedling transplantation, forest plantation, sustainable forestry practices, or other reforestation activities (Adler et al., 2018).
5	Firm reports on biodiversity projects undertaken to enhance the biodiversity in and around the manufacturing plants, mines, transport infrastructure and/or other locations (Adler et al., 2018).
6	Firm reports on its involvement in land management/land rehabilitation activities (Adler et al., 2018).
7	Firm reports on donations provided (or conducted philanthropic activities) which contributed to the conservation, protection, enhancement, promotion, and preservation of biodiversity (Adler et al., 2018).
8	Firm reports steps taken for creating biodiversity awareness among its employees or in the community (Adler et al., 2018).
9	Firm reports on amount spent (R&D, technologies, innovations) for biodiversity conservation/restoration (Adler et al., 2018).

10	Firm reports on environment policy strategy (or statement) values (or concerns) biodiversity (Adler et al., 2018).
11	Firm reports biodiversity action plans or biodiversity goals/targets for coming years (Adler et al., 2018).
12	Firm reports a record list of plant and animal species identified as endangered by the IUCN Red List, whose habitats are affected by the company's activities (GRI).
13	Firm reports where, geographically, the company's activities pose a threat to endangered plant and animal species, as identified by the IUCN Red List (GRI).
14	Firm reports and assess habitat status area protected, restored, affected, and conserved (GRI).
15	Firm reports on potential risks/impacts on these specific species arising from the company's operations (GRI).
16	Firm reports operations (countries) with activities in IUCN category I–IV protected areas (Adler et al., 2018).
17	Firm reports on companies' biodiversity/species loss due to its operations (Adler et al., 2018).
18	Firm reports on compliance with United Nations Sustainability Development Goal (No15) Life on Land or Life under water (No14) to take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species (UN, 2015).
29	Firm reports on compliance with Aichi Targets, and, by 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained (UN).
20	Firm reports using the International Integrated Reporting Council (IIRC) framework (IIRC, 2013).
21	Firm reports full details relating to any fines or ongoing claims relating to endangered species legislation, including the names of species and a summary of

	losses suffered with causes identified (Atkins and Atkins, 2018; Atkins and Maroun, 2018).

The weighted scoring method is adopted for disclosure, with a weight assigned to each item, which is considered the specificity of the disclosure provided (Cho et al., 2015b). Previous studies have tended to measure the level of biodiversity with dummy variables of 0 and 1 (Adler et al., 2017; Haque and Jones, 2020), however this does not indicate how much importance is given to a specific item and is too simplistic (Adler et al., 2018; Alshbili et al 2019). Further B/E studies employ the weighted scoring method, but do not differentiate between qualitative and quantitative information, rather scoring higher on content of information (Adler et al., 2017, Adler et al., 2018; Hassan et al., 2020). A stream of environmental research (e.g., Bewley and Li, 2000; Clarkson et al., 2008; Hughes et al., 2001; Patten, 2002) follow Wiseman (1982), who assigned quantitative information with a value of 3, qualitative information a value of 2, minimal information a value of 1, and no disclosure a value of 0. Panel A of Table 4.2 provides a description for the dependent variable. Valuing impact on B/E is required in both qualitative and quantitative terms, however the quantitative metric would facilitate measurable, comparable results across organisations and time periods with confidence (Biological Diversity Protocol, 2020; CBD, 2021; Dasgupta, 2021). Thus, this study follows Wiseman (1982), as it is considered the most appropriate method to measure B/E disclosure and uniquely values quantitative information higher in the B/E literature.

Independent variables

Panel B of Table 4.2 provides the definition and source for all independent variables of the study. To measure external governance, El Ghoul et al. (2017) are followed for the measurement of the legal system and property right (*Legal*), which is a score of 0 to 10, where countries that score higher are more constrained by formal laws and rules than those countries with lower scores. This results in an overall score of nine sub-components (see Table 4.2). The measurement of corruption is employed from the Corruption Perceptions Index, (*CPI)*, which is a score of 0 to 100, where 0 is a highly corrupt country, and 100 is regarded as a highly clean country, which is a scoring system employed in prior research (Cai et al., 2015).

Hofstede's cultural dimensions are applied in a stream of research to study country-level culture (e.g., Baldini et al., 2018; La Porta et al., 2008; Lee et al., 2017; Lu and Wang,

2021: Nandy et al., 2020; Nguyen and Truong, 2013). Hofstede's six dimensions are based on Hofstede (1980), Hofstede and Bond (1988), and Hofstede et al. (2010). The six dimensions are: *HofPD* for power distance, *HofIND* for individualism, *HofUAV* for uncertainty avoidance, *HofMAS* for masculinity, *HofLTO* for long-term orientation, and *HofINDUL* for indulgence. Each dimension is given a score of between 0 and 100.

Firm and country specific control variables

Drawing on prior literature (Abdelfattah et al., 2020; Cai et al., 2015; Elamer et al., 2017; El Ghoul et al., 2007; Elmagrhi et al., 2018; Gerged et al., 2020; Roberts et al., 2021), to deal with expected endogeneities, control variables are included. At a firm level, (*ESG*) is measured using Refinitiv's overall comprehensive score of a firm's subcomponent pillars of environmental (E), social (S), and governance (G) score (Demers et al., 2021). (*CSR*) is measured using a dummy variable with a value of 1 if a firm has a CSR committee and 0 if otherwise. A CSR committee is found to have a positive impact on environmental performance, and since it may influence B/E disclosure it is therefore included (Haque and Jones, 2020; Lu and Wang, 2021; Michelon and Parbonetti, 2012). The firm's *Leverage* is measured by total debt/total assets. The firm's *Size* is the natural logarithm of the firm's total assets. The firm's return on assets, referred to as *ROA*, is measured by the firm's operating income/total assets. Finally, country level variables *GOV* is the average of the six dimensions of governance, while *GDP* and *Inflation* are sourced from the World Bank, which are included in a stream of empirical studies (Elamer et al., 2020; Jacoby et al., 2019; Kaufmann et al., 2011; Roberts et al., 2021).

Table 4.2 Summary and variables definition of study

Variables	Description	Source
Panel A: Dependent Variable		
BE	Total score of a firm's B/E disclosure from 21 disclosure items. Scored 0-3; the maximum a firm can score is 63.	Hassan et al. (2020)
Panel B: Independent variables		
Legal	Legal system & property rights. An index of quality of legal system and security of property rights. A score of 0-10. Higher values imply a better legal system. The subcomponents are:	
	(1) judicial independence reliability of police	
	(2) protection of property rights	
	(3) impartial courts	Fraser Institute's
	(4) military interference in rule of law and politics	Economic Freedom
	(5) integrity of legal system	of the World.
	(6) legal enforcement of contracts	
	(7) reliability of police	
	(8) business costs of crime	
	(9) regularity restrictions of the sale of real property	
LegalLP	Law enforcement score. A score of 0-10, where 0 is highly corrupt, and 10 is very clean	La Porta et al. (1998)
CPI	Corruption Perceptions Index – A score of 0-100, where 0 is highly corrupt, and 100 is very clean	Corruption Perception Index
CCP	Country level corruption score	World Governance Indicator (WGI)
GOV	The sum of the six dimensions of WGI voice and accountability, political stability, government effectiveness, regularity quality, rule of law, control of corruption.	Kaufmann et al. (2011)
HofPD	Power distance	
HofIND	Individualism	Hofstede Cultural
HofMAS	Masculinity	Database
HofUAV	Uncertainty avoidance	
HofLTO	Long-term orientation	
HofINDUL	Indulgence	
PD_TK	Revised Hofstede dimension of power distance.	
IND_TK	Revised Hofstede dimension of individualism.	Tang and Koveos
MAS_TK	Revised Hofstede dimension of masculinity.	(2008)

UAV_TK	Revised Hofstede dimension of uncertainty avoidance.	
LTO_TK	Revised Hofstede dimension of long-term avoidance.	
Panel C: Control variables		
ESG	Refinitiv Eikon ESG score of a firm.	ASSET4
CSR	Dummy variable with a value of 1 if firms has CSR Committee and 0 otherwise	ASSET4
GDP	GDP annual growth percentage	World Bank
Inflation	Inflation - GDP deflator (annual %)	World Bank
Size	Natural logarithm of total assets for firm *i* in year *t* WCO2999	Worldscope
Leverage	Measured by total debt divided by total assets. WCO3255/WCO3501	Worldscope
ROA	Return on assets measured by operating income divided by total assets. WC01250/WC02999	Worldscope

4.5.2 Empirical model

The following equations were developed to test the hypotheses related to the relationship between a firm's B/E disclosure and external governance mechanisms. Equation 4.1 tests hypotheses H1 and H2. Equation 4.2 tests hypotheses H3a, H3b, H3c, H3d, H3e, and H3f. The regression models are as follows:

$$BE_{it} = \boldsymbol{\beta_0}_{it} + \boldsymbol{\beta_1} Legal_{it} + \boldsymbol{\beta_2} CPI_{it} + \boldsymbol{\beta_3} GOV_{it} + \boldsymbol{\beta_4} GDP_{it} + \boldsymbol{\beta_5} Inflation_{it} + \boldsymbol{\beta_6} ESG_{it} + \boldsymbol{\beta_7} CSR_{it} + \boldsymbol{\beta_8} ROA_{it} + \boldsymbol{\beta_9} Leverage_{it} + \boldsymbol{\beta_{10}} Size_{it} + Year\ Fixed\ Effect + \boldsymbol{\varepsilon} \quad (4.1)$$

$$BE_{it} = \boldsymbol{\beta_0}_{it} + \boldsymbol{\beta_1} HofPD_{it} + \boldsymbol{\beta_2} HofIND_{it} + \boldsymbol{\beta_3} HofMAS_{it} + \boldsymbol{\beta_4} HofUAV_{it} + \boldsymbol{\beta_5} HofLTO_{it} + \boldsymbol{\beta_6} HofINDUL_{it} + \boldsymbol{\beta_7} GDP_{it} + \boldsymbol{\beta_8} Inflation_{it} + \boldsymbol{\beta_9} CSR_{it} + \boldsymbol{\beta_{10}} ESG_{it} + \boldsymbol{\beta_{11}} ROA_{it} + \boldsymbol{\beta_{12}} Leverage_{it} + \boldsymbol{\beta_{13}} Size_{it} + Year\ Fixed\ Effect + Industry\ Fixed\ Effect + \boldsymbol{\varepsilon} \quad (4.2)$$

In equation 4.1, *BE* is a firm's biodiversity and extinction disclosure score of sample firm *i* in year *t.* Where, *Legal*, refers to strong or weak legal systems, and *CPI*, refers to high or low corruption. Other country level variables include *GOV*, *GDP*, and *Inflation* which refer to country level data. Other firm level variables include *ESG,* which refers to a firms ESG score, *CSR* refers to CSR committees, *ROA* refers to return on assets, *Leverage* refers to total debt/total assets, *Size* refers to the size of the firm, *it* period indicators, $\boldsymbol{\beta_0}$ the regression intercept, and $\boldsymbol{\varepsilon}$ the error term.

In equation 4.2, *BE* is a firm's biodiversity and extinction disclosure score of sample firm *i* in year *t. HofPD* refers to power distance, *HofIND* refers to individualism, Hof*MAS* refers to masculinity, *HofUAV* refers to uncertainty avoidance, *HofLTO* refers to long-term orientation, and *HofINDUL* refers to indulgence cultural dimensions. *GDP*, *Inflation, CSR, ESG, ROA, Leverage,* and *Size* remain the same as equation 4.1.

4.5.3 Statistical issues

The study employs the ordinary least squares (OLS) multiple regression analysis, which is considered best suited in line with previous studies (Bhattacharyya and Yang, 2019; Elmagrhi et al., 2019). OLS assumptions are evaluated to address any heteroskedasticity issues, following related studies (Boubakri et al., 2021; Cai et al., 2016; Gerged et al., 2020). The study uses year and industry fixed-effect regression models to address the effect of unobservable or omitted variables bias (Alshbili et al., 2019; Elamer and Benyazid, 2018). Specifically, the fixed-effect model is appropriate as it controls for unobservable firm-specific heterogeneities among countries over time, which standard OLS regression may not identify (Gerged et al., 2020; Gurjarati, 2003; Ntim and Soobaryen, 2013). Furthermore, alternative measures and definitions are considered for the dependent test variable for robustness, which is explained in the additional analysis section. The statistical software STATA is selected to perform the empirical analysis.

4.5.4 Sample selection and data collection

To measure the relationship between B/E disclosure and the influence of external governance, the headquarters country of a firm is examined. This research employs the sample of Chapter three and examines the sustainability reports (or equivalent) of the top 200 companies of the Fortune Global 2016 list. Initially, the sample for this research covered the fiscal years 2012, 2014, 2016, 2018, and 2020. However, due to the unavailability of country-level data for the year 2020, observations for 2020 are dropped. Furthermore, a company observation was excluded if their reporting format was missing, or if it was not possible to translate it into the English language. In total 18 companies were excluded, and the final sample[12] consisted of 782 firm-year observations.

A manual content analysis is employed in this research to capture all relevant information and was considered the most appropriate method, since most of the required information for the B/E disclosure index is not available from databases. A explained in Chapter 3.5, 28 key words were searched for B/E disclosure. In addition, reports were carefully read to ensure all relevant data was successfully captured. The data was manually coded by the researcher. To ensure that the reliability of coding is stable over time, the test-retest method was conducted on a sample of the same content to ensure the stability of coding by the researcher (Hassan and Marsden, 2010; Webber, 1990). The reliability and validity of content analysis is discussed in Chapter 3.5 and is considered an appropriate method for this research. Refinitiv is used to access the Worldscope and ASSET4 databases to collect environmental and financial variables.

4.6 Results

This section reports on and discusses the results of this study. First the descriptive statistics are reported in section 4.6.1. Then, the correlation analysis is presented in section 4.6.2. Next, in section 4.6.3 the regression results are reported and discussed. Finally, in section 4.6.4 additional analysis is presented.

[12] For the breakdown of the sample by country please refer to Appendix 6.

4.6.1 Descriptive statistics

The results shown in Panel A of Table 4.3 show that 465 out of 782 firm reports (59%) provide B/E disclosure. This is encouraging, as prior research has found that the majority of firms fail to provide any disclosure on biodiversity (e.g., Adler et al., 2018; Hassan et al., 2020; Rimmel and Jonäll, 2013). Moreover, this may indicate prior research is limited by employing GRI indicators for disclosure, which may gloss over B/E information, and this consequently confirms the suitability of the B/E disclosure framework of Hassan et al. (2020) employed in this study. The remaining 317 firms (41%) provide no accountability on their impact or efforts to protect or conserve biodiversity. This highlights that some of the world largest organisations who are leaders in sustainability reporting (KPMG, 2020) must begin to realise the intrinsic worth of nature, which is vital for business sustainability, for achieving the SDGs, and halting the B/E crisis (Dasgupta, 2021). Furthermore, if these firms continue to fail to report on efforts to halt the biodiversity crisis, they may face increased stakeholder pressures and potential financial risk (Deloitte, 2021, Zhao and Atkins, 2021).

Table 4.3 B/E disclosure for the total sample

Panel A. Sum of companies who provide B/E disclosure

B/E disclosure provided	**Frequency of companies**	**Percent**
No	317	41
Yes	465	59
Total sample	782	100

Panel B. B/E disclosure by year

Year	**Min**	**Max**	**Mean**	**SD**
2012	0	30	4.48	7.57
2014	0	38	5.70	8.609
2016	0	40	6.54	9.319
2018	0	52	9.37	10.933

Panel B of Table 4.3 presents B/E disclosure by year, with results positively finding an overall increase in the disclosure over the study period. The maximum firm score is 30, 38, 40, and 52 in 2012, 2014, 2016, and 2018, out of a possible 63, respectively. This supports the

findings of Hassan et al. (2020), who found B/E disclosure increased over the years. Overall, this implies firms are realising the severity of the B/E crisis and the introduction of the SDGs in 2015 may explain this increase.

Table 4.4 Descriptive results

Variable	N	Mean	Std. dev.	Min	Max
BE	782	6.460	9.299	0	52
Legal	782	6.750	1.051	4.52	8.39
GOV	782	0.847	0.790	-1.61	1.837
CPI	782	64.386	16.863	27	87
HofPD	782	53.852	18.133	31	100
HofIND	782	61.757	28.315	17	91
HofMAS	782	62.138	15.691	8	95
HofUAV	782	56.037	21.897	8	95
HofLTO	782	59.235	27.142	21	100
HofINDUL	782	49.873	18.446	20	97
GDP	778	2.813	2.386	-3.3	8.2
Inflation	778	1.659	1.552	-1.5	10.3
ESG	595	56.204	16.585	8.03	91.5
CSR	782	0.679	0.467	0	1
Size	768	19.726	2.409	9.830	26.534
ROA	749	0.829	17.298	-1.120	471.439
Leverage	738	0.637	6.003	0.003	153.883

Note: Please see Table 4.2 for variable definitions

Table 4.4 presents the summary statistics of all variables in the main regression analysis in the study. The dependent variables of biodiversity and extinction score (*BE*) range from 0 to 52, with a mean of 6.46. This result implies the average score of a firm is relatively low, which is consistent with empirical studies that find that disclosure is low, minimalistic, and vague (Adler et al., 2018; Bhattacharyya and Yang, 2019; Rimmel and Jonäll, 2013). The six Hofstede (2010) cultural dimensions of the of the study (power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, and indulgence) have average scores of 53, 61, 62, 56, 59, and 49 respectively. The average country-level legal (*Legal*) score

of the sample is around 6.7, and the corruption (*CPI*) scoreis around 64. The average ESG score (*ESG*) of firms in the sample is 56, however observations for this variable are lower due to missing observations. Furthermore, the summary statistics imply around 68% of firms who provide B/E disclosure have a CSR committee (*CSR*).

4.6.2 Correlation matrix

Table 4.5 provides the Pearson correlation matrix of all variables used in the main regression analysis. It shows that B/E disclosure *(BE)* is positively correlated with cultural dimension uncertainty avoidance (*HofUAV*), CSR committees (*CSR*) and company size (*Size*), and negatively correlated with GDP growth (*GDP*), which is consistent with prior research (Baldini et al., 2018; Lu and Wang, 2021). This provides preliminary evidence, which is further examined in the next section. As discussed in Chapter 3, this is done to detect any high correlation between variables which may cause multicollinearity issues (Gujarati and Porter, 2009). Similar to prior cultural research (Boubakri et al., 2021; Lu and Wang, 2021), Table 4.5 shows high correlation among the cultural dimensions, suggesting multicollinearity issues, therefore, to avoid this risk, each dimension is regressed individually in separate models. Similarly, the external governance variables legal (*Legal*), corruption (*CPI*), and governance (*GOV*) are regressed separately to avoid any problems. To further test for any multicollinearity issues, the tolerance of coefficients of Variance Inflation Factor (VIF) is carried out after each regression model. Literature suggests if VIF is above 10, or if the tolerance is less than 0.1 (Gujarati, 2003; Hair et al., 2013) show multicollinearity problems. The VIF tests are tabulated with each regression with results indicating no concern. Furthermore, initially *ROA* and *Leverage* were 0.9, therefore, these variables were orthogonalized for this study.

Table 4.5 Pairwise correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) BE	1.00																
(2) Legal	-0.02	1.00															
(3) CPI	-0.01	0.96*	1.00														
(4) GOV	0.01	0.94*	0.95*	1.00													
(5) HofPD	0.05	-0.90*	-0.86*	-0.85*	1.00												
(6) HofIND	-0.06	0.78*	0.75*	0.76*	-0.83*	1.00											
(7) HofMAS	-0.03	0.08*	0.07	0.08*	-0.09*	-0.10*	1.00										
(8) HofUAV	0.26*	0.24*	0.22*	0.28*	-0.04	0.00	0.05	1.00									
(9) HofLTO	0.04	-0.40*	-0.37*	-0.40*	0.53*	-0.80*	0.21*	0.23*	1.00								
(10) HofINDUL	0.00	0.67*	0.66*	0.67*	-0.72*	0.83*	-0.11*	-0.05	-0.85*	1.00							
(11) GDP	-0.16*	-0.67*	-0.64*	-0.67*	0.57*	-0.57*	0.04	-0.69*	0.28*	-0.48*	1.00						
(12) Inflation	0.11*	-0.36*	-0.37*	-0.35*	0.23*	-0.07	-0.28*	-0.07	-0.18*	0.02	0.06	1.00					
(13) ESG	0.03	0.13*	0.11*	0.12*	-0.07	0.00	-0.06	0.27*	0.10*	-0.05	-0.26*	-0.07	1.00				
(14) CSR	0.18*	0.37*	0.36*	0.37*	-0.36*	0.32*	-0.01	0.31*	-0.16*	0.28*	-0.46*	-0.03	0.32*	1.00			
(15) Size	0.15*	-0.16*	-0.18*	-0.18*	0.26*	-0.39*	0.21*	0.44*	0.41*	-0.31*	-0.09*	-0.01	-0.06	0.19*	1.00		
(16) oROA	0.01	0.03	0.03	0.03	-0.02	0.01	-0.11*	-0.01	0.02	0.02	0.00	-0.03	-0.01	-0.07	-0.17*	1.00	
(17) oLeverage	-0.06	-0.15*	-0.15*	-0.15*	0.14*	-0.13*	0.02	-0.06	0.08*	-0.13*	0.13*	0.02	-0.02	-0.12*	-0.11*	0.00	1.00

The above table contains Pearson's parametric correlation coefficients for the variables used in the main regression analysis. Variables are defined in Table 4.2 *** *p<0.01, ** p<0.05, * p<0.1*

4.6.3 Empirical results

Results of legal environment and corruption

Table 4.6 presents the main OLS regression of equation 4.1 to explain B/E disclosure by a firm and external institutional influence. The results, reported in column 1 to column 3 of Table 4.6, indicate the effects of legal environment, corruption, and country-level governance on a firm's B/E disclosure.

The coefficient of a countries legal environment (*Legal*) on a firm's B/E disclosure in Column 1 of Table 4.6 shows a negative significant result ($\boldsymbol{\beta}$=-1.891, p<0.01) at the 1% significance level, which empirically supports H1. This result implies firms headquartered in countries with stronger legal environments provide less B/E disclosure, which is in line with prior empirical studies (Baldini et al., 2018; Lu and Wang, 2021) that suggest other meaningful institutional influences take precedence and therefore disclosure is less effective. Legitimacy theory explains how firms in weaker legal institutions would provide more B/E disclosure to legitimise their negative behaviour, reduce exposure, and signal acceptable behaviour to society (Gray et al., 1996; Patten, 2002). This result suggests firms headquartered in countries with weaker legal systems disclosure more to deflect from exploitive activities, as they face less scrutiny and regulations. This supports the emerging argument that firms in weaker legal environments indulge in the unethical behaviour of illegal wildlife trade, wet markets, poaching and wildlife crime (Atkins et al., 2018; Ceballos et al., 2020; Wyatt and Cao, 2015). The implications of these findings signal the urgent requirement for further regulated law to protect biodiversity and species, given the continuation of weak legal institutions will continue to deplete nature. Consequently, this may provide a solution for the lack of disclosure from stronger institutions if mandatory B/E reporting is required. This result is significant; providing evidence to support biodiversity must be fully integrated into regulations with legally binding targets post 2021 (CBD, 2021; European Commission, 2020). The results imply policymakers and regulators must enforce firm and effective criminal convictions or significant fines to prevent firms from indulging in greenwashing and legitimising strategies, which is considered rife in B/E accounting studies (e.g., Adler et al., 2018; Rimmel and Jonäll, 2013) particularly in the context of achieving the SDG targets.

H2 predicts firms in countries with lower level of institutional corruption will provide less B/E disclosure. The coefficient of institutional corruption *(CPI)* in column 2 of Table 4.6 is a negative significant result ($\boldsymbol{\beta}$=-0.089, $p<0.05$). This result empirically supports H2. This result contributes to the argument in the literature that firms in institutions where the level of corruption is high are likely to provide more disclosure as they are expected to engage in unethical practices (Baldini et al., 2018). Conversely, some empirical studies evidence firms in less corrupt countries provide more environmental disclosure as they are responding to institutional pressures to gain a larger market presence (Beltratti and Stulz, 2012; Ioannou and Serafeim, 2012). Specifically, these findings are supported by theoretical perspectives and imply firms headquartered in more highly corrupt countries provide more disclosure to legitimise activities and are sensitive to institutional pressures, therefore portray a positive image in the institution they are based (Blanc et al., 2017; Boubakri et al., 2021; Gerged et al., 2020). Furthermore, this result supports the critical concern of corruption at a national level in regard to unethical practices and the facilitation of illicit markets and illegal wildlife trade, which is a major driver of B/E, specifically in developing countries rich in biodiversity (Wyatt and Cao, 2015; Wyatt et al., 2018). Consequently, the empirical result implies that more highly corrupt nations may associate with the aforementioned weak legal institutions in motivating firms to provide B/E disclosure, which supports the literature suggesting institutional corruption is linked to illegal wildlife trades (Lawson and Vin, 2014; Lin, 2005; Wyatt and Cao, 2015; Wyatt et al., 2018). Practically speaking, these findings justify the call for member states to heighten political concern on wildlife corruption (Zain, 2020) with the impending COP15, and G20 summit an opportunity for resolution in the form of policy and legislation on wildlife corruption. Failure to impose stringent anti-corruption policies and regulations will lead to an increase destruction, legitimising activities, and failure to achieve the SDGs.

Table 4.6 OLS regression of the relationship of the impact of external governance on B/E disclosure

BE	(1)	(2)	(3)
Legal	-1.891***		
	(-2.84)		
CPI		-0.089**	
		(-2.29)	
GOV			-1.558*
			(-1.81)
GDP	-1.138***	-1.016***	-0.980***
	(-4.24)	(-3.97)	(-3.74)
Inflation	0.137	0.254	0.337
	(0.44)	(0.84)	(1.13)
ESG	-0.033	-0.032	-0.030
	(-1.22)	(-1.23)	(-1.15)
CSR	2.625*	2.550*	2.417*
	(1.93)	(1.87)	(1.77)
Size	0.382*	0.398*	0.423**
	(1.76)	(1.96)	(2.03)
oROA	72.482	72.043	67.988
	(1.26)	(1.27)	(1.19)
oLeverage	-7.574*	-7.457*	-7.008*
	(-1.87)	(-1.87)	(-1.76)
_cons	15.215*	7.165	1.860
	(1.79)	(1.10)	(0.34)
Year	Yes	Yes	Yes
N	588	588	588
R^2	0.09	0.08	0.08
adj. R^2	0.07	0.06	0.06

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

The variable for governance (*GOV*), which is a measure of the six country-level governance indicators, shows a negative significant result ($\boldsymbol{\beta}$ =-1.558, p<0.10). This provides support for H1 and H2, that national institutional environments are important influencers on firms in nations with stronger institutional frameworks, thus providing less B/E disclosure. The results of the firm-level control variables show that CSR committees and company size are positively and significantly associated with a firm providing B/E disclosure, however leverage

has a statistically negative effect on B/E disclosure, which are findings consistent with the extant literature (Boubakri et al., 2021; Gerged et al., 2020; Roberts et al., 2021).

Future research

To better understand why these firms in weaker legal environments with higher levels of corruption provide disclosure, further examination is needed, which is a fruitful avenue for future research. There is a wall of silence regarding firms reporting on fines or convictions relating to B/E (see index item 21). Only 5 companies from the sample provide detail, which indicates they are failing to disclose negative behaviour and compensate for this by providing favourable disclosure in line with legitimacy theory. These findings imply that without mandatory B/E reporting firms will continue to be silent or indulge in impression management techniques. Another explanation may be that such firms are not exclusively engaging in illicit or illegal activities, rather they are committed through supply chains, or individuals at internal or external level. Therefore, this poses a series of questions that remain unanswered that would allow us to better understand the empirical evidence:

- Does the firm have policies and procedures to investigate misconduct of employees, managers, and owners relating to corruption or misuse of patronage?
- Are firms intentionally indulging in unethical practices with the knowledge they are in weaker legal environments?
- Has the firm conducted due diligence to establish if any illegal or illicit activities exist in supply chains?
- Is the firm aware of any illicit or illegal activities internally or in supply chains?

Individual firm case-studies would provide evidence to support the empirical findings. It is recommended that future corporate strategy should include the safeguarding of whistle-blowers and the introduction of a B/E compliance transparency statements similar to the best practice of modern slavery statements.

Results of cultural dimensions

Table 4.7 reports on the main OLS regression for equation 4.2 with year and sector fixed effects to explain B/E disclosure by a firm and cultural influences. The results reported in columns 1 to 6 of Table 4.7 indicate the dimensions of culture are associated with a firm providing B/E disclosure.

Table 4.7 OLS regression of the relationship of the impact of cultural dimension on B/E disclosure

BE	(1)	(2)	(3)	(4)	(5)	(6)
HofPD	0.046					
	(1.56)					
HofIND		-0.052**				
		(-2.25)				
HofMAS			0.047*			
			(1.93)			
HofUAV				0.064**		
				(2.25)		
HofLTO					0.009	
					(0.51)	
HofINDUL						0.024
						(0.84)
GDP	-0.606***	-0.715***	-0.477**	-0.091	-0.501**	-0.459**
	(-2.75)	(-3.11)	(-2.29)	(-0.33)	(-2.40)	(-2.15)
ESG	-0.011	-0.019	-0.001	-0.018	-0.008	-0.001
	(-0.49)	(-0.81)	(-0.05)	(-0.77)	(-0.33)	(-0.03)
Inflation	0.412*	0.483**	0.654***	0.577**	0.551**	0.508**
	(1.74)	(2.13)	(2.76)	(2.53)	(2.33)	(2.23)
CSR	0.039	0.140	-0.086	0.044	-0.240	-0.386
	(0.03)	(0.12)	(-0.07)	(0.04)	(-0.20)	(-0.33)
Size	0.842***	0.569**	0.909***	0.686***	0.926***	1.092***
	(4.15)	(2.19)	(4.98)	(3.06)	(4.11)	(5.19)
oROA	127.665**	139.506**	144.931***	142.820**	136.732**	137.077**
	(2.29)	(2.52)	(2.61)	(2.58)	(2.46)	(2.47)
oLeverage	-14.142***	-15.096***	-14.839***	-15.308***	-14.457***	-14.179***
	(-3.59)	(-3.83)	(-3.77)	(-3.88)	(-3.66)	(-3.60)
_cons	-8.255*	4.012	-10.582**	-7.209	-8.403*	-12.951**
	(-1.90)	(0.55)	(-2.45)	(-1.65)	(-1.77)	(-2.16)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes
N	588	588	588	588	588	588
R^2	0.37	0.37	0.37	0.37	0.36	0.36
adj. R^2	0.33	0.34	0.34	0.34	0.33	0.33

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

In column 1 of Table 4.7, the results show that firms in countries with high power distance (*HofPD*) provide more B/E disclosure than firms in lower power distance countries, although this is not statistically significant. This result empirically rejects H3a, which predicted a lower level of B/E disclosure from high power distance firms in line with prior literature (Boubakri et al., 2021: Cai et al., 2015; Lu and Wang, 2021). This result may imply that more B/E disclosure is provided in high power distance countries as they are less environmentally

friendly, pursue their own interests (since power is distributed unequally), are hierarchical, and consequently, disclose more to legitimise operations and mask unethical activities (Cai et al., 2015; Gaia and Jones, 2019; Lu and Wang, 2021). Institutional theory explains these firms face external pressures and respond by providing B/E disclosure to comply with rules and expectations (DiMaggio and Powell, 1983; Haque and Jones, 2020). Furthermore, high power distance is found to be associated with higher corruption due to a lack of cooperation and trust within an institution (Davis and Ruhe, 2003: Getz and Volkema, 2001), which may explain these findings and is supported by the results of equation 4.1.

Column 2 of Table 4.7 shows a negative significant result, which empirically supports H3b ($\boldsymbol{\beta}$ =-0.052, p<0.05) finding that firms in individualist (*HofIND*) countries provide a lower amount of B/E disclosure and further supports prior studies that find a relationship with collectivist countries and CSR disclosure (Lu and Wang, 2021). Collectivist countries are perceived to suppress individual identity to benefit the needs of the group (Hofstede et al., 2002). Institutional theory explains firms face higher scrutiny in collectivist nations and respond with B/E disclosure to maintain societal legitimacy and signal efforts in addressing the B/E crisis through coercive and mimetic isomorphism (Haque and Jones, 2020). Furthermore, Davis and Ruhe (2003) suggest corruption is associated with collectivist societies, which may explain results particularly in regard to the relationship with corruption in equation 4.1.

Column (3) of Table 4.7 shows a positive and statistically significant result ($\boldsymbol{\beta}$ =0.047, p<0.10) with B/E disclosure and masculine *(HofMAS)* countries and empirically rejects H3c, which predicted firms in feminine countries will provide more B/E disclosure. Feminine culture predicts a more caring attitude, being empathetic, and valuing quality of life in contrast to masculine culture, which predicts a more assertive, competitive culture (Hofstede, 2011). This result contrasts empirical studies that found a positive association with CSR disclosure and feminist culture (Garcia-Sanchez et al., 2013; Kim and Kim, 2010; Lu and Wang, 2021). To halt the B/E crisis and achieve the SDGs, feminine cultural behaviour is desired in order to shift from an anthropocentric to an eco-centric perspective in valuing nature, which aligns with feminine qualities. However, this result implies that masculine cultural behaviour influences a firm's B/E disclosure and therefore contributes to the academic debate of this cultural dimension. The theoretical construct explains how firms may increase B/E disclosure to meet the needs and desires of stakeholders, uphold their reputation, and signal compliance to pressures. Furthermore, Davis and Ruhe (2003) found masculine societies have higher

corruption than feminine societies, as they are driven by success and profit (Hofstede, 1980) which, along with evidence from equation 4.1, may justify the results.

Column 4 of Table 4.7 shows a positive and statistically significant result ($\boldsymbol{\beta}$ =0.064, p<0.05) and empirically supports H3d, finding that firms in high uncertainty avoidance (*HofUAV*) countries provide more B/E disclosure. This supports empirical studies that find a relationship with a firm's CSR disclosure in high uncertainty avoidance countries (Disli et al., 2016; Kim and Kim, 2010; Sannino et al., 2020). Such countries create institutions to ensure security and minimize risk through policy and law and therefore may provide B/E disclosure to conform to institutional pressures (Tang and Koveos, 2008). Theoretically, this supports the institutional assumptions of isomorphism, that firms comply with rules and expectations to maintain corporate legitimacy (DiMaggio and Powell, 1983; Haque and Ntim, 2018).

H3e predicts a positive association with B/E disclosure and firms in long-term orientated (*HofLTO*) countries. The results in column 5 of Table 4.7 support this, but they are not statistically significant. This is in line with a stream of CSR and environmental research (Boubakri et al., 2021; Halkos and Skouloudis, 2017; Kim and Kim, 2010; Lu and Wang, 2021) and optimistically implies that the cultural dimension will influence firms to engage in future strategies, such as the SDGs, to prevent further B/E decline. In line with institutional theory, this result suggests firms will increase B/E disclosure when they are willing to sacrifice current for future benefits (Hofstede, 2011) and implies a firm conforms to coercive institutional pressures and expectations from society to address the B/E crisis and achieve the SDGs.

Finally, H3f predicts firms in restrained *(HofINDUL)* countries provide more B/E disclosure than their indulgent counterparts. However, the coefficient in column 6 shows a positive insignificant result and empirically rejects H3f. This result therefore contributes to the academic debate that firms in restrained institutions are perceived to be more environmentally concerned, thus resulting in a positive association (Lu and Wang, 2021). However, this result implies firms in indulgent institutions provide more B/E disclosure and do so due to the indulgent characteristics of impulse and gratification, which aligns with anthropocentric corporate behaviour, where nature is viewed as having value insofar as it can fulfil human satisfaction (Jones, 2004, Thompson and Barton, 1994). To prevent further B/E loss, corporations must embed a more restrained culture to suppress demand on biodiversity for society and achieve the SDGs. This result implies firms provide B/E disclose to maintain corporate legitimacy and are distinctly motivated by institutional pressures of coercive,

mimetic and normative isomorphism (Alshibi and Elamer, 2019; Haque and Ntim, 2018; Ntim and Soobaroyen, 2013).

The results of the firm level control variables indicate that size and ROA are positively and significantly associated with a firm providing B/E disclosure. However, leverage has a statistically negative effect on B/E disclosure. The country-level control variable GDP is negatively statistically significant and inflation is positively statistically significant. These results are in line with the extant literature (Boubakri et al., 2021; Lu and Wang, 2021).

4.6.4 Additional analysis

Robustness

In this section, both equations are analysed for robustness. Table 4.8 shows the estimation results of equation 4.1 and equation 4.2, where OLS regression is controlled including robustness. Panel A presents the results for the impact of country-level governance on B/E disclosure, empirically supporting H1 and H2 indicating legal systems (*Legal*) and corruption (*CPI*) remain statistically significant, further indicating the results are consistent and robust. In Table 4.8, Panel B presents the results of the impact of cultural background on B/E disclosure and supports the main results, indicating that individualism (*HofIND*), masculine (*HofMAS*), and uncertainty avoidance (*HofUAV*) remain statistically significant.

Table 4.9 presents further analysis by presenting the estimation results of equation 4.1 and equation 4.2 with Poisson regression. As discussed in Chapter 3.5 as the dependent variable is a count variable Poisson regression is employed as a further robustness test and results are supportive of the main OLS regression analysis.

Table 4.8 Robustness analysis

Panel A: Country level governance

BE	(1)	(2)	(3)
Legal	-1.922**		
	(-2.38)		
CPI		-0.089*	
		(-1.69)	
Governance			-1.558
			(-1.54)
GDP	-1.151***	-1.016***	-0.980***
	(-3.87)	(-3.50)	(-3.45)
Inflation	0.132	0.254	0.337
	(0.31)	(0.56)	(0.82)
ESG	-0.033	-0.032	-0.030
	(-1.25)	(-1.22)	(-1.15)
CSR	2.580**	2.550**	2.417*
	(2.04)	(2.01)	(1.90)
Size	0.326	0.398*	0.423*
	(1.53)	(1.76)	(1.96)
oROA	73.138	72.043	67.988
	(1.43)	(1.41)	(1.33)
oLeverage	-7.690**	-7.457**	-7.008*
	(-2.06)	(-2.00)	(-1.89)
_cons	16.520*	7.165	1.860
	(1.72)	(0.89)	(0.33)
Year	Y	Y	Y
N	588	588	588
R^2	0.09	0.08	0.08
adj. R^2	0.07	0.06	0.06

Panel B: Culture

	(1)	(2)	(3)	(4)	(5)	(6)
HofPD	0.046					
	(1.45)					
HofIND		-0.052**				
		(-2.24)				
HofMAS			0.047*			
			(1.73)			
HofUAV				0.064**		
				(2.27)		
HofLTO					0.009	
					(0.51)	
HofINDUL						0.024
						(0.76)
GDP	-0.606***	-0.715***	-0.477***	-0.091	-0.501***	-0.459**
	(-2.89)	(-3.30)	(-2.65)	(-0.36)	(-2.75)	(-2.37)
ESG	-0.011	-0.019	-0.001	-0.018	-0.008	-0.001
	(-0.45)	(-0.74)	(-0.05)	(-0.70)	(-0.31)	(-0.03)
CSR	0.039	0.140	-0.086	0.044	-0.240	-0.386
	(0.04)	(0.13)	(-0.08)	(0.04)	(-0.22)	(-0.35)

Inflation	0.412	0.483*	0.654**	0.577**	0.551**	0.508*
	(1.52)	(1.88)	(2.40)	(2.11)	(2.00)	(1.95)
Size	0.842***	0.569**	0.909***	0.686***	0.926***	1.092***
	(3.43)	(1.99)	(4.17)	(2.65)	(3.46)	(4.10)
oROA	127.665**	139.506***	144.931***	142.820***	136.732***	137.077***
	(2.55)	(2.79)	(2.88)	(2.85)	(2.75)	(2.76)
oLeverage	-14.142***	-15.096***	-14.839***	-15.308***	-14.457***	-14.179***
	(-3.96)	(-4.17)	(-4.12)	(-4.24)	(-4.03)	(-3.98)
_cons	-8.255*	4.012	-10.582**	-7.209	-8.403	-12.951*
	(-1.70)	(0.51)	(-2.34)	(-1.49)	(-1.57)	(-1.83)
Year	Y	Y	Y	Y	Y	Y
Sector	Y	Y	Y	Y	Y	Y
N	588	588	588	588	588	588
R^2	0.37	0.37	0.37	0.37	0.36	0.36
adj. R^2	0.33	0.34	0.34	0.34	0.33	0.33

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

Table 4.9 Poisson regression analysis

Panel A: Country level governance

BE	(1)	(2)	(3)
Legal	-0.220**		
	(-9.30)		
CPI		-0.010*	
		(-7.10)	
Governance			-0.110*
			(-3.97)
GDP	-0.138***	-0.123***	-0.112***
	(-14.23)	(-13.05)	(-11.75)
Inflation	0.002	0.017*	0.041***
	(0.16)	(1.73)	(4.47)
ESG	-0.004***	-0.004***	-0.004***
	(-4.35)	(-4.27)	(-3.77)
CSR	0.426***	0.422***	0.379***
	(6.76)	(6.65)	(6.01)
Size	0.038***	0.046***	0.054***
	(5.13)	(6.21)	(7.05)
oROA	8.834***	8.093***	7.452***
	(3.76)	(3.43)	(3.16)
oLeverage	-0.956***	-0.890***	-0.811***
	(-6.05)	(-5.66)	(-5.20)
_cons	2.871***	1.769***	0.965***
	(9.43)	(7.24)	(4.68)
Year	Y	Y	Y
N	588	588	588
R^2			
adj. R^2			

Panel B:	*Culture*					
	(1)	(2)	(3)	(4)	(5)	(6)
HofPD	0.004***					
	(3.28)					
HofIND		-0.007***				
		(-6.40)				
HofMAS			0.007***			
			(6.79)			
HofUAV				0.009***		
				(6.88)		
HofLTO					0.001	
					(1.13)	
HofINDUL						0.006***
						(4.31)
GDP	-0.074***	-0.092***	-0.058***	-0.016	-0.066***	-0.065***
	(-6.62)	(-8.05)	(-5.19)	(-1.15)	(-6.00)	(-5.74)
ESG	0.000	-0.001	0.001	-0.001	0.000	0.002
	(0.33)	(-0.51)	(0.76)	(-0.95)	(0.34)	(1.62)
Inflation	0.025***	0.033***	0.058***	0.037***	0.038***	0.042***
	(2.87)	(4.05)	(6.61)	(4.58)	(4.66)	(5.07)
CSR	0.058	0.066	0.032	0.058	0.026	-0.003
	(0.90)	(1.03)	(0.50)	(0.91)	(0.41)	(-0.04)
Size	0.083***	0.044***	0.090***	0.053***	0.088***	0.118***
	(10.45)	(4.16)	(12.76)	(5.76)	(9.61)	(13.50)

oROA	15.742***	17.054***	19.002***	19.218***	17.493***	16.246***
	(4.17)	(4.71)	(5.17)	(5.31)	(4.73)	(3.88)
oLeverage	-2.136***	-2.220***	-2.295***	-2.371***	-2.216***	-2.228***
	(-10.66)	(-11.23)	(-11.62)	(-11.83)	(-11.13)	(-11.05)
_cons	0.234	1.791***	-0.074	0.551**	0.301	-0.725**
	(1.04)	(5.44)	(-0.33)	(2.44)	(1.24)	(-2.25)
Year	Y	Y	Y	Y	Y	Y
Sector	Y	Y	Y	Y	Y	Y
N	588	588	588	588	588	588
R^2						
adj. R^2						

The above table represents regression coefficients and t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01. See Table 4.2 for the definitions of each variable.

Alternative measure

For additional robustness checks, both equations were run using alternative measures of external governance and cultural dimensions, a method which is employed in the extant literature (Boubakri et al., 2021).

Alternative external governance measure

Column 1 of Table 4.10 shows estimation results with the alternative measure of country legal system (*LegalLP*)[13] and follows the legal enforcement score of La Porta et al. (1998), which is applied in the literature (e.g., Dhaliwal et al., 2012; Garcia-Sanchez et al., 2016; Lu and Wang, 2021). Furthermore, column 2 of Table 4.10 shows estimation results with the alternative measure for corruption (*CCP*), which is a country level corruption score from WGI and is employed in a stream of research (e.g., Baldini et al., 2018; Elamer et al., 2017; Gerged et al., 2020; Ioannou and Serafeim, 2012; Kaufmann et al., 2011). The results for both equations remain negative and statistically significant, offering empirical support for the main analysis.

[13] The variable is a score of 0-10, with lower scores for less efficient and higher risk. The value is an average of five components: (1) efficiency of judicial system, (2) rule of law, (3) corruption, (4) risk of expropriation, (5) risk of contract repudiation.

Table 4.10 Alternative measure for external governance

BE	(1)	(2)	(3)
LegalLP	-1.579***		
	(-2.65)		
CCP		-1.385*	
		(-1.91)	
GOV			-1.558*
			(-1.81)
GDP	-0.436	-0.927***	-0.980***
	(-1.08)	(-3.76)	(-3.74)
Inflation	-0.110	0.286	0.337
	(-0.29)	(0.93)	(1.13)
ESG	-0.039	-0.031	-0.030
	(-1.40)	(-1.17)	(-1.15)
CSR	3.291**	2.489*	2.417*
	(2.07)	(1.81)	(1.77)
Size	0.612**	0.422**	0.423**
	(2.52)	(2.05)	(2.03)
oROA	417.638***	65.566	67.988
	(2.85)	(1.15)	(1.19)
oLeverage	-2.039	-6.830*	-7.008*
	(-0.46)	(-1.72)	(-1.76)
_cons	26.085**	1.789	1.860
	(2.48)	(0.34)	(0.34)
Year	Yes	Yes	Yes
N	588	588	588
R^2	0.09	0.08	0.08
adj. R^2	0.07	0.06	0.06

Note: This table presents the estimation results of biodiversity and extinction disclosure (*BES*) with an alternative measure of external governance for a countries legal framework (*LegalLP*) and corruption (*CCP*). Year controls are included. The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

Alternative culture measures

Some studies question Hofstede's cultural dimensions, as they have remained unchanged over time (e.g., Kirkman et al., 2006; Schwarz, 1994; Tang and Koveos, 2008). Tang and Koveos (2008) offer an update to five of the Hofstede measures to adjust for the changing economic conditions. They suggest that power distance, long-term orientation, and individualism vary over time with national prosperity. Uncertainty avoidance and masculinity remain the same. There is no alternative measure for indulgence. Thus, as an alternative

measure Boubakri et al. (2021) are followed, who implemented these measures for additional robustness analysis[14]. In Table 4.11, the results for the alternative cultural dimensions of individualism, masculinity, and uncertainty avoidance remain statistically significant, offering support for the main analysis. Furthermore, with the alternative measure, power distance becomes statistically significant ($\boldsymbol{\beta}$ =0.063, p<0.05), however, it subsequently rejects H3a.

[14] The definitions for the alternative Hofstede dimensions are power distance (*PD_TK*), individualism (*IND_TK*), masculinity (*MAS_TK*), uncertainty avoidance (*UAV_TK*), and long-term orientation (*LTO_TK*).

Table 4.11 Alternative measures of cultural values

BE	(1)	(2)	(3)	(4)	(5)
PD_TK	0.063**				
	(2.20)				
IND_TK		-0.070***			
		(-3.01)			
MAS_TK			0.127***		
			(2.86)		
UAV_TK				0.117***	
				(4.01)	
LTO_TK					0.008
					(0.28)
GDP	-0.547	-0.617*	-0.693*	0.107	-0.554**
	(-1.54)	(-1.75)	(-1.96)	(0.27)	(-2.28)
Inflation	0.389	0.351	0.691**	0.796***	0.572*
	(1.23)	(1.12)	(2.28)	(2.63)	(1.93)
ESG	-0.015	-0.022	0.006	-0.028	-0.007
	(-0.57)	(-0.85)	(0.24)	(-1.09)	(-0.30)
CSR	-0.085	0.038	-0.419	0.253	-0.038
	(-0.06)	(0.03)	(-0.29)	(0.17)	(-0.03)
Size	0.905***	0.773***	1.322***	0.675***	0.954***
	(4.16)	(3.42)	(6.01)	(3.01)	(3.18)
oROA	303.582*	312.254*	348.274**	381.867**	315.096**
	(1.88)	(1.94)	(2.16)	(2.38)	(2.02)
oLeverage	-12.324***	-12.904***	-11.979***	-14.088***	-12.832***
	(-2.69)	(-2.83)	(-2.63)	(-3.09)	(-3.00)
_cons	-0.676	10.753	-12.312	1.926	-1.072
	(-0.08)	(1.18)	(-1.43)	(0.24)	(-0.13)
Year	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes
N	524	524	524	524	575
R^2	0.33	0.34	0.34	0.35	0.33
adj. R^2	0.30	0.30	0.30	0.31	0.30

Note: This table presents the estimation results of biodiversity and extinction disclosure (*BE*) with an alternative measure of cultural dimensions. The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

Lastly, as a final measure, the dependent variable in the two main models are changed from the B/E score to number of species disclosed by a firm, which is a measure discussed and employed in Chapter three. The untabulated results present similar results, which support the main analysis.

4.6.5 Sub-sample analysis

Subsample of developing and developed countries

The robustness of the results of external governance are further considered by dividing the sample of firms into a subsample of developing and developed nations. The prior literature argues that disclosure is largely affected by institutional context in developing and developed countries (Alshbili and Elamer, 2019). The results for equation 4.1 with year fix effects are reported in Table 4.12, with results mostly the same as the main analysis. Column 1 reports that firms in developing countries with weaker legal institutions have a statistically negative relationship, implying they are more likely to provide B/E disclosure than those in developed nations (Column 2). This result is in line with legitimacy theory expectations and supports studies that found developing nations provide more disclosure than would be expected in order to portray a positive image, deflect from negative events and thus influence stakeholder perception (Hassan et al., 2020; Roberts et al., 2021). Furthermore, this offers insights from the institutional perspective and suggests developing nations are more sensitive to the concerns of institutional pressure by providing more B/E disclosure.

Table 4.12 Effect of external governance on a firm's B/E disclosure in developing and developed countries subsample

BE	(1) Developing	(2) Developed	(3) Developing	(4) Developed
Legal	-10.832***	0.979		
	(-4.49)	(0.87)		
CPI			-0.269	0.029
			(-1.48)	(0.43)
GDP	-0.661	-0.083	-0.212	-0.032
	(-1.41)	(-0.21)	(-0.45)	(-0.08)
Inflation	0.198	-0.956	0.703	-0.980*
	(0.48)	(-1.63)	(1.31)	(-1.67)
ESG	-0.098*	0.012	-0.099	0.012
	(-1.77)	(0.43)	(-1.65)	(0.45)
CSR	2.261	-0.036	2.295	0.005
	(1.52)	(-0.03)	(1.39)	(0.00)
Size	-0.142	1.256***	-0.594	1.256***
	(-0.33)	(4.27)	(-1.21)	(4.26)
oROA	-46.745	236.154	48.857	238.300
	(-0.25)	(1.58)	(0.26)	(1.59)
oLeverage	-3.624	-13.151***	-10.734	-13.087***
	(-0.27)	(-3.37)	(-0.79)	(-3.37)
_cons	84.704***	-16.630	47.250***	-11.508
	(5.88)	(-1.46)	(3.05)	(-1.34)
Year	Yes	Yes	Yes	Yes
N	109	479	109	479
R^2	0.75	0.35	0.70	0.35
adj. R^2	0.70	0.31	0.65	0.31

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

Furthermore, Column 3 indicates firms headquartered in more highly corrupt countries in developing nations provide more B/E disclosure than those from their developed counterparts, although this is not statistically significant. However, this offers support to the argument that corruption is a prevalent issue, particularly in developing countries, which tend to harvest the globe's richest biodiversity and engage in illicit and illegal wildlife trades (Skouloudais et al., 2019; Wyatt and Cao, 2014). One explanation for this may be a lack of knowledge and expertise, however, this supports one of the proposed solutions of the post-2020 biodiversity framework pledges of a financial flow of US$200 billion to developing countries in order to halt the biodiversity crisis (CBD, 2021).

Table 4.13 shows estimations results on equation 4.2 for the subsample of developing (columns 1-6) and developed countries (columns 7-12). Primarily, the subsample results indicate B/E disclosure of firms in developed nations is negatively associated with individualism and positively associated with high uncertain avoidance and long-term orientation, which supports the main analysis. Furthermore, this additional analysis indicates that national culture is a mechanism that dominates developed countries and additionally may be influenced by a firms CSR committee.

Table 4.13 Effect of culture on a firm's B/E disclosure in developing and developed countries subsample

BE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Developing						Developed					
HofPD	-0.137						-0.000					
	(-0.72)						(-0.01)					
HofIND		-0.106						-0.117**				
		(-0.37)						(-2.33)				
HofMAS			-0.286						0.036			
			(-1.62)						(1.03)			
HofUAV				0.161						0.090**		
				(1.19)						(2.57)		
HofLTO					-0.138*						0.067**	
					(-1.92)						(2.52)	
HofINDUL						0.094						-0.123***
						(1.34)						(-2.62)
GDP	-1.719***	-2.006***	-1.004	-0.745	-1.531***	-1.575***	-0.422	-0.041	-0.435	0.073	0.037	0.280
	(-2.97)	(-3.97)	(-1.15)	(-0.62)	(-2.94)	(-2.67)	(-1.01)	(-0.10)	(-1.06)	(0.18)	(0.09)	(0.65)
Inflation	0.769	0.677	0.496	0.379	0.298	0.520	-1.673**	-0.720	-1.635**	-0.867	-0.954	-1.346**
	(1.15)	(0.79)	(0.87)	(0.60)	(0.49)	(0.92)	(-2.57)	(-0.85)	(-2.57)	(-1.16)	(-1.26)	(-2.03)
ESG	-0.097	-0.080	-0.112	-0.086	-0.107	-0.079	-0.022	-0.039	-0.023	-0.037	-0.034	-0.035

	(-1.10)	(-0.92)	(-1.49)	(-1.06)	(-1.32)	(-0.91)	(-0.77)	(-1.35)	(-0.85)	(-1.30)	(-1.20)	(-1.24)
CSR	0.995	1.144	0.154	1.617	1.145	1.389	3.188**	3.097**	3.396**	3.322**	2.693*	3.172**
	(0.48)	(0.56)	(0.07)	(0.85)	(0.57)	(0.66)	(2.12)	(2.06)	(2.23)	(2.19)	(1.79)	(2.09)
Size	-1.505**	-1.433**	-1.622***	-1.840***	-0.362	-0.963*	0.688**	0.303	0.499	0.423	0.525*	0.593**
	(-2.40)	(-2.43)	(-2.98)	(-2.63)	(-0.56)	(-1.77)	(2.29)	(0.98)	(1.50)	(1.38)	(1.79)	(2.00)
oROA	367.970***	309.736**	160.392	291.936**	304.377**	337.208**	353.332**	387.132**	307.146*	392.469**	459.470***	452.968***
	(2.70)	(2.33)	(1.21)	(2.08)	(2.31)	(2.58)	(2.30)	(2.52)	(1.91)	(2.58)	(2.84)	(2.92)
oLeverage	-32.292***	-28.222***	-18.015*	-28.003***	-26.422***	-29.418***	-2.101	-4.846	-2.862	-3.793	-3.555	-4.215
	(-3.26)	(-2.88)	(-1.81)	(-2.70)	(-2.65)	(-3.03)	(-0.51)	(-1.13)	(-0.69)	(-0.91)	(-0.87)	(-1.03)
_cons	75.349***	64.574***	73.524***	55.894***	49.007***	47.526***	7.970	25.026***	7.073	8.277	11.838*	20.440**
	(2.79)	(3.58)	(4.51)	(3.73)	(3.26)	(2.86)	(1.14)	(2.74)	(1.00)	(1.22)	(1.70)	(2.48)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	109	109	109	109	109	109	479	479	479	479	479	479
R^2	0.32	0.32	0.34	0.34	0.35	0.33	0.10	0.11	0.10	0.11	0.11	0.11
adj. R^2	0.25	0.24	0.27	0.27	0.27	0.25	0.07	0.08	0.08	0.08	0.09	0.09

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

Exogenous shock

In 2015, the United Nations announced the SDGs with the aim to transform the planet by 2030, which is the most recent global call to action to halt the B/E crisis. Therefore, the results could be driven by this exogenous shock. Thus, the sample is split into pre- and post-SDG period to investigate the impact of B/E disclosure. Table 4.14 presents the estimation results of equation 4.1. Table 4.14 shows a negative relationship between legal systems and corruption in both pre- (column 1 and 2) and post-SDGs (column 3 and 4), offering support for the main analysis. Furthermore, the post- SDGs result is statistically significant, implying that since the announcement in 2015, firms in institutions with stronger legal systems and lower corruption are disclosing less, and their counterparts in weaker institutions are disclosing more than pre- SDG. This is in line with the theoretical construct that firms in weaker institutions are motivated to provide more B/E disclosure in response to social and institutional pressures and do so to enhance corporate legitimacy (Bhattacharyya and Yang, 2019; Cho and Patten, 2002; DiMaggio and Powell, 1983).

This result provides insightful evidence of the motivation of firms conforming to SDG pressures by increasing disclosure since their implementation. Consequently, this indicates that firms' rationale for such disclosure is insincere and such disclosure is being manipulated to portray to stakeholders that they are addressing the SDGs to create a favourable corporate image and reputation. Practically speaking, this highlights the need for regulation, since a continuation of symbolic insincere reporting will result in failure to achieve the SDGs.

Difference-in-Difference analysis (DiD)

Furthermore, the relationship between B/E disclosure and legal environment and level of corruption may be affected by unobservable omitted variable bias. To mitigate concerns, the extant literature (e.g., Abdelfattah et al., 2020; Fang et al., 2018; Hardies et al., 2015; Lu and Wang, 2018; Shen and Zhang, 2020) is followed and the differences-in-differences (DiD) analysis is adopted. An exogeneous shock is considered an effective way to deal with endogeneity issues and therefore, the DiD test is used to compare how B/E disclosure and legal and corruption mechanisms changed before and after the significant SDG announcement in 2015, which may affect the motivation behind firms providing B/E disclosure (Fang et al., 2018; Lu and Wang, 2018; Shen and Zhang, 2020). The DiD analysis compares disclosure with a control sample of 290 firms before the SDGs to after the SDG announcement, with 298 firms.

A dummy variable (*SDG*) is generated that is equal to 1 if disclosure is post-SDG and a dummy of 0 if disclosure is pre-SDG announcement, with a final sample of 588 firm-year observations. The re-estimated regression models in Column 1 and 2 of Table 4.15, where (*Legal*) is the main independent variable for legal environment, and (*CPI*) is the main independent variable for corruption, with the dependent and control variables measured by the change (Δ) from year *t* – 1 to year *t*. The coefficient of SDG is statistically significant at 1% for model 1 and 2 respectively suggesting the post SDG announcement in 2015 are a significant factor in firms providing B/E disclosure and imply firms are increasing B/E disclosure to conform to institutional and stakeholder pressure, in line with the theoretical construct of legitimacy and institutional theories.

Table 4.14 Effect of external governance on a firm's B/E disclosure pre and post SDG

	Pre SDGs		Post SDGs	
BE	(1)	(2)	(3)	(4)
Legal	-0.609		-3.384***	
	(-0.66)		(-2.68)	
CPI		-0.003		-0.231***
		(-0.06)		(-2.61)
GDP	-0.602**	-0.490*	-1.902***	-1.882***
	(-1.99)	(-1.71)	(-3.61)	(-3.61)
Inflation	0.789	0.903*	-0.671	-0.800
	(1.60)	(1.79)	(-0.90)	(-1.03)
ESG	-0.047	-0.044	-0.012	-0.018
	(-1.58)	(-1.47)	(-0.29)	(-0.41)
CSR	2.821**	2.614*	2.357	2.758
	(2.12)	(1.92)	(1.09)	(1.26)
Size	0.454*	0.529**	0.086	0.018
	(1.77)	(2.00)	(0.26)	(0.05)
oROA	62.951	62.581	68.211	51.731
	(0.87)	(0.87)	(0.91)	(0.69)
oLeverage	-6.753	-6.475	-8.067	-7.237
	(-1.35)	(-1.30)	(-1.45)	(-1.32)
CPI		-0.003		-0.231***
		(-0.06)		(-2.61)
_cons	2.767	-3.167	34.914**	27.656**
	(0.26)	(-0.38)	(2.24)	(2.07)
Year	Y	Y	Y	Y
N	290	290	298	298
R^2	0.07	0.07	0.10	0.11
adj. R^2	0.04	0.04	0.08	0.08

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

Table 4.15 Difference-in-difference analysis of effect of SDGs

BE	(1)	(2)
SDG	4.658***	4.648***
	(4.00)	(3.93)
Legal	-1.922**	
	(-2.38)	
CPI		-0.089*
		(-1.69)
GDP	-1.151***	-1.016***
	(-3.87)	(-3.50)
Inflation	0.132	0.254
	(0.31)	(0.56)
ESG	-0.033	-0.032
	(-1.25)	(-1.22)
CSR	2.580**	2.550**
	(2.04)	(2.01)
Size	0.326	0.398*
	(1.53)	(1.76)
oROA	73.138	72.043
	(1.43)	(1.41)
oLeverage	-7.690**	-7.457**
	(-2.06)	(-2.00)
_cons	16.520*	7.165
	(1.72)	(0.89)
Year	Y	Y
N	588	588
R^2	0.09	0.08
adj. R^2	0.07	0.06

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

For the cultural dimensions, the results of Table 4.16 show that the B/E disclosure of firms in collectivist, high uncertainty avoidance countries is not driven by the SDGs. On the other hand, high power distance and indulgent nations are driven post announcement (column 7 to column 12), with long term orientation nations driven pre-SDGs (column 1 to column 6). This offers some support for the main analysis.

Table 4.16 Effect of culture on a firm's B/E disclosure pre and post SDG

	Pre SDG						Post SDG					
BE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
HofPD	0.041						0.187***					
	(1.06)						(3.45)					
HofIND		-0.109***						-0.156***				
		(-3.67)						(-3.93)				
HofMAS			0.038						0.012			
			(1.13)						(0.25)			
HofUAV				0.114**						0.198***		
				(2.46)						(4.54)		
HofLTO					0.056*						0.050	
					(1.95)						(1.57)	
HofINDUL						-0.019						-0.099*
						(-0.45)						(-1.70)
GDP	-0.591**	-0.982***	-0.473*	0.203	-0.536**	-0.513*	-1.719***	-1.920***	-1.115***	0.296	-1.224***	-1.417***
	(-2.09)	(-3.39)	(-1.85)	(0.53)	(-2.01)	(-1.94)	(-3.81)	(-3.97)	(-2.88)	(0.60)	(-3.04)	(-3.17)
Inflation	0.818*	0.874*	1.021**	0.987*	1.118**	0.925*	-0.244	0.160	0.310	0.570	0.456	0.307
	(1.70)	(1.88)	(2.07)	(1.94)	(2.24)	(1.88)	(-0.38)	(0.24)	(0.45)	(0.89)	(0.66)	(0.46)
ESG	-0.049	-0.076**	-0.040	-0.072**	-0.060*	-0.048	-0.016	-0.037	-0.004	-0.039	-0.015	-0.017

	(-1.63)	(-2.54)	(-1.36)	(-2.36)	(-1.90)	(-1.55)	(-0.37)	(-0.82)	(-0.09)	(-0.89)	(-0.32)	(-0.39)
CSR	2.880**	3.361***	2.673*	3.280**	2.674**	2.660*	2.154	1.854	1.513	1.403	1.350	1.634
	(2.23)	(2.66)	(1.94)	(2.56)	(1.99)	(1.94)	(1.02)	(0.86)	(0.71)	(0.66)	(0.63)	(0.75)
Size	0.398	-0.258	0.501**	0.017	0.138	0.460	-0.042	-0.573	0.639**	-0.147	0.289	0.224
	(1.62)	(-0.84)	(2.25)	(0.06)	(0.44)	(1.61)	(-0.13)	(-1.45)	(2.48)	(-0.52)	(0.82)	(0.61)
oROA	62.938	96.745	72.160	83.483	82.203	65.916	41.163	97.692	66.810	95.956	79.069	73.947
	(0.87)	(1.33)	(0.99)	(1.14)	(1.14)	(0.91)	(0.54)	(1.30)	(0.86)	(1.23)	(1.01)	(0.95)
oLeverage	-6.923	-10.638**	-7.069	-9.460*	-8.824*	-6.927	-6.295	-10.308*	-6.220	-9.887*	-7.607	-7.688
	(-1.37)	(-2.11)	(-1.40)	(-1.83)	(-1.76)	(-1.36)	(-1.12)	(-1.83)	(-1.08)	(-1.71)	(-1.31)	(-1.32)
_cons	-2.479	22.940***	-5.332	0.053	2.463	-0.748	2.834	37.043***	-2.997	1.737	3.221	12.774
	(-0.48)	(2.80)	(-1.00)	(0.01)	(0.41)	(-0.09)	(0.41)	(3.09)	(-0.39)	(0.26)	(0.40)	(1.10)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	290	290	290	290	290	290	298	298	298	298	298	298
R^2	0.07	0.10	0.07	0.09	0.08	0.07	0.11	0.12	0.07	0.12	0.08	0.08
adj. R^2	0.04	0.07	0.04	0.06	0.05	0.04	0.08	0.09	0.04	0.10	0.05	0.05

The above table represents regression coefficients and t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01. See Table 4.2 for the definitions of each variable

Weak and strong governance

Furthermore, the sample is divided into weak and strong firm and country-level governance[15]. Table 4.17 indicates that weak internal governance influences B/E disclosure among firms in countries headquartered in weaker legal environments (column 1) and with high corruption (column 2) and supports the main analysis. Theoretically, this aligns with the institutional and legitimacy argument supported by Gaia and Jones (2019), that firms are incentivised to provide B/E disclosure to satisfy stakeholders, portray a positive image to enhance reputation and respond to institutional pressures. These results imply firms in these institutions face less scrutiny, and fewer regulations and repercussions, which enable firms to indulge directly or indirectly in unfavourable illicit activities (WWF, 2021).

[15] To measure internal governance, a firm's governance pillar score from the ASSET4 database is collected. A dummy variable with the value of 1 is given if above average for strong internal governance, and a value of 0 for weak internal governance. External governance is measured with a value of 1 if above the average six dimensions from the WGI for strong governance, and a value of 0 for weak external governance.

Table 4.17 Effect of internal governance on legal environment and corruption

	Weak		Strong	
BE	(1)	(2)	(3)	(4)
Legal	-4.195***		0.143	
	(-3.98)		(0.12)	
CPI		-0.166**		-0.037
		(-1.97)		(-0.55)
GDP	-1.516***	-1.093**	-0.965**	-1.082***
	(-3.54)	(-2.39)	(-2.57)	(-3.05)
Inflation	-0.042	0.318	0.369	0.179
	(-0.07)	(0.44)	(0.61)	(0.30)
ESG	-0.023	-0.014	-0.061*	-0.067*
	(-0.55)	(-0.32)	(-1.69)	(-1.84)
CSR	4.661***	4.336***	-0.519	-0.346
	(3.29)	(2.94)	(-0.26)	(-0.17)
Size	-0.046	0.141	0.830***	0.718**
	(-0.14)	(0.37)	(2.68)	(2.37)
oROA	585.011**	569.614**	3.370	5.032
	(2.38)	(2.20)	(0.04)	(0.07)
oLeverage	-3.468	-3.542	-1.963	-2.483
	(-0.69)	(-0.70)	(-0.35)	(-0.44)
_cons	61.544***	37.604***	-6.570	-0.067
	(4.26)	(2.63)	(-0.46)	(-0.01)
Year	Yes	Yes	Yes	Yes
N	246	246	342	342
R^2	0.18	0.13	0.09	0.09
adj. R^2	0.14	0.09	0.06	0.06

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

Table 4.18 shows the effect of a firm's internal governance on culture and reports that weaker internal governance (column 1 to column 6) negatively influences firms in collectivist and indulgent nations and positively influences firms in high power distance, and long-term orientated countries. Moreover, high uncertain avoidance culture is not influenced by strong or weak internal governance. In summary, the results of the effect of internal governance on B/E disclosure show that cultural dimensions, legal environments, and level of corruption are more dominant when accompanied by weaker internal governance, which has some practical implications for firms in their future B/E reporting strategies. This evidence is significant for identifying the internal drivers of B/E disclosure, especially as firms align with the SDG targets. Consequently, internal governance plays a key role in influencing a firm's B/E disclosure and the results imply stronger internal governance is required to protect further biodiversity loss and align with the SDGs and implemented regulations.

Table 4.19 shows the estimation results of equation 4.2 for the effect of external governance on the cultural dimensions. External governance does not influence firms in collectivist or high uncertainty avoidance countries to provide B/E disclosure which supports the main analysis. Whereas, weak institutional governance (column 1 to column 6) is negatively associated with masculinity, long term orientation, and is positively associated with indulgence cultural dimensions.

Table 4.18 Effect of internal governance on culture

	Weak						Strong					
BE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
HofPD	0.154***						0.067					
	(3.35)						(1.31)					
HofIND		-0.206***						-0.048				
		(-6.41)						(-1.26)				
HofMAS			-0.011						0.043			
			(-0.24)						(1.10)			
HofUAv				0.165***						0.159***		
				(3.22)						(4.07)		
HofLTO					0.084***						0.039	
					(2.78)						(1.36)	
HofINDUL						-0.103**						-0.033
						(-2.23)						(-0.67)
GDP	-1.008***	-1.653***	-0.523*	0.588	-0.668**	-0.790**	-1.148***	-1.171***	-0.960***	0.006	-1.029***	-1.047***
	(-2.70)	(-4.70)	(-1.66)	(1.22)	(-2.02)	(-2.24)	(-3.50)	(-3.34)	(-3.35)	(0.02)	(-3.54)	(-3.40)
Inflation	0.489	0.847	0.799	0.918	1.062*	0.862	0.152	0.287	0.469	0.542	0.486	0.351

	(0.80)	(1.63)	(1.22)	(1.27)	(1.65)	(1.33)	(0.29)	(0.54)	(0.87)	(1.11)	(0.88)	(0.66)
ESG	-0.026	-0.062	-0.008	-0.046	-0.028	-0.020	-0.072**	-0.076**	-0.062*	-0.099***	-0.072**	-0.070*
	(-0.58)	(-1.46)	(-0.18)	(-1.06)	(-0.58)	(-0.44)	(-1.98)	(-1.99)	(-1.72)	(-2.74)	(-1.98)	(-1.93)
CSR	3.989***	4.846***	2.952**	3.730***	3.257**	3.266**	-0.177	-0.469	-0.452	-0.088	-0.613	-0.400
	(2.83)	(3.52)	(1.99)	(2.71)	(2.22)	(2.09)	(-0.09)	(-0.23)	(-0.22)	(-0.04)	(-0.31)	(-0.20)
Size	0.094	-0.942**	0.585*	-0.065	0.070	0.204	0.553*	0.436	0.758***	0.083	0.528*	0.671**
	(0.29)	(-2.51)	(1.85)	(-0.18)	(0.19)	(0.58)	(1.87)	(1.18)	(3.37)	(0.31)	(1.71)	(2.07)
oROA	625.728**	578.204**	631.746**	643.381**	800.806***	739.244***	7.707	23.435	13.006	40.642	21.477	11.970
	(2.44)	(2.39)	(2.32)	(2.48)	(2.96)	(2.75)	(0.10)	(0.31)	(0.17)	(0.53)	(0.28)	(0.16)
oLeverage	-1.777	-7.180	-2.746	-6.519	-4.592	-3.720	-3.137	-4.131	-2.590	-6.469	-3.882	-3.045
	(-0.35)	(-1.35)	(-0.50)	(-1.18)	(-0.86)	(-0.70)	(-0.54)	(-0.71)	(-0.46)	(-1.13)	(-0.67)	(-0.53)
_cons	22.381**	64.150***	19.761	21.209**	32.874***	37.836***	-2.181	7.553	-6.678	0.638	-0.482	0.210
	(2.13)	(5.38)	(1.65)	(1.98)	(2.69)	(2.88)	(-0.36)	(0.68)	(-1.06)	(0.12)	(-0.07)	(0.02)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	246	246	246	246	246	246	342	342	342	342	342	342
R^2	0.15	0.24	0.10	0.15	0.13	0.12	0.10	0.10	0.10	0.13	0.10	0.09
adj. R^2	0.11	0.21	0.06	0.11	0.09	0.08	0.07	0.07	0.07	0.10	0.07	0.06

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

Table 4.19 Effect of external governance on culture

	Weak						Strong					
BE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
HofPD	0.060						-0.000					
	(0.51)						(-0.01)					
HofIND		-0.178**						-0.143***				
		(-2.12)						(-2.77)				
HofMAS			-0.299***						0.027			
			(-3.13)						(0.74)			
HofUAV				0.169*						0.099***		
				(1.77)						(2.65)		
HofLTO					-0.139**						0.069**	
					(-2.02)						(2.50)	
HofINDUL						0.152**						-0.136***
						(2.50)						(-2.72)
GDP	-1.006**	-1.487***	-0.443	0.239	-0.652*	-0.681**	-0.460	0.331	-0.525	0.264	0.194	0.302
	(-2.08)	(-3.40)	(-1.24)	(0.31)	(-1.85)	(-1.99)	(-0.71)	(0.52)	(-0.83)	(0.42)	(0.32)	(0.47)
Inflation	0.984	1.068**	0.847*	1.068**	0.881	0.976*	-1.583**	-0.508	-1.534**	-0.761	-0.855	-1.261*

	(1.60)	(2.18)	(1.68)	(2.00)	(1.65)	(1.91)	(-2.34)	(-0.60)	(-2.27)	(-1.00)	(-1.08)	(-1.80)
ESG	-0.069	-0.055	-0.079	-0.090	-0.095	-0.073	-0.019	-0.040	-0.021	-0.036	-0.033	-0.034
	(-1.01)	(-0.85)	(-1.30)	(-1.42)	(-1.45)	(-1.12)	(-0.66)	(-1.34)	(-0.74)	(-1.21)	(-1.14)	(-1.17)
CSR	3.141	2.442	1.843	3.630*	3.302	3.403	2.707*	2.580	2.849*	2.738*	2.100	2.369
	(1.45)	(1.12)	(0.86)	(1.76)	(1.51)	(1.54)	(1.72)	(1.63)	(1.80)	(1.73)	(1.33)	(1.51)
Size	-0.678*	-1.419***	-1.459***	-1.151**	0.164	-0.369	0.741**	0.313	0.592*	0.468	0.605**	0.610**
	(-1.72)	(-2.90)	(-3.38)	(-2.41)	(0.28)	(-0.91)	(2.47)	(0.99)	(1.77)	(1.52)	(2.07)	(2.08)
oROA	226.726*	269.086**	189.901	273.368**	276.328**	314.331***	346.185**	376.702**	313.848*	377.908**	455.102***	442.831***
	(1.83)	(2.34)	(1.65)	(2.26)	(2.40)	(2.79)	(2.23)	(2.45)	(1.94)	(2.47)	(2.81)	(2.83)
oLeverage	-20.659**	-24.390***	-19.381**	-24.895***	-22.806***	-25.946***	-2.348	-5.181	-3.039	-3.901	-3.810	-4.686
	(-2.29)	(-2.83)	(-2.23)	(-2.74)	(-2.63)	(-3.08)	(-0.55)	(-1.19)	(-0.70)	(-0.90)	(-0.89)	(-1.09)
_cons	27.785**	57.119***	63.737***	29.572***	26.099**	22.116**	6.939	26.165***	6.590	6.401	10.203	21.112**
	(1.99)	(4.05)	(4.80)	(3.29)	(2.56)	(2.16)	(0.92)	(2.79)	(0.88)	(0.87)	(1.37)	(2.44)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	130	130	130	130	130	130	458	458	458	458	458	458
R^2	0.23	0.27	0.29	0.27	0.26	0.27	0.09	0.11	0.09	0.10	0.11	0.11
adj. R^2	0.16	0.20	0.23	0.20	0.20	0.20	0.07	0.09	0.07	0.08	0.08	0.09

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 4.2 for the definitions of each variable.

4.7 Concluding remarks

This study has empirically examined the influence of national culture, legal environment, and level of corruption on firms' B/E disclosure. This study was motivated by the lack of empirical evidence and the proposed strategies that biodiversity values should be integrated into policies and regulations at a national and firm level to halt the B/E crisis, which is an existential threat to humanity (CBD, 2021, WEF, 2020). Based on a cross-country sample of Fortune Global firms from 2012-2018, this study offers seminal insights with empirical analysis demonstrating that firms headquartered in countries with weaker legal systems and with a higher level of corruption disclose more B/E information than firms in stronger legal institutions with lower corruption. Additionally, this research identified that the announcement of the SDGs in 2015 was a significant factor in firms providing disclosure, with an observable increase after the implementation of the goals. Further, a sub-sample analysis revealed that disclosure in developing countries is more dominant, which offers support for the extant literature (Hassan et al., 2020; Roberts et al., 2021).

Furthermore, by examining the impact of national culture using Hofstede's dimensions, the estimation results show that firms in countries with collectivist, masculine, high uncertainty avoidance cultural dimensions have greater motivation for more B/E disclosure. Moreover, an association was found between firms in countries with higher power distance, long-term avoidance, and indulgence, although this was not statistically significant. The association between these cultural dimensions support the literature that suggests an association between these cultural dimensions and corruption and thus opens the debate on the cultural influence of B/E reporting (Davis and Ruhe, 2003). Furthermore, the sub-sample analysis reveals that cultural dimensions are more dominant in firms with weaker internal governance. In line with the theoretical construct, the empirical evidence suggests that, overall, firms are providing B/E disclosure as a legitimising strategy to protect, maintain, and enhance their reputation and signal to stakeholders they are responding to institutional pressures (Elamer et al., 2017; Gaia and Jones, 2019; Haque and Jones, 2020). The results hold to a battery of analyses by running robustness checks, using alternative proxies, splitting them into subsamples and addressing endogeneity concerns.

This study contributes to the literature in several ways. First, the study contributes to the emerging stream of B/E accounting literature by uniquely providing evidence-based

insights into the relationship between national culture, legal systems and corruption and a firm's B/E disclosure. The evidence suggest these mechanisms are major drivers of a firm's B/E disclosure and highlights how profit-seeking anthropocentrism dominates corporate behaviour. The findings support the argument that mandatory B/E reporting is required to prevent further B/E decline (Atkins and Atkins, 2018; Atkins and Maroun, 2018). Second, to the best of the researcher's knowledge, this is the first study to measure the influence of the SDGs on a firm's B/E disclosure. This study subsequently demonstrates a clear relationship between B/E reporting and the post-SDG period. Third, the study contributes more broadly to the literature by suggesting culture is a dominant factor in weak governance in the context of B/E reporting. Last, this research contributes by providing future research directions as this research does not conclude if the sample firms are exclusively engaging in corruption, rather it is posed as an area which warrants further investigation in order to identify the requirement for examination.

This research is considerably impactful as it contradicts the assumptions that firms in more regulated environments with less corruption conform to expectations and institutional pressures and provide more reporting, when in fact the evidence finds the opposite is true. These findings open the debate on the effectiveness of current governance mechanisms at both a firm and national level. Distinctively, these robust results can enlighten academics, policymakers, regulators, environmental groups, and wider stakeholders at this pivotal moment, and facilitate them in designing and embedding progressive and transformational strategies that are urgently required to halt the B/E crisis. The results give a clear indication of the changes required with the ongoing COP15, providing an excellent opportunity to regulate wildlife corruption, impose stronger criminal justice and law enforcement, and we endorse such powerful intervention mechanisms, which need to be truly impactful and must demand compliance from firms and institutions.

This study has several implications. The results undeniably signal that urgent transformation change is required, since the continuation of this insincere, misleading and dishonest behaviour will have severe consequences for societal and economic wealth, which wholly depends on healthy biodiversity and ecosystems for survival (IPBES, 2019). Stronger, more culturally diverse internal governance is required to lead firms in halting the B/E crisis and towards complying with increasing stakeholder expectations of conserving and protecting nature. Innovative corporate practices must include strategies and policies that are clearly aligned to tackling corruption and/or illegal activities related to B/E. Raising awareness to

employees, safeguarded whistleblowing, anti-corruption teams, and due diligence on supply chains could be introduced to mitigate risk. Furthermore, the introduction and publication of annual statements is recommended, similar to best practice of modern slavery statements, in order for firms to become more transparent to stakeholders. Finally, stakeholders and shareholders have an important part to play and must pile immense pressure on organisations that are failing to tackle the B/E crisis. Environmental groups and business coalitions must continue to demand and create pressure for more regulation.

Although this research employs rigorous methods, there are limitations to acknowledge. First, the study uses a qualitatively small representation of firms from a much larger population. Second, the sample is limited to the top 200 companies; future studies may extend this or investigate specific sectors over a longer time-series. Future research is undoubtedly required to investigate the diverse range of corruption involved in specific institutions. Subsequent studies can consider individual country or firm specific case studies to obtain a richer understanding of firms' awareness of corruption and illegal activities. In particular, developing nations would be a fruitful avenue of research. Furthermore, smaller and non-listed firms should be investigated to compare and contrast the present findings. Interviews would provide invaluable insights to contribute to this seminal research in order to better understand corporate rationale and firms' understanding of B/E disclosure.

Chapter 5 - The effect of Chief Executive Officer characteristics on biodiversity and extinction disclosure

5.1 Overview

This chapter aims to examine the effect of a Chief Executive Officer's (CEO) personal attributes on a firm's B/E disclosure. Specifically, this research aims to examine the influence of CEO characteristics of career horizon, CEO tenure, CEO power, and CEO gender on a firm's B/E disclosure. This chapter discusses the extant literature, theoretical construct, research design, then presents the empirical results. Thus, this chapter will provide the answer to RQ4: What CEO characteristics motivate biodiversity and extinction disclosure?

This chapter is structured as follows. Section 5.2 presents the literature review. Section 5.3 presents a discussion of theoretical applications. Section 5.4 provides the hypothesis of this study. Section 5.5 provides the research design, including the variable definitions and measurements in section 5.5.1, empirical models in section 5.5.2, statistical issues in section 5.5.3, and data collection and sample selection in section 5.5.4. Section 5.6 presents the main results of this study. Section 5.6.1 presents the descriptive statistics, 5.6.2 the correlation matrix, 5.6.3 presents the main empirical results, 5.6.4 the robustness, along with an additional analysis section. Finally, section 5.7 presents the concluding remarks of this study.

5.2 Literature Review

Drawing on Chapter four, which investigated how national culture, level of corruption, and an institution's legal framework affect a firm's B/E disclosure, the objective and aim of this final empirical chapter is to examine the effect of the personal attributes of the CEO on B/E disclosure. Past studies indicate the role of the CEO is instrumental in a firm's strategic decisions and organizational performance (e.g., Chen et al., 2019; Finkelstein, Hambrick and Cannella, 2009; McClelland et al., 2012). A growing body of research has considered the

effects of the CEO's personal attributes, and scholars have enhanced our understanding of how a CEO's observed characteristics can influence a firm's financial performance, earnings management and CSR activities (e.g., Haga et al., 2021; Haque, 2017; Henderson, Miller and Hambrick, 2006: Jeong et al., 2021; McClelland et al., 2012; Strike et al., 2015). Specifically, prior research indicates the characteristics of CEOs can influence corporate commitments to comply with regulations, which subsequently has a positive impact on environmental performance and sustainability (Shahab et al., 2019; Soobaroyen and Ntim, 2013). Thus, it will be argued that the personal attributes of CEOs are important mechanisms in a firm's B/E disclosure, which has implications for future boards in achieving sustainable development and the SDGs.

The extant B/E literature has begun to investigate the influence of corporate governance mechanisms on biodiversity disclosures by examining the role of board gender diversity (Haque and Jones, 2020; Carvajal et al., 2021). However, the existing literature is silent on what role the CEO and their personal attributes play in B/E disclosure. King and Atkins (2016) express that a modern-day CEO is responsible for implementing corporate strategies that are connected to the well-being of society and the environment, including the protection of biodiversity, which aligns with the wider global SDG objectives. The emerging literature suggests the attitudes and personal attributes of the executive role are crucial in developing CSR strategies (Fabrizi et al., 2014; Haga et al., 2021) and CEOs play a significant role in terms of environmental and social responsibility (Haga et al., 2021; Jeong et al., 2021; Oh et al., 2016). However, it is noted that empirical literature pertaining to CEO attributes, CSR, and environmental reporting is scarce (Oh et al., 2016; Shahab et al., 2019).

Given this backdrop, this study is motivated to fill this knowledge gap as it is important to understand which personal attributes of CEOs influence B/E disclosure, given there is a lack of empirical evidence examining how top executives are answering the B/E crisis. Hence, this offers the opportunity to empirically examine the effect of CEO characteristics, as it can potentially provide crucial insights into their consideration of the B/E crisis. The empirical analysis draws on upper echelon's theory (Hambrick, 2007; Hambrick and Mason, 1984), which explains that top management decision-making is shaped by CEO background characteristics (Carvajal et al., 2021; Hambrick and Mason, 1984; Ntim and Soobaroyen, 2013). This study argues that, as the top leaders, CEOs have the potential to implement goals and policies to prevent further B/E decline. This study further argues that the CEO's gender, tenure, power, and career horizon are important determinants on a firm's B/E disclosure. It

important to examine this relationship for three reasons. First, biodiversity loss and species extinction is a recognised globally critical challenge to society and there are implications for future corporate sustainability if the biodiversity crisis continues to deteriorate (KPMG, 2020; WEF, 2020; WHO, 2020). As discussed in Chapter Four, there may be legally binding targets and regulations following COP15 and the post-2020 global biodiversity framework, thus, it is imperative to understand what CEO characteristics motivate disclosure. The present results will therefore provide important insights for future corporate boards. Second, the extant literature suggests the personal attributes of the CEO are mechanisms for disclosure and are important determinants in corporate governance (e.g., Barker and Mueller, 2002; Haque, 2017; McClelland et al., 2012; Oh et al., 2016: Shahab et al., 2019). Mounting evidence warns that firms will face material financial risk if they do not begin to protect, conserve and reduce their impact on biodiversity (Deloitte, 2020; KPMG, 2020). Consequently, corporate governance must evolve to prevent future risks flowing from further biodiversity decline; the CEO will play an instrumental role in revolutionising firms to become responsible entities in saving the planet. Third, firms will face increased stakeholder pressure for transparency on corporate accountability towards the environment, and in particular, biodiversity impacts. Moreover, CEOs will face increased pressure to implement robust biodiversity strategies in order to contribute towards developing solutions for sustainable development and meeting the SDGs (Barut et al., 2020; Nadeem et al., 2021; Roberts et al., 2021).

Historically, the traditional corporate objective presented by Friedman (1970) is that a firm should primarily maximise the financial wealth of its shareholders (Li et al., 2018). However, in the last decade, sustainability issues and stakeholder concerns of corporate behaviour on social and environmental issues have gained momentum and stakeholders now demand that firms are accountability for their detrimental impacts to the environment, and in particular, biodiversity (Bhattacharyya and Yang, 2019; King and Atkins, 2016; Li et al., 2018; Nadeem et al., 2021). The CEO is responsible for leading and implementing long-term strategies and managing risk, thus, they are influential in setting the corporate tone and can make strategic decisions that contribute towards answering the call to reverse the B/E crisis (Bassyouny et al., 2020; Shahab et al., 2019).

Firms are expected to have an ethical responsibility towards society and the environment, and the CEO is considered the ultimate guardian of the firm and responsible for the corporation's reputation (Balmer et al., 2011). Irresponsible behaviour or unethical practice can have severe financial and reputational consequences, attract unfavourable media attention,

and agitate stakeholders (Cho and Patten, 2007; Clarkson et al., 2008; Nadeem, 2020). Corporate debacles can oust CEOs due to their misconduct, or because they have failed to act responsibly. Illustrated by two high-profile corporate environmental scandals, i.e., the BP Gulf of Mexico oil spill in 2010, and the Volkswagen emissions scandal in 2014, these catastrophic environmental violations led to firms replacing their CEOs with firms suffering financial distress, fines, disrupted operations, and legitimacy issues (Amernic and Craig, 2017; Balmer et al., 2011; Bouzzine and Lueg, 2020, Siano et al., 2017; de Villiers et al., 2011). This serves as a reminder of the importance of the leadership of the CEO, who must responsibly steer the firm to align with societal expectations in order to achieve the SDG goals to prevent further B/E decline, particularly since biodiversity loss is considered one of the greatest global challenges (WEF, 2020). Failing to provide accountability for B/E is no longer acceptable as it is unequivocal there is an existential threat to humanity from further biodiversity loss (Dasgupta, 2021; IPBES, 2019). Thus, there has never been a greater need to understand what CEO characteristics influence a firm when biodiversity is in its most fragile state in human history.

In this vein, recent empirical studies have examined the impact of a CEO's attributes on environmental reporting and performance on Chinese listed firms, finding that research background, financial expertise, and youth are key attributes (Shahab et al., 2019). Similarly, Borghesi et al. (2014) found that younger CEOs, female CEOs, and CEOs who donate to specific political parties invest in CSR strategies. Ntim and Soobaroyen (2013) state that executives' characteristics are associated with corporate commitment to sustainability strategies. Although no studies have examined the CEOs attributes in the context of biodiversity disclosures, researchers examined observable characteristics as key predictors in financial performance and CSR, and environmental management practices. A number of researchers examined CEO gender (Bassyouny et al., 2020; McGuiness et al., 2017; Zhang et al., 2021), CEO tenure and age (Fabrizi et al., 2014; Henderson, Miller and Hambrick, 2006: Jeong et al., 2021; Strike et al., 2015), CEO power (García-Sánchez et al., 2013; Haga et al., 2021; Haque, 2017), and CEO career horizon (Aktas et al., 2021; McClelland et al., 2012; Oh et al., 2016).

Based on the above discussion, it is worthwhile to empirically examine the effect of these CEO characteristics, given they influence corporate decisions, yet their participation in addressing the B/E crisis is still unclear. To answer the research question, this study examines the top 200 Fortune Global firms in a cross-country panel dataset, with a

sample of 22 countries over five years. Specifically, the relationship between a CEO's gender, tenure, power, and career horizon and a firm's B/E disclosure is examined. This research draws on upper echelons theory to explain the empirical findings.

Consequently, this study makes significant contributions to the extant literature in several ways. First, to the researcher's knowledge, it is the first to empirically examine the effect of a CEO's characteristics as determinant factors on B/E disclosure and therefore provides the first attempt to connect the personal attributes of the CEO to corporate accountability for B/E. Second, this research contributes to the upper echelon's perspective (Hambrick, 2007; Hambrick and Mason, 1984) by examining how the personal attributes of the CEO affect B/E disclosure. Third, the findings of this research stimulates debate on the importance of gender diversity on boards in B/E studies (Carvajal et al., 2021: Haque and Jones, 2020) along with the debate on whether female CEOs are more ethical (Zalata et al., 2019). Fourth, it contributes more broadly to the growing body of B/E literature (e.g., Atkins et al., 2018; Gaia and Jones, 2019; Hassan et al., 2020; Maroun and Atkins, 2018; Roberts et al., 2021) and corporate governance literature (Bassyouny et al., 2020; Liao, Luo, & Tang, 2015; Zalata et al., 2021) by demonstrating the importance of CEO characteristics for B/E accountability in addition to financial performance and CSR reporting and adds to the growing literature that examines how CEO attributes influence corporate decision-making.

Subsequently, the findings of this research are anticipated to be impactful with important practical and policy implications at a firm level. The findings can affect corporate policies, which informs national policies (Adams et al., 2011; Huang and Kisgen, 2013; Liu, 2018). The empirical evidence can assist, inform and can guide corporate boards in developing solutions to meet the SDGs, and mitigate any future financial risk from further B/E decline. Furthermore, the results have implications for directors in terms of CEO appointments, and will be of general interest to boards, shareholders, and regulators who wish to enhance B/E accountability, by highlighting the key attributes of CEOs.

5.3 Theoretical Framework

Some existing studies pertaining to CEO attributes have applied agency theory to explain the effect of the CEO's characteristics on a firm's performance, since the theory predicts that the goals of the owner and the CEO conflict, given the CEO may behave in a way that maximizes their own wealth, rather than focusing on the long-term objectives of the firm

(Che-Ahmad et al., 2019; Strike et al., 2015). However, it is particularly noteworthy that a stream of prior studies have adopted the upper echelons theory to explain the attributes of the CEO on CSR and environmental activities (Jeong et al., 2021; Oh et al., 2016; Zhang et al., 2021), environmental reporting (Shahab et al., 2018; Shahab et al., 2019), and narrative tone (Bassyouny et al., 2020). Upper echelons theory is a significant theoretical perspective that addresses the influence of CEOs, and particularly, the indicators of their characteristics on a firm's performance (Wang et al., 2016). In the context of the biodiversity literature, Carvajal et al. (2021) examine the effect of board gender on biodiversity disclosures and employ upper echelons theory in their study of US firms. Nevertheless, so far, existing studies have failed to examine the effect of the distinct attributes of the CEO on B/E disclosures from an upper echelon's perspective. Thus, this study seeks to apply the arguments of upper echelons theory to inform this research.

According to upper echelons theory (Hambrick, 2007; Hambrick and Mason, 1984), top executives possess distinct observable attributes such as age, personality, career experience, and education are important determinants of shaping organisational outcomes and a firm's performance (Carpenter et al., 2004; Jeong et al., 2021; Shahab et al., 2019). Upper echelons theory suggests scholars can examine "observable managerial characteristics as indicators" (Hambrick and Mason, 1984, p.196) such as age, tenure, and experience to explore how the CEO's personal attributes manifest in strategic decisions (Wang et al., 2016). Upper echelons theory explains that the personal attributes of top executives can predict the outcomes of the firm (Bassyouny et al., 2020; Chatterjee and Hambrick, 2007; Hambrick and Mason, 1984). Furthermore, the theory contends that CEOs have a critical role to play in CSR and their characteristics can affect the firm's CSR performance (Chen et al., 2019). Gounopoulos and Pham (2018) note that CEOs determine the tone at a board level, which impacts the decision-making of managers. As such, the unique characteristics of top executives influence corporate strategies and outcomes and their personal attributes affect their ability in decision-making (Carvajal et al., 2021). Cho and Hambrick (2006) state that the CEO's underlying biases behind their characteristics may distort information they are presented with and will therefore reflect on subsequent strategic choices and firm outcomes.

In summary, the research argues that a firm's performance and CSR depends on the personal attributes of the CEO. The findings of prior studies are consistent with the upper echelon's assumption that the observable features of managers are key determinants in CSR (Oh et al., 2016). Furthermore, upper echelons theory argues that firms are a reflection of their

top managers, and the strategic decisions they make are based on their characteristics (Chatterjee and Hambrick, 2007; Hambrick and Fukutomi, 1991; Jeong et al., 2021). The theory posits that CEOs have the potential to align biodiversity strategies and they comply to the SDGs based on their personal attributes. Moreover, this supports the notion that we must understand which personal attributes of CEOs are mechanisms for B/E disclosures given the ecological emergency and its threat to business sustainability.

Given the critical challenge facing humanity from the B/E crisis, firms must commit to long-term strategies to protect biodiversity and minimise the firm's impacts. Furthermore, to minimise future financial distress, the B/E crisis threatens long-term sustainability. This study argues that the CEO plays an integral role in steering firms to formulate corporate policies and strategies to ensure the long-term sustainable development of the firm, and responsibly contribute to achieving the SDGs. Upper echelons theory predicts that a firm's actions towards biodiversity is a reflection of the choices the CEO makes (Wang et al., 2016). CEOs failing to act responsibly and guide the firm in answering the B/E crisis may result in firms facing violation fines, stakeholder pressure, reputational damage, and legitimacy issues (Carvajal et al., 2021). From an upper echelon's perspective, CEOs are positioned to optimise the best strategies for corporate sustainable development (Shahab et al., 2019). The theory posits that the distinct characteristics of CEOs are key factors in strategic decisions, including the implementation of biodiversity strategies. Therefore, the upper echelons perspective seems appropriate as it can explain the effect of the CEO's observable characteristics on B/E disclosures, which can help influence future board governance, acting as a mechanism to reverse the biodiversity crisis.

5.4 Hypothesis development

This section presents the development of the research hypothesis. It is important to understand the role of the CEO in a firm's B/E disclosure as this can be an important factor to help minimise further biodiversity loss and decline in the corporate setting. Following previous studies (e.g., Aktas et al., 2021; Jeong et al., 2021; Haga et al., 2020; McClelland et al., 2012; Strike et al., 2015; Zhang et al., 2021) this research explores how the role of the CEO, and in particular, the CEO's characteristics of gender, power, tenure, and career horizon influence a firm's B/E disclosure. The literature suggests these attributes can provide powerful explanations for the differences in firms' performance, and more specifically, CSR performance (Carpenter et al., 2004; Chen et al., 2019; Hambrick and Mason, 1984; Tang et

al., 2015). The characteristics are discussed in this section, supported by the theoretical construct of upper echelons theory.

5.4.1 CEO Gender

The presence of female CEOs has increased dramatically over the last decade due to reformed laws and initiatives designed to increase the role of female participants at the senior level (Adams, 2016; Zalata et al., 2018). Thus, distinct strands of gender research have emerged on the effect of female CEOs in the corporate environment (e.g., Borghesi et al., 2014; Harris et al., 2019; Zalata et al., 2018). A body of academic research explains that the gender of a CEO in a corporate setting is a significant factor for firms' policies (e.g., Adams and Ferreira; Liu et al., 2014). In wider CSR studies, Rao and Tilt (2016) found female leadership positively influences CSR disclosure. Furthermore, this contention is echoed in numerous studies, with evidence that female leadership positively influences a firm's performance on social and environmental initiatives (e.g., Bear et al., 2010; Boulouta, 2013; Galbreath, 2011). More specifically, Liu (2018) empirically examined the role of female CEOs with a firm's environmental litigations and found the presence of female CEOs is significantly associated with reduced environmental lawsuits. Furthermore, McGuinness et al. (2017) found CSR performance is stronger where a female CEO is present and Jeong et al. (2021) found female CEOs influence CSR disclosures.

Conversely, some wider CSR empirical studies find that female CEOs do not influence workplace injuries or illnesses (Haga et al., 2021) and Zhang et al. (2021) found that male CEO's influence CSR activities more than their female counterparts. Haga et al. (2021) explain that the reason for this result may be due to the generally low presence of female CEOs.

Currently, a gap exists in the literature to investigate the role of CEO gender in B/E disclosure. It is important to provide insights into the interplay between CEO gender and a firm's B/E disclosure as it has been largely overlooked and it is expected that corporate governance structure will become an integral part of firm's accountability for the B/E crisis and future sustainable development (Dasgupta, 2021; King and Atkins, 2016). The presence of female CEOs warrants empirical examination to better explain if they are more sensitive to the B/E crisis than their male counterparts, which may have implications for future corporate boards in addressing the B/E crisis and achieving the SDGs. Building on the arguments of

upper echelons theory, which predicts that females are more ethical, sensitive to nature, and are more caring about the environment than males (Carvajal et al., 2021), it is expected that the presence of a female CEO will amplify B/E disclosure. Thus, the first hypothesis is as follows:

***H1**- There is a positive relationship between female CEOs and B/E disclosure*

5.4.2 CEO Power

CEO power is referred to if the CEO additionally serves as the board chair position. It is an important mechanism to explore as the CEOs power may influence and contribute to engaging in CSR strategies (Jeong et al., 2021). The positions of the CEO and chairperson are considered the two most powerful roles on the corporate board (Watson and Head, 2013). De Villiers et al. (2001) explain that when the role of the CEO and board chair is combined, this places much more power in a single individual, which may lead to agency problems within the firm.

A stream of literature considers the mechanism of the CEO's power (e.g., Haque and Jones, 2020; Jeong et al., 2021; Ntim et al., 2019; Zhang et al., 2021). Particularly, in CSR studies, Jizi et al. (2014) found that in firms where the CEO and the chairperson are the same person, more CSR disclosure is provided. Haga et al. (2021) support this notion finding that where there is no CEO/Chairperson separation there are fewer workplace injuries and illnesses and de Villiers et al. (2011) found environmental performance is improved when the CEO and chair are the same person. In biodiversity studies, Haque and Jones (2020) included CEO power in their study of European firms' biodiversity disclosures and found an association between biodiversity disclosures and CEO power, implying that in firms where the CEO holds the chair position more biodiversity disclosure is provided. Similarly, Carvajal et al. (2021) explore CEO power in their study of biodiversity disclosures of US firms and found when the CEO is more powerful, disclosure on biodiversity restoration protection and impact reduction disclosure is higher. However, a limitation in these studies is they fail to explain this relationship and therefore this warrants further examination.

Upper echelons regards the distinct characteristics of executives as fundamental in strategic decisions, thus CEOs with more power play a crucial role in the environmental crisis. More literature suggests that when CEOs have the additional power of chairing the corporate board, this acts as a mechanism for motivating disclosure. The upper echelons perspective

predicts CEO power as an important observable characteristic which can explain a firm's B/E disclosure. Thus, based on the above discussion, it is expected when the CEO additionally chairs the board, the CEO is more powerful, and therefore B/E disclosure is higher.

H2- *There is a relationship between CEO power and B/E disclosure*

5.4.3 CEO Tenure

A CEO's tenure has significant strategic implications for a firm, as it is considered an important mechanism of a firm's performance and outcomes (Chen et al., 2019; McClelland et al., 2012; Oh et al., 2016; Oh et al., 2018). Upper echelons perspective explains how CEOs show different attributes based on their experiences during the length of their tenure (Hambrick and Fukutomi, 1991; Jeong et al., 2021). CEO tenure is considered an indication of firm's experience and knowledge and is a heavily examined characteristic in the literature (Henderson et al., 2006; McClelland et al., 2012; Oh et al., 2018).

In the early stage of tenure, a CEO may be more motivated to engage in long-term investments as they can reap the benefits later in their tenure (Chen et al., 2019). Moreover, CEOs in early tenure may be more inclined to engage in CSR practices as they are more alert to environmental challenges and are adaptable to change (McClelland et al., 2012). The literature suggests newer CEOs may engage in CSR activities to signal their ability and mitigate any career concerns to the board of directors (Finkelstein et al., 2009; Hong et al., 2016). This is supported by the notion CEOs with enhanced performance in early tenure are more likely to receive future benefits such as compensation, status and reputation, and are therefore incentivised to indicate their competencies early in their appointment (Chen et al., 2019; Oh et al., 2018). Chen et al. (2018) found CSR performance is greater when the CEO has short tenure when examining US firms. Likewise, Kang (216) found when CEOs are close to retirement CSR is reduced and Lewis et al. (2014) found CEOs with short tenure are more likely to influence voluntary environmental information. On the other hand, Oh et al. (2018) found no significant relationship with CSR and tenure and Jeong et al. (2021) found the relationship between tenure and CSR changes with political orientation.

Conversely, the literature argues that as CEOs gain longer tenure, they become less adaptable (Miller, 1991), are risk averse (Simsek, 2007) and maintain the status quo with corporate strategy (McClelland et al., 2012). CEOs with longer tenure are less likely to implement change as the firm's success may lead to a reluctancy to adjust to newer strategies and they may fail to recognise new challenges (Hambrick and Fukutomi, 1991; Oh et al., 2018). Risky strategies such as CSR initiatives or biodiversity commitments are considered long-term with unpredictable outcomes, thus CEOs with longer tenure are less likely to implement strategies. The extant literature supports the notion that top executives with longer tenure favour the status quo as opposed to engaging in strategies with unknown outcomes (e.g., Finkelstein and Hambrick, 1990; McClelland et al., 2012; Miller et al., 1991). Furthermore, such CEOs may become over-confident due to past success (Oh et al., 2018).

In the context of B/E disclosure, this research argues CEOs with short tenure are more likely to motivate disclosure due to the infancy of the B/E crisis. CEOs with longer tenure may lack knowledge, experience or capacity with the introduction of new environmental challenges, such as the biodiversity crisis, and they remain silent, as the B/E crisis requires long-term commitment, investment and strategy. Based on the upper echelon perspective, this characteristic is an important factor which may influence a firm's B/E disclosure and can benefit a firm's strategy to implement biodiversity commitments and contribute to achieving the SDGs. Thus, based on this discussion, the third hypotheses predicts that CEOs with shorter tenure provide more B/E disclosure.

H3 *- There is a relationship between CEOs with short tenure and B/E disclosure*

5.4.4 Career Horizon

When a CEO is reaching a stage in their career when they are approaching retirement, their career horizon is short, and when their career is beginning, their career horizon is long (Matta and Beamish, 2008; Zhang et al., 2021). The horizon problem occurs when CEOs are near retirement, during which time they may pursue strategies where they personally benefit, which conflicts with maximising shareholder wealth and can have implications for a firm's strategic decisions (McClelland et al., 2012; Strike et al., 2015).

Previous researchers have examined the relationship between CEO career horizon and research and development spending (Barker and Mueller, 2002), international acquisitions

(Matta and Beamish, 2008), earnings quality (Che-Ahmad et al., 2019), and family ownership (Strike et al., 2015). Oh et al. (2016) explain a CEO's career horizon is an important factor in CSR studies as it is a critical element in corporate decisions on social responsibility and sustainability strategies. They note that there is a void in examining the relationship between CSR disclosures and career horizon problems.

The literature suggests CEOs who are near retirement are said to pursue short-term strategies, are expected to be focused on career security, and may be motivated by retirement compensation, and their reputation and legacy (Anita et al., 2010; Che-Ahmad et al., 2019; McClelland et al., 2012; Strike et al., 2015). A body of research finds older CEOs are cautious on entering long-term projects and are more risk averse as they are unable to correct any adverse outcomes (Anita et al., 2010; Gao, 2010; Strike et al., 2015). Particularly, Oh et al. (2016) provide evidence that as career horizon is shortened, CEOs are less likely to engage in CSR strategies as the outcomes are uncertain.

In contrast, some researchers explain that short term career horizon can improve corporate decisions, suggesting CEOs closer to retirement may implement stronger corporate governance strategies (Aktas et al., 2021). Furthermore, Jenter and Lewellen (2015) show that the likelihood of firm takeover bids is greater when the target CEO has short term career horizon.

Newly appointed CEOs have longer horizons than those who are near retirement. the literature suggests CEOs with a longer horizon are more incentivised to undertake more investment decisions with long-term benefits (Chen et al., 2019; Pan et al., 2016). CEOs in early tenure are thought to be more dynamic and are more likely to engage in CSR strategies. Chen et al. (2019) support this when examining the CSR performance of U.S firms and found CEOs with a longer horizon motivate CSR performance. Upper echelons theory posits that when CEOs have long career horizons and are younger in age they are more likely to undertake riskier strategies and ventures with the aim to prove their abilities to the firm (Shahab et al., 2018).

CSR commitments and policies are considered long-term investments (Oh et al., 2016; Orlitzky et al., 2003), and in the context of B/E reporting, the career horizon problem has yet to be examined. To halt the B/E crisis and meet the SDGs by 2030, firms are expected to implement long-term strategies and commitments to protect and conserve nature, reduce impact and achieve a firm's sustainable development (Dasgupta, 2021; KPMG, 2020). CEOs

with a short term career horizon are not expected to engage in B/E disclosures as they are considered a long-term commitment. These CEOs may have a lack of expertise and knowledge due to the infancy of the reporting, which they would consider risky to initiate. Building on upper echelons predictions, which regards age as a significant observable characteristic (Shahab et al., 2019; Wang et at., 2016), CEOs with long career horizons are expected to engage more in B/E strategies based on their observable personal attributes. Thus, based on the above argument and justification in CSR literature, this research proposes when career horizon is short, CEOs are not likely to engage in B/E disclosure.

H4 **-** *There is a relationship between short career horizon and B/E disclosure*

5.5 Research Design

This section outlines the research design in this chapter. Section 5.5.1 discusses the variable definitions and measurements. Section 5.5.2 presents the empirical models. Section 5.5.3 presents the statistical issues. Finally, section 5.5.4 provides the sample selection and data collection.

5.5.1 Variable definition and measurement

This section explains the variables selected for this study and explains the variable measurement. First the dependent variable is presented, then the explanatory variables are presented.

Dependent variable

The dependent variable is a firm's total B/E score, which is calculated from a B/E index of 21 indicators. This index is employed and presented in the research of Chapter Four (please refer to Table 4.1 for B/E disclosure index) and discussed in detail in section 4.5.1. In summary, the B/E index follows Hassan et al. (2020) and is based on prior B/E literature and the GRI biodiversity framework (Adler et al., 2018; Atkins and Maroun, 2018; GRI, 2020, UN, 2020). The use of this B/E disclosure index extends prior studies which rely on ESG databases, GRI standards, and biodiversity disclosures and provides opportunity to capture information that these alternative frameworks omit (e.g., Bhattacharyya and Yang; Boiral, 2016; Haque and Jones, 2020). Panel A of Table 5.1 provides a description of the dependent variable.

This research replicates the study of Chapter Four and measures the B/E disclosure index via the weighted scoring method of Wiseman (1982) by assigning quantitative disclosure with a value of 3, qualitative disclosure with a value of 2, minimal disclosure with a value of 1, and no disclosure a value of 0. As discussed in Chapter Four, section 4.5.1, a body of environmental research (e.g., Clarkson et al., 2008; Patten, 2002) follow this method. It is selected here because quantitative metrics are desired in future B/E reporting, as they can provide comparable and measurable information over time (CBD, 2021; Dasgupta, 2020).

Independent variables

Panel B of Table 5.1 provides the definition and source for all independent variables of this study. To test H1, *FCEO* is a binary variable that equals 1 if the firm's CEO is female, and 0 if male (Bassyouny et al., 2020; Haga et al., 2021; Liu, 2018; Zalata et al., 2021). To test H2, *Power* is measured as a dummy variable of 1 if the CEO is not the board chairperson, and 0 if otherwise (Haga et al., 2021; Jeong et al., 2021; Zhang et al., 2021). To test H3, *CEOTenure* is the number of years a CEO has occupied the position (Aktas et al., 2021; McClelland et al., 2012). To test H4, Strike et al. (2015) are followed to measure *Horizon*, which is calculated by deducting the CEO's age from 70 years of age, which is the expected retirement age of 65 plus subsequent service on boards. It is important to note that older CEOs have shorter career horizons. For example, a CEO who is 65 years old would have a career horizon of 5 years, whereas a 50-year-old CEO would have a career horizon of 20 years.

Control variables

Following related studies, a series of control variables are employed. Several corporate governance variables are included, which are employed in a stream of B/E and corporate governance research (e.g., Haque, 2017; Haque and Jones, 2020; Liu, 2018; Rao and Tilt, 2016; Zalata and Abdelfattah, 2021; Zalata et al., 2021). The variable definitions and measurements are explained in Panel C of Table 5.1. Where board size *Bsize* is the total number of board members, *Connections* is the affiliation average of the board, *Directors* is a measure of the proportion of independent board members, *CSR* is a dummy variable with a value of 1 if the firm has a CSR committee and 0 otherwise. *Big4* is a dummy variable with a value of 1 if the firm is audited by one of the big four accounting firms, and 0 if otherwise, *Assurance* is a dummy variable with a value of 1 if the firm report is assured and 0 if otherwise. Lastly, gender

diversity (*Diversity*) is measured as the proportion of female board members (Bassyouny et al., 2020; Cumming et al., 2015; Haque and Jones, 2020; Liu, 2018),

Following the extensive biodiversity and environmental literature, several financial control variables are included to deal with endogeneities (Clarkson et al., 2011; Elamer et al., 2017; Haque and Jones, 2020; Haque and Ntim, 2018; Roberts et al., 2021). In particular, this research controls for *Leverage*, which is measured by total debt/total assets. Firm *Size* is the natural logarithm of the firm's total assets. The firm's return on assets *ROA* is measured by the firm's operating income/total assets (please refer to Panel C of Table 5.1 for more details).

Table 5.1 Variables of study

Variables	Description	Source
Panel A: Dependent Variable		
BE	Total score of a firm's B/E disclosure from 21 disclosure items. Scored 0-3; the maximum a firm can score is 63.	Hassan et al. (2020)
Panel B: Independent variables		
FCEO	Dummy variable equal to 1 if CEO is female, 0 if male	Zalata et al. (2019)
Power	Dummy variable equal to 1 if CEO and board chairperson are two different individuals, 0 otherwise	Haque & Jones (2020)
CEO Tenure	Number of years as the CEO	
Horizon	The CEO's current age deducted from 70 years of age	Strike et al. (2015)
CEO Retire	Dummy variable equal to 1 if aged above 64 years old, and a value of 0 if aged 64 years and below	Jeong et al. (2021)
Panel C: Control variables		
BSize	Number of members on board	
Diversity	Percentage of female board members	Haque & Jones (2020)
Connections	Board affiliations average	
Directors	Percentage of independent directors	Zalata et al. (2021)
Assurance	Dummy variable equal to 1 if firm has assurance, 0 if otherwise	
Big4	Dummy variable equal to 1 if firm assured by one of big 4 accounting firms, 0 if otherwise	
CSR	CSR Committee. A dummy variable: 1 if the firm has a board CSR committee, 0 if otherwise	Haque & Jones (2020)
Size	Natural logarithm of total assets for firm *i* in year *t* WCO2999	Worldscope
Leverage	Measured by total debt divided by total assets. WCO3255/WCO3501	Worldscope
ROA	Return on assets measured by operating income divided by total assets. WC01250/WC02999	Worldscope

5.5.2 Empirical model

The following equation is developed to test the hypotheses related to the association between a firm's B/E disclosure and CEO characteristics. The regression model is as follows:

$$BE_{it} = \boldsymbol{\beta_{0it}} + \boldsymbol{\beta_1}FCEO_{it} + \boldsymbol{\beta_2}Power_{it} + \boldsymbol{\beta_3}CEOTenure_{it} + \boldsymbol{\beta_4}Horizon_{it} + \boldsymbol{\beta_5}CEORetire_{it} + \boldsymbol{\beta_6}BSize_{it} + \boldsymbol{\beta_7}Diversity_{it} + \boldsymbol{\beta_8}Connections_{it} + \boldsymbol{\beta_9}Directors_{it} + \boldsymbol{\beta_{10}}Assurance + \boldsymbol{\beta_{11}}Big4_{it} + \boldsymbol{\beta_{12}}CSR_{it} + \boldsymbol{\beta_{13}}Size_{it} + \boldsymbol{\beta_{14}}Leverage_{it} + \boldsymbol{\beta_{15}}ROA_{it} + \text{Year Fixed Effect} + \text{Industry Fixed Effect} + \text{Country Fixed Effect} + \boldsymbol{\varepsilon} \quad (5.1)$$

In equation 5.1, *BE* is a firm's biodiversity and extinction disclosure score of sample firm *i* in year *t.* Where, *FCEO* refers to CEO gender, *Power* refers to CEO and chairperson separation, *CEOTenure* refers to number of years of tenure, *Horizon* refers to career horizon, *CEORetire* refers to CEO retirement, *BSIZE* refers to board size, *Diversity* refers to board gender diversity, *Connections* refers to average board affiliation, *Directors* refers to proportion of independent directors, *Assurance* refers to a firm's assurance, *Big4* refers to if audited by one of the big four accounting firms, *CSR* refers to CSR committees, *Size* refers to the size of the firm, *Leverage* refers to total debt/total assets, *ROA* refers to return on assets, *it* period indicators, $\boldsymbol{\beta_0}$ the regression intercept, and $\boldsymbol{\varepsilon}$ the error term.

5.5.3 Statistical issues

Similar to Chapter Three, this research employs Poisson regression analysis as the dependent variable, which is a count of the number of disclosures. Poisson regression is appropriate for count data in a fixed period of time (Coxe et al., 2009; Lambert, 1992). To begin, the model in OLS regression was ran, but problems were encountered, since using count variables in OLS regression can be unpredictable (Cohen et al., 2003). Therefore, this justifies the choice of Poisson regression for this research.

To address heteroskedasticity issues, this study uses a year, country, and sector fixed effect regression model to address the effect of unobservable or omitted variable bias, which follows previous research (Elamer and Benyazid, 2018; Haque and Jones, 2020; Roberts et al., 2021). The fixed-effect method, which controls for heterogeneities over time is employed. The statistical software STATA was selected to perform the empirical regression.

5.5.4 Sample selection and data collection

This research employs the sample of Chapter Three and Four and examines the sustainability reports (or equivalent) of the top 200 companies from the Fortune Global 2016 list. The fiscal years 2012, 2014, 2016, 2018, and 2020 are examined. As discussed in Chapter Three, these firms are perceived as leaders in CSR reporting and are examined in prior biodiversity and CSR studies for this reason (e.g., Adler et al., 2018; Cho et al., 2015a; Kunz, 2016). Importantly, these large organisations are expected to negatively impact, and depend the most on, biodiversity and nature (Adler et al., 2018). Furthermore, as discussed in Chapter Two, there remains a limitation in the literature in examining a dataset of global firms, which justifies the choice of sample. This research investigates a five-year period, which extends previous contributions in literature (e.g., Adler et al., 2018; Hassan et al., 2020; Roberts et al., 2021). A firm observation was excluded if the reporting format is absent or if it was not possible to translate it into the English language. A total of 44 companies were excluded and the final sample consisted of 956 firm-year observations.

A manual content analysis is used to capture all relevant B/E disclosure. This method is considered appropriate as the B/E disclosure index contains items that are unobtainable in databases. Moreover, it is noted fewer researchers adopt a manual data collection in CSR studies (Nguyen et al., 2020) and they tend to encourage capturing all relevant information. As explained in Chapter 3.5, 28 key words were used to search for B/E disclosure. The researcher also carefully read reports to cover all relevant B/E disclosure. Disclosure was manually coded by the researcher, with the test-retest method performed to ensure stable coding (Hassan and Marsden, 2010). A discussion of the reliability and validity of content analysis is provided in Chapter 3.5. In summary, content analysis is regarded as a precise, replicable, and reasonable measure of a firm's information (Branco and Rodrigues, 2006; Klaus, 1980; Rao and Tilt, 2016). Although content analysis does present some reliability concerns, since voluntary disclosure can be presented for legitimising strategies by conveying misleading information to an audience, due to the infancy of this research and limited B/E information on databases, it is considered the most appropriate method for this study. Financial variables are obtained from Refinitiv and BoardEx data is used to measure board member characteristics.

5.6 Results

This section reports and discusses the results of this study. First the descriptive statistics are reported in section 5.6.1. Then, the correlation analysis is presented in section 5.6.2. Next, in section 5.6.3, the regression results are reported and discussed. Finally, in section 5.6.4 additional analysis is presented.

5.6.1 Descriptive

Panel A of Table 5.2 indicates that 595 out of 956 firms (62%) provide B/E disclosure and the remaining 361 (38%) fail to provide any. Similar to the results in Chapter Four (section 4.6.1), these results are promising given prior studies found most firms do not provide any disclosure (e.g., Adler et al., 2018; Rimmel and Jonäll, 2013). In explanation, prior studies employed GRI and limited disclosure indexes, which may not capture all relevant B/E information and therefore this justifies the use of the B/E disclosure index employed in this study. Nonetheless, this result highlights almost a third of the world's largest firms, who are leaders in sustainability reporting (Addison et al., 2019; Adler et al., 2018; KPMG, 2020), are failing to provide accountability for their impacts on biodiversity and their efforts to protect, conserve and restore nature.

Panel B of Table 5.2 presents the summary statistics of all the variables in the main regression analysis. The dependent variable, i.e., the biodiversity and species extinction disclosure score (*BE*), has a maximum score of 52, with a mean score of around 7 (standard deviation of 9.595). This suggests the average B/E disclosure score of a firm is significantly low, with a potential maximum score of 63 (21 x 3). This result is consistent with empirical B/E studies that conclude disclosure is minimal, vague and low (Adler et al., 2018; Hassan et al., 2020; Rimmel and Jonäll, 2013; Talbot and Boiral., 2021). This highlights how the standard of B/E reporting is inadequate and insufficient if firms are to effectively contribute to sustainable development and align with the SDGs, and further supports the need for transformational change and mandatory B/E reporting (Atkins and Atkins, 2018; Atkins and Maroun, 2018).

The longest CEO tenure (*CEOTenure*) is 41 years, with an average of around 11 years. CEOs have a career horizon (*Horizon*) average of around 12 years to retirement, with a maximum of 34 years to retirement. The largest board size (*Bsize*) is 30 board members, with

an average of around 15 members. The board has an average of three outside directorships (*Connections*), with a maximum of eleven, and the boards have around 54% independent directors, which is comparable with other studies (Bassyouny et al., 2020; Haque and Jones 2020). The female presence on boards is around 33% (*Diversity*), with the maximum presence on a board at around 3%. For other variables (dummy variables), the results imply around 6% of firms have female CEOs, which is line with prior research (Bassyouny et al., 2020). Around 13% of CEOs are more powerful (*Power*), by additionally holding the chair position. Around 12% of CEOs are over 64 years old and around 59% of firms have CSR committees, which is consistent with studies (Haque and Jones, 2020). Finally, around 65% of firms have gained assurance (*Assurance*), with around 40% gaining assurance from one of the big four (*Big4*) accounting firms.

Table 5.2 Descriptive results

Panel A. Sum of companies who provide B/E disclosure

B/E disclosure provided	Frequency of companies	Percent
No	361	38
Yes	595	62
Total sample	956	100

Panel B. Descriptive results of all variables

Variable	N	Mean	Std. dev.	Min	Max
BE	956	6.975	9.595	0	52
FCEO	804	0.064	.2461	0	1
Power	804	.1343	.3412	0	1
CEO Tenure	628	11.206	10.930	0	41.9
Horizon	621	12.458	6.021	0	34
CEO Retire	621	.1207	.3261	0	1
Bsize	804	14.937	5.010	1	30
Connection	804	3.176	1.342	1	11.6
Diversity	804	.3235	.344	0	3.18
Directors	804	.5404	.2326	0	1.31
CSR	956	.5847	.4930	0	1
Assurance	956	.6485	.4776	0	1
Big4	956	.3995	.4900	0	1
oROA	874	1.492	1.000	-1.114	29.410
oLeverage	874	2.225	1.000	-2.670	20.553
Size	911	19.814	2.301	9.830	26.647

5.6.2 Correlation

Table 5.3 presents the Pearson correlation matrix of all variables in the main regression of the study and provides preliminary evidence, which is further examined in the next section. Initial evidence is provided showing that B/E disclosure (*B/E*) is positively correlated with CSR committees (*CSR*), assurance (*Assurance*), assurance from one of the big four (*Big4*), and firm

size (*Size*), and negatively correlated with CEO career horizon (*Horizon*), and board size (*Bsize*). The purpose of the correlation matrix is to detect any high correlation between variables which may cause multicollinearity issues (Gujarati and Porter, 2009), which is discussed in Chapter Three. It is generally considered that the acceptance of coefficient correlation should be below 0.80 (Gujarati and Porter, 2009; Haniffa and Cooke, 2005). Table 5.2 shows the coefficients below 0.8 indicating there are no multicollinearity issues. Furthermore, the variables (*ROA*) and (*Leverage*) are orthogonalized to avoid high correlation for this study due to earlier detection of high correlation.

Table 5.3 Pearson correlation matrix of all variables used in the main regression analysis.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) BE	1.00															
(2) FCEO	-0.05	1.00														
(3) Power	-0.06	-0.05	1.00													
(4) CEO Tenure	0.08	0.00	-0.03	1.00												
(5) Horizon	-0.09*	0.04	0.04	-0.08*	1.00											
(6) CEO Retire	0.02	-0.01	0.00	-0.03	-0.59*	1.00										
(7) Board Size	-0.09*	0.00	0.03	-0.02	0.11*	-0.11*	1.00									
(8) Connection	-0.05	-0.03	0.21*	-0.23*	0.11*	-0.04	0.01	1.00								
(9) Directors	-0.05	0.07	-0.01	-0.08*	-0.06	-0.04	-0.06	0.16*	1.00							
(10)Diversity	-0.05	0.09*	0.01	-0.05	0.03	-0.05	0.09*	0.20*	0.37*	1.00						
(11) CSR	0.11*	0.06	0.01	0.11*	-0.03	-0.01	0.07*	0.06	0.14*	0.01	1.00					
(12) Assurance	0.17*	-0.06	-0.01	-0.05	-0.02	0.01	0.01	0.14*	0.01	0.01	0.17*	1.00				
(13) Big4	0.15*	-0.10*	-0.04	0.05	0.07	-0.06	0.02	0.07*	0.03	-0.04	0.08*	0.60*	1.00			
(14) oROA	0.01	0.04	-0.01	-0.02	-0.04	0.06	-0.01	-0.05	0.02	-0.05	-0.05	-0.04	-0.03	1.00		
(15) oLeverage	-0.06	0.01	-0.01	-0.01	-0.10*	0.10*	-0.03	-0.05	-0.01	-0.07	-0.10*	0.05	-0.04	0.00	1.00	
(16) Size	0.14*	-0.08*	-0.14*	0.06	-0.19*	0.18*	-0.14*	-0.28*	-0.36*	-0.19*	0.13*	0.09*	0.09*	-0.16*	-0.10*	1.00

The above table contains Pearson's parametric correlation coefficients for the variables used in the main regression analysis. Variables are defined in Table 5.1.

t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.6.3 Empirical results

Table 5.4 presents the main Poisson regression, which explains the effect of CEO characteristics on B/E disclosure. The main results, reported in column (1) to column (4) of Table 5.3, indicate the effects of CEO gender, CEO power, CEO tenure, and CEO career horizon on a firm's B/E disclosure.

The coefficient of CEO gender (*FCEO*) on a firm's B/E disclosure in column 1 of Table 5.3 shows a negative result ($\boldsymbol{\beta}$ =-0.048), which empirically rejects H1. This is predicted based on the assumptions of upper echelons theory, which posits that female CEOs would provide more B/E disclosure than male CEOs. Conversely, the results imply that male CEOs influence B/E disclosure, although this is not statistically significant. Overall, this research finds no evidence to support the argument that female CEOs and their attributes based on the predictions of upper echelons theory are more ethical and caring for the environment (Carvajal et al., 2021). Rather, the results imply they are less sensitive to the B/E crisis, which has important implications for future boards.

This result is in line with prior studies, which suggest that male CEOs engage in more CSR activities than their female counterparts (Haga et al., 2021; Zhang et al., 2021) and rationalise this by explaining how male CEOs dominate in corporate firms despite reformed initiatives to increase the role of females at the executive level (Zalata et al., 2018). This empirical analysis contrasts with a body of research showing that female CEOs motivate CSR activities (e.g., Lu, 2018; Jeong et al., 2021, McGuiness et al., 2017). Female CEOs may lack knowledge on the B/E crisis or may be unaware of the severity and implications a firm faces, which may justify the results. This highlights the need for collaboration with multidisciplinary teams of key advisors, scientists, and wildlife partnerships, who all need to share knowledge (Jones and Solomon, 2013; Roberts et al., 2021).

This research provides the first insights into the influence of female CEOs and subsequently contrasts prior empirical biodiversity studies, which found that the presence of female executives motivates disclosure (Carvajal et al., 2021; Haque and Jones, 2020). Corporate governance is expected to play an integral role in answering the B/E crisis and achieving the SDGs. The literature argues that the presence of females on boards can improve governance, decision-making, positing that the presence of females is an important determinant

of a firm's policies, thus warranting the attention of policymakers, regulators, management and researchers alike (Huang and Kisgen, 2013; Liu, 2018; Nguyen et al., 2020; Zalata et al., 2021). The debate on gender diversity has received growing attention in accounting literature in recent years, with research arguing that the personal attributes of females can influence corporate board decisions (e.g., Elmagrhi et al., 2019; Nguyen et al., 2020; Zalata and Abdelfattah, 2021; Zalata et al., 2019). Consequently, the findings of this research adds to the ongoing debate on corporate justification for mandating gender quotas for boards; these findings provide timely evidence to inform policymakers, particularly in their efforts to achieve the SDGs by 2030 (Liu, 2018; Zalata et al., 2021).

Column 2 of Table 5.4 shows a negative significant result empirically supporting H2 ($\boldsymbol{\beta}$ =-0.171, p<0.01), with results implying that when firms are headed by powerful CEOs (*Power*) they provide more B/E disclosure. This is supported by a body of research in the context of CSR disclosure and related activities (Haga et al., 2021; Jizi et al., 2014; de Villiers et al., 2011). More specifically, prior studies evidence a similar relationship (Carvajal et al., 2021; Haque and Jones, 2020) when examining biodiversity disclosures and therefore an argument is built in the literature that CEO power is an important determinant of B/E disclosure.

The results imply more powerful CEOs provide more B/E disclosure, since they may recognise the severity of the B/E crisis and understand its threat to corporate sustainability, and consequently, they may utilise their power to implement biodiversity strategies to conserve and protect nature. Powerful CEOs are greatly valued in firms that require quick decision-making (Haga et al., 2021; Li et al., 2019), and given the B/E crisis is an evolving corporate challenge, this may justify the results. Conversely, the literature suggests that B/E disclosure is often a dramatization of efforts to protect nature and may be a smokescreen to obfuscate negative impacts (Boiral, 2016). With this in mind, it may be that more powerful CEOs utilise their authority and adopt this strategy to comply with stakeholder demands and pressures and CEOs may be motivated to provide B/E disclosure as a legitimacy exercise, signalling to stakeholders they are responsible corporate citizens (Adler et al., 2018; Atkins et al., 2018; Rimmel and Jonäll, 2013). In summary, the results are explained by the predictions of upper echelons theory, which posits that CEO power is an observable attribute and is a key driver of a firm's B/E disclosure.

H3 predicts that CEOs with short tenure (*Tenure*) will provide more B/E disclosure. The results in column 3 empirically reject this hypothesis and indicate that CEOs with longer tenure influence B/E disclosure; this is statistically significant ($\boldsymbol{\beta}$ =0.008, p<0.01). This result is in line with some empirical studies, which found no association between tenure and CSR disclosures (e.g., Jeong et al., 2021; Oh et al., 2018). The literature informs us CEOs with short tenure are expected to be more motivated to invest in long-term strategies, are more observant of environmental challenges, and are adaptable to change (Chen et al., 2019; Kang, 2016; McClelland et al., 2012). This result may imply CEOs with longer tenure are more experienced, are more committed to the firm due to their long tenure, and thus they may implement biodiversity strategies. Furthermore, CEOs may recognise potential financial risks associated with further B/E loss (Dasgupta, 2021; Deloitte, 2020) and their experience motivates them to influence disclosure. The upper echelons perspective explains how tenure is an important attribute due to top executives' experiences in their tenure (Hambrick and Fukutomi, 1991; Jeong et al., 2021). This result contributes to the discussion in the literature that tenure has significant strategic implications for a firm's performance (Chen et al., 2019; Hambrick and Fukutomi, 1991; Oh et al., 2018) and adds to the debate that, in line with upper echelons expectations, the personal attribute of tenure is significant in the context of B/E reporting.

Finally, column 4 of Table 5.4 shows CEO career horizon (*Horizon*) has a positive and statistically significant effect on B/E disclosure, which supports H4 ($\boldsymbol{\beta}$ =0.017, p<0.01). This result indicates that when CEOs have longer to retire, they are more likely to provide B/E disclosure. Equivalently, the closer CEOs are to retirement, the less likely they are to influence B/E disclosures. This result is in line with a considerable number of studies that highlight the career horizon problem (e.g., Che-Ahmad et al., 2019; Oh et al., 2016; Shahab et al., 2019; Strike et al., 2015). Upper echelons predicts age is a significant observable characteristic in explaining social and sustainability strategies (Oh et al., 2016; Shahab et al., 2019; Wang et al., 2016). This finding provides the first insights into the career horizon problem in the context of B/E accountability. In line with the expectation that CEOs near retirement are more risk averse and may pursue personal strategies (Che-Ahmad et al., 2019; McClelland et al., 2012; Strike et al., 2015), these CEOs may avoid B/E disclosure due to the uncertainty of the crisis and the long-term commitment required to conserve, protect, and reduce impacts to biodiversity. Furthermore, to align with the SDGs by 2030, firms must implement ambitious, transformational goals and policies to avoid material financial risk from the B/E crisis (Dasgupta, 2021). This argument is supported by the notion that CEOs with long career horizon

are more dynamic, less cautious, and incentivised to make decisions with long-term benefits (Chen et al., 2019; Pan et al., 2016). These findings have important implications for future boards in answering the B/E crisis and highlight a possible linkage between future corporate governance and B/E disclosures.

For control variables at the board level, all models results show a positive statistically significant relationship with board size (*Bsize*) and firms who gain assurance (*Assurance*). This is potentially the case because larger boards can be more experienced and knowledgeable and thus may better enhance environmental performance (de Villiers et al., 2011; Haque and Jones, 2020). Significant results are additionally evident with board member affiliations (*Connections*). Finally, regarding the financial control variables, this study found a negative statistically significant relationship with (*Leverage*) and a positive relationship with firm (*Size*), which supports other studies (e.g., Bhattacharyya and Yang, 2019; Haque and Jones, 2020; Roberts et al., 2021).

Table 5.4 Poisson regression of the effect of CEO characteristics on B/E disclosure

BE	(1)	(2)	(3)	(4)	(5)
FCEO	-0.048				
	(-0.74)				
Power		-0.171***			
		(-3.53)			
CEO Tenure			0.008***		
			(4.57)		
Horizon				0.017***	
				(4.47)	
CEO Retire					-0.274***
					(-4.93)
Bsize	0.018***	0.019***	0.021***	0.030***	0.027***
	(3.66)	(3.82)	(3.65)	(4.95)	(4.52)
Connection	0.131***	0.134***	-0.043**	-0.038*	-0.046**
	(9.11)	(9.31)	(-2.19)	(-1.91)	(-2.34)
Directors	-0.015	-0.019	0.437***	0.434***	0.439***
	(-0.16)	(-0.21)	(3.76)	(3.72)	(3.76)
Diversity	-0.086	-0.087	-0.098	-0.116*	-0.117*
	(-1.43)	(-1.46)	(-1.58)	(-1.85)	(-1.85)
CSR	0.080*	0.077	0.076	0.059	0.045
	(1.70)	(1.64)	(1.40)	(1.07)	(0.81)
Assurance	0.380***	0.391***	0.230***	0.240***	0.223***
	(8.82)	(9.06)	(4.63)	(4.75)	(4.43)
Big4	0.002	0.001	0.200***	0.217***	0.224***
	(0.04)	(0.02)	(4.45)	(4.74)	(4.86)
oROA	-1.399	-1.591	0.060	0.005	0.106
	(-0.55)	(-0.62)	(0.02)	(0.00)	(0.04)
oLeverage	-1.649***	-1.634***	-1.544***	-1.353***	-1.403***
	(-9.55)	(-9.52)	(-7.36)	(-6.34)	(-6.60)
size	0.269***	0.262***	0.247***	0.238***	0.250***
	(12.60)	(12.25)	(8.69)	(8.27)	(8.74)
_cons	-4.287***	-4.186***	-3.676***	-3.994***	-3.807***
	(-9.92)	(-9.69)	(-6.80)	(-7.26)	(-6.99)
Year	Y	Y	Y	Y	Y
Sector	Y	Y	Y	Y	Y
Country	Y	Y	Y	Y	Y
N	767	767	611	604	604
R^2					
adj. R^2					

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 5.1 for the definitions of each variable.

5.6.4 Additional analysis

Robustness

In the previous section, Poisson regression was employed to examine the relationship between B/E and CEO characteristics. To ensure the robustness of the main results, in this section a series of additional tests are conducted. (1) The main analysis is re-run by employing a lagged model of the dependent and exploratory variables, (2) all variables in one model are re-run, (3) an alternative measure for CEO career horizon is examined, and (4) two-stage least squares (2SLS) statistical technique is used (Abdelfattah et al., 2021; Elamer et al., 2019; Ullah et al., 2021).

For the first step, the hypotheses is re-examined by running a lagged model of the main regression. This is a method employed in prior research designed to omit endogeneity concerns of reverse causality that could affect the main results (Carvajal et al., 2021; Lui, 2018). Subsequently, table 5.5 presents the Poisson regression analysis, where the dependent variable (*Lag_BE*) and exploratory variables (*Lag_FCEO, Lag_Power, Lag_CEO Tenure, Lag_Horizon*) are examined with year, country, and industry fixed effect. Table 5.5 presents the coefficients, which mostly support the main results, indicating the coefficients of CEO power and CEO career horizon remain statistically supported, and CEO gender and CEO tenure are rejected. Board level and financial control variables remain the same.

Table 5.5 Lagged Poisson regression of the effect of CEO characteristics on B/E disclosure

LagBE	(1)	(2)	(3)	(4)	(5)
Lag_FCEO	-0.103				
	(-1.31)				
Lag_Power		-0.328***			
		(-5.52)			
Lag_CEO Tenure			0.013***		
			(6.13)		
Lag_Horizon				0.014***	
				(3.04)	
Lag_CEO Retire					-0.169**
					(-2.39)
BSize	0.028***	0.028***	0.020***	0.025***	0.021***
	(4.70)	(4.81)	(2.74)	(3.38)	(2.97)
Connection	0.170***	0.176***	-0.016	-0.015	-0.027
	(9.16)	(9.47)	(-0.62)	(-0.57)	(-1.03)
Directors	0.147	0.076	0.821***	0.779***	0.766***
	(1.32)	(0.68)	(5.56)	(5.28)	(5.21)
Diversity	-0.101	-0.083	-0.095	-0.091	-0.114
	(-1.47)	(-1.21)	(-1.33)	(-1.24)	(-1.57)
CSR	0.244***	0.261***	0.096	0.096	0.093
	(4.38)	(4.71)	(1.43)	(1.42)	(1.36)
Assurance	0.350***	0.366***	0.274***	0.273***	0.264***
	(6.97)	(7.28)	(4.68)	(4.62)	(4.47)
Big4	-0.119**	-0.102**	0.088	0.131**	0.128**
	(-2.49)	(-2.15)	(1.62)	(2.37)	(2.31)
oROA	-2.164	-2.403	1.930	2.030	1.603
	(-0.70)	(-0.76)	(0.70)	(0.77)	(0.60)
oLeverage	-1.042***	-1.080***	-1.029***	-0.863***	-0.890***
	(-5.24)	(-5.50)	(-4.47)	(-3.89)	(-3.97)
Size	0.297***	0.284***	0.370***	0.354***	0.366***
	(11.14)	(10.74)	(10.44)	(9.85)	(10.28)
_cons	-4.877***	-4.680***	-5.884***	-5.860***	-5.733***
	(-9.10)	(-8.78)	(-8.70)	(-8.62)	(-8.45)
Year	Y	Y	Y	Y	Y
Sector	Y	Y	Y	Y	Y
Country	Y	Y	Y	Y	Y
N	599	599	481	477	477
R^2					
adj. R^2					

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 5.1 for the definitions of each variable.

Second, for additional support of the main analysis, the CEO career horizon is run by employing an alternative measure. Extant literature adopts an alternative measure of CEO career horizon; therefore, the research follows Jeong et al. (2021) and Fu et al (2021), who measured career horizon as a value of 1 if aged 64 years old and over (*CEO Retire*) and 0 if younger than the age of 64, with the expectation that younger CEOs provide more B/E disclosure. Column 5 of Table 5.4 shows a negative statistically significant result ($\boldsymbol{\beta}$ =-0.274, $p<0.01$). This result supports the findings that a career horizon problem exists in the context of B/E disclosure and younger CEOs with longer to retirement influence greater disclosure. Furthermore, this additional measure is supported in the lagged model in column 5 of Table 5.5. This additional analysis supports and confirms the robustness of the main regression analysis presented.

Third, the main Poisson regression analysis in Table 5.4 regresses each model separately. Table 5.6 presents the equation 5.1 in one model with year fixed effect, which fundamentally supports the main analysis with the exception of CEO power, which is not statistically significant. Overall, these additional robustness examinations confirm and support the findings of the main analysis.

Table 5.6 Poisson regression of the effect of CEO characteristics on B/E disclosure

BE	(1)
FCEO	-0.004
	(-0.05)
Duality	0.077
	(1.46)
CEO Tenure	0.009***
	(4.76)
Horizon	0.011**
	(2.41)
CEO Retire	-0.190***
	(-3.03)
Bsize	0.034***
	(5.47)
Connection	-0.039**
	(-1.97)
Director	0.517***
	(4.34)
Diversity	-0.153**
	(-2.41)
CSR	0.033
	(0.60)
Assurance	0.245***
	(4.82)
Big4	0.197***
	(4.24)
oROA	-0.018
	(-0.01)
oLeverage	-1.381***
	(-6.39)
Size	0.228***
	(7.85)
_cons	-3.901***
	(-7.08)
Year	Y
N	604
R^2	
adj. R^2	

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 5.1 for the definitions of each variable.

To address the endogeneity concern, this research employs the 2SLS instrumental variable approach to address concerns of endogeneity that may arise from unobserved heterogeneity and omitted variable bias (Abdelfattah et al., 2020; Elamer et al., 2019; Ullah et al., 2021). Ullah et al. (2021) explain the 2SLS regression is an appropriate postestimation

technique for empirical justification. The 2SLS requires an additional exogeneous variable, therefore, this research employs the average biodiversity score per year and sector (*BE_Yr_Se*) as the exogeneous instrumental variable. This is because it is associated with the biodiversity score, i.e., the dependant variable. The main independent variables of *FCEO, Power, CEO Tenure,* and *Horizon* are estimated in the main regression models (1-4). The results from the 2SLS are reported in columns 1-4 of Table 5.7. Results from the 2SLS are fundamentally similar to those reported in Table 5.4 and the evidence is fairly robust with regards to any endogeneity concern after directly controlling with 2SLS, supporting the notion that the personal attributes of the CEOs characteristics play a significant role in influencing a firm's B/E disclosure.

Table 5.7 2SLS estimation results for the impact of CEO characteristics on B/E disclosure

BE	(1)	(2)	(3)	(4)
FCEO	-966.805			
	(-1.00)			
Power		-962.598		
		(-0.72)		
CEOTenure			5.188***	
			(3.71)	
Horizon				-17.509**
				(-2.01)
Bsize	4.873	0.947	0.542	1.344
	(0.91)	(0.33)	(0.99)	(1.10)
Connection	-8.653	45.358	9.242***	5.806
	(-0.81)	(0.71)	(2.93)	(1.30)
Directors	32.468	-118.310	27.534**	-55.534
	(0.60)	(-0.68)	(2.02)	(-1.57)
Diversity	29.932	-17.781	-5.279	0.370
	(0.74)	(-0.40)	(-0.68)	(0.03)
CSR	-2.997	5.030	-15.948**	-3.544
	(-0.16)	(0.19)	(-2.36)	(-0.37)
Assurance	17.367	1.625	14.318**	-13.861
	(0.63)	(0.05)	(2.09)	(-1.05)
Big4	-52.410	-29.764	-12.107*	28.030*
	(-0.90)	(-0.57)	(-1.76)	(1.72)
oROA	-1.302	-789.580	93.882	247.829
	(-0.88)	(-0.53)	(0.53)	(0.72)
oLeverage	73.499	36.771	-4.941	-50.293
	(0.80)	(0.41)	(-0.38)	(-1.49)
Size	-4.806	-16.830	1.560	-9.020*
	(-0.70)	(-0.68)	(1.35)	(-1.73)
_cons	57.154	366.326	-124.041***	402.848*
	(0.46)	(0.69)	(-2.87)	(1.94)
N	767	767	611	604
R^2	.	.	.	.
adj. R^2	.	.	.	.

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 5.1 for the definitions of each variable.

Lastly, as a final robustness check, the main regression with Censored Poisson and Multilevel Poisson are re-run; the results (unpresented) remained the same, thus supporting the main regression analysis.

5.6.5 Sub-sample analysis

This section presents a sub-sample analysis with lagged dependent and independent variables with year and sector fixed effects. This section also examines the moderating effects

of CEO gender, developed and developing countries, weak and strong internal governance, pre and post SDGs, firms gaining assurance on CSR reports, CEO power, and finally low and high biodiversity impact industries on B/E disclosure.

CEO gender

The first sub-sample analysis shows the effect of CEO gender on CEO characteristics in Table 5.8. Overall, the results mostly support the main analysis that female CEOs do not motivate B/E disclosure. Interestingly, column 3 reports that male CEOs with long tenure provide more B/E disclosure. The literature explains 'old-boy networks' can be one of the major barriers preventing females progressing to executive roles (Adams, 2016; Zalata et al., 2019; Zalata et al., 2021). Furthermore, column 5 indicates male CEOs with a short career horizon correlate with less B/E disclosure, which may support the push for increasing female representation on corporate boards given their silence on B/E disclosures. A combination of these results may offer some explanation behind how females face difficulty securing an executive role, such as a CEO position, due to males possessing a long tenure in the CEO role. However, the overall results imply male CEOs are providing more accountability and disclosure on the B/E crisis. These findings offer some further insights into the debate of gender diversity in executive roles and support the findings of the main analysis.

Developed and developing nations

The study considers the robustness of the results of the CEO characteristics by dividing the sample into developing and developed countries. The literature argues disclosure may be affected by institutional influences (Alshbili and Elamer, 2019; Roberts et al., 2021). The results are reported in Table 5.9 and overall, the hypotheses are mainly supported particularly in developed nations. Furthermore, the results in column 6 imply CEOs with long tenure in developed countries motivate B/E disclosure. This is in line with the upper echelons perspective that executive characteristics are an important mechanism of B/E disclosure. Furthermore, the sub-sample analysis offers insights into how the CEO career horizon problem is apparent in firms headquartered in both developed and developing countries in respect to B/E disclosure.

Table 5.8 Effect of CEO gender on CEO characteristics

Lag_BE	(1) (Male)	(2) (Female)	(3) (Male)	(4) (Female)	(5) (Male)	(6) (Female)
Lag_Power	-0.380**	-1.682*				
	(-2.30)	(-1.65)				
Lag_CEO Tenure			0.009*	-0.036		
			(1.70)	(-0.36)		
Lag_Horizon					0.027***	-0.005
					(2.61)	(-0.06)
Bsize	0.013	0.098*	0.007	0.024	0.007	0.027
	(1.30)	(1.76)	(0.53)	(0.74)	(0.61)	(0.55)
Connection	0.203***	-0.716***	0.098*	-1.169***	0.092*	-1.131***
	(4.61)	(-3.08)	(1.89)	(-4.43)	(1.96)	(-4.69)
Directors	-0.219	-9.875***	0.226	-10.311***	0.263	-11.131***
	(-0.83)	(-3.62)	(0.69)	(-2.97)	(0.80)	(-3.44)
Diversity	-0.082	-6.372***	0.052	-5.983**	0.084	-5.269***
	(-0.85)	(-3.43)	(0.57)	(-2.37)	(0.95)	(-2.76)
CSR	0.334**	3.908**	0.266	1.732**	0.283	1.745**
	(2.28)	(2.45)	(1.38)	(2.00)	(1.45)	(2.11)
Assurance	0.290**	0.442	0.241	0.272	0.260	0.135
	(2.03)	(1.29)	(1.39)	(0.48)	(1.50)	(0.31)
Big4	0.090	-3.595***	0.290**	-4.688***	0.288**	-4.191***
	(0.76)	(-5.44)	(2.18)	(-3.09)	(2.16)	(-3.72)
oROA	-1.010	-221.635*	0.093	-46.329	-0.142	-32.175
	(-0.19)	(-1.69)	(0.02)	(-0.68)	(-0.03)	(-0.58)
oLeverage	-1.139***	-9.646**	-0.856*	-3.696*	-0.863*	-3.499*
	(-2.58)	(-2.00)	(-1.87)	(-1.70)	(-1.81)	(-1.80)
size	0.129***	2.767***	0.127***	3.099***	0.148***	2.841***
	(4.43)	(7.95)	(3.63)	(3.81)	(3.95)	(6.14)
_cons	-2.860***	-50.949***	-2.628**	-45.388***	-3.375***	-40.995***
	(-3.02)	(-5.43)	(-2.52)	(-3.27)	(-2.86)	(-5.91)
Year	Y	Y	Y	Y	Y	Y
Sector	Y	Y	Y	Y	Y	Y
N	558	41	440	41	436	41
R^2						
adj. R^2						

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 5.1 for the definitions of each variable.

Table 5.9 Effect of CEO characteristics on a firm's B/E disclosure in developing and developed countries

Lag_BE	(1) (Devng)	(2) (Deved)	(3) (Devng)	(4) (Deved)	(5) (Devng)	(6) (Deved)	(7) (Devng)	(8) (Deved)
Lag_FCEO	0.372	-0.198						
	(1.48)	(-0.73)						
Lag_Power			0.109	-0.193				
			(0.56)	(-1.02)				
Lag_CEO Tenure					-0.002	0.011*		
					(-0.15)	(1.84)		
Lag_Horizon							0.068*	0.018*
							(1.68)	(1.66)
Bsize	0.002	0.032***	-0.004	0.031***	-0.056	0.034***	-0.008	0.031**
	(0.12)	(2.77)	(-0.19)	(2.63)	(-1.50)	(2.60)	(-0.26)	(2.52)
Connection	0.371***	0.145***	0.364***	0.151***	0.316*	0.032	0.427***	0.024
	(3.71)	(2.66)	(3.74)	(2.75)	(1.70)	(0.55)	(2.84)	(0.43)
Directors	0.235	0.065	0.256	0.002	0.996**	0.823*	1.200**	0.717
	(0.75)	(0.17)	(0.76)	(0.00)	(2.11)	(1.85)	(2.12)	(1.64)
Diversity	1.512**	-0.048	1.714**	-0.049	1.563	0.037	1.344	0.034
	(1.96)	(-0.47)	(2.26)	(-0.50)	(1.48)	(0.38)	(1.42)	(0.37)
CSR	0.213	0.253	0.247	0.260	-0.691*	0.126	-0.199	0.100
	(1.03)	(1.34)	(1.25)	(1.38)	(-1.73)	(0.61)	(-0.55)	(0.49)
Assurance	0.014	0.384**	-0.022	0.389**	0.017	0.331*	-0.146	0.334*
	(0.06)	(2.38)	(-0.09)	(2.42)	(0.05)	(1.93)	(-0.43)	(1.95)
Big4	0.156	0.016	0.157	0.015	0.514	0.185	0.455	0.190
	(0.61)	(0.12)	(0.58)	(0.11)	(1.38)	(1.29)	(1.59)	(1.38)
oROA	-2.335	-2.455	-10.338	-2.211	-11.138	-0.576	-61.114***	0.681
	(-0.11)	(-0.39)	(-0.46)	(-0.35)	(-0.62)	(-0.09)	(-2.61)	(0.11)
oLeverage	-1.524	-1.405**	-1.046	-1.470**	-0.980	-1.190*	2.318**	-1.160*
	(-1.46)	(-2.41)	(-1.17)	(-2.51)	(-0.87)	(-1.93)	(2.11)	(-1.90)
size	0.034	0.197***	0.025	0.194***	0.011	0.221***	-0.058	0.259***
	(0.52)	(5.37)	(0.40)	(5.34)	(0.13)	(5.25)	(-0.59)	(5.83)
_cons	0.452	-4.003***	0.459	-3.893***	1.626	-4.606***	-0.934	-5.213***
	(0.31)	(-4.00)	(0.31)	(-3.99)	(1.00)	(-4.45)	(-0.30)	(-4.54)
Year	Y	Y	Y	Y	Y	Y	Y	Y
Sector	Y	Y	Y	Y	Y	Y	Y	Y
N	113	486	113	486	58	423	56	421
R^2								
adj. R^2								

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 5.1 for the definitions of each variable. Devng indicates developing country, Deved indicates developed country.

Exogenous shock SDGs

Similar to Chapter Four, the exogeneous shock of the pre and post SDG period is subsequently examined. As explained in Chapter Two, the SDGs are the most recent global call to action to transform the planet by 2030 and specifically halt biodiversity decline (UN, 2020). Previous works (Carvajal et al., 2021) have examined the exogeneous shock of the 2010-2020 UN biodiversity strategy as a moderating factor in empirical analysis, however a limitation of this is that the 2010-2020 framework is outdated and considered a failure, with few firms providing disclosure (CBD, 2020; Hassan et al., 2021); thus, the current SDG strategy is examined. Table 5.10 offers support for the main analysis, indicating the results are not driven by the SDGs, which is in line with upper echelons predictions that the personal attributes of the CEO are more powerful than institutional pressures (Carpenter et al., 2004; Hambrick and Mason, 1984). Column 6 of Table 5.10 offers some support that CEOs with long tenure provide more B/E disclosure in the post- SDG period, and there is significance with the CEO career horizon problem in both pre- and post- SDG period. Although this indicates that CEO tend to avoid conforming to pressures, in order to meet the SDGs by 2030 and responsibly contribute to preventing further biodiversity decline, CEOs must drive corporate strategies to become responsible citizens by implementing ambitious strategies to reduce impact, conserve and protect nature. These factors are thus essential for long-term corporate sustainability via providing B/E disclosure.

Table 5.10 Effect of CEO characteristics on a firm's B/E disclosure pre and post SDGs

Lag_BE	(1) (Pre)	(2) (Post)	(3) (Pre)	(4) (Post)	(5) (Pre)	(6) (Post)	(7) (Pre)	(8) (Post)
Lag_FCEO	0.431	-0.022						
	(0.61)	(-0.08)						
Lag_Power			-0.497	-0.184				
			(-1.27)	(-1.08)				
Lag_CEO Tenure					0.012	0.011*		
					(0.90)	(1.91)		
Lag_Horizon							0.035*	0.026**
							(1.85)	(2.46)
Bsize	0.067***	0.002	0.058***	0.002	0.076***	-0.009	0.072***	-0.009
	(3.57)	(0.18)	(2.98)	(0.13)	(2.78)	(-0.65)	(2.70)	(-0.67)
Connection	0.247***	0.169***	0.237***	0.177***	0.071	0.108**	0.056	0.097**
	(2.73)	(3.45)	(2.59)	(3.55)	(0.51)	(2.01)	(0.49)	(2.01)
Directors	1.490**	-0.238	1.188**	-0.314	1.946***	0.219	2.054***	0.201
	(2.36)	(-0.83)	(2.02)	(-1.09)	(2.58)	(0.62)	(2.74)	(0.58)
Diversity	-1.070**	-0.015	-0.964**	-0.011	-0.458	0.092	-0.296	0.122
	(-2.12)	(-0.16)	(-1.98)	(-0.12)	(-1.17)	(0.96)	(-0.80)	(1.31)
CSR	-0.097	0.364**	-0.003	0.366**	-0.288	0.231	-0.190	0.252
	(-0.32)	(2.37)	(-0.01)	(2.38)	(-0.72)	(1.21)	(-0.56)	(1.25)
Assurance	0.388	0.300**	0.328	0.311**	-0.056	0.291*	-0.039	0.299*
	(1.30)	(2.01)	(1.12)	(2.09)	(-0.15)	(1.72)	(-0.10)	(1.78)
Big4	0.027	0.096	-0.019	0.094	0.494**	0.234	0.369	0.259*
	(0.11)	(0.73)	(-0.07)	(0.72)	(2.20)	(1.63)	(1.61)	(1.83)
oROA	-7.236	0.335	-9.150	0.732	-14.111	1.571	-13.938	1.562
	(-0.69)	(0.05)	(-0.95)	(0.11)	(-1.26)	(0.24)	(-1.21)	(0.24)
oLeverage	-1.005	-1.082**	-0.693	-1.068**	0.461	-0.983*	0.545	-1.008*
	(-0.97)	(-2.26)	(-0.74)	(-2.19)	(0.56)	(-1.84)	(0.63)	(-1.81)
size	0.289***	0.121***	0.244***	0.119***	0.329***	0.119***	0.355***	0.140***
	(4.37)	(3.84)	(3.70)	(3.87)	(2.91)	(3.39)	(3.61)	(3.65)
_cons	-9.214***	-1.466	-8.048***	-1.373	-9.456***	-1.502	-10.413***	-2.076*

	(-3.96)	(-1.64)	(-3.55)	(-1.58)	(-3.14)	(-1.53)	(-3.70)	(-1.91)
Year	Y	Y	Y	Y	Y	Y	Y	Y
Sector	Y	Y	Y	Y	Y	Y	Y	Y
N	157	442	157	442	125	356	125	352
R^2								
adj. R^2								

The above table represents regression coefficients and t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01. See Table 5.1 for the definitions of each variable.

Difference-in-Difference (DiD) analysis

This section follows prior literature and adopts DiD analysis to mitigate the concern of omitted variable bias (Abdelfattah et al., 2020; Hardies et al., 2015; Lu and Wang, 2018). An exogenous shock is an effective method to deal with endogeneity issues. As explained in Chapter 4.6.4, DiD analysis is considered an appropriate way to examine if the SDG announcement in 2015 motivates B/E disclosure. The DiD analysis compares disclosure with a control sample of 400 firms pre- SDG announcement, and 556 firms following the SDG announcement. A dummy variable is created (*SDG*), which is equal to 0 if disclosure is pre-SDG announcement, and a dummy variable of 1 if disclosure is post- SDG announcement, with a final sample of 767 firms. The re-estimated regression models are shown in Table 5.11 where columns 1-4 are the main independent variables *FCEO, Power, CEO Tenure*, and *Horizon*, with the dependent and control variables measured by the change (Δ) from year $t - 1$ to year t. The estimated coefficient for *SDG* is statistically significant at 1% for models 1, 2, 3, and 4 respectively. These findings suggest that the SDG announcement in 2015 is a defining mechanism that influences CEO characteristics to provide B/E disclosure. This finding implies CEOs are conforming to institutional and stakeholder pressures to align with the SDGs. However, the evidence of overall low B/E disclosure may imply that accountability towards impacts and efforts to preserve and protect B/E is inadequate, signalling disclosure is provided as a legitimising strategy, coupled with the CEO attributes of power, long tenure, and showing males tend to be dominant in providing B/E disclosure.

Table 5.11 Difference-in-Difference analysis on the effect of the SDGs

BE	(1)	(2)	(3)	(4)
SDG	1.053***	1.048***	1.069***	1.068***
	(20.24)	(20.12)	(17.86)	(17.67)
FCEO	-0.127**			
	(-2.04)			
Power		-0.083**		
		(-1.96)		
CEO Tenure			0.004***	
			(3.05)	
Horizon				-0.004
				(-1.31)
Bsize	-0.025***	-0.025***	-0.034***	-0.035***
	(-8.54)	(-8.73)	(-9.31)	(-9.38)
Connection	0.000	0.004	-0.053***	-0.060***
	(0.02)	(0.37)	(-4.03)	(-4.63)
Directors	-0.491***	-0.499***	-0.084	-0.117
	(-7.15)	(-7.26)	(-0.99)	(-1.39)
Diversity	-0.205***	-0.213***	0.019	0.026
	(-4.43)	(-4.58)	(0.42)	(0.56)
CSR	0.456***	0.455***	0.401***	0.430***
	(12.66)	(12.63)	(9.26)	(9.92)
Assurance	0.338***	0.337***	0.311***	0.295***
	(8.90)	(8.87)	(7.13)	(6.71)
Big4	0.182***	0.186***	0.305***	0.337***
	(5.61)	(5.74)	(8.16)	(8.91)
oROA	1.209	1.335	1.412	1.419
	(0.80)	(0.88)	(0.83)	(0.83)
oLeverage	-0.556***	-0.558***	-0.830***	-0.824***
	(-5.51)	(-5.54)	(-6.76)	(-6.58)
size	0.028***	0.028***	0.043***	0.038***
	(4.30)	(4.24)	(5.97)	(4.98)
_cons	1.033***	1.051***	0.631***	0.843***
	(5.89)	(5.99)	(3.15)	(4.00)
Year	Y	Y	Y	Y
N	767	767	611	604
R^2				
adj. R^2				

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 5.1 for the definitions of each variable.

Assurance

Furthermore, this study considers the robustness of the results by examining the sample divided into whether firms have gained assurance or not. Table 5.12 indicates some support for the empirical analysis and mainly suggests that CEO characteristics are more powerful than the influence of gaining assurance. The literature suggests assurance is gained to improve the credibility of CSR reports and stakeholders are more confident when reports gain assurance (Farooq and de Villiers, 2017; Kolk and Perego, 2010). Thus, it is possible assurance is provided to impress stakeholders and signal good biodiversity performance and is therefore employed as a greenwashing strategy (Cho et al., 2014; Maroun, 2018). Column 4 of Table 5.12 indicates powerful CEOs provide more B/E disclosure when the CSR report is assured. It may be the case that powerful CEOs realise assurance signals are reliable and credible information, which enhances stakeholders' confidence in information, and thus improves the firm's reputation (Cho et al., 2014; Farooq and de Villiers, 2017) and therefore this motivates B/E disclosure. Furthermore, column 8 of Table 5.12 implies when CEOs have a long career horizon and CSR reports are assured, B/E disclosure increases. Upper echelons predicts that the personal attributes of CEOs who are newer to the role may gain assurance, as they recognise that as a CEO of one of the world's largest firms, they are expected to responsibly account for impacts and gain assurance to prove their abilities and demonstrate they are eager to implement riskier strategies (Shahab et al., 2019).

Table 5.12 Effect of CEO characteristics on a firm's B/E disclosure with and without assurance

Lag_BE	(1) (No)	(2) (Yes)	(3) (No)	(4) (Yes)	(5) (No)	(6) (Yes)	(7) (No)	(8) (Yes)
Lag_FCEO	0.114	0.032						
	(0.37)	(0.10)						
Lag_Power			-0.201	-0.323**				
			(-0.48)	(-1.97)				
Lag_CEO Tenure					0.031***	0.004		
					(2.64)	(0.67)		
Lag_Horizon							0.032	0.034***
							(1.58)	(3.14)
Bsize	-0.053**	0.016	-0.050**	0.014	-0.080**	0.005	-0.076***	0.007
	(-1.99)	(1.47)	(-1.97)	(1.24)	(-2.55)	(0.41)	(-2.65)	(0.61)
Connection	0.221**	0.172***	0.224**	0.188***	0.219**	0.056	0.135	0.065
	(2.24)	(3.50)	(2.26)	(3.74)	(1.97)	(1.04)	(1.44)	(1.29)
Director	0.508	-0.178	0.422	-0.350	0.853	0.231	1.105	0.217
	(0.69)	(-0.59)	(0.58)	(-1.17)	(1.05)	(0.65)	(1.36)	(0.61)
Diversity	-0.235	-0.060	-0.219	-0.048	-0.223	0.128	-0.249	0.190*
	(-1.50)	(-0.47)	(-1.53)	(-0.41)	(-1.43)	(1.15)	(-1.50)	(1.73)
CSR	0.287	0.336*	0.295	0.342**	0.250	0.269	0.114	0.344
	(1.05)	(1.89)	(1.10)	(1.96)	(0.75)	(1.18)	(0.33)	(1.46)
Big4	0.000	0.078	0.000	0.062	0.000	0.278**	0.000	0.253*
	(.)	(0.61)	(.)	(0.51)	(.)	(2.05)	(.)	(1.90)
oROA	12.199	-1.323	8.224	-0.838	32.289	-1.361	18.581	0.182
	(0.42)	(-0.23)	(0.28)	(-0.15)	(1.13)	(-0.22)	(0.64)	(0.03)
oLeverage	0.105	-1.567***	0.171	-1.525***	0.760	-1.447**	1.059	-1.366**
	(0.12)	(-2.65)	(0.20)	(-2.64)	(0.68)	(-2.10)	(0.93)	(-2.04)
size	0.121*	0.135***	0.111*	0.129***	0.099	0.125***	0.122	0.155***
	(1.95)	(4.12)	(1.80)	(3.99)	(1.40)	(3.27)	(1.53)	(3.91)
_cons	-0.182	-2.828***	-0.061	-2.560**	0.814	-2.416**	0.081	-3.488***
	(-0.12)	(-2.65)	(-0.04)	(-2.45)	(0.43)	(-2.25)	(0.04)	(-3.03)
Year	Y	Y	Y	Y	Y	Y	Y	Y
Sector	Y	Y	Y	Y	Y	Y	Y	Y
N	206	393	206	393	168	313	167	310
R^2								
adj. R^2								

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 5.1 for the definitions of each variable.

CSR committees

Table 5.13 presents the results of the sample divided into whether the firm has a CSR committee or not. The presence of CSR committees can influence a firm's policies and

strategies on environmental impact and reporting (Carvajal et al., 2021; Haque and Jones, 2020). Overall, the results are stronger without the presence of CSR committees. This is in contrast with prior studies which found that CSR committees positively influence biodiversity disclosure (Carvajal et al., 2021; Haque and Jones, 2020). Column 4 of Table 5.13 suggests when the firm has a powerful CEO, and a CSR committee is present, this has a negative effect on B/E disclosure. This may imply powerful CEOs fail to take the advice of CSR committees, instead, they are silent on their impacts and effort to protect nature. Column 7 of Table 5.13 further shows an association between the career horizon problem and when there is no CSR committee. This supports the main analysis, that CEOs near retirement fail to engage in B/E disclosure particularly when there is no firm CSR committee. This may be due to the possibility that CEOs near retirement lack knowledge on the B/E crisis and therefore remain silent on such issues. If a CSR committee were present they may provide knowledge on the B/E crisis, which could persuade CEOs to provide disclosure.

Table 5.13 Effect of CEO characteristic on a firm's B/E disclosure with and without CSR committees

Lag_BE	(1) (No)	(2) (Yes)	(3) (No)	(4) (Yes)	(5) (No)	(6) (Yes)	(7) (No)	(8) (Yes)
Lag_FCEO	0.379	-0.109						
	(1.31)	(-0.29)						
Lag_Power			0.149	-0.507***				
			(0.59)	(-2.79)				
Lag_CEO Tenure					0.009	0.013**		
					(0.79)	(2.01)		
Lag_Horizon							0.034*	0.018
							(1.89)	(1.47)
Bsize	0.019	0.022*	0.020	0.019*	0.031	0.009	0.035*	0.009
	(1.10)	(1.87)	(1.13)	(1.68)	(1.36)	(0.61)	(1.66)	(0.65)
Connection	0.268***	0.135**	0.258***	0.142***	0.276***	-0.019	0.263***	-0.025
	(3.59)	(2.42)	(3.42)	(2.59)	(2.87)	(-0.28)	(3.22)	(-0.37)
Directors	-0.107	0.054	-0.084	-0.146	-0.248	0.702*	-0.068	0.679*
	(-0.29)	(0.16)	(-0.23)	(-0.43)	(-0.50)	(1.68)	(-0.13)	(1.66)
Diversity	-0.042	-0.128	-0.044	-0.125	-0.006	0.102	0.033	0.112
	(-0.37)	(-0.93)	(-0.40)	(-0.96)	(-0.04)	(0.84)	(0.25)	(0.97)
Assurance	0.558***	0.214	0.570***	0.239	0.423*	0.186	0.385*	0.253
	(2.70)	(1.17)	(2.76)	(1.34)	(1.74)	(0.86)	(1.71)	(1.13)
Big4	-0.417*	0.302**	0.463**	0.289**	-0.325	0.512***	-0.292	0.510***
	(-1.87)	(2.01)	(-2.01)	(1.99)	(-1.36)	(3.03)	(-1.27)	(2.92)
oROA	0.080	13.398	-1.335	13.057	-3.438	6.391	-2.973	7.200
	(0.01)	(1.10)	(-0.18)	(0.99)	(-0.36)	(0.46)	(-0.33)	(0.46)
oLeverage	-0.708	-1.881***	-0.607	-1.930***	-0.360	-1.322	-0.232	-1.405
	(-1.29)	(-2.75)	(-1.07)	(-2.78)	(-0.49)	(-1.53)	(-0.34)	(-1.52)
size	0.119**	0.153***	0.115**	0.140***	0.118*	0.158***	0.133*	0.177***
	(2.33)	(4.43)	(2.29)	(4.16)	(1.92)	(3.98)	(1.89)	(3.96)
_cons	-2.261	-2.076*	-2.071	-1.657	-2.541	-2.229*	-3.389*	-2.628*
	(-1.62)	(-1.78)	(-1.52)	(-1.44)	(-1.38)	(-1.82)	(-1.74)	(-1.88)
Year	Y	Y	Y	Y	Y	Y	Y	Y
Sector	Y	Y	Y	Y	Y	Y	Y	Y
N	200	399	200	399	151	330	150	327
R^2								
adj. R^2								

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 5.1 for the definitions of each variable.

Power

This section examines the effect of CEO power on the sample. The results in Table 5.14 suggest a strong CEO can negatively affect some CEO characteristics. Overall, this supports the notion that CEO power is an important mechanism of B/E disclosure, which affects other personal attributes and is consistent with the predictions of the upper echelon's perspective (de Villiers et al., 2011; Jeong et al., 2021; Hambrick and Mason, 1984). The findings suggest

when a CEO is more powerful this can have a negative effect on CEO gender and CEO tenure. However, column 5 indicates more B/E disclosure is provided when CEOs have longer to retire, and when the CEO is does not chair the board. This offers support for the main findings of the career horizon problem regardless of CEO power, which supports the argument that CEOs close to retirement avoid uncertain strategies with unknown outcomes and are more inclined to focus on self-serving agendas (McClelland et al., 2012; Oh et al., 2016; Strike et al., 2015).

Table 5.14 Effect of CEO characteristics on a firm's B/E disclosure with CEO power

Lag_BE	(1) (No)	(2) (Yes)	(3) (No)	(4) (Yes)	(5) (No)	(6) (Yes)
Lag_FCEO	0.104	-1.444**				
	(0.46)	(-2.50)				
Lag_CEO Tenure			0.009	-0.107***		
			(1.61)	(-4.05)		
Lag_Horizon					0.027***	-0.042
					(2.69)	(-1.47)
Bsize	0.011	0.050	0.003	0.013	0.003	0.035
	(1.10)	(1.12)	(0.27)	(0.29)	(0.23)	(0.76)
Connection	0.198***	-0.051	0.103*	-0.365**	0.095*	-0.093
	(4.10)	(-0.35)	(1.74)	(-2.03)	(1.78)	(-0.68)
Directors	-0.164	0.656	0.135	3.196***	0.099	1.729*
	(-0.59)	(0.52)	(0.37)	(3.09)	(0.28)	(1.70)
Diversity	-0.150	-0.212	-0.009	0.136	0.021	-0.097
	(-1.37)	(-0.32)	(-0.09)	(0.23)	(0.23)	(-0.17)
CSR	0.401***	-0.625	0.306*	0.168	0.351*	-0.666
	(2.69)	(-1.38)	(1.65)	(0.30)	(1.88)	(-1.42)
Assurance	0.244*	0.917**	0.176	1.392***	0.191	0.999**
	(1.75)	(2.35)	(1.07)	(3.09)	(1.18)	(2.49)
Big4	0.095	0.620	0.310**	1.126**	0.317**	0.908**
	(0.75)	(1.45)	(2.29)	(2.37)	(2.34)	(2.13)
oROA	-0.611	-54.594*	-0.646	-34.526**	-0.875	-50.218**
	(-0.10)	(-1.82)	(-0.11)	(-2.07)	(-0.15)	(-2.43)
oLeverage	-0.996**	-4.903	-0.611	-5.656	-0.548	-6.715*
	(-2.29)	(-1.58)	(-1.35)	(-1.48)	(-1.19)	(-1.89)
size	0.129***	0.364***	0.124***	0.460***	0.144***	0.350***
	(4.01)	(2.74)	(3.24)	(3.76)	(3.49)	(2.92)
_cons	-2.772***	-7.631**	-2.446**	-7.277***	-3.093***	-7.261***
	(-2.86)	(-2.35)	(-2.34)	(-2.84)	(-2.75)	(-2.64)
Year	Y	Y	Y	Y	Y	Y
Sector	Y	Y	Y	Y	Y	Y
N	521	78	405	76	401	76
R^2						
adj. R^2						

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 5.1 for the definitions of each variable.

Industry

The final sub-sample analysis is divided into low, and medium-high biodiversity impact sectors to examine the effect on CEO characteristics. This is measured by the F & C (2004) biodiversity industry classification, which is applied in prior B/E studies (e.g., Hassan et al.,

2020 Rimmel and Jonäll, 2013). Interestingly, column 8 of Table 5.15 indicates the career horizon problem is amplified in medium/high industries. This implies CEOs with longer tenure to retirement in exploitative industries provide more disclosure. This may be explained by the strong argument in a stream of B/E studies that disclosure is provided to defend legitimacy and firms indulge in impression management techniques, with symbolic disclosure, to impress stakeholders in exploitative industries; thus, it cannot be ruled out as the motivation for disclosure. (Adler et al., 2018; Bhattacharyya and Yang, 2019; Boiral, 2016; Hassan et al., 2020; Solomon et al., 2013). Upper echelons explains CEOs in these high impact industries may provide disclosure, given the characteristic of career horizon recognises they are more likely to engage in long-term strategies and commitments, such as B/E. CEOs in these industries may face external pressures such as conforming to regulations and policies, which may motivate them to provide disclosure and signal they are conforming to such pressures and prove their competencies (Boiral and Heras-Saizarbitoria, 2017).

Nonetheless, to align and contribute to the SDGs and achieve long-term corporate sustainability, a CEO must implement transformational B/E strategies; it is imperative that disclosure is transparent, honest, and sincere and not exercised as a legitimising or greenwashing opportunity as the results suggest. Furthermore, this offers support for the career horizon problem, in line with the upper echelons expectation that CEOs near retirement will not engage in long-term strategies as they are considered risky, with unknown outcomes, subsequently preferring to remain in status quo, which is in line with prior studies (e.g., Finkelstein and Hambrick, 1990; McClelland et al., 2012; Miller et al., 1991). Overall, the results support the main finding and indicate that a firm's industry is an important mechanism of a CEOs characteristics.

Table 5.15 Effect of CEO characteristics on a firm's B/E disclosure in low and high biodiversity impact sectors

Lag_BE	(1) (Low)	(2) (High)	(3) (Low)	(4) (High)	(5) (Low)	(6) (High)	(7) (Low)	(8) (High)
Lag_FCEO	-0.077	0.294						
	(-0.20)	(0.82)						
Lag_Power			-0.408	-0.273				
			(-1.48)	(-1.50)				
Lag_CEO Tenure					0.021***	-0.015**		
					(2.95)	(-2.47)		
Lag_Horizon							0.004	0.048***
							(0.22)	(3.44)
Bsize	0.028**	-0.022	0.028*	-0.022	0.013	-0.030**	0.007	-0.019
	(1.97)	(-1.44)	(1.95)	(-1.44)	(0.67)	(-2.08)	(0.40)	(-1.34)
Connection	0.064	0.017	0.082	0.046	0.002	-0.084	-0.066	-0.029
	(0.91)	(0.30)	(1.16)	(0.75)	(0.02)	(-1.41)	(-0.69)	(-0.47)
Directors	-0.644*	0.337	-0.654*	0.225	-0.137	0.609	-0.442	0.598
	(-1.78)	(0.95)	(-1.83)	(0.62)	(-0.33)	(1.34)	(-1.08)	(1.40)
Diversity	-0.793*	0.247**	-0.827*	0.242**	-0.194	0.247**	-0.205	0.353***
	(-1.90)	(2.33)	(-1.92)	(2.37)	(-0.38)	(2.36)	(-0.38)	(3.34)
CSR	0.815***	0.038	0.821***	0.028	0.428*	-0.035	0.606***	-0.045
	(3.78)	(0.21)	(3.83)	(0.16)	(1.73)	(-0.16)	(2.64)	(-0.22)
Assurance	0.276	0.215	0.267	0.254	0.149	0.279	0.127	0.375*
	(1.25)	(1.08)	(1.22)	(1.29)	(0.63)	(1.24)	(0.53)	(1.70)
Big4	-0.087	0.480***	-0.092	0.449***	0.005	0.651***	0.047	0.533***
	(-0.49)	(2.86)	(-0.52)	(2.78)	(0.02)	(3.65)	(0.22)	(3.15)
oROA	7.016	25.841***	7.886	22.095**	6.893	22.009**	7.109	26.105**
	(1.00)	(2.70)	(1.10)	(2.28)	(1.00)	(1.99)	(1.01)	(2.31)
oLeverage	0.779	-2.957***	0.776	2.698***	0.479	-2.840***	0.696	-2.925***
	(1.54)	(-4.23)	(1.57)	(-3.69)	(0.82)	(-3.39)	(1.20)	(-3.33)
size	0.047	0.155***	0.041	0.150***	0.097***	0.087**	0.080**	0.142***
	(1.28)	(4.19)	(1.14)	(4.08)	(2.62)	(2.11)	(2.00)	(3.31)
_cons	-0.285	-0.469	-0.106	-0.492	-1.301	0.972	-0.435	-1.103
	(-0.30)	(-0.49)	(-0.12)	(-0.52)	(-1.30)	(0.95)	(-0.40)	(-0.91)
Year	Y	Y	Y	Y	Y	Y	Y	Y
Sector	Y	Y	Y	Y	Y	Y	Y	Y
N	399	200	399	200	320	161	318	159
R^2								
adj. R^2								

The above table represents regression coefficients and t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. See Table 5.1 for the definitions of each variable.

5.7 Concluding remarks

This research has empirically examined the effect of the CEO's personal attributes of gender, tenure, power, and career horizon on B/E disclosure. This study is motivated by the lack of empirical evidence regarding how top executives are answering the B/E crisis and thus it responds to calls to examine how firms can contribute to developing solutions for the B/E emergency and meet the SDGs (Gaia and Jones, 2019; Gibassier et al., 2020a; Roberts et al., 2020). It is suggested that CEOs will play an instrumental role in the coming years, since firms are expected to set corporate strategies, policies and commitments to reduce their impacts and protect biodiversity from further decline, given failure to achieve the SDGs will result in extreme consequences for humanity (Dasgupta, 2021; King and Atkins, WEF, 2020). Based on a cross-country sample of the top 200 firms from the Fortune Global over five years, this study offers seminal empirical evidence that CEO attributes are important mechanisms of B/E disclosure.

The analysis of this study indicates that the majority of firms are failing to provide adequate B/E disclosure, implying they are not responsibly engaging in efforts to protect and conserve biodiversity. The results show the B/E disclosure of the world's largest companies is low, sporadic, and vague, which is consistent with prior studies (Adler et al., 2018; Rimmel and Jonäll, 2013; Skouloudis et al., 2019; van Liempd and Busch, 2013). However, the results indicate the B/E disclosure that is provided is motivated by the personal attributes of the CEO. Particularly, when the CEO has the additional power of chairing the board, the firm provides more B/E disclosure. This research also provides evidence of a career horizon problem with B/E disclosure, implying CEOs near retirement are eluding B/E strategies. Conversely, CEOs in earlier tenure are more likely to influence B/E disclosure, although a subsample analysis suggests it cannot be ruled out that CEOs in early tenure engage in legitimising and impression management strategies to signal their competencies and conform to external pressures. Contrary to the study's expectations, the findings suggest CEOs with long tenure motivate B/E disclosure. Finally, this research finds no evidence that female CEOs motivate B/E disclosure, which conflicts a stream of prior studies that suggest female CEOs are pioneers in CSR and environmental disclosures.

This study contributes to the literature in several ways. First, this research enriches existing B/E knowledge by uniquely providing evidence-based insights into the relationship between CEO characteristics and a firm's B/E disclosure. Particularly the results suggest when firms are headed by powerful CEOs they provide more B/E disclosure. Additionally, this

research evidences a career horizon problem exists in B/E reporting, with results indicating CEOs close to retirement avoid engaging in B/E strategies, which is supported by the theoretical assumption of upper echelons. Contrary to recent works in academic literature finding female CEOs stimulate disclosure practices (e.g., Liu, 2018, Jeong et al., 2021; Zalata et al., 2019), in the context of B/E disclosure, this study finds no evidence in support, thus contributing to the debate on gender diversity. Second, this research contributes to the theoretical limitations of upper echelons theory by evidencing that the personal attributes of the CEO are important mechanisms in the context of B/E reporting, in addition to CSR performance and reporting. Third, this research contributes to the growing body of B/E literature, and more broadly to the corporate governance literature, by establishing the importance of CEO characteristics, which compliments other studies that evidence how a CEO's personal attributes are key drivers of corporate decision-making.

Subsequently, the findings of this research are anticipated to be impactful, with important practical and policy implications at the firm level. The findings can affect corporate policies, which informs national policies (Adams et al., 2011; Huang and Kisgen, 2013; Liu, 2018). The empirical evidence can assist, inform and guide corporate boards in developing solutions to meet the SDGs and mitigate any future financial risk from further B/E decline. Furthermore, the results have implications for directors in terms of CEO appointments, and will be of general interest to boards, shareholders, and regulators by highlighting the attributes of CEOs if they wish to enhance B/E accountability.

Finally, this research stresses that the CEO is intrinsic in leading the firm to reduce impacts, restore and rehabilitate biodiversity, and prevent further species extinctions. If a CEO is immersed in unethical practice or irresponsible leadership leading to biodiversity loss or violations, this would have catastrophic consequences with the potential expulsion of the CEO and severe financial and reputation implications for the firm. Leadership from a CEO in terms of the biodiversity crisis is at a pivotal moment, considering the severe implications to business sustainability and humanity in general, who wholly depend on biodiversity for survival (CBD, 2021; Dasgupta, 2021; WEF, 2020). Stakeholder pressures now demand corporate accountability on nature and potentially shareholders may disinvest from irresponsible firms (King and Atkins, 2016). Therefore, this research argues that it is imperative CEOs embed corporate strategies and commitments to sincerely account for B/E and improve disclosure, given inaction is no longer acceptable. Thus, this research highlights which characteristics

influence a firm's guardian at a time when biodiversity is in its most fragile state in human history.

This study contains some limitations, which should be acknowledged and considered as research directions. First, this research uses a sample of the world's largest organisations. Future research may examine small and medium size enterprises to compare and contrast findings. Furthermore, additional characteristics of CEOs, such as the financial experience, education, and research background would be fruitful avenues of research. Finally, this research relies on the use of secondary data. Future research might consider case-studies or interviews with CEOs to better understand motivations, strategies, and their knowledge and plans with regards to the B/E crisis to guide firms in contributing to achieving the SDGs.

Chapter 6 - Summary and Conclusion

Findings, Contributions, Implications, Limitations and Future Research Directions

6.1 Overview

This chapter concludes the thesis, providing a summary of each chapter, with explanations regarding how the chapters answer the research questions, and finally presents empirical evidence to support the conclusions. This thesis sought to address the lack of empirical evidence on which determinant factors motivate corporate firms to provide B/E disclosure. To the best of the researcher's knowledge, this is the first study to examine the relationship between a firm's B/E disclosure, external governance mechanisms, and CEO characteristics. Furthermore, it provides new evidence for factors which influence firms to provide species information. The findings make a number of new contributions, which have important implications for decision-makers, policymakers, regulators, and academics.

Section 6.2 provides a summary of the thesis. Section 6.3 provides the synopsis of the findings of the SLR and empirical chapters. Section 6.4 provides the research contributions. Section 6.5 presents implications and recommendations of the thesis. Finally, section 6.6 presents the limitations of the study and provides future research directions.

6.2 Summary of Thesis

The B/E crisis is recognised as one of the top five global risks to humanity and is considered a defining challenge of our generation. Businesses depend on healthy ecosystems, which are supported by a variety of species. Businesses therefore rely on biodiversity to supply goods and services. Yet, despite business operations being dependent on nature, research examining the relationship between firms and B/E remains underexplored. B/E is an embryonic strand of literature and. in particular, there is limited empirical evidence examining determinant factors motivating firms to provide disclosure on their efforts to reduce impacts on biodiversity and conserve and protect biodiversity and species. Thus, this thesis sought to advance our understanding of corporate accountability towards B/E. To the best of the researcher's knowledge, no previous research has empirically examined the association of external governance mechanisms and CEO characteristics on B/E disclosure. Furthermore, there remains a gap in understanding the relationship between species information and factors which motivate firms to provide species disclosure.

Thus, this thesis enhances our knowledge on corporate accountability for the B/E crisis by examining a sample of the top 200 firms from the Fortune Global from twenty-two countries over a period of five years. These firms are considered leaders in sustainability reporting and significantly impact and rely on biodiversity and healthy ecosystems the most (Addison et al., 2019; Adler et al., 2018; KPMG, 2020). A manual content analysis of a firm's CSR (or equivalent) reports is conducted in this research to capture all relevant information. A twenty-one item B/E disclosure framework is employed, which extends the limitations of prior studies that rely on databases or GRI indicators to examine disclosure. Furthermore, this research values quantitative disclosure higher, as it is suggested in future B/E reporting that the quantitative metric will allow comparable, measurable results across organisations (CBD, 2021; Dasgupta, 2021). Thus, this thesis seeks to determine how the world's largest firms are providing accountability for their impacts and efforts to protect and restore B/E.

6.3 Synopsis of Findings

This thesis is motivated by the dearth of empirical studies examining how firms are responding to the B/E crisis and contributing to achieving sustainable development and

meeting the SDGs by 2030. This study is also motivated by the urgency of the B/E crisis and the existential threat posed by further planetary decline, which has severe implications for humanity if the SDGs are not met. Each of the empirical results chapters focuses on one of the four research questions. This section summarizes findings from each chapter.

Chapter Two builds on the work of Roberts et al. (2020), providing a comprehensive SLR of fifty-one journal publications, chapters, and books of existing B/E literature. By critically analysing the literature, this chapter identifies limitations and gaps in the current literature and provides future research directions. The SLR identifies potential methodologies, theoretical frameworks and samples to enhance our understanding and contribute to the existing literature. Specifically, the SLR identifies the potential to examine firm's accountability for B/E from varied datasets, industries and countries. Notably, the current body of B/E literature distinctly lacks primary data in the form of case studies and interviews, which is a fruitful avenue of research to pursue, given this will facilitate researchers in gaining a better understanding of a firm's rationale and motivation for B/E disclosure. Furthermore, the SLR identifies there is a clear lack of empirical evidence, which influences and motivates the subsequent empirical chapters. Particularly, the SLR identifies the void in researching a firm's species-specific disclosure and the relationship between determinant factors (along with institutional and board level determinant factors) and B/E disclosure, which motivates the empirical chapters.

Chapter Three seeks to understand which factors motivate a firm to provide species disclosure. This chapter extends the work of Roberts et al. (2021) and empirically examines the relationship between a firm's species disclosure and determinant factors which motivate such disclosure. Using a data set of the top 200 companies from the Fortune Global over five years, the results indicate 71% of firms are failing to respond to the B/E crisis, however encouragingly, species disclosure increases over the years of examination. These firms provide no disclosure on their efforts to minimise impacts and protect species and their habitats, which implies the world's largest companies are failing to act responsibly towards the B/E crisis. Poisson regression results indicate firms that gain external assurance, gain assurance form one of the big four accounting providers, engage with wildlife partnerships, along with firms who self-report environmental fines and firms that operate in high biodiversity impact industries have a statistically significant association with a firm's B/E disclosure. Contrary to expectations, firms that gain environmental awards have a negative statistically significant relationship with B/E disclosure. These results are in line with the multi-theoretical framework

of deep ecology, legitimacy, and the dimension of stakeholder theory that species should be valued as a main stakeholder by the firm.

Chapter Four sought to address the lack of empirical evidence regarding how external governance mechanisms affect a firm's B/E disclosure. This research empirically examines the impact of the legal environment, level of corruption, and the national culture of a firm's headquarter country on B/E disclosure. The 200 Fortune Global firms are examined over four years. OLS regression results indicate that firms headquartered in countries with weaker legal systems and with a higher level of corruption disclose more B/E information than those in stronger institutions. Furthermore, the sub-sample analysis identified that the announcement of the SDGs in 2015 was a mechanism for B/E disclosure, with an observable increase in disclosure after the implementation of the goals. Examining the effect of national culture using Hofstede's dimensions, the results indicate that firms in collectivist, masculine, high uncertainty avoidance cultural dimensions have greater motivation for more B/E disclosure. Moreover, an association was found between firms in countries with higher power distance, long-term avoidance, and indulgence, although this was not statistically significant. The results are consistent with legitimacy theory, which suggests firms provide B/E disclosure to signal to stakeholders they are conforming to institutional pressures.

The final empirical chapter sought to understand the effect of the CEOs characteristics on B/E disclosure. Given the CEO is instrumental in embedding policies and strategies in a firm, CEOs will play a pivotal role in firms contributing to achieve the SDGs and sustainable development. Currently, a void exists in the literature explaining the relationship between the CEO and B/E disclosure, which motivated this chapter. Overall, disclosure is found to be minimal, which implies firms' top executives are failing to adequately respond to the B/E crisis. Examining firms that provide disclosure, consistent with the predications of upper echelons theory, Poisson regression analysis provides seminal insights and indicates that the personal attributes of the CEO are important mechanisms of a firm's B/E disclosure. Particularly, thr results demonstrate a statistically significant relationship between B/E disclosure and when the CEO is more powerful by additionally chairing the board. Furthermore, the results provide statistical evidence of a career horizon problem with CEOs and B/E disclosure. This result implies that CEOs near retirement engage less in B/E disclosure, whereas CEOs with a longer time to retire are responding to the B/E crisis and are motivated to provide B/E disclosure. Contrary to expectations, this research finds a statistically significant relationship between CEOs with long tenure and B/E disclosure, which implies CEOs who have held the executive

position for a longer period have a more significant influence a firm's B/E disclosure. Finally, this research finds no evidence that female CEOs motivate B/E disclosure, which contributes to the gender diversity debate in literature.

6.4 Contributions to research

The results of this thesis extend upon and make a number of new contributions to B/E literature. First, this research extends the work of Roberts et al. (2020) and provides the most recent SLR on B/E literature, thereby improving our understanding of how (methods), why (theoretical), and what (evidence) is currently known in B/E literature.

Second, by further extending the research of Roberts et al. (2021), to the best of the researcher's knowledge, this study offers first time evidence that firms with environmental fines, firms gaining assurance on CSR reports by one of the big four accounting firms, and firms being in high impact industries are all factors that motivate firms to provide species disclosure.

Third, and to the best of the researcher's knowledge, this study offers first time evidence on the effect of the external governance mechanisms of legal framework, level of corruption and national culture on a firm's B/E disclosure. The findings are thus impactful as they contradict the assumptions that firms in more regulated institutions with less corruption and a stronger legal framework conform to expectations and institutional pressures and provide more accountability, when in fact the evidence of this research finds the opposite is true.

Fourth, this study provides first time evidence of the effect of the CEO's characteristics on a firm's B/E disclosure. Particularly, this research evidences that a short-term career horizon problem exists in B/E disclosure. Furthermore, this research provides the first insight into CEO gender and finds no evidence to suggest females motivate B/E disclosure. Fifth, this research contributes to the literature uniquely by providing first time evidence on the moderating effect of the SDGs on B/E disclosure.

Sixth, this study contributes to methodological developments by offering a B/E framework that can assist firms to responsibly respond to the B/E crisis and help them achieve the SDGs. Based on GRI indicators, the SDGs, and prior literature, this B/E framework offers an opportunity for progressive disclosure and can potentially be adopted and utilised by organisations. Seventh, to the researcher's knowledge this is the first study to rank quantitative

disclosure higher in B/E disclosure. Eighth, this study contributes to the lack of empirical evidence in the B/E literature and responds to the call to provide evidence-based research.

Ninth, this research offers evidence for the effect of determinant factors on B/E disclosure using a multi-theoretical framework. The results contribute to the theoretical discussion that firms must value species as a main stakeholder in corporate strategy. Furthermore, this study contributes to the upper echelon's perspective and provides evidence that CEO characteristics are important mechanisms of B/E disclosure in addition to financial performance and CSR activities. Tenth, this research contributes by offering potential future research directions based on the evidence of this study warranting further investigation.

Eleventh, the findings of this research contribute generally to the embryonic stream of B/E literature and more broadly to corporate governance literature. Overall, this research enhances our knowledge by improving our understanding of how and why firms are responding to the B/E crisis and what determinant factors motivate them to provide B/E disclosure.

6.5 Implications and Recommendations

The findings of this thesis have a number of important implications for policymakers, regulators, practitioners, corporate boards, investors, and academics, as well as consumers and stakeholders at large. First, the results from all three empirical chapters show overall B/E and species disclosure is disappointingly low, sporadic, and vague. This evidence shows that the world's largest firms are failing to adequately respond to the B/E crisis and lack a commitment to achieving the SDGs, or otherwise fail to understand the severe implications to business sustainability and impact on society at large if biodiversity continues to decline. This signals a need for urgent transformational change, and it is imperative that firms must begin to realise their dependence on healthy biodiversity for sustainable development. Firms must provide transparent and sincere reporting for B/E. The consequences of failing to be responsible corporate citizens may result in material financial risk and severe reputational damage.

Second, the evidence of low disclosure in this thesis gives a clear indication and supports the notion from corporate coalitions for the need for mandatory regulated B/E reporting. Regulators and policymakers must implement a standardised reporting format at a national and firm level and demand compliance from firms and institutions to meet the SDG goals. To incentivise responsible reporting, both governments and institutions must implement ambitious

strategies and policies to protect biodiversity and species which firms must comply with. Consequently, continuing with current voluntary B/E reporting suggests the SDGs will not be met, which will have severe implications for society at large.

Third, this thesis offers methodological implications. The B/E framework employed in this research can be implemented by firms as a starting point for B/E reporting. Presently, B/E disclosure is voluntary, with the GRI guidelines being the most widely adopted reporting format. It is argued they are a mechanism to reference B/E only, while more ambitious, progressive, and advanced reporting is required to halt the B/E crisis. Consequently, the B/E framework offered in this thesis extends the GRI indicators to include the SDG targets, providing the opportunity to disclose information on partnership collaboration, conservation efforts, philanthropic activities, corporate policies, strategies and commitments, biodiversity or species loss from operations, and ongoing fines or claims.

Fourth, B/E reporting requires the collaboration of multi-disciplinary experts, since a lack of knowledge on B/E may be one factor that explains low disclosure. Accountants, scientists, ecologists, and other key advisors must collaborate, since firms' dependence on nature is poorly understood. Subsequently, collaboration particularly with wildlife partnerships, is a defining mechanism that can encourage disclosure, and shared knowledge is essential to develop solutions and mitigate further B/E decline.

Fifth, this thesis has implications for academics who must contribute to enhancing knowledge, achieving sustainable development and SDGs. Inter-disciplinary academic research and practitioner collaboration is required to provide impactful research and help develop solutions. Furthermore, B/E must be embedded in the curriculums of university and professional accounting bodies as future accountants will play a pivotal role in providing B/E reporting.

Sixth, evidence suggests firms must mitigate the risk of unethical behavior by conducting due diligence on supply chains to establish if any illegal or illicit activities exist. This research recommends firms implement annual statements, similar to best practice of modern slavery statements, to eliminate wildlife corruption from their operations and supply chains. Additionally, corporate strategies should include the safeguard of whistle-blowers and embed procedures to investigate the misconduct of employees relating to wildlife corruption.

Seventh, the evidence for a distinct lack of species protection and presence of wildlife corruption is particularly concerning given the suggestion that pandemics such as COVID-19 are a consequence of human infringement on nature. The evidence of this research demonstrates to decision-makers and policy makers the vital need to protect species and their habitats. Eighth, results suggest that the personal attributes of CEOs are important mechanisms of B/E disclosure which have implications for boards when approving CEO selection.

Ninth, this thesis offers various theoretical implications. Insights from deep ecology, legitimacy, institutional, stakeholder, and upper echelons theory can explain the motivations and consequences behind firms providing B/E disclosure. Furthermore, this research adds to stakeholder theory, positing that in order to achieve the SDGs and prevent further B/E decline species must be considered as main stakeholders, which supports the deep ecology perspective of valuing nature for its intrinsic worth. Thus, a shift is required from anthropocentric corporate behaviour.

Tenth, stakeholders, shareholders, and investors must place immense pressure on firms to provide honest and sincere reporting for their impact on nature. Consumer awareness is gaining momentum, particularly since the COVID-19 pandemic. Moreover, firms face increased pressure from environmental groups to be accountable for impacts. Consequently, if firms fail to be responsible corporate citizens they face serious implications, including shareholder disinvestment, reputational damage, stakeholder conflict and material financial risk.

6.6 Limitations and Future Research Directions

The researcher recognises this thesis contains some limitations. This research relies on firms' voluntary disclosure in CSR (or equivalent) reports only. Future research can provide case studies or focus on interviews with corporate heads and managers to better understand motivation and understanding of firms providing B/E disclosure. This will enable a better understanding of their knowledge and awareness of the B/E crisis, and their strategies and plans to contribute to achieving the SDGs and sustainable development. Furthermore, future studies can address sample size limitations or future research could try examining firms in specific industries or examine firms in one country to enhance knowledge. This research focuses on the world's largest companies, future studies may focus on small and medium sized enterprises to compare and contrast findings on B/E disclosure. The researcher tried their best to deal with

endogeneity concerns however there may be limitations which future research may apply different statistical techniques to eliminate potential concerns. This research examines species disclosure quantitatively, future research may examine if higher profile species gain more attention than others, this may provide further insights if species disclosure is provided as impression management strategy. Further quantitative studies may examine other board and ownership characteristics, for example, board education, financial background and expertise, and gender diversity requires more investigation which will provide further insights. Lastly, this study recommends research to closely examine wildlife corruption and illicit and illegal activities particularly in firms in developing countries.

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Appendices

Appendix 1 Definition of key words

Biodiversity	"Biodiversity is short for biological diversity, which can be defined as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (CBD, 2006, non-paginated). It is "the term given to the variety of life on Earth and the natural patterns it forms. The biodiversity we see today is the fruit of billions of years of evolution, shaped by natural processes and, increasingly, by the influence of humans. It forms the web of life of which we are an integral part and upon which we so fully depend" (CBD, 2000, p.2).
Species	"Species is the variety of plants (flora), animals (fauna), fungi, and microorganisms that make up the natural world. Species intricately work together in ecosystems" (WWF, 2021, non-paginated).
Ecosystems	"Ecosystems means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit" (CBD, 2006, non-paginated). Interaction with biodiversity in ecosystems provides healthy goods and services which sustain human life. Ecosystem services benefit humanity by provisioning services such as water, food, and timber; support soil formation and nutrient cycling; regulate water purification, disease, flood, and climate; culturally support spiritual, educational, recreational, and aesthetic benefits" (Millennium Ecosystem Assessment 2005).
Extinct	A "category for a species where there is no reasonable doubt that the last individual potentially capable of reproduction has died or disappeared in the wild" (IUCN, 2021, non-paginated).

Appendix 2 Top 200 companies from Fortune Global 500 List in 2016

1	Walmart	24	Total	47	Walgreens Boots Alliance
2	State Grid	25	Hon Hai Precision Industry	48	HP
3	China National Petroleum	26	General Electric	49	Assicurazioni Generali
4	Sinopec Group	27	China State Construction Engineering	50	Cardinal Health
5	Royal Dutch Shell	28	AmerisourceBergen	51	BMW
6	Exxon Mobil	29	Agricultural Bank of China	52	Express Script Holding
7	Volkswagen	30	Verizon	53	Nissan Motor
8	Toyota	31	Chevron	54	China Life Insurance
9	Apple	32	E.ON	55	JP Morgan Chase
10	BP	33	AXA	56	Gazprom
11	Berkshire Hathaway	34	Allianz	57	China Railway Engineering
12	McKesson	35	Bank of China	58	Petrobras
13	Samsung	36	Honda Motor	59	Trafigura Group
14	Glencore	37	Japan Post Holdings	60	Nippon Telegraph & Telephone
15	Industrial & Commercial Bank of China	38	Costco	61	Boeing
16	Daimler	39	BNP Paribas	62	China Railway Construction
17	UnitedHealth Group	40	Fannie Mae	63	Microsoft
18	CVS Health	41	Ping An Insurance	64	Bank of America Corp
19	EXOR Group	42	Kroger	65	ENI
20	General Motors	43	Société Generale	66	Nestle
21	Ford Motors	44	Amazon	67	Wells Fargo
22	China Construction Bank	45	China Mobile Communications	68	HSBC Holdings
23	AT&T	46	SAIC Motor	69	Home Depot

70	Citigroup	96	Comcast	122	Tewoo Group
71	Siemens	97	Target	123	ArcelorMittal
72	Tesco	98	Pemex	124	Freddie Mac
73	Carrefour	99	Pacific Construction Group	125	Petronas
74	Phillips 66	100	Airbus Group	126	Prudential Financials
75	Banco Santander	101	Metro	127	PepsiCo
76	Lukoil	102	China South Industries Group	128	Panasonic
77	Credit Agricole	103	Johnson & Johnson	129	Huawei Investment & Holding
78	Enel	104	MetLife	130	China FAW Group
79	Hitachi	105	China Post Group	131	JX Holdings
80	Electricite de France	106	Munich Re Group	132	China Communications
81	Dongfeng Motor Group	107	US Postal Service	133	Vodafone Group
82	IBM	108	Deutsche Post	134	China North Industries
83	Valero Energy	109	China National Offshore Oil	135	Dai-ichi Life Holdings
84	Hyundai Motor	110	China Communications Construction	136	United Technologies
85	Anthem	111	AEON	137	Telefonica
86	Procter & Gamble	112	Archer Daniels Midland	138	Marubeni
87	Robert Bosch	113	Sony	139	Sinochem Group
88	BASF	114	Nippon Life Insurance	140	Peugeot
89	Engie	115	Banco do Brasil	141	Zurich Insurance Group
90	Deutsche Telekom	116	Noble Group	142	Aetna
91	China Resources Natural	117	ING Group	143	Aviation Industry Corp. of China
92	SoftBank Group	118	Rosneft Oil	144	Auchan Holding
93	State Farm Insurance Cos	119	Peoples Insurance Co. of China	145	Statoil
94	Alphabet	120	Marathon Petroleum	146	PTT
95	China Southern Power Grid	121	COFCO	147	Unilever

148	Lowe's	174	RWE	200	PowerChina
149	UPS	175	Novartis		
150	AIG	176	Woolworths		
151	Mitsubishi	177	Tokyo Electric Power		
152	Prudential Financials	178	Renault		
153	Bank of Communications	179	Seven & I Holdings		
154	America Movil	180	LG Electronics		
155	Groupe BPCE	181	Barclays		
156	CITIC Group	182	CNP Assurances		
157	Louis Dreyfus	183	Cisco Systems		
158	Intel	184	ThyssenKrupp		
159	Itau Unibanco Holding	185	JBS		
160	Beijing Automotive Group	186	Pfizer		
161	Indian Oil	187	DOW Chemical		
162	Humana	188	Sysco		
163	Shandong Weiqao Pioneering Group	189	China Merchants Bank		
164	Disney	190	Amer International Group		
165	Bayer	191	Mitsubishi UFJ Financial Group		
166	Deutsche Bank	192	FedEx		
167	Roche Group	193	Lloyds Banking Group		
168	BHP Billiton	194	Caterpillar		
169	Toshiba	195	Industrial Bank		
170	Finatis	196	Saint-Gobain		
171	Wesfarmers	197	Lockheed Martin		
172	Korea Electric Power	198	New York Life Insurance		
173	POSCO	199	Sberbank		

Appendix 3 F&C (2004) Report Industry Classification

RED	AMBER	GREEN
Construction & Building		
	Beverages	Aerospace & Defence
Electricity		
	Chemicals	Automobiles & parts
Food & Drug Retailers		
	Financial services	Diversified Industries
Food Producers and Processors	General Retailers	Electronic & Electrical equip
Forestry & Paper	Household Goods & Textiles	Engineering & Machinery
Leisure & Hotel	Personal care & Household products	Health
Mining	Pharma & Biotech	Information Technology Hardware
Oil & Gas	Support services	Media & entertainment
	Tobacco	Software & computer services
	Transport	Steel and other metals

Appendix 4 Censored Poisson regression

NoSpecies	(1)	(2)
Assurance	2.883***	2.883***
	(26.89)	(3.06)
Big4	1.304***	1.304
	(23.42)	(1.40)
Award	-1.181***	-1.181
	(-23.43)	(-1.09)
Partner	1.721***	1.721***
	(36.60)	(2.62)
SelfFine	1.304***	1.304*
	(9.70)	(1.72)
Industry	0.222***	0.222
	(5.32)	(0.30)
GDPGrowth	-1.408***	-1.408**
	(-21.74)	(-2.06)
Inflation	0.164***	0.164
	(6.28)	(0.51)
C02Emission	0.307***	0.307
	(13.09)	(1.57)
ForestArea	0.000***	0.000**
	(9.77)	(2.17)
Governance	3.684***	3.684***
	(30.59)	(2.69)
oROA	-20.373***	-20.373
	(-6.03)	(-0.91)
oLeverage	-30.540***	-30.540***
	(-93.33)	(-5.17)
Size	-1.276***	-1.276***
	(-56.24)	(-4.09)
_cons	-1.492***	-1.492
	(-3.04)	(-0.27)
Year	Yes	Yes
Country	Yes	Yes
N	545	545
R^2		
adj. R^2		

Column (1) presents year and country fixed effects. Column (2) presents year and country fixed effects with robustness. *t* statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix 5 Poisson regression

NoSpecies	(1)	(2)
Assurance	3.277***	1.467*
	(3.67)	(1.73)
Big4	-2.986***	3.304***
	(-3.76)	(4.20)
Award	-3.788***	0.492
	(-4.95)	(0.87)
Partner	5.570***	3.973***
	(4.54)	(4.21)
SelfFine	-0.910	1.223*
	(-1.07)	(1.87)
Industry	1.018	0.253
	(1.52)	(0.55)
GDPGrowth	-0.142	0.404
	(-0.41)	(0.67)
Inflation	0.381	1.258***
	(1.26)	(3.41)
C02Emission	0.071	0.057
	(0.36)	(0.62)
ForestArea	-0.000	-0.000***
	(-0.06)	(-4.51)
Governance	1.369	-39.049***
	(1.42)	(-3.48)
oROA	91.494***	-25.541
	(2.72)	(-1.41)
oLeverage	-18.386***	-49.610***
	(-6.55)	(-5.55)
Size	-0.104	-1.648***
	(-0.34)	(-4.53)
_cons	-2.256	157.029***
	(-0.34)	(4.85)
Year	Yes	Yes
Country	Yes	Yes
N	143	402
R^2		
adj. R^2		

Column (1) presents Poisson regression with year and country fixed effects and robustness in developing countries. Column (2) presents Poisson regression with year and country fixed effects and robustness in developed countries. *t* statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix 6 Chapter Four sample by country

Country	Observations	Percent
Australia	12	1.53
Brazil	16	2.05
China	146	18.67
France	59	7.54
Germany	64	8.18
India	4	0.51
Italy	16	2.05
Japan	76	9.72
Luxembourg	4	0.51
Malaysia	4	0.51
Mexico	7	0.90
Netherlands	16	2.05
Norway	4	0.51
Russia	15	1.92
Singapore	5	0.64
South Korea	21	2.69
Spain	8	1.02
Switzerland	20	2.56
Taiwan	4	0.51
Thailand	4	0.51
UK	32	4.09
USA	245	31.33
Total	**782**	**100.00**